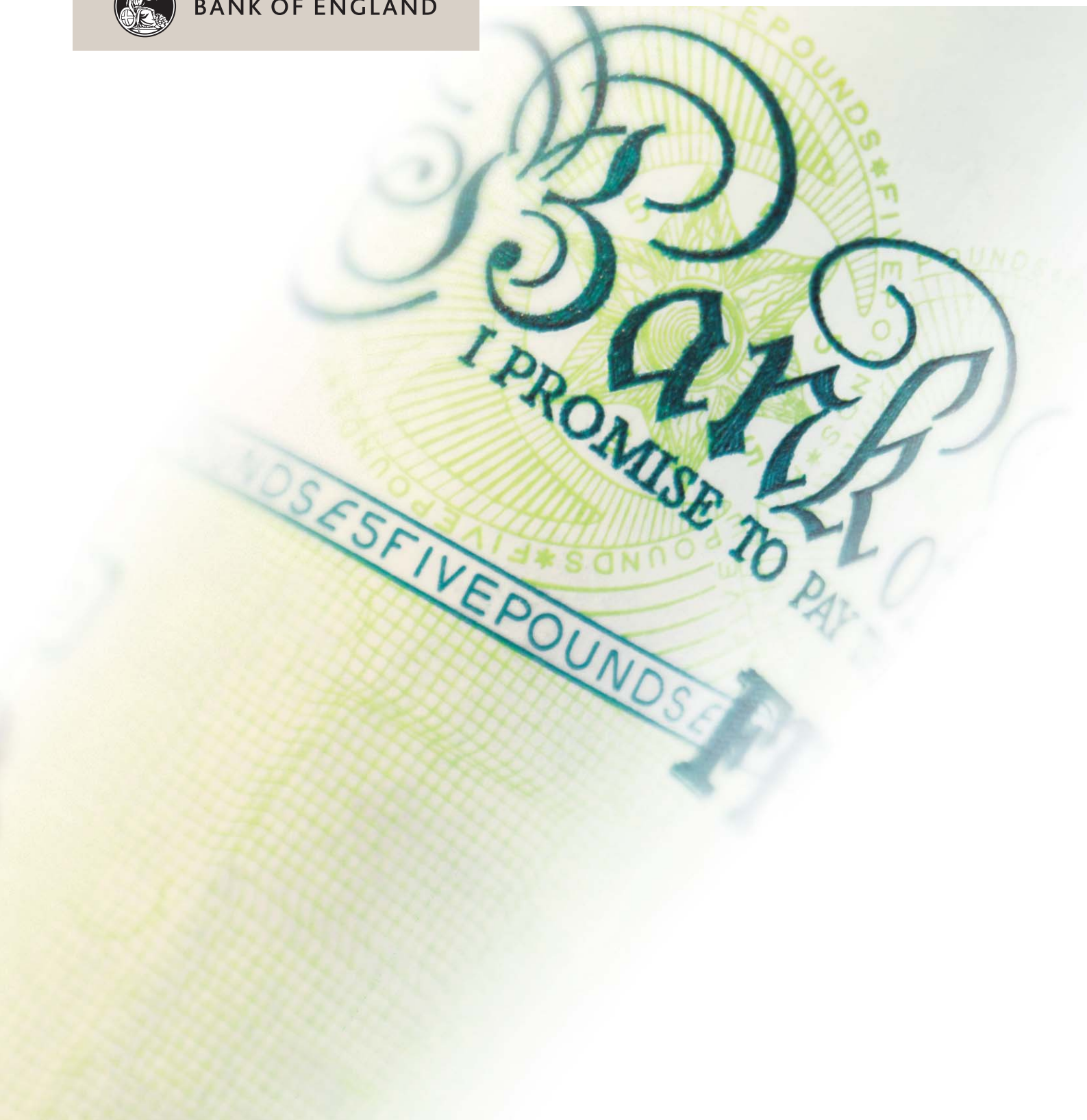
Quarterly Bulletin

2008 Q1 | Volume 48 No. 1

BANK OF ENGLAND



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Foreword

This edition of the *Quarterly Bulletin* begins with the regular *Markets and operations* report, summarising recent developments in global capital markets and the Bank's official operations over the past three months. There were some signs of improvement in sterling money markets around the turn of the year, but during February conditions deteriorated again and wider funding markets remained impaired. Furthermore, UK equity markets fell quite sharply in January and became more volatile.

A concern has been the extent to which developments in advanced economies' financial markets might impact on capital flows to emerging market economies. Guillermo Felices, Glenn Hoggarth and Vasileios Madouros look at the strength of capital flows to emerging market economies in recent years. They conclude that a reversal of these inflows is less likely than in the past, as to a large extent they reflect stronger policy frameworks and outcomes in these economies, which have enabled them to attract more foreign direct investment and issue debt denominated in their own currency. That could also help to explain why asset prices in emerging market economies have been rather less affected by the present financial turmoil than might have been expected on the basis of previous episodes of financial market disruption. Nevertheless some countries in central and eastern Europe, which have attracted large foreign currency debt inflows to the private sector as the counterpart to their current account deficits, remain potentially vulnerable.

Innovation in financial markets in principle allows risk to be carried by those best able to bear it. The development of portfolio insurance is one example. Darren Pain and Jonathan Rand describe how portfolio insurance allows investors to limit the downside risk to the value of their portfolios. They go on to discuss how portfolio insurance can, in certain circumstances, interact with market frictions, such as illiquidity or imperfect information, to increase market volatility. Nevertheless the Bank's market contacts have indicated that hedging strategies followed by institutions issuing portfolio insurance are unlikely to have contributed significantly to the volatility in financial markets since last summer.

Timely information on how the economy is evolving is essential if the Monetary Policy Committee (MPC) is to meet its mandate to achieve the 2% target for CPI inflation effectively. The Bank's Agents play a key role in providing the MPC with such information. Jacqueline Dwyer reviews how the Agents' economic intelligence is used to support the formulation of monetary policy, highlighting the value of direct information from business people on how they are responding to changes in the economic environment.

One key feature over the past ten years has been the increase in the share of UK imports sourced from the emerging market economies, such as China. Using detailed information on the cost of products imported from different countries, Conall Mac Coille estimates the quantitative impact

of these developments on UK import prices. But while this exploitation of gains from trade has pushed down on the prices of manufactured goods in the United Kingdom, the expansion of manufacturing production by economies like China has also put upward pressure on other prices, for example energy and raw material costs.

The interest rates that matter most for the spending decisions of businesses and households depend not only on the current setting of Bank Rate, but also on the path that it is expected to follow over the future. So market participants need to understand how the MPC is likely to respond to incoming data. Consequently, effective communication is at the heart of a successful monetary policy. As part of its efforts to monitor and improve its monetary policy communication strategy, the Bank last year asked the Society of Business Economists to conduct a survey of its members' views. Tim Taylor, Iain de Weymarn and Bronwyn Curtis present the results of this survey. They also discuss how recent changes in the discussion of the outlook and risks in the *Inflation Report* are intended to address the lessons contained therein.

Charles Bean
Chief Economist and Executive Director for Monetary Policy, Bank of England.

Research work published by the Bank is intended to contribute to debate, and does not necessarily reflect the views of the Bank or of MPC members.

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Except where otherwise stated, the source of the data used in charts and tables is the Bank of England or the Office for National Statistics (ONS). All data, apart from financial markets data, are seasonally adjusted.

Recent economic and financial developments

Markets and operations

This article reviews developments in sterling financial markets since the 2007 Q4 *Quarterly Bulletin* up to the end of February 2008. The article also reviews the Bank's official operations during this period.

Sterling financial markets(1)

Overview

There were some signs of improvement in sterling money markets in December and early January, including a more orderly year-end period than many market participants had feared. But during February, conditions deteriorated again. While banks were reportedly able to raise very short-term funds — up to around one month — longer-maturity funding markets remained impaired.

Information from market prices and comments by market participants suggested that difficult conditions in bank term funding markets would continue for some time, which would be likely to lead to a reduction in the supply of credit to the economy generally. This could act as a drag on economic activity, and in turn could prompt further deterioration in the quality of banks' assets and limit their ability and willingness to lend. Perhaps consistent with perceptions of possible adverse feedback effects between banks' balance sheets and the macroeconomy, UK equity markets fell quite sharply in January (and became more volatile).

Against that background, uncertainty about the future path of short-term interest rates increased. Expectations for the future path of Bank Rate fell further.

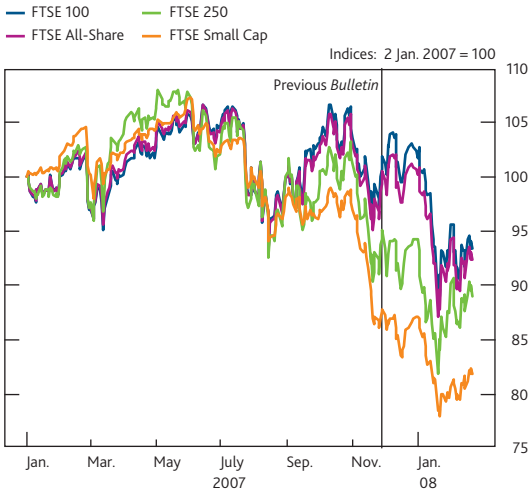
Recent developments in sterling capital markets

Equities

Through most of the second half of 2007, the ongoing stress in financial markets had been largely concentrated in credit and bank funding markets. However, in recent months, UK equity markets weakened quite sharply, in line with a global fall in equity prices. This continued the falls of November reported in the previous *Bulletin*. The share price declines were experienced by smaller and larger firms alike, suggesting a common influence (**Chart 1**).

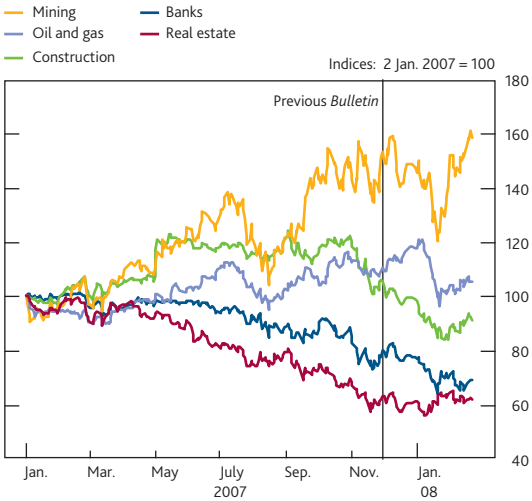
The share prices of banks and construction companies experienced particularly marked falls since the previous *Bulletin* (**Chart 2**). Contacts suggested that banks' share prices fell sharply as worries about their profits and capital adequacy intensified on the back of further write-downs on structured

Chart 1 Changes in UK equity indices since 2 January 2007



Sources: Bloomberg and Bank calculations.

Chart 2 Selected sectoral UK equity indices(a)



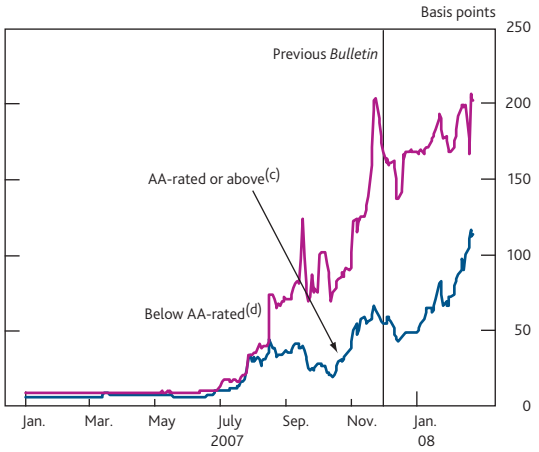
Sources: Bloomberg and Bank calculations.

(a) Selected sectoral components of FTSE All-Share index.

(1) This article focuses on sterling capital market developments. The data cut-off for this section is 22 February.

credit investments, and the ongoing process of bringing assets back onto their balance sheets. These concerns were also reflected in higher premia on credit default swaps (CDS), referencing UK banks (**Chart 3**).

Chart 3 Spreads on five-year credit default swaps referencing UK banks[a][b]



Sources: Fitch Ratings, Markit, Thomson Datastream, UK banks' published accounts and Bank calculations.

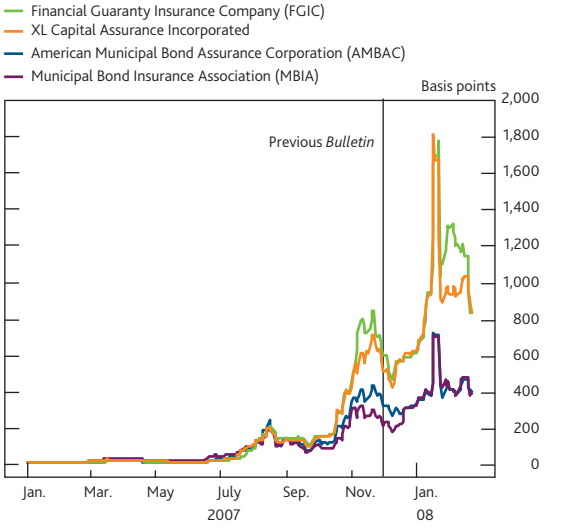
(a) Asset-weighted average five-year premia using latest published asset values (typically 2007 Q4).
(b) Using Fitch Ratings long-term issuer ratings.
(c) Banco Santander, Barclays, HBOS, HSBC, Lloyds TSB and RBS.
(d) Alliance & Leicester, Bradford & Bingley, Nationwide and Northern Rock.

A number of financial institutions reported details of their write-downs associated with exposures to US sub-prime mortgage-backed securities. By late February, in aggregate, the major UK banks had reported write-downs of around $17 billion, part of global estimated write-downs by financial institutions of around $110 billion. Contacts also reported signs that the credit problems in US mortgage markets may have spread beyond sub-prime assets to include securities related to prime residential and commercial real estate mortgages. But considerable uncertainty remained about the ultimate scale and location of the losses across the global financial system, not least because of further increases in delinquency rates on the underlying mortgages in the United States.

A particular source of uncertainty was banks' exposures — both direct and indirect — to financial guarantors, and the potential losses associated with further credit rating downgrades to these institutions. Banks have various contractual exposures to financial guarantors (also known as monoline insurers). These include direct exposures via credit derivative contracts where financial guarantors guaranteed payments on structured finance securities held by banks; and indirect exposures arising from banks' investment in municipal bonds and asset-backed securities that include a credit enhancement provided by the guarantors (sometimes called monoline 'wraps').

Continuing a theme discussed in the previous *Bulletin*, worries persisted about the adequacy of some of the major financial guarantors' capital cushions in light of further downgrades to the underlying securities they insured and resulting marked-to-market losses. As a result, spreads on their CDS remained elevated (**Chart 4**), although they have narrowed sharply since early January, reflecting some successful efforts to raise capital; reports of a possible restructuring of some firms in the industry; and ratings affirmations of some of the largest guarantors.

Chart 4 Spreads on five-year credit default swaps of financial guarantors[a]



Source: Markit.

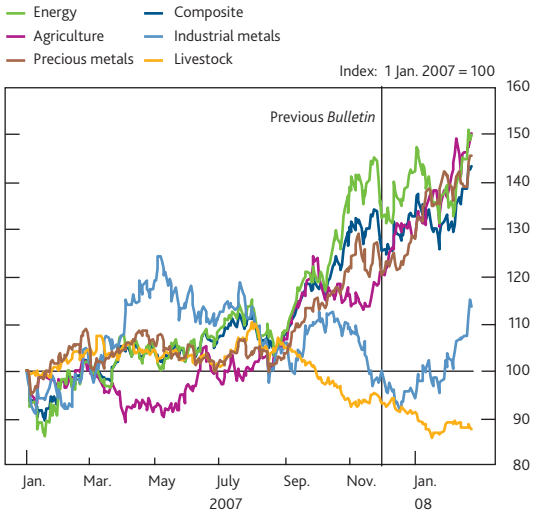
(a) Spreads refer to credit default swap contracts written on the financial guarantee affiliates of the named companies.

However, some of the major financial guarantors remained on review for downgrade by the rating agencies. In the event of further downgrades, the value of the guarantees provided against the underlying assets would fall. This could lead to additional marked-to-market losses on banks' asset portfolios and in turn to further write-downs. Contacts noted that downgrades to a major financial guarantor would increase the cost of borrowing for relatively low-rated issuers that raise finance through monoline-wrapped debt securities, and also that the type of securities affected could include bonds issued to finance UK private finance initiative (PFI) projects.

Among the other business sectors, the decline in the equity prices of UK construction companies was perhaps linked to wider concerns about the outlook for UK residential and commercial property markets. In particular, UK commercial property prices fell further over recent months prompting investor redemptions from commercial property funds. Some property funds halted redemptions, in part reflecting the time it takes to liquidate property assets in order to return funds to investors.

In contrast to banks and construction, sectoral equity indices for the mining and the oil and gas sectors ended the period little changed (**Chart 2**). It is likely that the equity prices of

Chart 5 Selected commodity price indices[a]



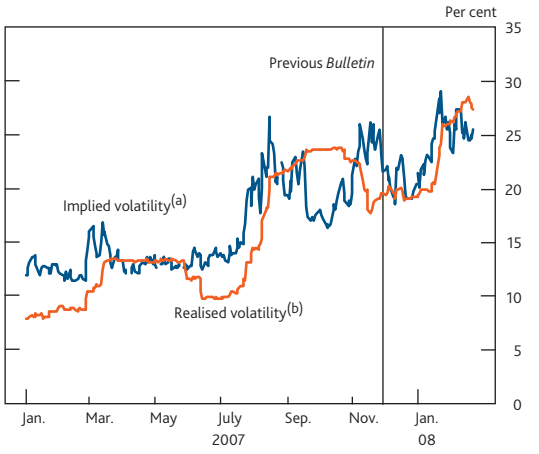
Source: Bloomberg.

(a) Indices refer to S&P GSCI total return index.

these firms were supported by the rise in many commodity prices during the period (**Chart 5**).

Accompanying the overall fall in UK equity indices, share prices became more volatile over recent months. Realised volatility of daily movements in the FTSE 100 index picked up further from around 20% to close to 27% (**Chart 6**). And implied uncertainty about future equity prices, inferred from options, indicated that market participants expected volatility to remain at these elevated levels.

Chart 6 FTSE 100 implied and realised volatility

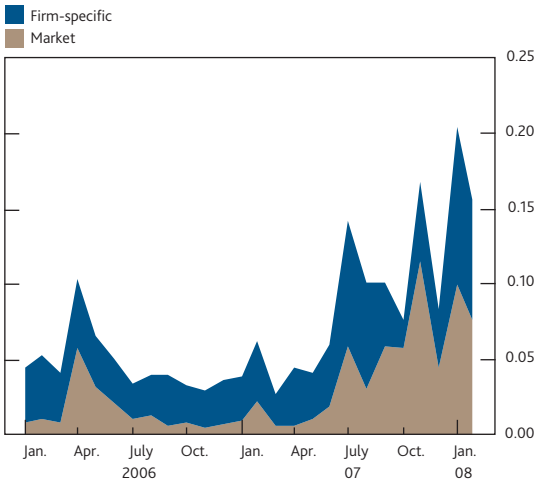


Sources: Bloomberg, Euronext.liffe and Bank calculations.

(a) Three-month (constant maturity) implied volatility derived from options.
(b) Annualised rolling standard deviation of log returns estimated over a three-month window.

Lower and more volatile share prices might suggest that investors feared that ongoing stress in money and credit markets would spill over to the broader economy. In particular, contacts reported that worries intensified about the possible impact of a weaker macroeconomic outlook on the prospects for corporate profits. Perhaps consistent with that, by late February around 50% of the increased volatility of the FTSE 100 index reflected common drivers of the market; firm-specific factors accounted for the other half (**Chart 7**).

Chart 7 Decomposition of average variance of returns of FTSE 100 firms[a]

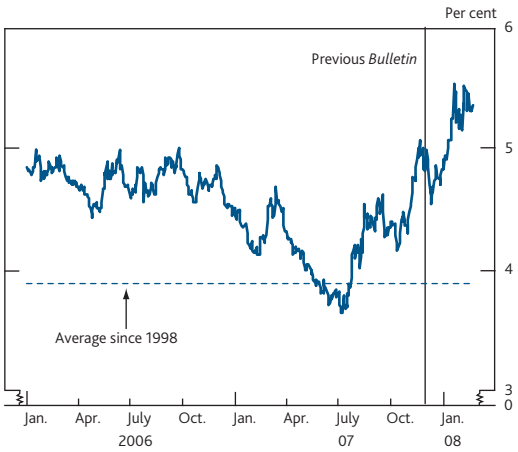


Sources: Thomson Datastream and Bank calculations.

(a) Decomposition of the average return volatility in a market index into a systematic component that is common to all the assets in the index and an idiosyncratic component that reflects the average level of asset-specific volatility. For more information on the analytics behind the decomposition see Campbell *et al* (2001), 'Have individual stocks become more volatile? An empirical exploration of idiosyncratic risk', *Journal of Finance*, Vol. 56, pages 1–43.

Increased uncertainty about the macroeconomic environment could have prompted a rise in the risk compensation required by equity investors. According to a simple dividend discount model, recent price moves indicated a significant rise in the implied equity risk premium (**Chart 8**).

Chart 8 Implied equity risk premium for the FTSE 100[a]



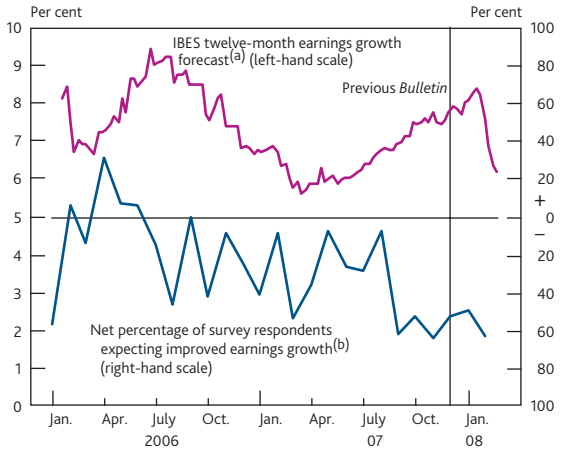
Sources: Bank of England and Thomson Datastream.

(a) Estimated using a one-stage dividend discount model, with an exogenous long-term dividend growth rate equal to 3%. For more details of dividend discount models see Vila Wetherilt, A and Weeken, O (2002), 'Equity valuation measures: what can they tell us?', *Bank of England Quarterly Bulletin*, Winter, pages 391–403.

A weaker perceived macroeconomic outlook might also have led investors to lower their estimates of UK companies' future earnings. And indeed, equity analysts revised down their

forecasts for near-term earnings growth for UK companies having previously revised them higher through much of 2007. Likewise, in a recent survey, investment fund managers became more pessimistic about the outlook for UK corporate earnings (**Chart 9**).

Chart 9 Forward-looking indicators of UK company earnings



Sources: Merrill Lynch and Thomson Datastream.

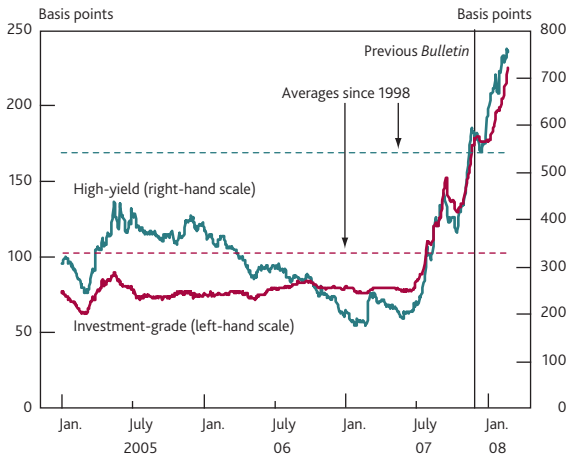
(a) Institutional Brokers' Estimate System (IBES) uses Consensus forecasts of earnings per share growth over the next twelve months by sell-side analysts.
(b) The net percentage of fund managers in the Merrill Lynch Fund Managers Survey that expected improved earnings growth over the next twelve months.

Corporate credit

The falls in UK equity market indices were accompanied by a further widening in sterling-denominated corporate bond spreads (**Chart 10**). Spreads on investment-grade sterling-denominated corporate bonds were well above the peaks seen between 1998 and 2002, while non-investment grade spreads approached their peaks during the same period.

As a result of these moves on credit spreads (together with changes in long-term risk-free interest rates), yields on sterling corporate bonds increased over recent months, suggesting an increase in firms' cost of debt capital. Specifically, yields on non-investment grade corporate bonds rose above 12%, compared with around 7% at the start of 2007 while yields on investment-grade bonds, which account for the majority of corporate bond issuance, increased to around 7% (**Chart 11**).

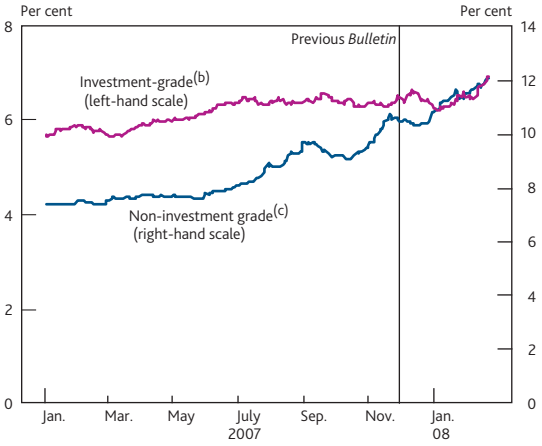
Chart 10 Sterling-denominated corporate bond spreads(a)



Source: Merrill Lynch.

(a) Option-adjusted spreads over government bond yields.

Chart 11 Sterling-denominated corporate bond yields(a)



Source: Merrill Lynch.

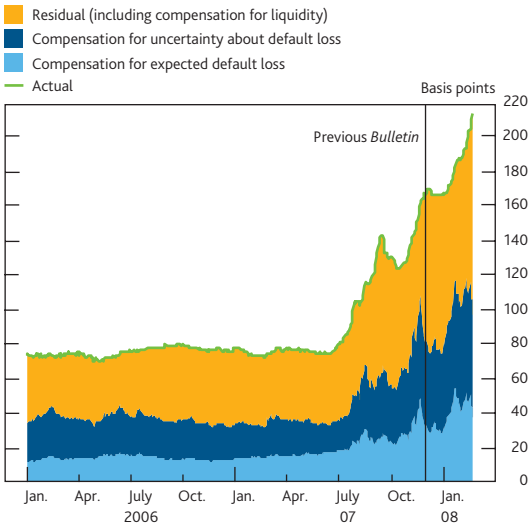
(a) Yields to maturity.
(b) Aggregate indices of bonds rated BBB3 or higher.
(c) Aggregate indices of bonds rated lower than BBB3.

Contacts noted that perceptions of corporate credit risk increased as projected defaults were revised higher. For example, Moody's forecast that the twelve-month global speculative-grade default rate would rise from 0.9% in 2007 to 5.3% in 2008. This remains some way below the levels observed in 1990–91 and 2000–02.

Consistent with increased worries about possible company defaults, a model-based decomposition suggested that the recent widening in spreads on corporate bonds in large part reflected increased compensation for expected defaults and the credit risk premium (**Chart 12**). Taken together, the model suggested these two components accounted for almost two thirds of the widening in spreads on investment-grade bonds since the previous *Bulletin*. The remainder reflected an increase in the residual term, which could be consistent with contacts' reports that illiquidity in secondary corporate bond markets persisted.

In fact, many firms may not have been able to raise new capital even at wider credit spreads. Some contacts reported that sterling corporate bond primary markets remained largely closed. And while some firms may have drawn down previously arranged credit lines from financial institutions, the Bank's Q4 *Credit Conditions Survey* reported that lenders had significantly reduced the availability of credit to firms. Moreover, lenders indicated that they expected further reductions would take place in Q1 (**Chart 13**).

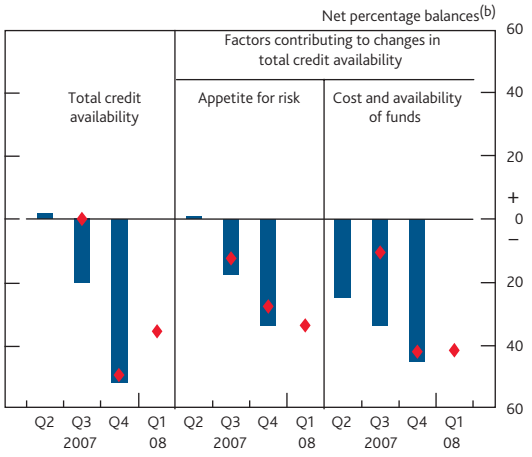
Chart 12 Decomposition of sterling-denominated investment-grade corporate bond spreads[a]



Sources: Bloomberg, Merrill Lynch, Thomson Datastream and Bank calculations.

(a) For details of the method underlying the decomposition, see Webber, L and Churm, R, 'Decomposing corporate bond spreads', *Bank of England Quarterly Bulletin*, Vol. 47, No. 4, pages 533–41.

Chart 13 *Credit Conditions Survey*: credit availability to corporates[a]

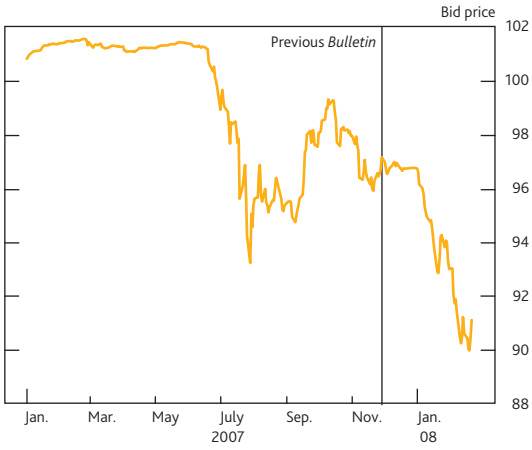


Source: Bank of England *Credit Conditions Survey*.

(a) Net percentage balances are calculated by weighting together the responses of those lenders who answered the question. The blue bars show the responses over the previous three months. The red diamonds show the expectations over the next three months. Expectations balances have been moved forward one quarter so that they can be compared with the actual outturns in the following quarter.
(b) A positive balance indicates more corporate credit is available or that the change in the factors described have served to increase credit availability.

In leveraged loan markets, the prices of European leveraged loans fell sharply, reportedly to their lowest levels since the mid-1990s (**Chart 14**). Contacts attributed this in part to low primary issuance of collateral loan obligations (CLOs) which have typically accounted for the bulk of demand for leveraged loans and some reduction in risk-taking by banks with a large volume of leveraged loan exposures stuck on their balance sheets. In addition, although only a handful of existing CLOs had been unwound, the potential for further unwinds might have added to the downward pressure on prices. Such fears may have been particularly acute in credit markets relative to, say, equity markets given the greater proportion of investors that are highly leveraged in complex ways.

Chart 14 Price of European senior leveraged loans[a]



Source: Reuters Loan Pricing Corporation.

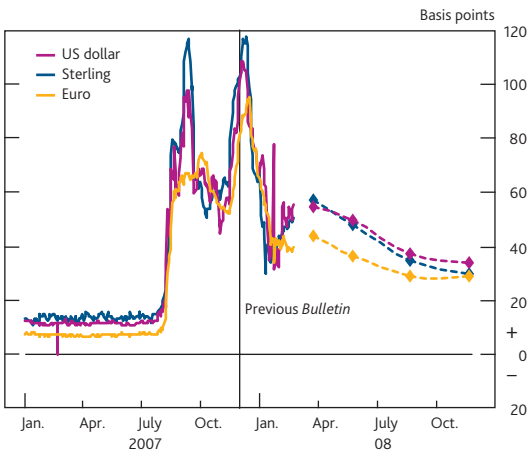
(a) The iTraxx LevX five-year senior index. The index comprises 35 equally weighted first-lien credit agreements traded in the European Leveraged Loan CDS (LCDS) market. The index trades on a price rather than spread basis.

Bank funding markets

Funding markets for financial institutions also remained under pressure, partly reflecting the difficulty of securitising loans and mortgages. The cost of longer-term bank funding and capital increased and spreads on covered bonds — securities issued by banks backed by assets on their balance sheets — widened further.

At shorter maturities, contacts reported that interbank money market conditions improved during December and early January. But spreads between Libor and rates on overnight index swaps (OIS) remained wide and indeed widened further during February (**Chart 15**). And contacts noted that liquidity in term money markets generally deteriorated through February and remained very thin at maturities beyond one month. The renewed difficulties in sterling money markets were broadly paralleled in other major currencies — euro and US dollar Libor-OIS spreads remained fairly similar to those in

Chart 15 Three-month Libor rates relative to expected policy rates[a]



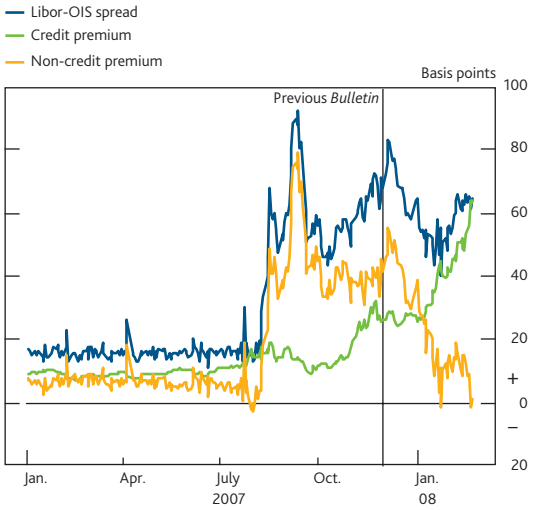
Sources: Bloomberg, British Bankers' Association and Bank calculations.

(a) Spread of three-month Libor to three-month overnight interest swap rates. Dashed lines show implied forward spreads derived from forward rate agreements as at 22 February.

sterling (**Chart 15**). And forward Libor-OIS spreads remained elevated, indicating that market participants expected difficult conditions in bank funding markets would continue for some time.

According to an indicative decomposition, credit premia (derived from CDS prices) increased over recent months and by the end of the period seemed to account for the sterling Libor-OIS spread (**Chart 16**). However, the inability of banks to obtain funding in the interbank market might have affected the perceived likelihood of bank default. This interrelation between perceptions of liquidity and default risk is not captured by the simple decomposition.

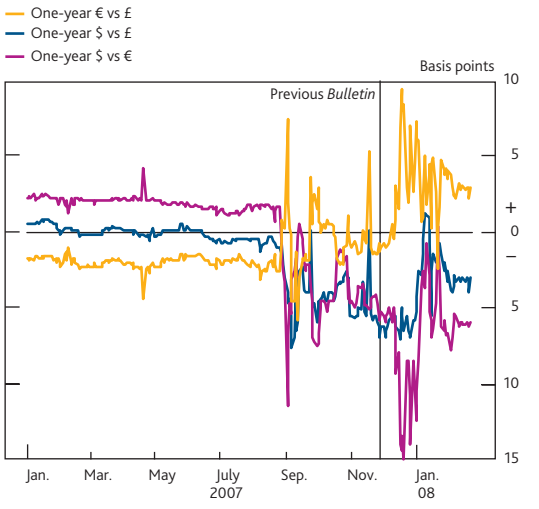
Chart 16 Indicative decomposition of the sterling twelve-month Libor-OIS spread(a)



Sources: Bloomberg, British Bankers' Association, Markit and Bank calculations.

(a) Estimates of credit premium are derived from credit default swaps on banks in the Libor panel. Estimates of non-credit premium are derived by residual. The method for decomposing interbank spreads is described in the box on pages 498–99 of the 2007 Q4 *Bank of England Quarterly Bulletin*.

Chart 17 One-year basis swap spreads



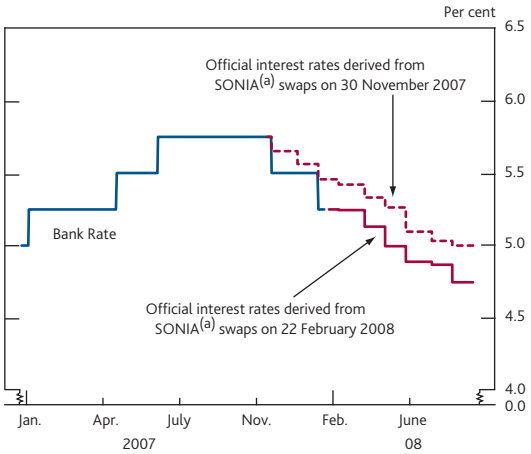
Source: Bloomberg.

Moreover, contacts suggested that worries about banks' credit risk continued to impair the functioning of the foreign exchange swap market. In particular, basis swap spreads, which measure the relative cost of obtaining funding in one currency in exchange for another currency, reached wide levels just before the year end due to heightened demand to receive dollars upfront (**Chart 17**).(1)

Short-term interest rates

Given the ongoing stress in money and credit markets, and taking into account other macroeconomic factors likely to affect inflation, the UK Monetary Policy Committee reduced Bank Rate in two 25 basis point moves, from 5.75% to 5.25%, over the period. Looking ahead, short-term sterling implied interest rates declined since the previous *Bulletin* as market participants revised down the expected path for future UK policy rates. On 22 February, market expectations derived from rates on sterling OIS suggested that market participants had fully priced in two further 25 basis point cuts in Bank Rate by August 2008 (**Chart 18**).

Chart 18 Bank Rate and forward market interest rates



Sources: Bank of England and Reuters.

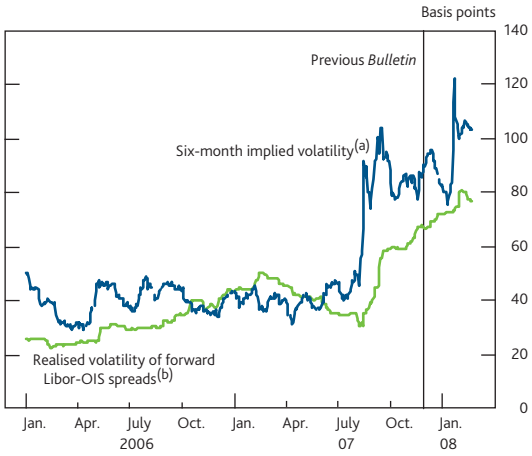
(a) Sterling overnight index average.

This was also broadly consistent with surveys of market economists. According to a survey conducted by Reuters in February, the mean expectation was for a 25 basis point reduction in Bank Rate by June and a further 25 basis point cut by December to 4.75%. In contrast, the equivalent November survey had suggested that short-term rates were expected to remain above 5% throughout 2008.

Uncertainty about the future path of short-term sterling interest rates remained high and indeed increased over the period (**Chart 19**). However, the implied volatility measures are derived from options that reference Libor rates. This means that some of the rise may have reflected uncertainty about

(1) For more details of basis swaps see the box 'Basis swaps', page 120 of the Summer 2004 *Quarterly Bulletin*.

Chart 19 Short-term sterling interest rate volatility

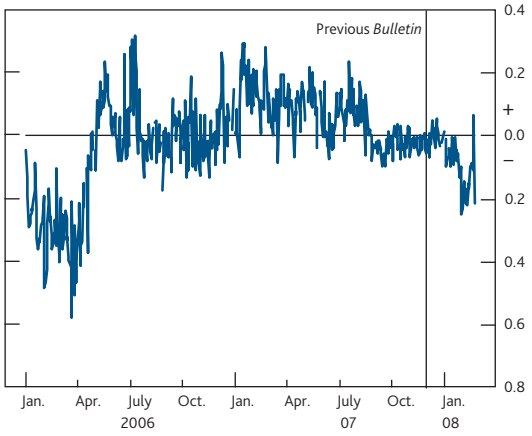


Sources: Bank of England, Bloomberg, British Bankers' Association and Euronext.liffe.

(a) Inferred from options on Libor futures.
(b) Annualised rolling standard deviation of the spread between three-month, three-month forward Libor and overnight indexed swaps over a six-month window.

credit and liquidity premia in Libor rates rather than uncertainty about the future path of Bank Rate. Indeed, the pickup in implied volatility on sterling Libor rates broadly coincided with an increase in the realised volatility of forward Libor-OIS spreads (**Chart 19**).

Chart 20 Six-month skew from sterling interest rate options



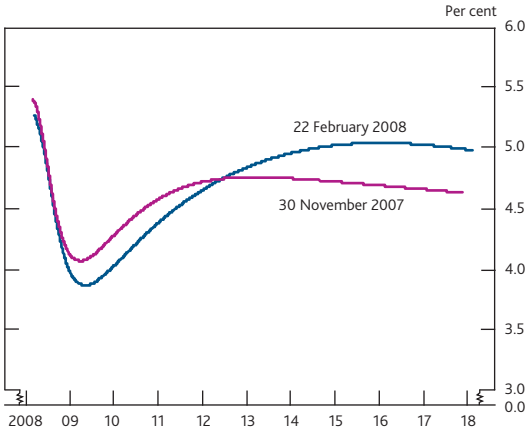
Sources: Bank of England and Euronext.liffe.

The skew of the implied distribution of future sterling interest rates became more negative, despite a shift down in the mean expected path for near-term rates (**Chart 20**). This indicated that market participants placed more weight on further large reductions in near-term interest rates relative to large rises. But again, this measure relates to future Libor rates and will also be affected by perceptions of future moves in the Libor-OIS spread.

Long-term interest rates

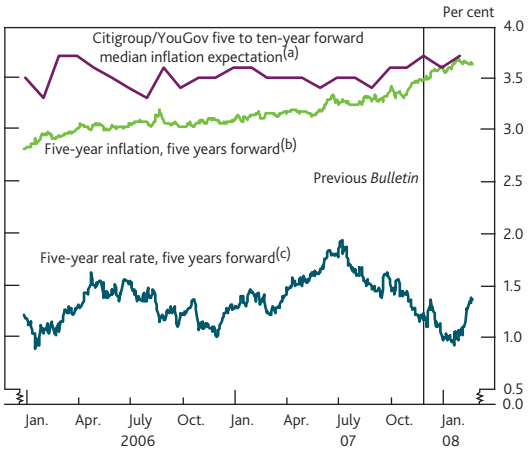
At longer horizons, sterling nominal forward rates rose since the previous *Bulletin* (**Chart 21**). Decomposing nominal forward rates into their real and inflation compensation components shows that both long-horizon sterling real and

Chart 21 Sterling nominal forward rates(a)



(a) Instantaneous forward rates derived from the Bank's government liability curve.

Chart 22 Sterling long-term real and inflation forward rates and inflation expectations



Sources: Citigroup, YouGov and Bank calculations.

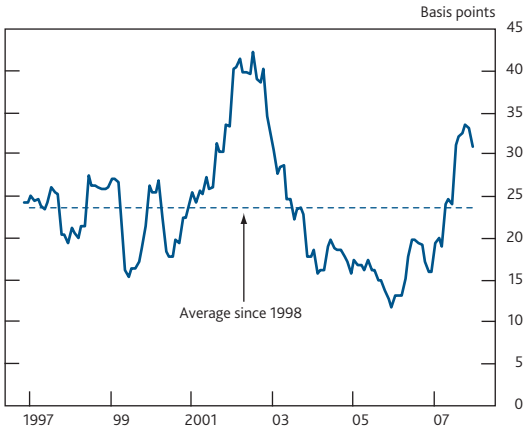
(a) This survey indicator of inflation expectations relates to general goods and services inflation and does not correspond to a recognised inflation measure.
(b) RPI inflation forward rates derived from the Bank's government liability curve.
(c) Derived from the Bank's government liability curve.

inflation forward rates increased compared with three months ago (**Chart 22**). During the period, long-term implied real rates initially fell quite sharply, coming close to the recent lows of January 2006, before rebounding. In contrast, long-horizon inflation forward rates rose fairly steadily, continuing their gradual drift higher since the beginning of 2006.

It is possible that market participants revised up further their long-run expectations of RPI inflation. However, a survey of the general public's inflation expectations at long horizons remained relatively steady (**Chart 22**). An alternative explanation is that investors required increased compensation for inflation risk, perhaps in response to the pickup in the realised volatility of RPI inflation outturns (**Chart 23**).

If that were the case, one would expect this premium for inflation uncertainty to have shown up in other market indicators. There has been an increase in implied uncertainty inferred from nominal swaptions over the past three months (**Chart 24**), though implied volatility is currently slightly lower

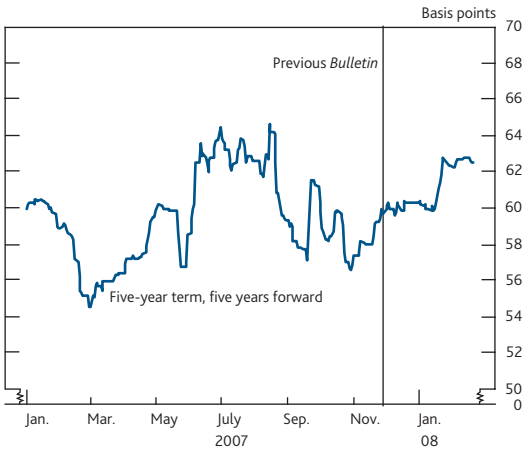
Chart 23 Realised volatility of RPI inflation[a]



Sources: National Statistics and Bank calculations.

(a) Rolling standard deviation of changes over twelve-month window.

Chart 24 Implied volatility for sterling long-term nominal forward interest rates[a]



Source: JPMorgan Chase & Co.

(a) Based on swaptions settling on five-year swap rates, five years ahead.

than it was in the middle of 2007 and little changed from levels at the beginning of 2007. However, market contacts cautioned that long-horizon sterling swaptions are not traded very heavily, which limits the extent to which these data can be relied upon as an accurate forward-looking measure of market uncertainty.

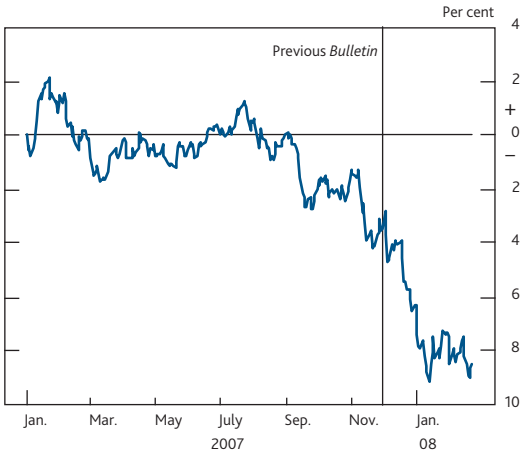
Among other explanations for the rise in long-term inflation forward rates, contacts continued to cite the influence of strong demand for index-linked gilts from institutional investors, in particular pension funds, seeking to match better their assets with their liabilities. Given relatively inelastic supply — reportedly worsened recently by the difficulties experienced by monoline insurers, which typically insure inflation-linked bonds issued by corporates — this continued strong institutional demand may have helped push the price of index-linked bonds higher and their yields lower. To the extent that nominal gilt yields have been less affected by the increased institutional demand, this will have tended to increase measured breakeven inflation rates (measured by the difference between the yields on nominal and index-linked government bonds).

This explanation might also be consistent with a model-based decomposition of the sterling real and inflation forward rates outlined in the box on pages 14–15. This shows that most of the rise in inflation long-horizon forward rates since early 2006 was unlikely to be explained by inflation expectations or indeed inflation risk premia. Instead, the model suggests that the rise was due to an unexplained residual term, which may capture the recent effects of particularly strong institutional demand.

Foreign exchange

Developments in relative interest rates seemed to account for some of the depreciation in the value of sterling during the first half of the review period. The sterling effective exchange rate index (ERI) fell by approximately 5% over this period, reflecting falls against most of the major currencies (**Chart 25**). However, since mid-January news about relative interest rates might have been expected to have supported an appreciation in the currency, other things being equal, when in fact the sterling ERI remained broadly unchanged from its level in early January (**Chart 26**).

Chart 25 Cumulative changes in the sterling effective exchange rate index since 2 January 2007



One possible explanation for changes in sterling exchange rates could be that investors altered their required risk compensation to hold sterling assets. However, implied volatilities inferred from exchange rate options were little changed from their levels at the time of the previous *Bulletin* (**Chart 27**).

Nonetheless, an implied risk reversal for the sterling ERI inferred from option prices remained negative, indicating that market participants were more concerned about a possible depreciation in the sterling ERI over the next two years than an appreciation (**Chart 28**).

A model-based decomposition of sterling government yield curves

Yield curves can provide policymakers with information about expected future interest rates, attitudes to risk and the underlying shocks hitting the economy. But extracting and interpreting this information is not straightforward. This box uses a so-called 'affine' model to decompose sterling yield curves into expectations of future interest rates and inflation, as well as risk premia.

Factors driving movements in yield curves

If investors are risk-averse and face uncertain future real returns, they will either require extra compensation to hold bonds with long maturities (if long-term bonds are perceived to be risky) or be prepared to hold them at a discount (if long-term bonds act as insurance). So forward interest rates will embody term premia, which will be positive (negative) if returns on long-term bonds, compared to short-term bonds, are low (high) when the returns are most needed — ie when times are bad.

Term premia and investors' expectations are unobservable. Hence some form of model is needed to measure these influences on yield curves. And to the extent that such a model can be estimated for both the nominal and real yield curves, it may be possible to decompose nominal forward interest rates into expectations about real rates and inflation, real term premia and inflation risk premia.

An empirical model of the yield curve

A common empirical approach to modelling yield curves is to identify factors that are statistically important in explaining movements in yield curves. Early models used changes in a single factor — for example, the current short-term interest rate — to explain the term structure of interest rates. But limitations in the ability of single-factor models to capture fully the empirical regularities in yield curves prompted the development of so-called multi-factor affine (linear) models.

This type of model can be applied in different ways, but is based on three common assumptions: (1) bond prices are arbitrage free, so that risk-free profits cannot be made by trading bonds of different maturities; (2) bond prices are driven by a small set of factors; and (3) the 'stochastic discount factor' in the model, which embodies attitudes towards risk, has a flexible form that allows for time-varying term premia.

Attempts to model yield curves solely as a function of observable macroeconomic indicators have tended to have problems fitting the data, particularly at longer maturities. So the model described here incorporates a number of latent (unobservable) factors, in addition to data on inflation and inflation expectations.[1] The methodology employed is consistent with the literature on so-called essentially affine term structure models.[2]

Imposing no-arbitrage across yields of different maturities enables the derivation of a recursive relationship between nominal and real yields and the underlying factors.[3] The model assumes that two latent factors drive the real yield curve, and a third latent factor and inflation (the fourth factor) affect real term premia, inflation risk premia and inflation expectations. Given the relatively short sample period used to estimate the model, it may be difficult to attribute the dynamics of long-term inflation forward rates correctly into inflation expectations and risk premia. To alleviate this problem, the model also incorporates survey information from Consensus forecasts on long-horizon inflation expectations.[4] However, these forecasts may differ from the expectations of bond investors, so the model also includes a measurement error term to allow long-term inflation expectations to differ from those of the surveys, although on average they must be the same.

Consistent with the literature on these models, it is assumed that yields are measured with error because they are derived from a limited number of bonds. This allows the model to be estimated using standard econometric methods.[5] From the estimated relationships, it is possible to back out estimates of expected risk-free real interest rates, inflation expectations, real term premia and inflation risk premia.

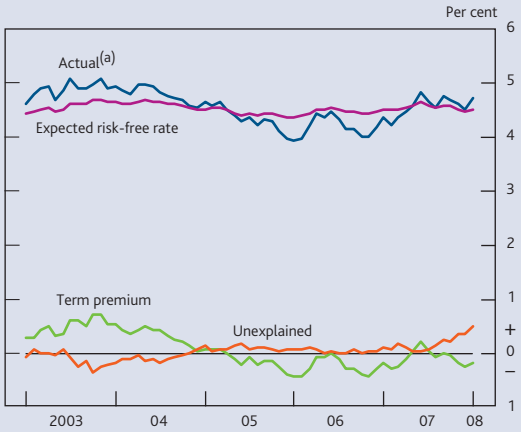
Results

The main finding is that term premia seem to have played an important role in explaining movements in long-term UK forward interest rates in recent years. In contrast, derived expected risk-free real and nominal interest rates appear to have changed less over time.

Over the period since 2005, the model suggests that term premia on nominal forward rates have typically been negative, mainly reflecting negative real term premia (**Charts A** and **B**). This might imply that investors in index-linked gilts were prepared to pay a premium for insurance-like characteristics of these bonds and/or were constrained in their investment decisions; possibly consistent with views of market contacts that new pension fund regulations and changes in accounting rules increased institutions' demand for these bonds in order to match better their assets with their liabilities.

The model also suggests that little of the increase in ten-year forward inflation rates over the past couple of years can be accounted for by a rise in expected inflation (**Chart C**). Furthermore, the model indicates that there has been only a very modest pickup in the inflation risk premium.[6]

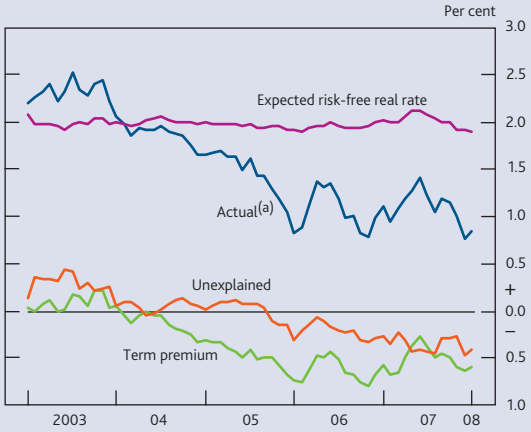
Chart A Decomposition of sterling ten-year nominal forward rates



Source: Bank calculations.

(a) Instantaneous sterling ten-year nominal forward rates derived from the Bank's government liability curve.

Chart B Decomposition of sterling ten-year real forward rates



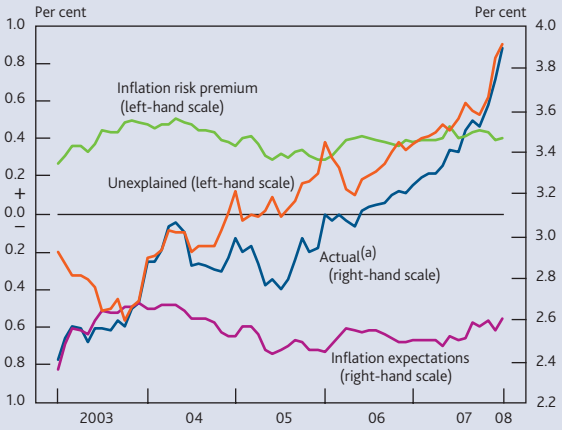
Source: Bank calculations.

(a) Instantaneous sterling ten-year real forward rates derived from the Bank's government liability curve.

Most of the rise in long-horizon inflation forward rates is therefore not explained by the model. But the fact that the model fits nominal forward rates well (until the recent market turbulence) means that the residual in inflation forwards is almost the mirror image of the residual for real forwards. Hence the unexplained component of inflation forwards largely reflects the model's inability to fit long-term real forward rates. Put another way, the real rates priced into nominal bonds may be higher than the real rates implied by index-linked bonds.

One possible explanation for this might be that recent moves in long-term real rates have been affected by particularly strong demand for index-linked gilts in the face of limited supply. In part linked to regulatory factors, market contacts suggest that institutional demand for index-linked bonds has become very price inelastic over the past few years. If this unusually strong recent demand was not well captured by the model, it might help explain the pickup in the model's residual term.

Chart C Decomposition of sterling ten-year inflation forward rates



Source: Bank calculations.

(a) Instantaneous sterling ten-year inflation forward rates derived from the Bank's government liability curve.

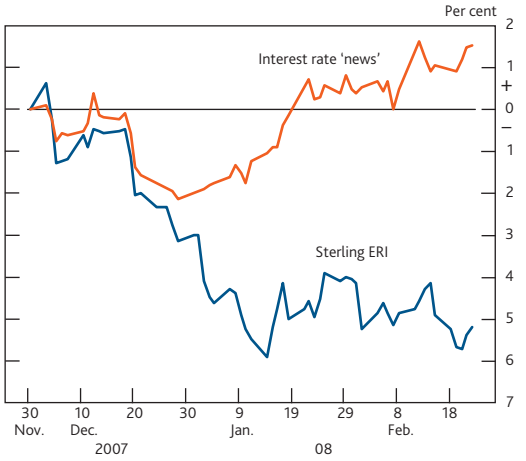
Conclusions

Using a model to decompose movements in UK yield curves suggests that term premia have played a major role in explaining movements in UK long-horizon forward interest rates. In particular, a large part of the fall in real forward rates since 2005 can be attributed to negative real term premia, suggesting that investors paid a premium for these bonds. The model also suggests that much of the recent pickup in ten-year breakeven inflation rates did not reflect a rise in expected inflation, and only a modest pickup in the inflation risk premium. Instead, much of the rise could be consistent with particularly strong recent institutional demand for long-term index-linked bonds, perhaps in response to accounting and regulatory changes.

These results are, however, subject to the normal caveats with any empirical modelling approach. Furthermore, while this model allows some economic interpretation, a full understanding of the fundamental drivers of yield curves requires a general equilibrium model that incorporates the behaviour of different investors. But, such heterogeneous agent models are extremely complicated and not yet well developed.

(1) This model is described more fully in a forthcoming *Bank of England Working Paper*, entitled 'Extracting inflation expectations and inflation risk premia from the term structure: a joint model of the UK nominal and real yield curves'.
(2) See Duffee (2002), 'Term premia and interest rate forecasts in affine models', *Journal of Finance*, Vol. 57, No. 1, pages 405–43.
(3) See 'An affine macro-factor model of the UK yield curve', *Bank of England Working Paper no. 322*.
(4) It is not uncommon to include surveys in latent factor models. For example, see Orphanides and Kim (2005), 'Term structure estimation with survey data on interest rate forecasts', *Finance and Economics Discussion Series*, 2005–48.
(5) The model is estimated using end-month Bank of England data on UK zero-coupon nominal and real yields at a range of maturities.
(6) This conclusion is not significantly altered if inflation survey information is excluded from the model.

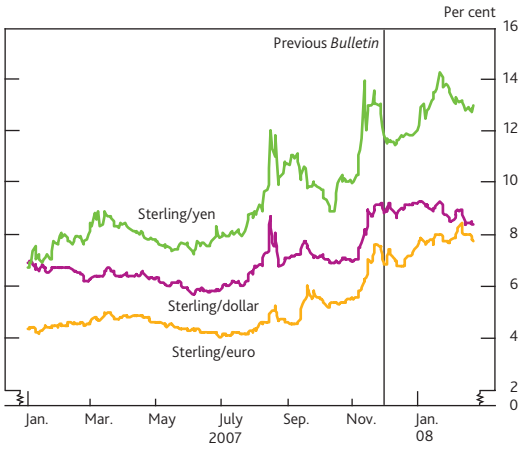
Chart 26 Implied contribution of interest rate 'news' to cumulative change in the sterling ERI since previous *Bulletin*[(a)]



Source: Bank calculations.

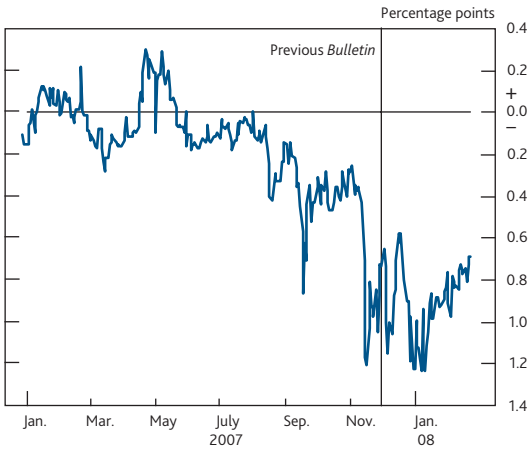
(a) For more information on the analytics required to isolate the impact of interest rate 'news' on exchange rates, see Brigden, A, Martin, B and Salmon, C (1997), 'Decomposing exchange rate movements according to the uncovered interest parity condition', *Bank of England Quarterly Bulletin*, November, pages 377–89.

Chart 27 Twelve-month implied sterling exchange rate volatility



Sources: Bank of England and Bloomberg.

Chart 28 Three-month 'synthetic' risk reversal for the sterling ERI[(a)]



Sources: Bank of England and British Bankers' Association.

(a) For more information on the construction of this measure see the box 'Using option prices to derive a probability distribution for the sterling exchange rate index', on pages 130–31 of the Summer 2006 *Quarterly Bulletin*.

It is also possible that market participants revised down their estimates of the long-run equilibrium sterling exchange rate. This could have been because of a renewed focus on the sustainability of the UK current account deficit. In particular, figures on foreign income receipts released in December showed net earnings on foreign assets by UK investors were revised down. Furthermore, the increased spreads on bank debt, and debt backed by credit-related assets, would be likely to imply an increase in future net payments abroad, given that the UK banking sector has been a net borrower from overseas.

Bank of England official operations

The Bank's balance sheet is managed in accordance with its policy purposes. These relate to the implementation of monetary policy; management of the Bank's foreign exchange reserves; provision of payment services for the UK financial system and the wider economy; provision of banking services to other central banks; and management of the Bank's free capital and cash ratio deposits from financial institutions.

Sterling monetary framework

This section reviews three full maintenance periods between 8 November and 6 February and summarises key developments during the February–March maintenance period.

Reserves targets

The Bank's operations in the sterling money markets have been aiming to keep secured market overnight interest rates in line with Bank Rate. They do so by ensuring a net supply of reserves sufficient for the banking system, in aggregate, to meet chosen targets for average balances held at the Bank of England over a maintenance period running from one MPC decision date until the next.

Each month, ahead of the start of a reserves maintenance period, reserves banks in the United Kingdom have the opportunity to set new reserves targets, and the Bank undertakes to supply the reserves that banks in aggregate need to meet those targets. Thus the monthly resetting of reserves targets provides an opportunity for banks individually, and the banking system as a whole, to obtain extra liquidity from the Bank in the light, *inter alia*, of their evaluation of the likelihood of payment shocks.

Following the emergence of strains in money markets in August 2007, reserves banks in aggregate increased their targets ahead of each subsequent maintenance period during the remainder of 2007. Ahead of the maintenance period beginning on 8 November, members of the Bank's reserves scheme increased their aggregate targets by 6%, to £21,200 million. For the maintenance period starting on 6 December, aggregate reserves targets increased by a further £1.5 billion, bringing the cumulative increase in reserves since the August maintenance period to £6.1 billion, or 37%. For the

maintenance period beginning on 9 January aggregate reserves targets were set 8% lower than in the December maintenance period, but remained substantially higher than in August. For the maintenance period starting on 7 February they increased by 1% to £21.1 billion (**Charts 29** and **30**).

Chart 29 Aggregate reserves targets

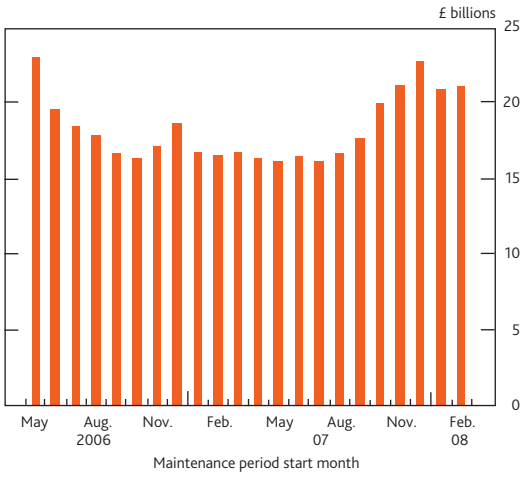
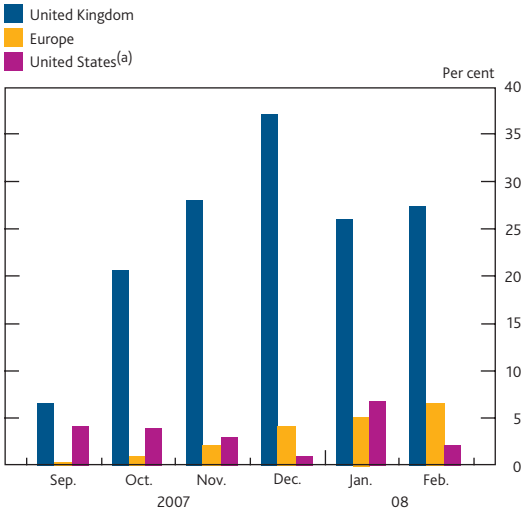


Chart 30 Cumulative increase in aggregate reserves targets since August 2007



Sources: Bank of England, Board of Governors of the Federal Reserve System and European Central Bank.

(a) Required reserves less vault cash used to satisfy reserves plus required clearing balances.

Reserves target ranges

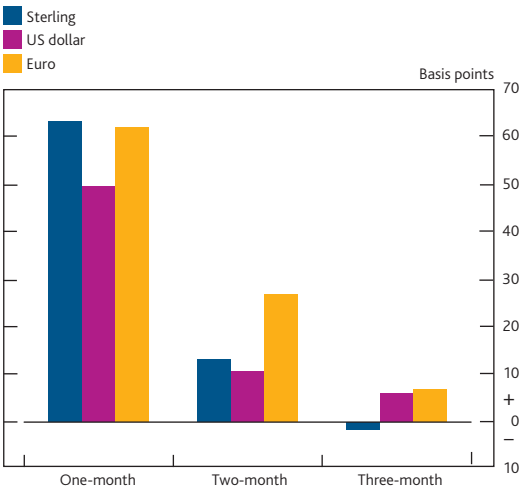
Between the introduction of the Bank's reformed framework for its money market operations, in May 2006, and September 2007, the range around reserves targets within which reserves are remunerated was set at ±1%. The range is designed to reduce the probability of banks needing to use standing facilities by mitigating the effect of any errors in the Bank's forecast of sterling flows between the banking system and the Bank's balance sheet (so-called autonomous factors). This in turn helps to stabilise market interest rates. Following the Bank's provision of additional reserves above the level necessary to allow reserves banks in aggregate to meet their targets in the September maintenance period, the ranges were widened, ultimately to ±60%, in order to ensure that reserves banks could, in aggregate, hold the additional reserves without penalty, consistent with the Bank's rate-setting objective.

Throughout the period covered by this *Quarterly Bulletin*, the Bank maintained the range around reserves targets within which reserves are remunerated at ±30%, even though there was no additional provision of reserves by the Bank above that necessary to allow reserves banks in aggregate to meet their targets. This was done in response to feedback from counterparties that the wider range provided useful additional flexibility in prevailing market conditions. The Bank announced in January that it would keep under review, in the light of market conditions, whether some reduction in the target range was warranted.

November–January maintenance periods

As reported in the previous *Bulletin*, a key influence on market interest rates over the November and December maintenance periods was market participants' approach to funding in the run-up to the new year. Short-term money market rates often rise over the year end because banks try to 'window-dress' their balance sheets over what is an important reporting date.(1) In particular, banks tend to reduce interbank lending and hoard liquidity, which both put upward pressure on money market rates. At the end of 2007, against a backdrop of the protracted period of stressed money market conditions, uncertainty about the year end was unusually high. As the year end approached, short-term market rates in sterling and other currencies increased significantly when the relevant maturity began to span the year end (**Chart 31**).

Chart 31 Change in Libor spread to OIS rates as they spanned year end(a)

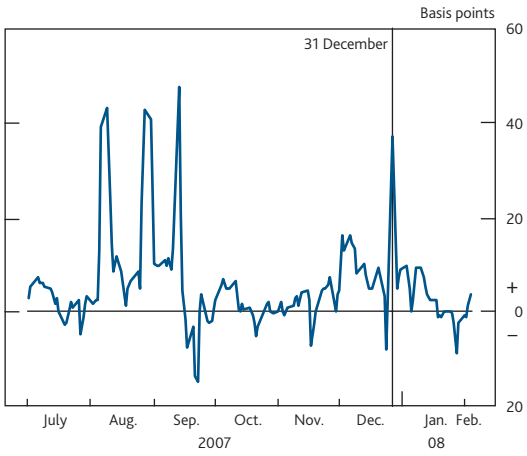


Sources: Bloomberg and Bank calculations.

(a) Sterling Libor first crossed the year end on different dates from dollar and euro rates, as determined by BBA Libor settlement conventions. See www.bba.org.uk/bba/jsp/polopoly.jsp?d=225&a=1413&artpage=4.

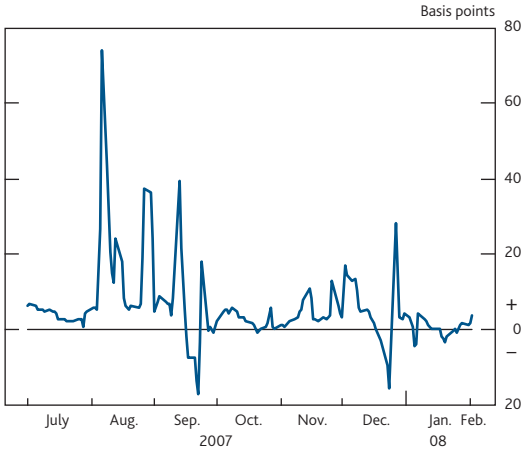
(1) See 2007 Q1 *Quarterly Bulletin*.

Chart 32 Spread to Bank Rate of secured sterling overnight interest rate



Sources: BrokerTec and Bank calculations.

Chart 33 Spread to Bank Rate of unsecured sterling overnight interest rate



Sources: Wholesale Market Brokers' Association and Bank calculations.

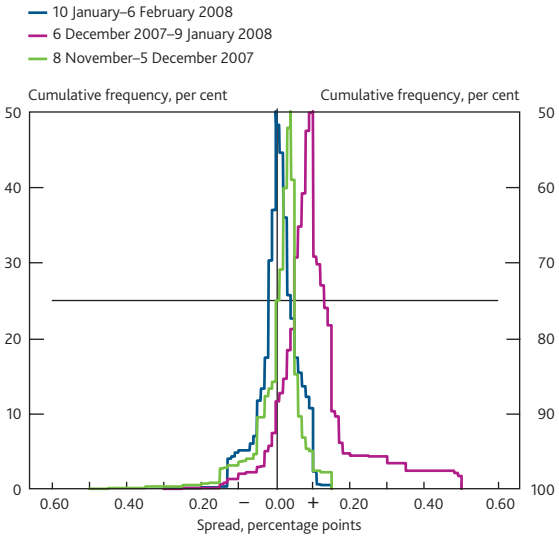
Overnight secured and unsecured sterling money market rates also rose somewhat relative to Bank Rate in late November and early December, although not to the extent seen in August and September (**Charts 32** and **33**).

On 29 November, the Bank announced its intention to offer £10 billion in the form of a five-week repo open market operation (OMO). This constituted a significant proportion of its scheduled supply of reserves for the whole maintenance period beginning on 6 December. It was done in order to help to alleviate concerns that money market conditions would be particularly tight by providing, at the very start of the maintenance period, financing that would remain outstanding over the year end. The decision to conduct a five-week repo OMO followed discussions with reserves scheme banks and with the Money Market Liaison Group. The operation was oversubscribed, with a cover ratio of 6.2.

The Bank also stated on 29 November that it stood ready to take further measures to keep overnight rates in line with Bank Rate. In the event, counterparties reported that market conditions remained orderly.

Secured overnight market rates in the January maintenance period were generally stable and close to Bank Rate (**Chart 34**).

Chart 34 Folded cumulative distribution[a] of spread of sterling secured overnight interest rate (trade weighted) to Bank Rate



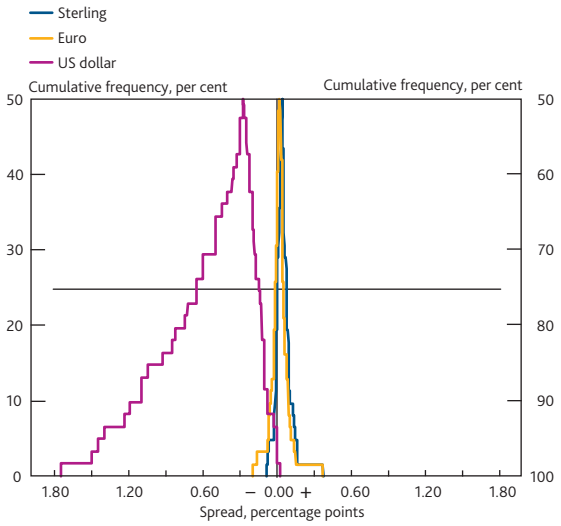
Sources: BrokerTec and Bank calculations.

(a) Distribution of the spread between overnight interest rate at end-of-day and the official interest rate. The distributions are folded at the median so that cumulative probabilities for values above (below) the median are indicated by the right-hand (left-hand) scale.

For the November, December and January maintenance periods combined, sterling secured and unsecured overnight market interest rates tended to be at least as close to policy rates as comparable euro and dollar overnight rates (**Charts 35** and **36**). In dollars the appropriate comparator for sterling secured rates is the unsecured overnight rate, since this is the rate targeted by the FOMC.

The amounts supplied in the Bank's weekly OMOs continued to decline over the review period. As explained in the previous *Bulletin* and in the box on page 20, this does not mean that the net amount of reserves supplied to the banking system fell — until end-December this rose in line with the increase in reserves targets, and in January and February remained substantially higher than it had been in August. Rather it reflected central bank money being injected into the system via drawings by Northern Rock on the liquidity facility available to it; via the five-week repo; and via the larger three-month long-term repos that the Bank offered in December and January (see the section below on 'Co-ordinated central bank action and the Bank's longer-term repo OMOs') (**Chart 37**).

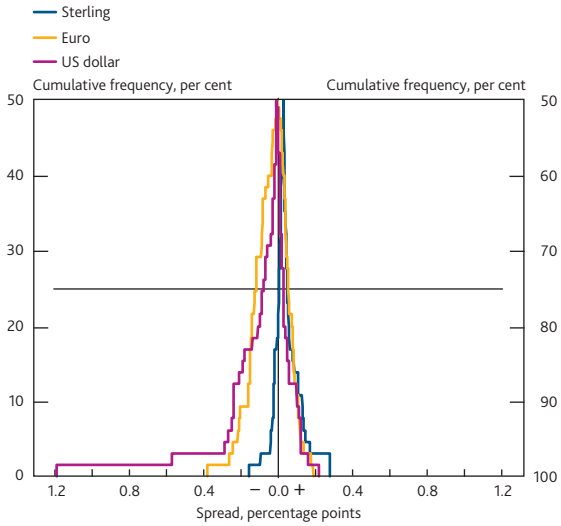
Chart 35 Folded cumulative distribution[a] of spread of international secured overnight interest rates to official interest rates[b]



Sources: ICAP and Bank calculations.

(a) Distribution of the spread between overnight interest rate at end-of-day and the official interest rate. The distributions are folded at the median so that cumulative probabilities for values above (below) the median are indicated by the right-hand (left-hand) scale.
(b) Chart shows the distribution for period 8 November 2007–6 February 2008. Differences in the median level of the spread of secured rates to official rates are due to differences in the way official operations are conducted.

Chart 36 Folded cumulative distribution[a] of spread of international unsecured overnight interest rates to official interest rates[b]



Sources: Wholesale Market Brokers' Association and Bank calculations.

(a) Distribution of the spread between overnight interest rate at end-of-day and the official interest rate. The distributions are folded at the median so that cumulative probabilities for values above (below) the median are indicated by the right-hand (left-hand) scale.
(b) Chart shows the distribution for period 8 November 2007–6 February 2008.

In announcing the larger long-term repos on 12 December, the Bank stated that, consistent with its objective of keeping overnight market interest rates in line with Bank Rate, it would offset in its other market operations the additional reserves taken up (**Chart 37**). The partial repayment in January of the balance of the UK central government's overdraft facility with the Bank, known as the 'Ways and Means' facility, had the effect of draining reserves from the banking system,

Chart 37 Liquidity provided in OMOs and short-term OMO cover ratio

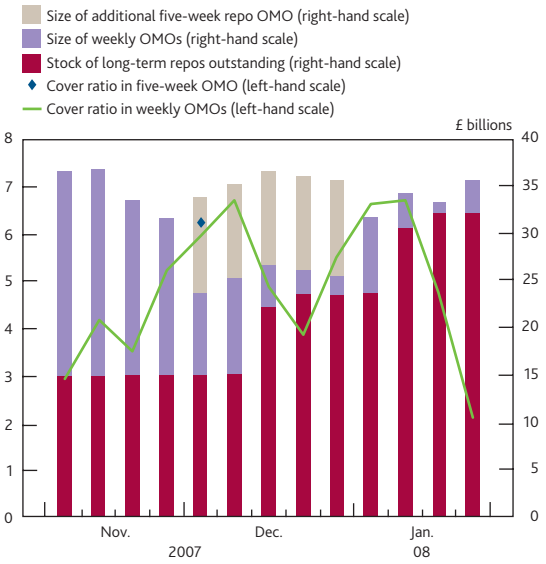
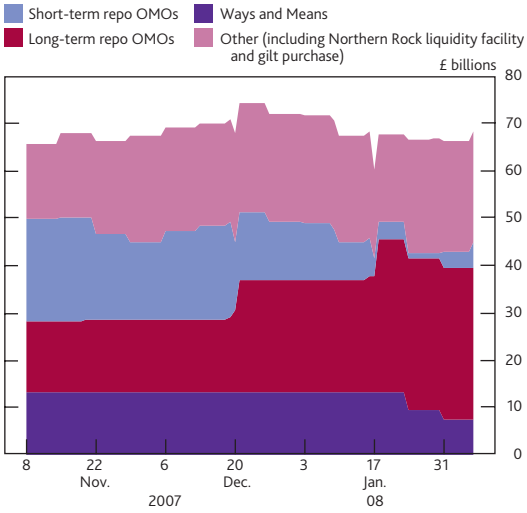


Chart 38 Breakdown of sterling market transactions



contributing to the Bank's offsetting of the reserves supplied via lending to Northern Rock and via the larger long-term repos (**Chart 38**). The box on page 20 explains the background to, and the effect of, the Ways and Means repayment.

February maintenance period

The spread between overnight market rates and Bank Rate generally remained low and stable during February. The maintenance period ending on 5 March will be reviewed in the 2008 Q2 *Bulletin*.

Co-ordinated central bank action and the Bank's longer-term repo OMOs

Along with other central banks, the Bank announced on 12 December further measures designed to address pressures in short-term funding markets.[1] These measures were

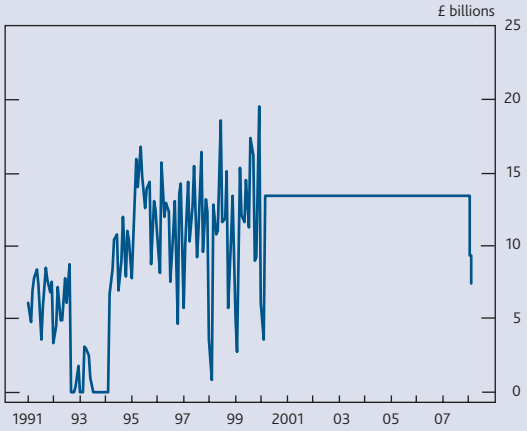
(1) www.bankofengland.co.uk/publications/news/2007/158.htm.

Repayment of part of the 'Ways and Means' facility

'Ways and Means' is the name given to the UK central government's overdraft facility at the Bank.

Prior to the transfer of the government's day-to-day sterling cash management from the Bank to the Debt Management Office (DMO) in March 2000, the outstanding daily balance varied significantly, reflecting net cash flows into and out of government accounts. The average level had risen significantly in the mid-1990s.(1) Between March 2000 and the beginning of 2008, borrowing from the Bank was not used to facilitate day-to-day management of the government's cash flows and the balance was stable, at £13.4 billion (**Chart A**).

Chart A Ways and Means facility: outstanding balance



In implementing monetary policy the Bank generally aims to supply reserves banks, in aggregate, with the reserves they have chosen to target. This enables the Bank to ensure that overnight market interest rates are in line with Bank Rate.(2) Ordinarily the Bank ensures that the correct level of reserves is supplied to the market, at the margin, by varying the size of its one-week repo OMOs and, on the final day of the maintenance period, by holding an overnight fine-tuning OMO. As explained on page 506 of the previous edition of the *Bulletin*, the size of the weekly OMO has fallen in recent months to offset the injection of central bank money to the banking system via the Bank's lending to Northern Rock under the liquidity support facility.

In addition, the increase in the size of the Bank's long-term repo operations in December and January meant that more reserves than normal were supplied to the market via long-term repo OMOs. In announcing the changes to the December and January long-term repo OMOs on 12 December, the Bank announced that, consistent with its objective of keeping overnight market interest rates in line with Bank Rate, it would offset in its other operations the additional reserves taken up.

The size of the Bank's weekly short-term OMO is however bounded at zero. Beyond that point the Bank must 'drain' reserves from the system by other means in order to ensure that the correct level of reserves is supplied in aggregate.

As with any other sterling flow across the Bank's balance sheet, the Bank's lending to the government under the Ways and Means facility constitutes a supply of reserves to the banking system. On 24 January HM Treasury instructed the DMO to make an initial part repayment to the Bank of £4 billion of the Ways and Means facility; and on 31 January instructed a further repayment of £2 billion, taking the outstanding balance down to £7.4 billion.

The repayment of part of the balance therefore had the effect of draining reserves from the banking system, and thus contributed to the Bank's objective of offsetting the additional reserves taken up in the December and January long-term repo OMOs. The repayments also improved the longer-term flexibility of the Bank's balance sheet. The Bank will replace the claim on the government with other assets that may be routinely utilised to adjust the net supply of reserves to the banking system, for example by repoing out for cash, or selling, bonds.

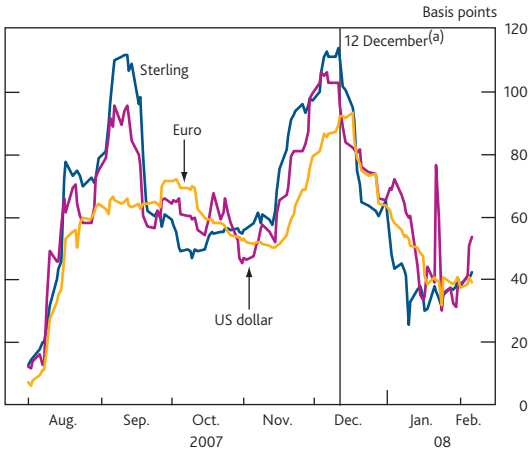
In making the repayments HM Treasury reiterated its intention to continue to reduce the size of the balance of the Ways and Means facility over time.

Other central banks from time to time also need to drain 'excess' reserves from the banking system. For example, the Federal Reserve Bank of New York has in recent months redeemed or sold part of the Federal Reserve system's holdings of Treasury bills, in order to offset factors that added reserves to the banking system.

(1) At that time the government aimed to 'fully fund' the Public Sector Borrowing Requirement (PSBR) and any increase in the foreign exchange reserves by selling central government debt with a maturity of three years or more. But as local authorities and public corporations were repaying debt to the private sector the PSBR was smaller than the central government's cash needs, and the central government had recourse to short-term borrowing, including from the Bank under the Ways and Means facility.

(2) The Bank's regime for the implementation of monetary policy is explained in *The Framework for the Bank of England's Operations in the Sterling Money Markets*, available at www.bankofengland.co.uk/markets/money/publications/redbookjan08.pdf.

Chart 39 Three-month Libor spread to three-month OIS rate



(a) Date of co-ordinated central bank announcement.

motivated by the re-emergence of strains in term money markets towards the end of 2007. The spread between three-month interbank rates and market expectations of central bank policy rates increased during November and December in sterling, dollars and euro, to peaks above the highs reached earlier in the year (**Chart 39**).

Specifically, the Bank announced changes to its long-term repo OMOs scheduled for 18 December and 15 January. In those operations, it announced that the total amount of funds offered at the three-month maturity would be expanded and the range of high-quality collateral accepted at this maturity would be widened, including to AAA RMBS and covered bonds.

The total size of reserves offered in each of the operations was raised from £2.85 billion to £11.35 billion, of which £10 billion was offered at the three-month maturity. The range of securities eligible as collateral in the three-month operations was wider than in the Bank's normal OMOs but narrower than those eligible for the special term tenders, with a minimum penalty rate, that the Bank held in September and October, described on pages 509–10 of the previous *Bulletin*.(1)

Following the joint central bank announcement, spreads between Libor rates and expected policy rates declined considerably, although remaining above the levels prevailing prior to August, and contacts reported some improvement in interbank money market conditions during the second half of December, that persisted during the first part of January. However, later in January, and during February, conditions deteriorated, with spreads between Libor rates and expected policy rates increasing.

Possibly reflecting the wider range of eligible collateral, the range of successful bid rates in the three-month operations in December and January was wider than normal. The cover ratios in those operations were relatively low (**Table A**).

Table A Long-term repo operations

	Three-month	Six-month	Nine-month	Twelve-month
20 November 2007				
On offer (£ millions)	1,600	750	400	200
Cover	1.15	3.07	3.55	4.10
Weighted average rate(a)	5.643	5.526	5.416	5.327
Highest accepted rate(a)	5.700	5.550	5.430	5.340
Lowest accepted rate(a)	5.560	5.490	5.415	5.325
Tail(b)	8.30	3.60	0.10	0.20
18 December 2007				
On offer (£ millions)	10,000(c)	750	400	200
Cover	1.09	2.07	2.46	3.68
Weighted average rate(a)	5.949	5.410	5.351	5.303
Highest accepted rate(a)	6.600	5.430	5.370	5.320
Lowest accepted rate(a)	5.360	5.381	5.345	5.285
Tail(b)	58.92	2.85	0.63	1.75
15 January 2008				
On offer (£ millions)	10,000(c)	750	400	200
Cover	1.31	0.93	1.34	3.00
Weighted average rate(a)	5.278	4.988	4.940	4.850
Highest accepted rate(a)	5.630	5.020	4.950	4.850
Lowest accepted rate(a)	5.140	4.800	4.870	4.850
Tail(b)	13.85	18.79	6.95	0.00

(a) Per cent.
(b) The yield tail measures, in basis points, the difference between the weighted average accepted rate and the lowest accepted rate.
(c) December and January long-term repos were held against an expanded range of high-quality collateral.

Electronic tendering system for OMOs

As reported in the previous *Quarterly Bulletin*, the Bank has introduced a new electronic tendering system for its OMOs, called Btender. The first weekly repo OMO using Btender was conducted on 22 November; the first long-term repo OMO using Btender on 18 December; and the first gilt-purchase OMO on 28 January.

Bond-purchase OMOs

The Bank announced in May 2006 that it intended to conduct OMOs to inject reserves to the banking system via the outright purchase of bonds. The box on pages 22–23 explains the policy motivation for the Bank's bond purchases; and how the operations are structured.

On 2 January the Bank announced the dates and sizes of the first three OMOs for the outright purchase of gilts. The first such OMO was conducted on 28 January, and was well covered at all maturities (**Table B**).

Foreign currency reserves

The Bank's foreign currency reserves currently comprise around £1 billion equivalent of assets. These are funded by a $2 billion three-year issue, the first liability under the Bank's programme

(1) Details of the additional eligible collateral securities, including the margins applied by the Bank, and of the operational arrangements for the three-month long-term OMOs in December and January, were contained in a Market Notice issued on 14 December. It is available at www.bankofengland.co.uk/markets/money/documentation/statement071214.pdf.

The injection of reserves via bond-purchase OMOs

This box explains the rationale for the Bank's new open market operations (OMOs) for the outright purchase of bonds; and sets out the operational framework for the purchases.

As part of the reforms to its money market framework introduced in May 2006, the Bank introduced voluntary reserves — balances which a wide range of banks and building societies may choose to hold at the Bank. Members of the reserves scheme each set their own target for average holding of reserves in a maintenance period running from the date of one MPC interest rate decision to the eve of the next. These reserves are remunerated, at Bank Rate, provided that average holdings are within a range around the target. Between £15 billion–£25 billion has been held in these new reserves accounts.

Because the Bank's liabilities have expanded in this way, so too have its assets. In particular the Bank uses its OMOs to ensure that members of the reserves scheme can hold the reserves they demand. The money that the Bank pays out in its OMOs finds its way, directly or indirectly, into the reserves accounts of reserves holders at the Bank.

In recent years the Bank has conducted its OMOs in the form of loans by way of reverse repo, lending money for a fixed term against high-quality collateral securities. Usually, most of the Bank's reverse repos are for just one week (or for just one day on the final day of a maintenance period). Since 2006 these OMOs have included repos of three, six, nine and twelve months. The Bank announced on 15 May 2006, in a joint statement with the Debt Management Office, that it planned also to conduct open market operations to make outright purchases of bonds, including gilts and high-quality foreign currency bonds.(1)

The Bank's repo OMOs inject reserves into the banking system for the term of the loan. If the Bank makes a one-week loan via reverse repo, the money that it puts out in the loan will add to the total of reserves balances until the loan has to be repaid. With outright purchases the same basic mechanism will apply as with repos. When the Bank buys a bond it will plan to hold it to maturity. The money that the Bank pays for the bond will therefore be added to commercial banks' reserves accounts until the bond is redeemed. Purchasing a five-year bond, for example, provides central bank money to the banking system for five years; injected on the day of purchase and withdrawn on the day of maturity. By buying longer-term assets the Bank will be reducing the size of its refinancing of the banking system that has to be rolled over frequently.

The bonds will be marketable instruments, so the Bank will be able readily, if necessary, to adjust the net supply of reserves to the banking system by selling bonds or by repoing bonds for cash.

For these reasons, bond purchases are a flexible means of injecting reserves into the banking system. A number of central banks, including the Federal Reserve Bank of New York and the Bank of Japan, provide financing for the banking system's purchase of banknotes and reserves holdings via outright purchases of government bonds.

The Bank's bond portfolio will in general, appear on the balance sheet of its Issue Department, backing banknotes.(2) The reason for this is that the underlying growth of the banknote issue has been steady for many years and so the majority of the necessary financing for banknotes can in most circumstances, be provided via the purchase of longer-maturity assets. The overall net supply of reserves supplied by the Bank will not change, but reserves supplied in the form of bond purchases will over time replace reserves supplied in the form of short-term repo OMOs.

Five principles guide the Bank's provision of central bank money via the acquisition and management of this bond portfolio:

i. The process for purchasing the bonds and the structure of the resulting portfolio is designed to be simple and transparent.

ii. The purchases are, and can be seen to be, non-discretionary, given that the Bank is acquiring assets whose yields reflect, among other things, expectations of the path of Bank Rate set by the MPC.

iii. The portfolio is designed to expose the Bank to minimal credit risk.

iv. The portfolio is structured broadly to match the expected behavioural maturity of Issue Department's banknote liabilities, while allowing for the possibility of persistent reductions in demand for banknotes.

v. The purchases and structure of the portfolio are designed to avoid disruption to HMG debt management. In particular, the Bank seeks to avoid actions or arrangements that would undermine the efficient functioning of the gilt market, or conflict with the Government's debt management policy and the operational requirements of the UK Debt Management Office (DMO) in implementing that policy.

Given those principles, the following framework governs the Bank's bond-purchase OMOs:[3]

- Over each calendar year as a whole, the maturity profile of the bonds purchased by the Bank is determined by the maturity distribution of UK government sterling fixed-rate debt in issue.

- Bonds purchased have a maximum residual maturity of 21 years and, initially, a minimum residual maturity of three years. In each operation the Bank purchases bonds from each of three different maturity segments in that part of the curve.

- Bonds are purchased via open market operations with the Bank's OMO counterparties, conducted on a regular, published timetable; and, as far as possible, of broadly even sizes.

The Bank held its first bond-purchase OMO, to purchase £400 million of gilts, on 28 January. The results are shown on page 24. The Bank plans that gilt-purchase OMOs will be held each calendar month in 2008 with the exception of December (due to the Christmas holiday).

The Bank intends, later in 2008, to begin purchasing high-quality foreign-currency denominated bonds, with the cash flows swapped into fixed-rate sterling. The reasons for buying swapped foreign currency bonds, in addition to gilts, are to ensure that the Bank's purchases do not put undue pressure on the gilt market; and to allow the overall size of the portfolio to be built up more quickly in the coming years.

When the portfolio is mature the same principles will apply to the Bank's purchases but their scale will then be driven by the growth of the note issue and redemptions of bonds in the Bank's portfolio, and not by the initial need to build up the portfolio.

The Bank intends to lend from its gilt portfolio in due course. This will help to avoid the risk that its purchases of gilts exacerbate any undesirable volatility in secured money market rates due to collateral shortages, or contribute to particular stocks trading at a significant premium in the cash gilt market. After consultation with the DMO, the Bank published a statement on 28 January setting out its plans for bond lending in more detail.[4]

Further details of these planned changes to the Bank's operations will be provided in subsequent *Quarterly Bulletins*.

(1) The Bank subsequently issued a consultative paper on its planned bond purchases in July 2006; and in November 2006 a Market Notice setting out the framework that it was minded to adopt. All these papers, and other material, are available at www.bankofengland.co.uk/markets/money/omo/outright_purchases.htm.
(2) Under the Bank Charter Act of 1844, banknotes and the assets backing those notes are separated from the rest of the Bank's business and appear on the balance sheet of the Issue Department of the Bank.
(3) Further details of the Bank's approach may be found in *The Framework for the Bank of England's Operations in the Sterling Money Markets*, available at www.bankofengland.co.uk/markets/money/publications/redbookjan08.pdf; in particular on pages 9–10 and 23–24.
(4) Available at www.bankofengland.co.uk/markets/money/omo/statement080128.pdf.

Table B Issue Department gilt-purchase OMO

	Amount purchased (£ millions)	Sector cover ratio	Weighted average accepted price	Highest accepted price	Lowest accepted price	Tail[a]
28 January 2008						
Short		3.12				
UKT 4.25% 07/03/2011	81.10		99.695	99.700	99.686	0.005
UKT 9% 12/07/2011	102.80		114.693	114.700	114.680	0.007
Medium		4.91				
UKT 4.75% 07/03/2020	52.03		102.184	102.190	102.183	0.006
UKT 8% 07/06/2021	71.87		133.930	133.950	133.923	0.020
Long		4.75				
UKT 5% 07/03/2025	45.79		106.264	106.290	106.250	0.026
UKT 6% 07/12/2028	45.83		120.372	120.400	120.290	0.028
Total purchased[b]	399.41					

(a) The tail measures the difference between the highest accepted price and the weighted average accepted price.
(b) Figures may not sum to total due to rounding.

of annual bond issuance which commenced in March 2007. Planning is under way for the second issue in this programme; on 29 February, the Bank announced that it had mandated Barclays Capital, Deutsche Bank, HSBC and JPMorgan to bring a three-year US dollar transaction of size $2 billion, expected to take place in the week beginning 10 March. The intention is that by mid-2009 the Bank's reserves will have reached a steady-state level of around £3 billion equivalent.

On 28 January 2008 one of the Bank's remaining two Euro Notes, for €2 billion nominal, matured. This has led to a temporary drop in the Bank's holdings of foreign currency bonds.

Facilitating the provision of payment services

The final Euro Note, for €3 billion nominal, matures on 27 January 2009. Assets funded by this issue are currently lent out each day to generate intraday liquidity to facilitate the Bank's participation in TARGET, the euro area's wholesale payments system. As detailed in previous *Quarterly Bulletins*, during 2008 the Bank will cease to be a direct member of TARGET; going forward, its intraday liquidity requirements will be somewhat lower.

Capital portfolio

The Bank holds an investment portfolio that is approximately the same size as the Bank's capital and reserves (net of equity holdings, eg in the BIS and ECB, and the Bank's physical assets) together with aggregate cash ratio deposits. The Bank's 'free' capital and cash ratio deposits are invested in a portfolio of sterling-denominated securities. Securities purchased by the Bank for this portfolio are normally held to maturity; nevertheless sales may be made from time to time, reflecting for example, risk management, liquidity management or changes in investment policy.

The bond portfolio currently includes around £2 billion of gilts and £1 billion of other debt securities. Purchases are generally made each month with purchase details announced in advance on the Bank's wire service pages. Over the current review period, gilt purchases were made in accordance with the announcement on 3 December: £20 million each in November and January.

Table C Simplified version of Bank of England consolidated balance sheet[a][b]

£ billions

Liabilities	6 Feb.	7 Nov.	Assets	6 Feb.	7 Nov.
Banknote issue	41	41	Short-term sterling reverse repo	6	21
Reserves account balances	23	22	Long-term sterling reverse repo	32	15
Standing facility deposits	0	0	Ways and Means advance	7	13
Other sterling deposits, cash ratio deposits and the Bank of England's capital and reserves	14	14	Standing facility assets	0	0
Foreign currency denominated liabilities	18	17	Other sterling-denominated assets	30	24
			Foreign currency denominated assets	21	21
Total[c]	**96**	**94**	**Total**[c]	**96**	**94**

(a) The Bank Charter Act 1844 requires the Bank of England to separate the note issue function from its other activities. Accordingly, the Bank has two balance sheets: for Issue Department and Banking Department. See 'Components of the Bank of England's balance sheet' (2003), *Bank of England Quarterly Bulletin*, Spring, page 18.
(b) Based on published weekly Bank Returns. The Bank also uses currency, foreign exchange and interest rate swaps to hedge and manage currency and non-sterling interest rate exposures — see the Bank's 2006 *Annual Report*, pages 36–37.
(c) Figures may not sum to totals due to rounding.

Research and analysis

Capital inflows into EMEs since the millennium: risks and the potential impact of a reversal

By Guillermo Felices, Glenn Hoggarth and Vasileios Madouros of the Bank's International Finance Division.

Capital inflows into emerging market economies (EMEs) were at a record level in 2007 and higher than prior to the East Asian and Russian crises a decade earlier. These inflows largely reflect improvements in EMEs' economic and financial strength in recent years. But some EMEs, especially in Central and Eastern Europe, may be vulnerable to a reversal of capital flows if the global credit squeeze is prolonged or global GDP growth falls sharply. This could adversely affect both EMEs and foreign investors.

Introduction

Notwithstanding the turmoil in developed financial markets since last July, capital flows into EMEs in 2007 were at a record level and larger than prior to the East Asian crisis a decade ago. And at end-February 2008, sovereign bond spreads remained well below, and equity price/earnings ratios above, their historical averages in many EMEs. Following the strengthening in EMEs' economic and financial position in recent years, foreign investors currently appear to be treating EME assets as a relatively safe haven. However, some EME borrowers may be vulnerable to a reversal of capital flows if global financial market conditions remain fragile or world GDP growth slows sharply. Moreover, previous experience, such as in East Asia and subsequently in Russia a decade ago, shows how EME crises can cause losses and/or funding difficulties for global financial institutions, including UK-owned firms, either directly or indirectly through disrupting global financial markets.

The first section of this article assesses whether the strong capital inflows into EMEs in recent years are likely to be sustained. It looks at the size and composition of inflows, and whether they have been attracted mainly by domestic ('pull') or global ('push') factors. The second section then assesses some of the channels through which a withdrawal of capital from EMEs could feed back to affect global financial institutions, either directly, or indirectly through affecting financial asset prices in developed countries.

The sustainability of capital inflows into EMEs

Trends in capital inflows into EMEs

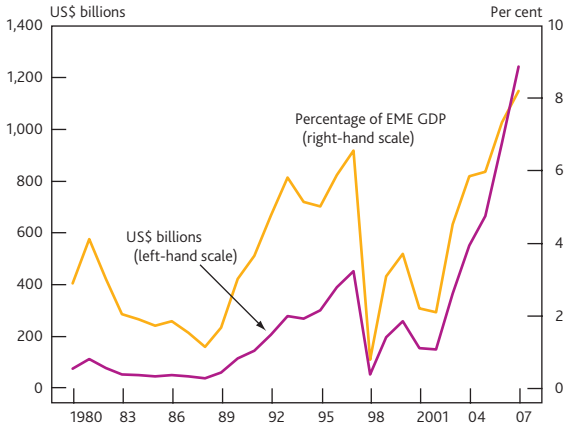
The current wave of globalisation is characterised by a substantial increase in international trade flows and an even more rapid expansion of capital flows(1) to and from EMEs.(2) Trade openness in EMEs has almost doubled since the early 1980s, while *de facto* financial openness — measured as the sum of the stock of foreign liabilities and assets as a percentage of GDP — has almost trebled over the same period.

There have been two waves of particularly rapid capital inflows(3) to EMEs over the past 20 years. The first was in the mid-1990s prior to the East Asian crisis and the second has been over the past five years (**Chart 1**). In the current wave, inflows reached a record high in 2007 and have been particularly strong from private sector investors.

In contrast to the mid-1990s, capital inflows have not, in aggregate, been required to finance current account deficits (domestic investment in excess of domestic savings). Overall, EME domestic savings have exceeded domestic investment in recent years, so that the large inflows have contributed to a marked build-up of foreign exchange reserves and other foreign assets. But, whereas capital inflows have been strong in all EME regions, there have been marked regional differences in current account balances (see the box on page 28).

(1) These trends are evident in developed markets as well.
(2) Unless otherwise stated, the following sample of 44 emerging market countries is used throughout the text. Latin America and Caribbean: Argentina, Brazil, Chile, Colombia, Dominican Republic, Ecuador, Guatemala, Mexico, Peru and Venezuela. Central and Eastern Europe (CEE) and the Commonwealth of Independent States (CIS): Croatia, Czech Republic, Hungary, Kazakhstan, Poland, Romania, Russia, Slovak Republic, Turkey and Ukraine. Emerging Asia and newly industrialised countries (NIC): Bangladesh, China, Hong Kong, India, Indonesia, Malaysia, Pakistan, Philippines, Republic of Korea, Singapore, Sri Lanka, Taiwan Province of China, Thailand and Vietnam. Middle East and Africa: Algeria, Egypt, Iran, Kuwait, Libya, Morocco, Nigeria, Saudi Arabia, South Africa and the United Arab Emirates. Data for the CIS countries in the sample (Kazakhstan, Russia and Ukraine) are only available from 1992.
(3) Capital inflows consist of debt, portfolio equity and foreign direct investment (FDI). The vast majority of these inflows into EMEs are from private sector investors, but also include flows from governments and international financial institutions.

Chart 1 Gross capital inflows into EMEs, 1980–2007[a]



Sources: IMF *World Economic Outlook*, October 2007 and Bank calculations.

(a) 2007 numbers are an IMF estimate.

Capital inflows should bring benefits to EMEs over the longer term. The increasing ability of EME companies to borrow from abroad should reduce their cost of capital and thus boost their investment and GDP growth. Capital inflows also offer the prospect to both domestic borrowers and foreign investors of more efficient risk-sharing. In theory, through borrowing from abroad, EME companies and households should be better able to smooth consumption against temporary losses of income. And through buying EME assets, foreign investors have the opportunity of holding financial assets with a broader combination of risk and return than may be available in their domestic, or other developed, markets.(1)

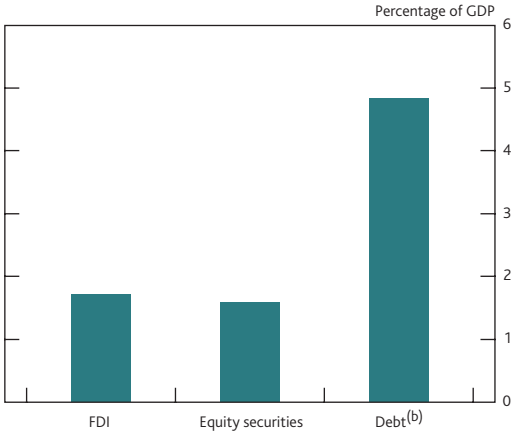
But very rapid capital inflows can be difficult to absorb and in the past have been at times associated with rapid increases in asset prices and domestic credit booms.(2) The recent large build-up of foreigners' holdings of EME assets also has potential implications for lenders because their income and wealth is more exposed than previously to changes in EME asset prices and the risk that EME borrowers will default. For example, the value of UK investors' holdings of securities issued by EMEs doubled from 7% to 14% of UK GDP between end-2001 and end-2006, while the value of UK-owned banks' claims on EMEs increased from 19% to 25% of UK GDP over the same period. Moreover, faced with losses in one or more EMEs, investors may reduce their lending in other markets thus transmitting the shock across countries. The potential for contagion is discussed further below.

Composition of capital inflows into EMEs: causes and effects

The vulnerability of EMEs currently to such a capital reversal partly depends, *inter alia*, on the composition of gross capital inflows. Research emphasises that equity flows are likely to provide the most benefits and least potential costs to EMEs. FDI, in particular, may bring the direct benefit of transferring technology from abroad. Recent evidence also emphasises the potential indirect 'catalytic' benefits to GDP growth, for example, through foreign ownership promoting the development of the domestic financial sector, increasing competition and acting as a discipline device to improve macroeconomic policies and corporate governance.(3)

Debt flows have in the past generally been more volatile than equity (**Chart 2**), especially in the wake of EME crises. Perhaps reflecting this, Kose *et al* (2007) find that over the 1987–2004 period, debt inflows increased the volatility of EME consumption growth rather than reduced it as suggested by theory. As highlighted by the empirical early warning literature on financial crises, in times of stress high short-term foreign currency debt in relation to foreign currency reserves and a high share of non-FDI liabilities in total external liabilities increase a country's susceptibility to a currency crisis (on the former see Berg *et al* (2005) and on the latter see Frankel and Wei (2005)).

Chart 2 Volatility[a] of gross capital inflows to EMEs, 1980–2006



Sources: IMF *World Economic Outlook*, October 2007, *International Financial Statistics*, national central banks and Bank calculations.

(a) Measured by the standard deviation of capital flows (in percentage of GDP) averaged across 44 EMEs.
(b) Debt consists mainly of debt securities and bank loans, but also includes trade credits, currency and deposits and loans by multilateral institutions.

However, the composition — and size — of capital inflows may be partly a reflection rather than a cause of vulnerability. For example, foreigners will be more willing to invest long term and in local currency debt, the less risky their perception is of the borrower. They will also be more willing to invest in FDI if there is good governance and macroeconomic policy making (Wei (2006)). This points to the possibility of a virtuous circle, whereby an improvement in domestic policies may not only reduce directly the likelihood that EMEs are hit by an adverse shock and thus a marked capital outflow but also allow them to improve the composition of their external financing which, in turn, reduces further their external vulnerability

(1) For more discussion on risk-sharing see Kubelec *et al* (2007).
(2) See, for example, IMF (2004) and (2007a).
(3) Kose *et al* (2006).

Balance of payments in EMEs

A country's real and financial transactions with the rest of the world are recorded in its external balance. The balance of payments identity between residents and non-residents shows that a current account surplus, that is the excess of domestic savings over investment, is invested either by the central bank in foreign exchange reserves and/or by other sectors of the economy in foreign debt, equity or FDI.(1) Conversely, a current account deficit, domestic investment in excess of domestic savings, is financed through an increase in net liabilities — net capital inflows — and/or through a run down in the central bank's foreign exchange reserves. This is shown in equation **(1)** below.(2)

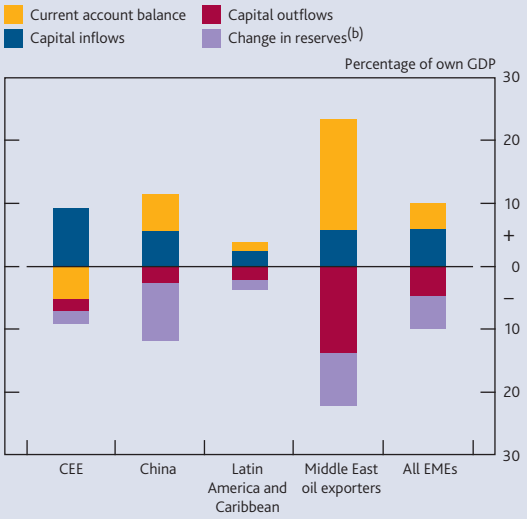
$$CAD = NKI - \Delta R = (KI - KO) - \Delta R \qquad (1)$$

where:
CAD = current account deficit.
NKI = gross capital inflows (KI) less outflows (KO) of debt, equity and FDI.
ΔR = increase in the central bank's foreign exchange reserves.

Capital inflows into EMEs as a whole were at a record level in 2007. But, in aggregate, domestic savings in EMEs were more than sufficient to fund domestic investment, resulting in a current account surplus (around 1% of world GDP). That meant that these strong trade and financial foreign exchange inflows have been reflected in a very large build-up in foreign exchange reserves.

Gross capital inflows into EMEs — the focus of this article — have been strong in all regions in recent years. But there has been a marked divergence across EMEs in the other main components of the balance of payments (**Chart A**). In Central and Eastern Europe, strong capital inflows have financed large current account deficits, while capital outflows and reserve accumulation have been smaller. In contrast, capital inflows in China and oil-exporting countries have combined with very large current account surpluses. This has been reflected in a rapid accumulation of foreign assets, mainly by central banks in the form of foreign exchange reserves (especially in China), and by sovereign wealth funds (especially in the Middle East). And in Latin America, large capital inflows have coincided with positive, albeit small, current account surpluses. This has been reflected both in a large accumulation of foreign exchange reserves by central banks as well as foreign investments by the private sector.

Chart A Balance of payments for selected EMEs,(a) average 2003–06



Sources: IMF *World Economic Outlook*, October 2007, *International Financial Statistics* and Bank calculations.

(a) Individual components may not sum to zero because the capital account and errors and omissions are excluded.
(b) An increase in reserves is shown as a negative change in the chart.

(1) Note that in the balance of payments framework the accumulation of foreign assets by sovereign wealth funds could be potentially included under a number of subcategories — 'central government', 'financial corporations' or 'other sectors' — depending on each country's institutional framework. As these funds have grown in recent years, especially in oil-exporting countries and East Asia, the IMF intends to provide clearer guidance to help national statisticians determine the appropriate sectoral classification.
(2) For simplicity, and given the focus of the article on transactions in financial assets, equation **(1)** assumes that another component of the balance of payments, the capital account, which records capital transfers and transactions in non-produced, non-financial assets, is zero.

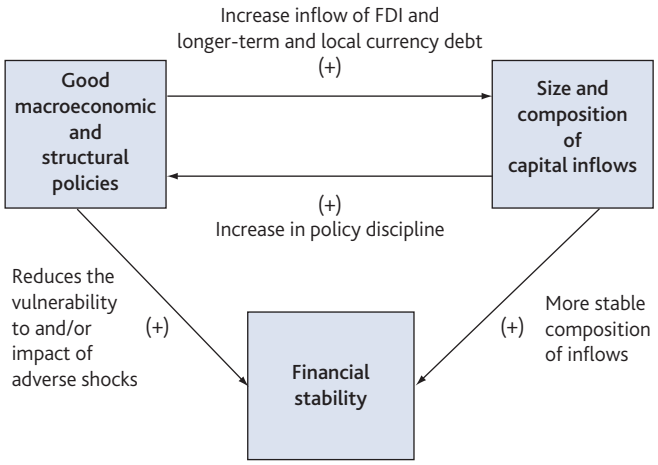
(**Diagram 1**). Of course, the circle can also work in reverse. EME governments or companies that have weak financial positions may only be able to borrow at short maturity and in foreign currency. Their vulnerability to adverse shocks will be compounded by the structure of their external financing.

EMEs' recent economic performance

The virtuous, rather than vicious, circle has been evident for most EMEs over the past five to ten years. This partly reflects the efforts by EME governments to improve macroeconomic policies and the frameworks under which they are applied. A number of EME central banks have adopted inflation targets since the late 1990s while inflation rates were on a steady downward trend until 2006. Government debt levels have also been reduced, particularly debt owed to foreigners.

The susceptibility of EMEs to exchange rate crises has also fallen. In most regions (with the clear exception of Central and Eastern Europe (CEE)) current account balances have moved into surplus or surpluses have got bigger. This, in combination with the large net capital inflows, has meant that foreign exchange reserves have increased markedly and in most EMEs are now several multiples higher than short-term debt (on average a multiple of six). GDP growth has also been strong in all EME regions for the past five years. Therefore, the average

Diagram 1 Virtuous circle of capital inflows into EMEs

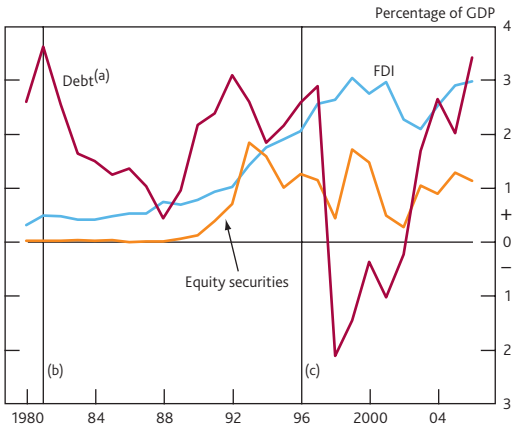


Note: Signs in brackets signify the direction of the expected impact.

credit rating of EMEs in the emerging market sovereign bond index (global), the EMBIG, has increased by around three notches over the past decade and by two notches over the past five years alone and is now only marginally below investment grade.

Consequently, EMEs have attracted a large inflow of FDI over the past decade (**Chart 3**) which has resulted in a marked increase in the share of FDI within their total outstanding external liabilities (**Chart 4**). Many EME governments have also been able to reduce the vulnerability of their debt profile through financing more in local rather than foreign currency and through extending the maturity of their (non-sterilisation related) domestic debt. For example, the original maturity of EME central government debt increased from 5.3 years at end-1995 to 8.3 years at end-2005 (BIS (2007)).(1)

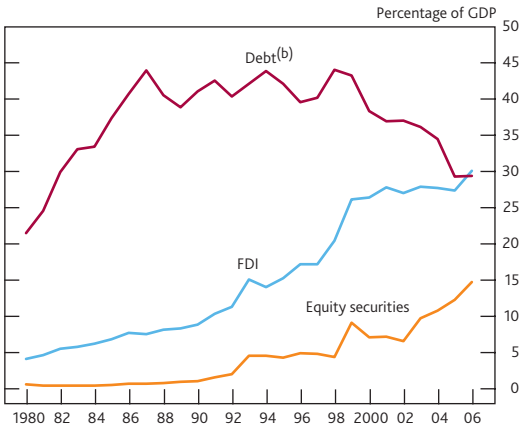
Chart 3 Gross capital inflows to EMEs, 1980–2006



Sources: IMF *World Economic Outlook*, October 2007, *International Financial Statistics*, national central banks and Bank calculations.

(a) Debt consists mainly of debt securities and bank loans, but also includes trade credits, currency and deposits and loans by multilateral institutions.
(b) Year before the start of the early 1980s Latin American debt crisis.
(c) Year before the start of the 1997–98 Asian crisis.

Chart 4 Composition of EMEs' gross outstanding external liabilities,(a) 1980–2006



Sources: IMF *World Economic Outlook*, October 2007, *International Financial Statistics*, Lane and Milesi-Ferretti (2007), updated with data provided by the authors, national central banks and Bank calculations.

(a) The stock of external liabilities can change either due to the accumulation of new liabilities (capital inflows) or due to changes in the valuation of the existing stock.
(b) Debt consists mainly of debt securities and bank loans, but also includes trade credits, currency and deposits and loans by multilateral institutions.

However, there has also been a rapid increase in debt inflows into the private sector in recent years, especially in CEE. These flows may reflect expectations of higher future income as these countries 'catch up' with income levels in developed countries.(2) But they may also partly reflect a 'search for yield' by foreign investors. Debt inflows have been used mainly to finance growth in domestic credit particularly to the household sector and are contributing to domestic and external imbalances in the region. Real domestic demand growth has been strong, house price inflation very high and current accounts are in deficit — in the Baltic and Balkan countries particularly so. Also, much of the domestic credit to households is denominated in foreign currency. This has some parallels with the rapid build-up of debt in Latin America in the early 1980s and in East Asia in the mid-1990s prior to their respective crises.

Measuring the importance of 'pull' and 'push' factors

Econometric evidence can help to distinguish whether the marked increase in EME capital inflows and rise in asset prices in recent years is due mainly to improvements in economic and financial positions and stronger institutional frameworks ('pull' factors) or an increase in global liquidity and investors' risk appetite ('push' factors).

Updated estimates based on the model reported in the *Bank of England Quarterly Bulletin* (2006) suggest that an improvement in domestic 'fundamentals' — at least to the

(1) Some EME governments are also issuing inflation-link debt as a signal of their commitment to an anti-inflation monetary policy. In the past, inflation-linked debt was seen as a sign of weakness of EMEs with a track record of high inflation since it was the only debt that foreigners were willing to buy.
(2) For CEE countries, this catch up is in the context of further integration with Western Europe through joining the EU and/or adopting the euro.

extent that these are captured accurately by changes in sovereign credit ratings[1] — can account for more than four fifths of the narrowing in the aggregate EME sovereign foreign currency bond spreads (the EMBIG) between mid-1998 and mid-2007 (first column in **Table A**). A number of IMF authors also find that better credit ratings have been an important factor contributing to a narrowing in spreads.[2] And IMF (2007b) finds that (lagged) domestic GDP growth has also been an important determinant of capital inflows into EMEs over the 1998–2006 period.

Table A Accounting for changes in EME sovereign bond spreads[a]

Contribution to changes in spreads (basis points)	End-June 1998 to end-June 2007	End-Dec. 2002 to end-June 2007	Mid-July 2007 to mid-Jan. 2008[b]
Pull factors			
Credit ratings	-371	-367	-13
Push factors			
Risk appetite (VIX)	-41	-165	124
Residual	-17	-11	18
Actual change in spreads (basis points)	-429	-544	128

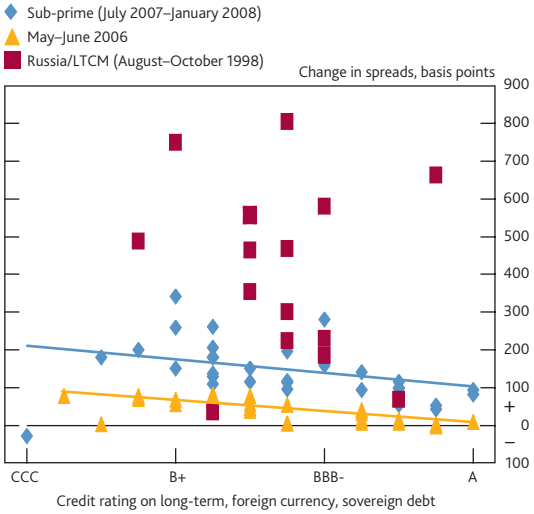
Source: Bank of England calculations.

(a) The model has been estimated using monthly data from June 1998 to January 2008.
(b) From the trough to the most recent peak of risk aversion — as proxied by the VIX — during the sub-prime market turmoil (17 July 2007 to 22 January 2008). The VIX also reached similar levels in August and November 2007.

This strengthening in fundamentals in recent years seems to have been an important factor helping to insulate EME capital markets from the turmoil in developed financial markets since the summer of 2007. There has been only a relatively modest rise in EME sovereign bond spreads during the financial market disruption — much less than the increase in spreads on risky bonds in developed markets. Moreover, the widening in EME spreads in the current global market turmoil can be almost fully accounted for by the fall in global risk appetite over the period (proxied by the rise in the VIX),[3] whereas most EME sovereign credit ratings have been unaffected so far by the current market turmoil (third column in **Table A**).[4] Also, within the EME asset class, sovereign bond spreads rose less for EMEs with higher credit ratings and exchange rates fell more for countries with larger current account deficits. A similar pattern occurred during the temporary market correction in May–June 2006 although it was less apparent during the Russian crisis in 1998 (**Chart 5**). This highlights the financial stability benefits to EMEs from improving policy frameworks and outturns.

All the studies mentioned above, however, also suggest that an increase in global liquidity and/or in risk appetite have contributed to the rise in EME capital flows and reduction in bond spreads in recent years (second column in **Table A**). Foreign investors, particularly those involved in carry trades such as banks and hedge funds, have been attracted to emerging markets by high domestic yields relative to the low yields witnessed in recent years in developed economies. Consequently, and notwithstanding the increase in

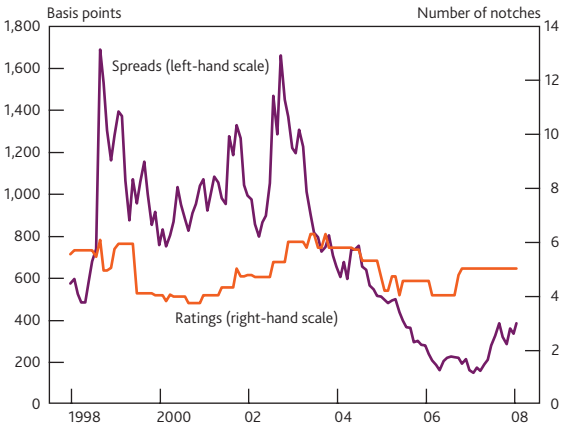
Chart 5 Corrections in sovereign foreign currency denominated bond spreads by credit rating



Sources: Bloomberg, JPMorgan Chase & Co., Standard and Poor's and Bank calculations.

discrimination in favour of EMEs with stronger credit ratings during the financial market turbulence since the summer of 2007, the search for yield has meant that investors have differentiated less in recent years between EMEs of different credit quality. In other words, the dispersion of sovereign bond spreads across EMEs has fallen by much more than that of sovereign credit ratings (**Chart 6**).

Chart 6 Dispersion[a] in EME sovereign foreign currency bond spreads and credit ratings[b]



Sources: Bloomberg, JPMorgan Chase & Co., Standard and Poor's and Bank calculations.

(a) Difference between the 25th and the 75th percentiles for sovereigns in the EMBIG.
(b) For countries in the EMBIG.

(1) Increases in sovereign credit ratings also reflect potential temporary improvements in economic performance including those brought about by the particular benign external environment witnessed in recent years.
(2) See IMF (2007c), Remolona *et al* (2007) and Hartelius *et al* (2008).
(3) The VIX (Chicago Board Options Exchange Volatility index) is an index of volatility in the Standard and Poor's 500 equity index implied from options prices and is widely used as a measure of global risk aversion.
(4) There were one notch downgrades by Fitch in Latvia in August 2007 and by Standard and Poor's in Kazakhstan in October 2007 and in Lithuania in January 2008. Fitch also put several Central and Eastern European countries (Bulgaria, Estonia, Latvia and Romania) on negative outlook in January 2008.

The relative resilience of EMEs as a whole to the credit turmoil since mid-2007 does not imply necessarily that vulnerabilities in specific EMEs cannot crystallise. Since the start of the turmoil, some EME borrowers in CEE and the CIS, especially banks, have faced a sharp rise in the cost of external finance and reduction in capital inflows. This could be a precursor to a much larger turnaround in the future. Moreover, the strengthening in economic and financial conditions of EMEs discussed above also partly reflect the unusually favourable external environment in recent years — strong growth in world GDP, low world real interest rates and consumer price inflation and high commodity prices. None of these factors can be relied upon to continue over the medium term.

Therefore, although capital flows into EMEs were at a record level in 2007, this raises the question of how a capital reversal might play out across EMEs and onto developed markets should global liquidity conditions remain tight or world GDP growth fall sharply.

Potential spillovers from a reversal of capital flows to EMEs

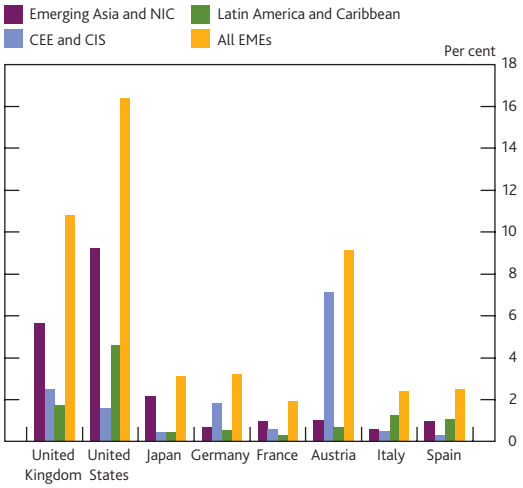
There is now a vast theoretical and empirical literature on potential contagion channels across countries.(1) This section looks at some of the ways to quantify spillovers from EMEs to developed financial markets. The first part looks at the direct exposures that foreign investors currently have with EME borrowers. Then the potential indirect risks that investors may face are highlighted due to contagion between EME asset markets and mature markets. The third part looks at recent evidence of the interaction between changes in asset prices in EMEs, on the one hand, and the United States and the United Kingdom on the other.

Foreign investors' direct exposures to shocks in EMEs

A measure of the *ex-ante* exposure of foreigners through investing in individual EMEs can be derived from information on the current pattern of debt and equity financing between creditor and debtor countries.

Chart 7 shows the concentration of (long-term debt plus equities) portfolio investment by investors resident in major developed countries in EME regions at end-2006, according to the latest IMF annual *Co-ordinated Portfolio Investment Survey*.(2) Also shown is the concentration of foreign exposures in EME regions of developed (BIS) country banking systems (**Chart 8**). These show that for most investing countries, portfolios are reasonably dispersed across EME regions, with any one region not constituting a large share of most lending countries' total global portfolio.(3) The main exceptions are Austrian-owned banks in emerging Europe and Spanish-owned banks in Latin America. But even here exposures are somewhat less concentrated than those of Japanese and US-owned banks prior respectively to the East Asian crisis in 1997–98 and the Latin American debt crisis in the early 1980s. At first sight then, this suggests that the risk faced by foreigners investing in EMEs is in most cases quite diversified.(4)

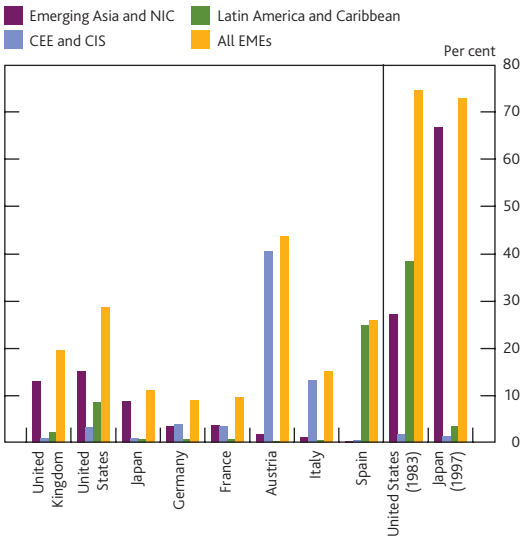
Chart 7 Regional dispersion of holdings of EME securities[a][b] (percentage of creditor country's total holdings of foreign securities), end-2006



Source: IMF *Co-ordinated Portfolio Investment Survey* (2007).

(a) Long-term debt (original maturity greater than one year) and equity securities.
(b) The data show cross-border holdings on a residency basis.

Chart 8 Regional dispersion of consolidated bank exposures[a] to EMEs (percentage of banking sectors' total foreign exposures), end-June 2007



Sources: Bank of England and BIS.

(a) These include local exposures of foreign-owned subsidiaries and branches as well as cross-border claims. Exposures include holdings of foreign securities.

(1) See, for example, the collection of papers in Classens and Forbes (2001).
(2) The data consist of both domestic private and public sector securities held by the foreign private and public sectors (excluding holdings of foreign exchange reserves). The data also exclude derivatives. For more details on limitations to these data see De Alessi Gracio *et al* (2005).
(3) Disaggregating the portfolio investment into long-term debt and equity shows a similar picture.
(4) An important caveat is that these data show only the aggregate position of creditor countries and so mask the potential concentration of EME exposures at individual banks or other large financial institutions.

But the concentration risk faced by foreign investors might be higher than suggested by their direct exposures to individual EMEs. This is because a shock to one or more EMEs could affect all EME asset markets. Investors might face balance sheet constraints(1) forcing them to unwind positions in unrelated markets or there might be a generalised reassessment of risky asset markets. After the Russian crisis, for example, highly leveraged institutions cut back their positions from as far afield as Brazil, Hong Kong and Mexico.

Foreign investors' indirect exposures to shocks in EMEs

These propagation mechanisms could also affect asset prices in mature markets and, therefore, investors' balance sheets even if they do not have direct exposures to EMEs. In the Russian crisis, for example, investors also unwound their positions in private sector assets in developed economies, especially in lower credit quality bonds. This flight to quality and liquidity resulted in bond spreads rising in all risky asset markets and government bond yields falling a lot in developed countries.(2) Trading income of US banks, in aggregate, fell by $2 billion during 1998 Q3 compared with the previous two quarters, while several large US banks posted trading losses(3) and LTCM, a hedge fund, was rescued by a private sector bailout.

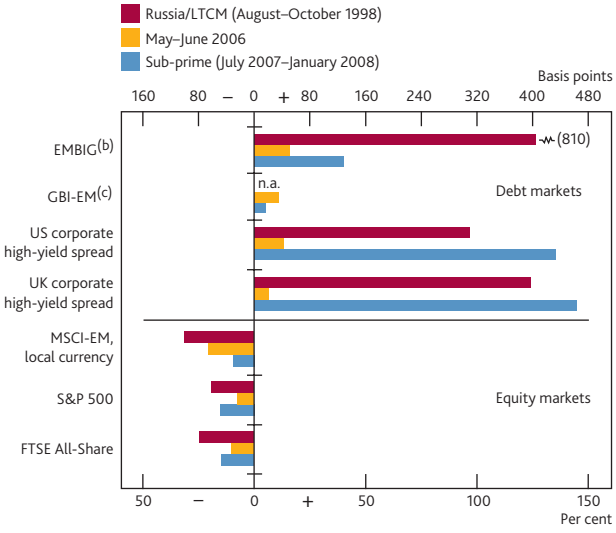
A new development in recent years is that some EME governments have become major creditors of developed countries, including the United Kingdom. For example, deposits in UK-resident banks from Russia and OPEC countries, some of which are likely to be from the governments or central banks, increased from $80 billion at end-2002 to $290 billion in 2007 Q3. Faced with private sector capital flight, these governments might react by running down their foreign assets. Although this would reduce the adverse impact of the capital outflows on the domestic economy it could exacerbate the disruption to developed markets, including the liquidity pressures on international banks.

Relationship between EME and developed country asset prices

To get some idea of how asset prices in EMEs might affect risky asset prices in developed markets during a crisis, it may be helpful to look at the relationship between asset prices during recent periods of adverse shocks. Although there have been no major EME crises over the past five years, there have been periods of abrupt EME asset price corrections. The biggest two were in May–June 2006 and since July 2007. It is difficult to pinpoint the precise trigger for these shocks, but the one in 2006 appears to have been a concern over the possibility of a slowdown in US GDP growth and was reflected in a generalised fall in risk appetite in global financial markets. The more recent one, in contrast, was caused by a deterioration in US sub-prime mortgage assets which resulted in a major disruption to developed financial markets.(4)

Chart 9 shows that the correction in emerging market asset prices in these two episodes were nonetheless small compared to the 1998 Russia/LTCM crisis. Since July 2007, the EMBIG has risen by 130 basis points.(5) This is around one quarter of the increase in spreads on high-yield corporate debt in mature markets, which increased by more than during the Russia/LTCM crisis. And EME equity prices have fallen somewhat less than in developed markets. These differences, in part, probably reflect the fact that the crisis in 1998 clearly started in an EME credit market, following the Russian government's (unexpected) default on its domestic debt, rather than reflecting simply a generalised decline in risk appetite or even a shock emanating from developed financial markets.(6)

Chart 9 Comparison of market corrections(a) in EME, US and UK asset prices



Sources: Bloomberg, JPMorgan Chase & Co. and Bank calculations.

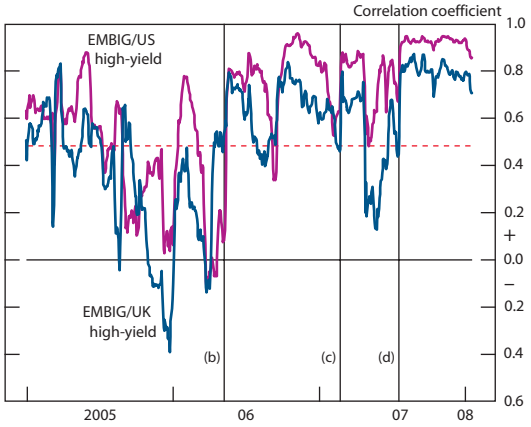
(a) Changes in asset prices are calculated from the trough to the peak in risk aversion (as proxied by the VIX) in each episode of market turbulence.
(b) Spread on dollar-denominated EME sovereign bonds.
(c) Yield on local currency-denominated EME sovereign bonds.

Despite these relatively small corrections, however, there was a large jump in the correlation between average EME and US and UK bond and equity prices in these two periods and also during the smaller market turbulence in February–March 2007.(7) In fact, correlations in the bond market between the EMBIG and US high-yield spreads rose from levels already well

(1) It is worth noting, however, that despite the losses from the current sub-prime market turmoil, foreign bank lending to EMEs remained strong in the second half of 2007.
(2) There was also a sharp appreciation of the yen and Swiss franc, as now, the main (carry trade) currencies used to borrow in order to invest in emerging market currencies.
(3) See Bomfim and Nelson (1999).
(4) See the October 2007 *Financial Stability Report*, for a detailed discussion of the recent turmoil in developed financial markets.
(5) In fact, because of the fall in US government bond yields, which are used as the reference price for EME spreads, EME sovereign bond yields have remained little changed over the period.
(6) Note though there was limited contagion also across (other) EMEs following the default of Argentina in January 2002. This crisis, however, was a slow burn and seen clearly by financial markets as a country-specific problem.
(7) There was also a large jump in the average correlation of bond and equity prices across EMEs in these two periods.

above their historical average (**Chart 10**) and to levels even higher than witnessed in the wake of the Russian/LTCM crisis (measured in the same way the bilateral correlation coefficient reached 0.85 during that crisis). Therefore, although the impact of these recent bouts of market turmoil on EMEs has been relatively modest, EME sovereign bond spreads have nonetheless moved in the same direction as risky bond spreads in mature markets suggesting that any diversification benefits to foreigners investing in EME assets may have fallen during these periods.

Chart 10 Correlations between weekly changes in the EMBIG and US and UK high-yield spreads[a]



Sources: Bloomberg, JPMorgan Chase & Co. and Bank calculations.

(a) Correlations are estimated over a 40-day rolling window. The red line represents the average correlation between EMBIG and the US high-yield spreads over the past ten years (January 1998 to December 2007).
(b) Start of May–June 2006 episode.
(c) Start of February–March 2007 episode.
(d) Start of sub-prime episode (mid-July 2007).

Although the correlations between EME and mature market asset prices suggest a strong degree of comovement in times of financial market stress, they do not provide evidence on the direction of causation. For example, this comovement may reflect the impact of shocks from EMEs to mature markets, those from mature markets to EMEs or a common shock to both markets.

Recent Bank research assesses the relationship between mature and EME bond spreads over the past decade through explicitly taking account of the source of the shock.(1) It finds that shocks to EME asset prices affect mature markets as well as the other way around. It also suggests that shocks that emanate from risky developed country debt markets, such as the recent sub-prime problem, should have much less than a one-for-one impact on EME bond spreads. That said, the rise in EME bond spreads since the summer of 2007 has been around 25 basis points less than the model prediction. This is despite the fact that the flight from risky to safe mature assets (reflected in the fall in government bond yields) has been bigger than expected. This undershooting in EME sovereign spreads may reflect improvements in EME fundamentals during the estimation period which have reduced their vulnerability to shocks in risky mature asset markets and, in turn, the perceived riskiness of EME sovereign bonds. (For more details see the Annex.)

Conclusions

Capital inflows into EMEs, particularly to the private sector, have risen markedly in recent years and in 2007 were higher than prior to the East Asian and Russian crises in the second half of the 1990s. This should bring benefits to growth over the longer run but, as has been seen in previous EME crises, also has the potential to reverse quickly causing losses to both EMEs and foreign investors.

There are a number of reasons why a generalised reversal in capital inflows is less likely than in the past. To a large extent, the increase in inflows and rise in EME asset prices over the past five years seems to reflect stronger EME fundamentals. This is reflected in EMEs now being able to attract more FDI and to issue government debt in local currency and at longer maturities. It also helps explain why EME asset prices have been less affected by the current turmoil in developed financial markets than might have been expected based on previous financial crises, and that investors have discriminated between EMEs according to their perceived credit risk. And, unlike ahead of previous EME capital reversals, EMEs are currently, in aggregate, net lenders to the rest of the world. A combination of high domestic savings, particularly in Asian economies and the oil-exporting countries, and strong capital inflows, have led to a large accumulation of foreign assets by EME central banks and governments.

But some countries, especially in Central and Eastern Europe, have attracted large foreign-currency debt inflows into their private sectors, including into lower credit-rated borrowers, to finance very large current account deficits associated with strong growth in domestic demand. If the recent fall in global risk appetite persists or world GDP growth slows it could result in a reduction in international investors' demand for these EME assets.

How would an EME shock affect global and UK financial stability? It is not possible, of course, to be sure. Most foreign investors, at least at the country level, do not have a high concentration of exposures in any one emerging market country or region. This does not preclude the possibility that some individual banks or other large financial institutions have concentrated exposures. It also ignores any indirect impact working through financial markets. Econometric evidence reported here suggests that shocks to EME asset markets can affect mature markets as well as the other way round. This is especially likely to be the case against the background of fragile global financial markets.

(1) Felices *et al* (2008 forthcoming).

Annex
Relationship between EME and developed asset prices — a vector autoregressive (VAR) model approach

Assessing the causal relationship between asset prices in EMEs and developed countries requires a separate identification of whether a shock originates in an EME, a mature market or is a common shock that affects both markets.

In a series of papers Rigobon (2003) and Rigobon *et al* (2004 and 2005) and Caporale *et al* (2005) use a structural VAR model to assess the relationship between asset markets (such as equities and short-term interest rates) in developed economies. They identify a shock as a period when the volatility in the particular asset price exceeds a certain threshold and is unique to that market.

Felices *et al* (2008 forthcoming) carry out a similar approach and look at the interaction between changes in EME sovereign bond spreads (EMBIG), high-yield corporate bond spreads (USHY) and three-month (US3M) and ten-year (US10Y) interest rates in the United States. The analysis concentrates on US bond markets since they are the biggest and most liquid in the world and are used as the benchmark for EME bond spreads. But using UK data instead gives qualitatively similar results.

The model is estimated using daily changes in the variables from January 1997–April 2007. The threshold used to identify the regimes of high volatility is when the variance of the residual from the particular equation is one standard deviation above its mean.(1) The periods of shocks identified in this way for the EMBIG capture all the known EME sovereign crises over the past decade (such as in Argentina, Brazil, Russia and Turkey).

As usual there are caveats to such empirical analysis. Although the technique uses a quantifiable threshold to identify the various shocks to each variable, it does not tell us what caused the shock and this, in practice, may vary from period to period. Also the coefficients in the model are averages over the whole sample period and so it assumes that the sensitivity to a given size of shock is the same in a crisis and a tranquil period.

Bearing these caveats in mind, **Table A1** shows the contemporaneous effects, ie on the same day, of a one unit shock (μ) to each of the variables after allowing for feedback effects. For example, a one unit shock to EME bond spreads (μEMBIG) — say as a result of a currency crisis — usually leads to a flight away from risky to safe assets (ie a 'flight to quality'). This is reflected in the negative association (-0.11) with US ten-year bond yields in the last column of the table.

Another well-known stylised fact supported by these results is that periods of adverse shocks to EME bond spreads lead to a contemporaneous increase in US high-yield debt spreads, estimated at close to one tenth the size (0.10). However, shocks in the opposite direction from US high-yield spreads onto EME spreads tend to be about twice as large (0.17).

Table A1 Results from the structural VAR model

Overall contemporaneous feedback effects

From shock μ… …to	μUS3M	μUS10Y	μUSHY	μEMBIG
US3M	**1.01**	**0.23**	**-0.05**	**-0.07**
US10Y	**0.04**	**1.06**	**-0.09**	**-0.11**
USHY	**-0.05**	**-0.57**	**1.06**	**0.10**
EMBIG	0.01	**-0.11**	**0.17**	**1.02**

Source: Application of model in Felices *et al* (2008 forthcoming). Bold coefficients are statistically significant at the 95% level.

This model allows 'what if?' simulation exercises to be carried out. **Table A2** shows the maximum estimated impact on each variable derived from the model if different types of exogenous shocks are applied in mid-2007, just prior to the start of the sub-prime episode. This starting point allows us to assess the model-predicted impact on the different variables if past large shocks were repeated and also to compare the model-predicted impact of the sub-prime shock with the actual level of bond yields or spreads. The simulations here also include the impact of the common shock to risk appetite proxied by the change in the VIX at the time. A large EME shock, of the magnitude of the (unanticipated) Russian/LTCM crisis, would at its peak lead to an estimated 280 basis points widening in US high-yield spreads and a 135 basis points fall in US long yields. However, a more confined EME shock, such as

Table A2 Impact of a repeat of previous adverse financial market shocks on interest rates and spreads (mid-2007)

		Model-predicted impact of shocks (basis points)(a)				
	Level of variables on 17 July 2007(b) (basis points)	Russia/ LTCM (1998)	Argentina (2001)	May–June correction (2006)	Sub-prime (2007)	Memo: Actual change during the sub-prime shock period (basis points)(c)
US3M	505	-75	-29	-17	-55	-269
US10Y	496	-136	-45	-23	-58	-161
USHY	305	278	93	47	389	434
EMBIG	175	992	228	64	154	128
Memo: Size of shock		μEMBIG = 729 basis points VIX = 85%	μEMBIG = 151 basis points VIX = 76%	VIX = 105%	μUSHY = 285 basis points VIX = 99%	

Source: Application of model in Felices *et al* (2008 forthcoming).

(a) Change in spreads/yields from the 17 July 2007 to the maximum impact predicted by the model.
(b) The starting date of the current turmoil in developed financial markets.
(c) From 17 July 2007 to 22 January 2008.

(1) Alternative thresholds used to identify the shocks produce similar results.

the largely anticipated Argentine crisis at end-2001, would have an estimated impact on US asset markets of about one third of this size.

Interestingly, the model predicts that the size of shock to US risky credit markets witnessed during the market turmoil since mid-2007 should have resulted in a widening of EMBIG spreads of about 155 basis points — around 25 basis points more than the actual increase.(1) This undershooting in EME sovereign spreads may reflect the impact of the improvements in EME fundamentals during the estimation period in reducing their vulnerability to shocks in risky mature asset markets. The model also underestimates substantially the impact of the recent market turmoil in reducing interest rates on safe US assets, especially of shorter maturities. This probably reflects both the fact that the recent turmoil was a liquidity problem and not just a solvency one, as well as the sharp reduction in policy rates by the Federal Reserve over the period.

(1) The sub-prime turmoil is proxied by the estimated shock to US high-yield spreads from July 2007 through to January 2008 combined with the common rise in risk aversion at the time (proxied by the actual rise in the VIX).

References

Bank of England (2006), 'Markets and operations', *Bank of England Quarterly Bulletin*, Spring, pages 14–15.

Bank of England (2007), *Financial Stability Report*, October.

Bank for International Settlements (2007), 'Financial stability and local currency bond markets', *CGFS report no. 28*, June.

Berg, A, Borensztein, E and Pattillo, C (2005), 'Assessing early warning systems: how have they worked in practice?', *IMF Staff Paper*, Vol. 52, No. 3.

Bomfim, A and Nelson, W (1999), 'Profits and balance sheet developments at US commercial banks in 1998', *Federal Reserve Bulletin*, Vol. 85, June, pages 369–95.

Caporale, G, Cipollini, A and Demetriades, P (2005), 'Monetary policy and the exchange rate during the Asian crisis: identification through heteroskedasticity', *Journal of International Money and Finance*, Vol. 24, pages 39–53.

Classens, S and Forbes, S (eds) (2001), *International financial contagion*, Kluwer Academia Publishers.

De Alessi Gracio, C, Hoggarth, G and Yang, J (2005), 'Capital flows to emerging markets: recent trends and potential financial stability implications', Bank of England *Financial Stability Review*, December, pages 94–102.

Felices, G, Grisse, C and Yang, J (2008), 'International financial transmission: emerging and mature markets', *Bank of England Working Paper*, forthcoming.

Frankel, J and Wei, S-J (2005), 'Managing macroeconomic crises: policy lessons', in Aizenman, J and Pinto, B (eds), *Managing economic volatility and crisis: a practitioner's guide*.

Hartelius, K, Kashiwase, K and Kodres, L (2008), 'Emerging market spread compression: is it real or is it liquidity?', *IMF Working Paper no. 10*.

International Monetary Fund (2004), 'Are credit booms in emerging markets a concern?', *World Economic Outlook*, April, pages 147–66.

International Monetary Fund (2007a), *Co-ordinated Portfolio Investment Survey (CPIS)*.

International Monetary Fund (2007b), *Global Financial Stability Report*, Chapter III, 'Quality of domestic financial markets and capital inflows', October.

International Monetary Fund (2007c), *Global Financial Stability Report*, Spring.

Kose, M A, Prasad, E, Rogoff, K and Wei, S-J (2006), 'Financial globalisation: a reappraisal', *IMF Working Paper no. 189*.

Kose, M A, Prasad, E and Terrones, M (2007), 'How does financial globalisation affect risk sharing? Patterns and channels', *IMF Working Paper no. 238*.

Kubelec, C, Orskaug, B and Tanaka, M (2007), 'Financial globalisation, external balance sheets and economic adjustment', *Bank of England Quarterly Bulletin*, Vol. 47, No. 2, pages 244–57.

Lane, P R and Milesi-Ferretti, G M (2007), 'The external wealth of nations mark II: revised and extended estimates of foreign assets and liabilities, 1970–2004', *Journal of International Economics*, Vol. 73, pages 223–50.

Remolona, E, Scatigna, M and Wu, E (2007), 'Interpreting sovereign spreads', BIS *Quarterly Review*, March.

Rigobon, R (2003), 'Identification through heteroskedasticity', *The Review of Economics and Statistics*, Vol. 85, pages 777–92.

Rigobon, R, Ehrmann, M and Fratzscher, M (2005), 'Stocks, bonds, money markets and exchange rates: measuring international financial transmission', *ECB Working Paper no. 452*.

Rigobon, R and Sack, B (2004), 'The impact of monetary policy on asset prices', *Journal of Monetary Economics*, Vol. 51, pages 1,553–75.

Wei, S-J (2006), 'Connecting two views on financial globalisation: can we make further progress?', *Journal of the Japanese and International Economies*, Vol. 20(4), pages 459–81.

Recent developments in portfolio insurance

By Darren Pain of the Bank's Foreign Exchange Division and Jonathan Rand of the Bank's Sterling Markets Division.

The aim of this article is to describe how portfolio insurance works, the main strategies employed and how these have evolved over recent years, and the possible links between their use and financial market stability. The key benefit of portfolio insurance is that it enables financial risk to be distributed among those agents most willing to absorb it. The downside is that it can possibly create conditions for greater fragility in financial markets and leaves issuers of portfolio insurance exposed to potential unexpectedly high losses. It seems unlikely that portfolio insurance-related investments contributed significantly to the financial market volatility that began in Summer 2007. Nonetheless, it is important to keep alert to situations when portfolio insurance could potentially work to amplify financial market instability.

Introduction

Portfolio insurance is a generic term for investment strategies that allow the investor to limit any downside risk to the value of a portfolio while retaining exposure to higher returns. For example, an investor with a basket of shares might additionally enter into a contract with a third party to guarantee, or insure, the total value of the basket should the price of the shares fall.

Such investment strategies are not especially new. Indeed, they have their roots in applications of the Black-Scholes-Merton option pricing theory that was developed in the early 1970s. But portfolio insurance has become increasingly commercially feasible over recent years as a result of the falling costs of trading and product innovation.

A key attraction of portfolio insurance is that it allows investors to move closer to the portfolios of assets they really want to hold, thereby facilitating a better allocation of their risk capital. In principle, this should help to support financial market stability. However, some have suggested that portfolio insurance can also affect financial markets in inefficient and destabilising ways, as those institutions who have sold the insurance seek to hedge their exposures.(1)

The potential association between portfolio insurance and financial market stability is not a new issue. Some commentators believe that the stock market crash of 1987 was exacerbated by the actions of institutional investors following automatic trading rules as part of their portfolio insurance strategies. Similarly, some commentators suggest that the collapse of Long Term Capital Management (LTCM) in 1998 and the ensuing market instability was, in part at least, linked to portfolio insurance. LTCM reportedly provided 'reinsurance' to many banks by selling financial options to offset the 'guaranteed' products these banks had sold (mostly) to retail investors.

It appears unlikely that portfolio insurance has played any significant part in the financial market volatility which began in Summer 2007. The Bank's market contacts have not cited it as a major contributory factor. The markets most closely associated with the recent turmoil and where prices have fallen most sharply have been structured credit markets. Although portfolio insurance products linked to credit had apparently been growing in popularity, the bulk of portfolio insurance has reportedly been linked to equities. But it remains possible that portfolio insurance-related investments could potentially be a more important influence on financial market dynamics in the face of more widespread and sharp falls in asset prices. And financial institutions could, having provided portfolio insurance to investors, be exposed to extreme moves in financial market asset prices.

More generally, portfolio insurance is an example of how financial innovations, which in most circumstances enable risk to be better managed, can also potentially accentuate market instability.(2) Importantly, as with the increased use of credit derivatives over recent years, the issue is not with such

(1) See for example, Jacobs (1999, 2004).
(2) This theme is explored further in the speech by Paul Tucker, 'Where are the risks?', reprinted in the *Financial Stability Review*, December 2005.

innovations *per se*, but with how they can interact with market frictions, such as illiquidity or imperfect information, to add to market volatility in certain circumstances.

The rest of the article is organised as follows. By way of technical background, the next section describes in more detail the mechanics of portfolio insurance, outlining how such products relate to the theory of financial options. The article then goes on to highlight some recent innovations in the market and reviews the implications for financial market stability. The final section offers some concluding remarks.

How does portfolio insurance work?

The theory

Portfolio insurance can be thought of as akin to an investment in a financial option. More formally, a simple option-based portfolio insurance (OBPI) strategy consists of an investment in a risky asset (usually a financial index such as the FTSE All-Share) plus a put option written on that asset — ie a contract that gives the holder the right to *sell* a certain quantity of the underlying asset to the writer of the option at a specified price, up to a specified date. This strategy enables the investor to put a floor under the value of the portfolio should the value of the risky asset fall.

Figure 1 Profit at expiration to an investor in OBPI

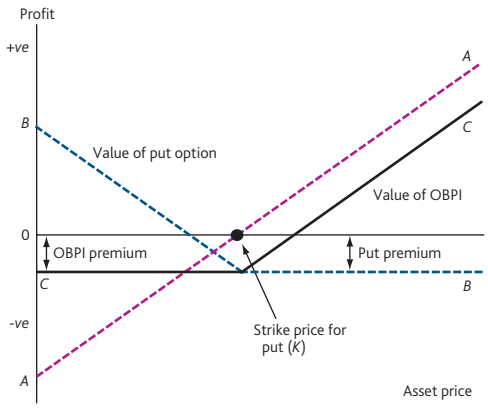


Figure 1 describes the net pay-off profile for an investor in an OBPI position at the expiry date of the put option. The dashed magenta line (*AA*) shows the pay-off to the investor, at different levels of the price of the underlying asset, from simply owning that asset. If the value of the risky asset is below the cost of purchase (*K*) the investor would be facing a loss. The dashed blue line (*BB*) shows the net pay-off from simply owning a put option on the underlying asset with the strike price for the option set at the initial capital investment, *K*. If at expiry of the option the value of the risky asset is below the strike price, the investor can profit by buying the asset in the open market and selling it to the writer of the option (say, a financial institution) at the agreed price (less the premium paid for the option itself). In contrast, if the price of the asset is above the strike price at expiration, the investor does not exercise the put option and it expires with no value.

As with all derivatives, an option transaction is a zero-sum game — for every person who gains on a contract, there is a counterparty that loses. So in this case, if the put option expires with positive value the investor gains but the writer of the option (ie the counterparty to the contract) loses.

By combining the two investments (the underlying risky asset and a put option) in a single strategy, the OBPI enables the investor to obtain the pay-off line *CC* which limits the potential downside risk — the pay-off on the option offsets any loss on holding the risky asset, thereby providing the capital protection.

In principle, the pay-off from an OBPI is identical to the pay-off from a call option on the underlying asset (a contract that gives the holder the right to *buy* the underlying asset at a specified price) and investing the remainder of the funds in a risk-free asset such as a government security. The maximum loss for the investor is the cost of the premium for the OBPI.

Cast in this light, there is an analogy with traditional types of insurance. The investor seeks an assured value for his investment in return for paying a premium for the option while the option writer hopes to make profits from these deals by charging premiums (typically across a range of options that he may have sold) that compensate for the risk taken.

Of course, some investors seeking portfolio insurance, for example retail investors, may not have direct access to options markets. And for some asset classes, an options market may not exist at all. However, in theory at least, it is possible to achieve the pay-off on an option without using options directly. Using the insights of Black-Scholes (1973), Leland and Rubenstein (1981) showed that it was possible to replicate the pay-off of an option by creating a dynamic portfolio of the underlying asset and a risk-free asset. By adjusting the holding of the underlying asset in response to changes in the underlying asset price over time (dynamic hedging), the returns to the portfolio mimic those of a call option.

The practice

The ability to replicate perfectly an option pay-off depends on certain key assumptions. These include the ability to trade continuously and at zero cost, and an absence of credit constraints on investors should they need to borrow funds to acquire more of the risky asset. In practice, these conditions are unlikely to hold and so this approach is not always practical. Consequently, a variant portfolio insurance strategy — constant proportion portfolio insurance (CPPI) — has become popular.

In a CPPI strategy, the investor seeks to approximate the pay-offs from a call option on the underlying asset (equivalent

The mechanics of CPPI

The basic structure of a CPPI is a portfolio that switches the investment mix dynamically between a risk-free and a risky asset according to a discrete trading rule. Each period the investor calculates how much needs to be invested in the risk-free asset in order to guarantee a given percentage of the initial investment — this is known as the cost of the guarantee or the 'floor' — as well as the value of the portfolio in excess of that floor (the 'cushion' or 'reserve'). A constant 'multiple' is then applied to the cushion to determine the amount to be invested in the risky asset in each period.

The multiple is typically chosen to reflect the expected performance of the risky asset as well as the risk preferences of the investor. In so doing, the multiple determines the potential leverage of the investment. A multiple of one implies no leverage; a multiple of zero is equivalent to a purely risk-free investment.

Table 1 provides an illustrative worked example of a simple CPPI strategy for a £100 investment over ten years where the price of the underlying asset is assumed to first rise and then fall over the investment period. At time zero, the guarantee of 100% of principal costs £74.4 (the present value of £100 received in ten years' time at a risk-free rate of 3%) so the initial cushion is £25.6 (£100–£74.4). With a multiple of 3 this implies an investment in the risky asset of £76.8 and £23.2 (£100–£76.8) in the risk-free asset.

Over time, if the growth in the value of the risky asset exceeds the risk-free rate of interest, the cushion will rise and more of the portfolio should be switched into the risky and away from the risk-free asset. In the example, by period 2 the CPPI strategy involves a negative position in the risk-free asset (ie borrowing funds to invest more in the risky asset than the value of the portfolio). When in period 3 the risky asset performs less well the portfolio is rebalanced towards the risk-free asset in order to provide the protection of principal at maturity. As the risky asset price continues to fall, more of the portfolio is reallocated away from the risky asset. In the second half of the investment period, the portfolio is switched mostly into the risk-free asset. If developments in the risky asset require that the CPPI portfolio be entirely reallocated to the risk-free asset this is a situation known as 'close-out' or 'knock-out'.

Table 1 Possible evolution of a CPPI strategy for a £100 investment — example 1[a]

Period	Cost of guarantee (£)	Risky asset price (£)	Cushion (£)	Risky asset exposure (£)	Risk-free asset exposure (£)	Portfolio value (£)
	A	*B*	*C=F–A*	*D=C x multiple*	*E=F–D*	$F=E_{t-1}(A_t/A_{t-1})+D_{t-1}(B_t/B_{t-1})$
0	74.4	100.0	25.6	76.8	23.2	100.0
1	76.6	110.0	31.7	95.2	13.2	108.4
2	78.9	130.0	47.1	141.4	-15.3	126.1
3	81.3	110.0	22.6	67.7	36.2	103.9
4	83.7	102.0	16.3	48.8	51.2	100.0
5	86.3	100.0	14.3	43.0	57.6	100.6
6	88.8	95.0	11.3	34.0	66.2	100.2
7	91.5	90.0	8.9	26.6	73.8	100.4
8	94.3	80.0	5.4	16.1	83.5	99.6
9	97.1	85.0	6.1	18.2	85.0	103.1
10	100.0	85.0	5.7	17.1	88.6	105.7

Source: Bank calculations.

(a) Ten-year instrument with multiple = 3; risk-free rate = 3%.

to the pay-off to an OBPI) by switching his portfolio between the risk-free asset and a risky asset according to a mechanical decision rule.

The box above describes the mechanics of CPPI, including a worked example. In summary, the trading rule results in the investor increasing exposure to the risky asset after it has performed well and switching out of the risky asset following poor performance (switching completely into a risk-free asset or 'guarantee' if the value of the risky asset falls sufficiently). Typically CPPI strategies also incorporate some form of gearing whereby the investor is allowed to borrow funds to invest more in the risky asset than the value of the portfolio.

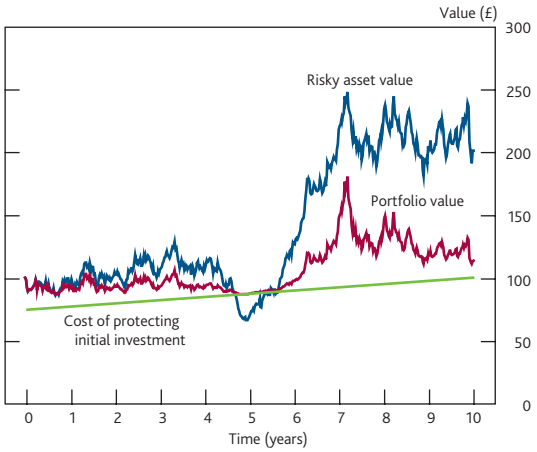
As an illustration, **Chart 1** shows how a second example CPPI strategy might evolve over a ten-year investment horizon. The price of the risky asset is assumed to develop over time in a random fashion(1) and the CPPI incorporates features typical of those seen in the market. The chart demonstrates that the CPPI captures some of the upside performance and its value always remains sufficient to switch into the risk-free asset if required, thereby enabling the investor to protect his initial capital.

However, **Chart 1** also shows that, if the price of the risky asset appreciates significantly towards the end of the investment horizon, the value of the CPPI will typically share only partially in this recovery. This is because by the end of the investment horizon the CPPI strategy needs to hold sufficient funds in the risk-free asset to provide the guarantee and so the investor cannot switch heavily into the risky asset.

The final return to a CPPI is said to be 'path dependent' — it depends on the whole history of prices of the underlying asset throughout the term and not just the terminal value. As a

(1) More formally, the asset price is assumed to evolve as a geometric Brownian motion with a drift of 10% per annum and with volatility of 20%.

Chart 1 Possible evolution of a CPPI strategy — example 2



Source: Bank calculations.

result it is not possible to know in advance the precise pay-offs to the strategy at expiry of the investment.

However, simulations of the possible paths for the price of the underlying asset can provide a guide. The box on page 41 describes in more detail the typical factors that influence CPPI performance. It shows that the possible overall returns to CPPI look broadly similar to the pay-off structure for a call option, as the theory of portfolio insurance would suggest. However, the pay-off line for the CPPI is more convex (ie more curved) than for an options-based approach which reflects the effect of gearing on the returns to the strategy.

Recent market developments

Type of investment

Although portfolio insurance has been around for some time, it has experienced something of a re-emergence over the past few years. This appears to stem from lower structuring and trading costs and a broadening in, and growth of, asset classes on which investors find the idea of principal protection attractive. Many of the developments in principal-protected products are common to structured products more generally. Structured notes are securities that can be specifically created to meet needs that cannot be met from standard financial instruments. They typically embed some form of derivative, with characteristics that adjust the security's risk/return profile.(1)

Market contacts report that traditional OBPI investments have not been particularly common over recent years. In part, this reflects the difficulty in explaining options to investors. But CPPI products have become much more prevalent and over time have been designed with additional features (see box on page 42).

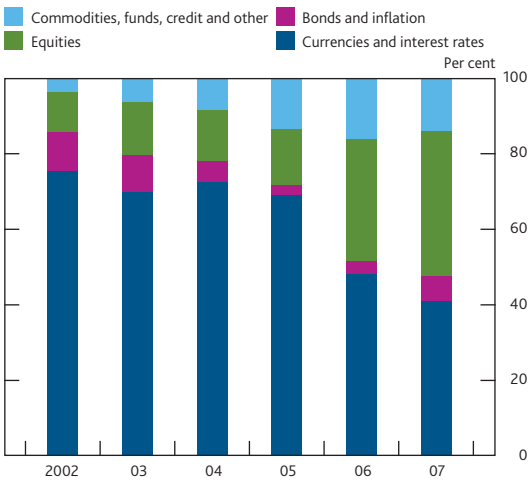
An important development has been the broadening of asset classes associated with CPPI. This includes investment in hedge funds and funds of hedge funds (ie investment funds that consist of a portfolio of other investment funds rather than investing directly in shares, bonds or other securities). But CPPI has also been written on corporate bonds and credit derivatives such as credit default swaps (so-called credit CPPI), property and private equity. In early 2007, a CPPI investment linked to a basket of water, renewable energy, solar energy and bio-fuel commodity indices was also issued, giving investors exposure to growth in sustainable energy industries.

Market size

It is difficult to be precise about the size and the rate of growth of CPPI (or portfolio insurance more generally). What data are available do not always isolate portfolio insurance products from other structured products. However, market contacts indicate that CPPI has been an important element in the expansion of structured products more generally.

The bulk of structured notes are not related to portfolio insurance. But the share of notes linked to equity and 'alternative' assets, such as commodities and credit (some of which could be related to CPPI) have become increasingly significant. In 2005, those sorts of assets were referenced in around 28% of structured notes (by value), but in 2007 this share had risen to over 50% (**Chart 2**).

Chart 2 Share of structured note issuance by type of underlying asset



Source: MTN-i.

Issuance of structured notes linked to credit and funds have increased in particular, although in aggregate terms they remain relatively small in value (**Chart 3**). Consistent with this, funds under management with financial institutions with specialist arms in portfolio insurance products have reportedly risen sharply over the past few years.

Market participants

The market for portfolio insurance investments has reportedly been more prevalent in Europe than in the United States. In

(1) For more details about structured products see Rule, Garratt and Rummel (2004).

The performance of CPPI

Table 1 reports summary statistics for pay-offs on CPPI portfolios with different multiples and compares them with a pure investment in the risky asset (with no portfolio insurance) and with a basic OBPI strategy. Leverage in the CPPI strategy is constrained at 250% and portfolio rebalancing is undertaken weekly.(1)

Table 1 Comparison of the pay-offs to different portfolio insurance strategies under variable multiples(a)

	Strategy				
	Risky asset	OBPI	CPPI	CPPI	CPPI
Multiple			2	4	6
Mean (£)	271.6	257.5	234.0	462.0	580.0
Standard deviation	57.0	54.0	59.1	275.0	356.8
Skew	0.8	0.8	1.6	2.1	2.0
Number of knock-outs(b)			2	37	106

(a) Assumes a risk-free rate of 3% and volatility of 10%. The underlying price process is also assigned a 10% per annum upward drift.
(b) Defined as returns less than risk-free rate.

When the underlying asset performs strongly, a CPPI strategy will tend to underperform a pure investment in the risky asset since it does not generally allocate 100% of funds to the risky asset from the start. But on weak performance in the underlying asset, CPPI will limit the downside. The results of the simulations confirm this, as indicated by the much more positive skew of the distribution of CPPI pay-offs (with a skew of around 2, compared to a skew of 0.8 for the pure risky asset investment).

Moreover, higher levels of leverage (as defined by the multiple) tend to increase the upside to a CPPI strategy but also result in more frequent underperformance and hence more variable returns. **Chart A** illustrates this graphically. The higher the multiple, the larger the upside pay-off from a CPPI but the higher the incidence of low pay-off outcomes (shown in the inset chart). Put another way, the greater the multiple, the higher the convexity of the pay-off profile.

Chart A Distribution of portfolio insurance approaches under variable multiples

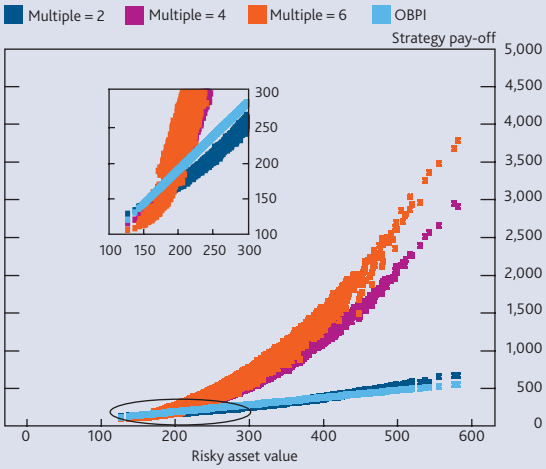


Table 2 shows simulation results under different assumptions about the volatility of the risky asset price process. Higher realised volatility in the underlying price process results in weaker performance for CPPI. This is because, since the strategy involves buying after a price rise and *vice versa*, the number of knock-outs rises as asset price volatility increases.

The impact of volatility on the pay-off to different portfolio insurance strategies can be linked to their option-like characteristics. This is intuitively most obvious for an OBPI strategy in which the investor has explicitly bought options — options cost more if volatility is expected to be high.

Developments in risk-free rates also influence the performance of CPPI. They determine the initial value of the floor, and hence the cushion, with higher risk-free rates permitting a greater investment in the risky asset (since the price of the risk-free bond is lower). Given the path dependence of CPPI, it is not only the initial level of risk-free rates that is important, but also the level at each rebalancing point. These simulations assume constant risk-free interest rates. However, if risk-free rates were to fall between rebalancing points, the cost of principal protection would increase by more than otherwise; and the cushion would be lower, requiring a rebalancing out of the risky asset even in the absence of poor performance.

Table 2 Comparison of the pay-offs to different portfolio insurance strategies under different assumptions about volatility(a)

	Strategy			Strategy			Strategy		
	Risky asset	OBPI	CPPI	Risky asset	OBPI	CPPI	Risky asset	OBPI	CPPI
Volatility		10%			20%			30%	
Mean (£)	271.6	257.5	462.0	271.6	238.3	270.0	269.5	215.1	178.7
Standard deviation	57.0	54.0	275.0	120.6	105.6	471.6	203.7	159.6	1109.9
Skew	0.8	0.8	2.1	1.8	1.8	13.0	4.1	4.2	44.1
Number of knock-outs(b)			37			4959			9034

(a) Assumes a risk-free rate of 3%, and a multiple of 4. The underlying price process is also assigned a 10% per annum upward drift.
(b) Defined as returns less than risk-free rate.

(1) Given the path dependence feature of CPPI, there exists no closed-form solution for valuing the portfolio. Simulations are therefore required to assess the terminal value of the product. This is undertaken using a Monte Carlo technique with 10,000 simulations for three investment strategies on a CPPI with a ten-year maturity.

Popular features in CPPI investments

Over time, CPPI investments have evolved to incorporate various different features. Of particular note are the following:

Constraints on the investment level

In the event that the underlying asset price falls, the allocation to the risky asset can potentially fall to zero. Once that happens there is no chance for the strategy to recover. To counter this, some products have been developed that incorporate a minimum level of investment in the risky asset. Equally, to avoid unbounded investment in the risky asset as its price rises, a maximum investment level is sometimes imposed.

Constraints on leverage

Exposure to the risky asset of more than the initial available funds can be achieved by allowing borrowing. But often there will be limits on how much can be borrowed, depending on collateral or margin limits.

Variable and 'straight-line' floors

When the price of the underlying asset increases, any gains made by the CPPI strategy can still be lost if prices subsequently fall. To address this, products with so-called 'ratcheting' are available which allow the investor to lock-in gains made from upward movements in the risky asset price. More specifically, the floor is increased if the cushion exceeds some agreed threshold, with the trigger typically set as a percentage of the highest portfolio value or as a percentage of any gains achieved.

The floor in a conventional CPPI is sensitive to the level of interest rates (since it affects the present value of the pay-off on the risk-free asset). As interest rates fall, the floor would rise and the investment switches away from the risky asset. This in turn would limit the potential upside from the CPPI, which could be significant (if interest rates and the risky asset are negatively correlated for example). However, this sensitivity can be removed and the floor can be allowed to vary linearly with time, a feature sometimes known as a 'straight-line' floor.

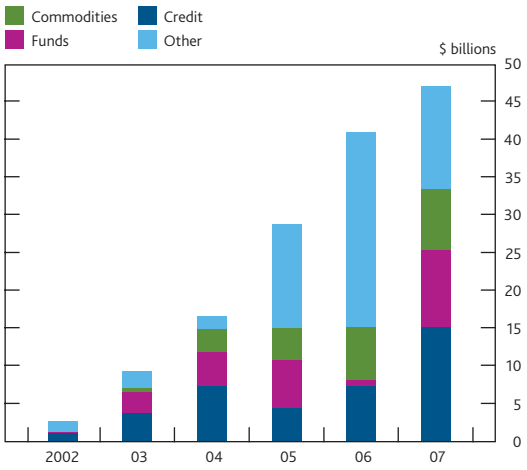
Variable multiples

Rather than having a fixed multiple, some product structures allow for the multiple to vary over time in relation to the volatility of the risky asset and reflecting investors' appetite for risk. This is sometimes referred to as dynamic portfolio insurance (DPI). There is often a maximum level for the multiple, which is often based on the results of stress tests performed on the risky asset.

Volatility caps

Some CPPI products include mechanisms that allow the percentage exposure to the risky asset to be reduced if its realised volatility exceeds a certain level.

Chart 3 Issuance of structured notes linked to 'alternative' assets



Source: MTN-i.

terms of participants in the market, the key issuers (ie sellers) are typically large banks that can provide the necessary structuring and marketing expertise. The scale of their balance sheets also means that they can extend loans to clients who leverage their investments within CPPI strategies. Access to a distribution network to both retail and wholesale clients is also said to be important.

According to market contacts, the main investors in portfolio insurance products are high net worth individuals; private banks who purchase products for onward sale to their clients; and institutional investors such as pension funds. The latter have reportedly been especially important in continental Europe.

Implications for financial market stability

To the extent that portfolio insurance enables individuals and firms to match their exposures better to their risk preferences, such products should in theory result in risks being better distributed among agents most willing to absorb them and hence benefit financial stability. However, in practice markets are imperfect and portfolio insurance could potentially contribute to market instability.

This article highlights three (interrelated) ways in which portfolio insurance might add to market instability: the impact of dynamic hedging on illiquid markets; imperfect information and the potential for 'gap risk' (ie the risk that the value of the investment drops sharply without trades taking place); and the limited available instruments to hedge this exposure to gap risk.

Dynamic hedging and illiquid markets

The issuers of portfolio insurance products have essentially sold or written options to the buyers of these products. This is most obvious for issuers of OBPI. But it is also typically true for CPPI strategies if the issuer provides a guaranteed minimum return and takes on the possible shortfall between the return from the CPPI strategy and the guarantee (ie implicitly writes an option on the CPPI strategy).

Issuers will typically look to hedge their exposures. One way they can do this is to replicate the pay-offs that they might have to make to investors by dynamically hedging the option they have sold to investors. Broadly speaking, this entails buying the underlying asset as prices rise, and selling it as prices fall. In this way however, the hedging actions of portfolio insurance providers can potentially generate feedback effects in markets which work to reinforce and amplify market price developments.

The actions of final investors following their own CPPI strategies could also conceivably have feedback effects on asset markets since they too would buy following price rises in the risky asset and sell when prices fall. But in practice the larger transactions are undertaken by the issuers of CPPI.

Under normal circumstances, where the underlying asset markets are generally deep and liquid, dynamic hedging of portfolio insurance products should have a limited impact on prices. However, amplifying feedback effects can become significant if markets are, or become, illiquid, so that small changes in demand relative to supply prompt large changes in the price (which in turn could trigger more hedging flows).

Given the paucity of aggregate data on portfolio insurance sold, it is difficult to gauge the impact of hedging by issuers on market dynamics. However, according to market contacts, the amount of portfolio insurance-related dynamic hedging flows still remain modest relative to the size of the corresponding underlying asset markets. Moreover, contacts do not generally perceive dynamic hedging as having been a significant factor in the period of financial market turmoil which began in the summer of 2007, even in those new asset classes that had increasingly become referenced in CPPI strategies during recent years.

In particular, as noted above, credit securities had become popular as assets underlying CPPI. And, as prices of these assets fell, these instruments would in some cases have needed to be sold as part of a rebalancing/hedging of CPPI exposures. When credit markets became unusually illiquid in August 2007, contacts noted that this deleveraging process was not always easy to undertake. But, on the whole, the aggregate size of rebalancing required was not thought sufficient to have generated any significant feedback effects.

Likewise, issuers of CPPI that reference mutual funds, hedge funds and funds of hedge funds reported that they have not noticed particular problems hedging their exposures over the past few months. Such asset classes are not always actively traded and when they are, the frequency of trading is typically restricted. For example, for most hedge funds, invested monies in the fund can only be withdrawn at fixed intervals, (usually at least a month) and some have much longer lock-in periods. The inability to disinvest quickly makes it more difficult to hedge these investments compared with those in more traditional financial assets, such as equities, and means that the impact of dynamic hedging on these markets could potentially be greater.

In the event, returns to diversified portfolios of hedge funds were relatively stable during the second half of 2007. And initiatives taken by hedge fund managers to mitigate large drawdowns were also thought to have been helpful in breaking any feedback loop before it took effect.

Furthermore, in seeking to rebalance their portfolios in response to changing market conditions, market contacts report that issuers exercise discretion over how and when this is achieved in order to minimise the impact on the price of the underlying asset. For example, CPPI providers often only rebalance their portfolios when the value of the portfolio breaches some pre-agreed tolerance levels. This avoids the potential for feedback effects, at least for relatively small moves in the price of the referenced asset. However, it conceivably might result in a need to trade in larger size if tolerance levels were eventually breached.

Imperfect information and gap risk

Even if the dynamic hedging flows are relatively small compared with the overall trading volume of the underlying asset, these dynamic investment strategies may potentially reduce the information available from market prices. Because other investors cannot distinguish dynamic hedging flows, they may misread such trades as containing information about more fundamental factors.(1)

More generally, imperfect information surrounding the possible values that some insured assets may take can mean that portfolio insurance strategies are particularly vulnerable to sudden jumps in asset prices. In particular, if the price of the risky asset falls sharply before the portfolio can be rebalanced, the value of the CPPI strategy may fall below the floor.

In practice, such exposure to gap risk is often underwritten by the issuer of the CPPI because of the hard guarantee on returns

(1) Gennotte and Leland (1990) showed that information asymmetry between market players can mean that the impact of portfolio insurance strategies can potentially trigger relatively illiquid conditions in markets. Likewise, Frey and Stremme (1997) showed that the strength of feedback effects depends not only on hedging demand but also significantly on the heterogeneity of views about the distribution of hedged pay-offs.

they typically provide. In the first instance, the issuer will look to build the cost of this implicit option into the premiums and fees charged to the investor. But the pricing of an option on a CPPI can be quite complex, especially when bespoke features are added.

Furthermore, in much the same way that a financial option is more (less) valuable to the investor (issuer) if the price of the asset is expected to be volatile, the returns on a CPPI strategy are also affected by asset market volatility. But given the path dependence feature, the parties to a CPPI are exposed to *actual* market fluctuations — ie realised volatility — rather than future expected volatility (see the box on page 41). If realised volatility turned out to be higher than expected at the time the guarantee on the CPPI was sold, the issuer could incur unanticipated losses which might potentially prompt further unwinds of positions.

To assess and manage the gap risk, the issuer needs to model the likely 'worst-case' move in the risky asset price before the next rebalancing opportunity. But in practice, issuers do not know perfectly the underlying processes generating asset prices and may not have sufficient data to estimate gap risk accurately. In particular, given the limited trading history of some of the referenced underlying assets, as is the case for many hedge funds, assessing the degree of correlation across assets, and hence any potential diversification benefits, may be especially difficult.

More specifically, those assets that appear uncorrelated in normal trading conditions may become much more correlated in stressed conditions when investors in less traditional asset classes may all look to exit their trades simultaneously. Taken together with the inherently less liquid nature of the markets for certain underlying assets, these factors mean that issuers could underestimate the scale of potential losses.

In fact, during the period of heightened market volatility that began in Summer 2007, contacts believed that only a very few CPPI investments experienced such large falls in the prices of their underlying assets that gap risk would have crystallised. To the extent that some portfolios have suffered significant losses over recent months, contacts highlighted vulnerable investments as those most exposed to structured credit portfolios with a relatively low level of diversification between assets (for example, CPPI written on single hedge funds specialising in structured credit).

Some issuers employ scenario analysis to help calibrate gap risk. Others employ due diligence procedures to interrogate the structure and management of the selected funds, in a bid to understand the risks being taken by a hedge fund and, in particular, ensure that assets offer genuine diversification benefits. These procedures remain relatively untested, though contacts noted that the events of recent months will be useful in the future stress testing of their exposures.

Limited hedging instruments and gap risk

Rather than dynamically hedging their option exposures, issuers of CPPI might look to offset the gap risk they face by using options markets directly. In particular, institutions may look to purchase put options, where the strike prices would typically be set so that they would only become valuable if the underlying asset price fell very sharply. These option positions would not typically be changed over time and as such would represent a static hedge.

However, in practice, those who have sold tailored options may find that there are few available financial options on the underlying asset through which to hedge their exposures. This might be especially true for the recent popular types of referenced assets in CPPI deals, such as structured credit, hedge funds and funds of funds. And even if suitable hedging options did exist, dealers and market makers may find buying them is uneconomical in market environments in which there was a marked preference for buying over selling options.

Anecdotal evidence suggests that insurers and reinsurers may have taken on some of the gap risk associated with portfolio insurance products. Some contacts have also reported that issuers of CPPI sometimes create securities that package up the gap risk and these have been sold to investors, including private banks and funds. But these structured notes are not thought to be that prevalent, in part because the level of documentation necessary to understand the nature of the risk transferred can be significant.

As a result, issuing banks may alternatively seek to limit their exposure to gap risk through other (albeit imprecise) hedging strategies. For example, financial institutions faced with short option positions from structured notes based on commodities have reportedly issued collateralised commodity obligations in an attempt to offset some of their gap risk exposures.

The imprecise nature of the available hedges may itself create potential problems. Such hedging exposes the portfolio insurance issuer to so-called basis risk (ie the risk that offsetting investments in a hedging strategy will not experience price changes in entirely opposite directions from each other).

Concluding remarks

Portfolio insurance strategies enable investors to unbundle financial risks and tailor their investments to their risk preferences. In this way, they facilitate a better allocation of risk and so potentially provide broader welfare benefits. However, the existence of financial market imperfections

means that portfolio insurance and the associated hedging flows could potentially have destabilising feedback effects on financial markets. Further, the issuers of portfolio insurance also expose themselves to significant gap risk, which if it crystallised, could lead to significant unexpected losses that might potentially trigger disorderly unwinds of positions.

Most of the arrangers of CPPI have so far tended to be large international banks. These types of institutions might be better placed than smaller institutions to absorb large unexpected losses. However, in environments in which the appetite for risk among product providers is strong, there is a danger that strategies such as portfolio insurance transfer financial risk to financial institutions who may have limited capacity to provide protection in the event of severe financial market stress. In this way, risk avoidance on the part of end-investors can lead to the development of investment products that, while intended to reduce risk, have the potential to increase the fragility of financial markets.

Overall, it seems unlikely that portfolio insurance-related investments contributed significantly to the latest bout of financial market volatility that began in Summer 2007. And, in all but a handful of cases, market contacts observe that the gap risk in CPPI products has not crystallised. Nonetheless, financial markets currently remain fragile and vulnerable to further shocks. It is therefore important that market participants and policymakers alike are alert to situations when portfolio insurance could potentially work to amplify financial market instability.

References

Black, F and Scholes, M (1973), 'The pricing of options and corporate liabilities', *Journal of Political Economy*, Vol. 81, pages 637–54.

Frey, R and Stremme, A (1997), 'Market volatility and feedback effects from dynamic hedging', *Mathematical Finance*, Vol. 7, pages 351–74.

Gennotte, G and Leland, H (1990), 'Market liquidity, hedging, and crashes', *American Economic Review*, Vol. 80, pages 999–1,021.

Jacobs, B (1999), *Capital ideas and market realities*, Blackwell.

Jacobs, B (2004), 'Risk avoidance and market fragility', *Financial Analysts Journal*, Vol. 60, No. 1, pages 26–30.

Leland, H and Rubenstein, M (1981), 'Replicating options with positions in stock and cash', *Financial Analysts Journal*, Vol. 12, pages 63–72.

Rule, D, Garratt, A and Rummel, O (2004), 'Structured note markets: products, participants and links to wholesale derivatives markets', Bank of England *Financial Stability Review*, June, pages 98–117.

The Agents' scores: a review

By Jacqueline Dwyer of the Bank's Inflation Report and Bulletin Division.[1]

The Bank's Agents collect economic intelligence from the business community around the United Kingdom, enriching the range of information available to the Monetary Policy Committee (MPC). This intelligence is largely qualitative, and provides timely insights into economic conditions and behaviour not available from published data alone. While the greatest value from their intelligence gathering is such insight, Agents also make quantitative judgements about economic conditions in the form of a series of scores. With a decade of scores now available, this article reviews their properties and usefulness. The scores are found to be well correlated with many official data series, with correlations tending to increase through time. Some scores are also useful in predicting revisions to official data, or capturing major turning points in economic activity. Consequently, they make a valuable addition to the broad suite of information reviewed by the MPC in its policy deliberations.

Introduction

The Bank has long been engaged in gathering economic intelligence, through both its previous branch network and, in more recent decades, its regional Agencies.[2] Following the Bank's independence in 1997, intelligence gathering became the Agencies' principal function. In the years since then, the approach to this task has become progressively more focused, and the use of economic intelligence in the monetary policy process has increased, with Agents regularly seeking answers to questions of specific interest to the MPC. As a by-product of this more focused approach, the Agents have developed a series of 'scores' to represent their quantitative judgement about various economic factors. These scores are published monthly in a statistical annex to the *Agents' Summary of Business Conditions* and are one of a range of communications devices for the Agencies to relay observations about economic conditions to the MPC.

With a decade of scores now available, this article explains the role of economic intelligence in policymaking, and reviews the usefulness of the Agents' scores. In doing so, it extends earlier work by Ellis and Pike (2005)[3] by exploring the distinguishing characteristics of the information that informs the Agents' scores, and by looking more closely at the relationships between scores and official data.

A role for economic intelligence

Central banks make decisions about monetary policy in an environment of uncertainty. They face uncertainty about the nature of the shocks hitting an economy, the magnitude and duration of those shocks, and the availability and quality of data with which to assess them. There is also uncertainty about the underlying model of the economy, and the way in which the economy might respond to events.[4] These uncertainties make it important for policymakers to have access to diverse and timely sources of information about economic developments. While official data play the most prominent role in assessment of economic conditions, it is particularly useful to supplement this with information from those who actually make economic decisions day to day. Not only can these decision-makers be an additional source of quantitative information about the economy, they are a crucial source of qualitative information about companies' behaviour and expectations. As a result, many central banks now highlight the benefits of liaison with the business community in informing their decision-making.[5] The way in which this information is collated and used by the Bank of England is summarised in the box on 'Collecting and reporting economic intelligence' on page 48.

(1) This article was written while Jacqueline Dwyer was on secondment from the Reserve Bank of Australia. It has benefited from comments from Agents and their Deputies, in particular Tim Pike, Deputy Agent for the South East.
(2) There are twelve of these Agencies located around the United Kingdom. Some have a history dating back to the 1820s and others are more recently established. Since the 1930s, Agencies have been engaged in gathering economic intelligence to help inform the Bank's assessments of economic conditions. For earlier discussions of the role of the intelligence collected by Agencies in the monetary policy process, see Beverly (1997) and Eckersley and Webber (2003).
(3) Ellis and Pike (2005) describe the introduction of the Agents' scores and their comparability with ONS data.
(4) See, for instance, Jenkins and Longworth (2002) for a useful summary of types of uncertainty.
(5) For example, Macklem (2002) and Jenkins and Longworth (2002) provide a Canadian perspective, while Stevens (2006) provides an Australian example.

Collecting and reporting economic intelligence

The Agents draw on information from around 8,000 contacts which come from a cross-section of the business community in terms of industry, size and location. Collectively, each month the Agents talk to around 700 contacts, with coverage that is broadly representative of the economic structure of their respective areas and is monitored through time. Their conversations relate to the current conjuncture and outlook, and also focus on specific issues of interest to the MPC. Importantly, the Agents conduct face-to-face interviews with the decision-makers in organisations, so they obtain a timely, detailed and well-informed picture of economic conditions.

Agents summarise the themes from their intelligence gathering into monthly economic reports (MERs) for their areas. These MERs include an assessment of recent trends in demand, output, employment costs and prices, as viewed from the region. They are accompanied by a statistical annex which comprises the scores for economic conditions in each area.

The twelve regional MERs are then distilled into a national summary. The Agents' statistical annex for each area, which includes their scores, is combined to form a national statistical annex (with national average scores weighted by the gross value added generated by each main region and country in the United Kingdom).

The Agents also conduct surveys on topics of particular interest to the MPC. There are usually around ten special surveys a year in which contacts are asked three or four key questions on a policy-relevant issue.

The intelligence gathered by the Agents informs the presentations they give to the pre-MPC meeting that the Committee has with Bank staff each month. One presentation always provides an update on economic conditions over the past month, and when a survey has been conducted it too will be presented. Subsequently, the *Agents' Summary of Business Conditions*, along with the national scores, are published. They are available on the Bank's website at www.bankofengland.co.uk/publications/agentssummary/index.htm.

In recent years, the economy has experienced a number of major economic events, such as the marked pickup in inwards migration, financial market turmoil and sharp increases in energy prices. These have contributed to an unusual degree of uncertainty, both about the true nature of the pre-existing environment, and about how these events have subsequently affected economic activity. In such an environment, economic intelligence can play a particularly important role.

In essence, the picture of conditions compiled by the Agents helps fill information gaps. Agents are able to report on factors for which there are no timely, published data. Where published data have moved in surprising ways, Agents are well placed to advance possible explanations of such change, as reported by their contacts. And Agents can tap into the attitudes and expectations of contacts to suggest why some economic events have evolved in a particular manner. Their ability to harness such information has deepened the Bank's understanding of a range of issues, as highlighted in the box on 'Filling information gaps' on page 49.

The richness of the testimony of those making economic decisions will always be the greatest benefit of the Agents' intelligence. But users of this intelligence also want to know the actual extent to which conditions are changing. Given this need, information about key variables has been usefully represented by Agents' scores. As these scores cumulate to form time series, they allow current conditions observed by Agents to be compared with past experience. Scores can also be compared with other data. And in some cases they can provide a signal about the extent of change in variables for which there are no published data. With Agents' scores now available for a decade, they are an increasingly useful source of quantitative intelligence and are one of the many sources of information that the Bank considers in its effort to reduce uncertainty, particularly data uncertainty.(1)

The Agents' scores

Each month, the Agents assign scores for variables covering demand, output, labour market conditions, capacity pressures, costs and prices. There are typically separate scores for different sectors. While the number and definition of scores have changed through time as the Bank has reviewed their usefulness, at present 25 variables are subject to scoring:

Demand and output
- Retail sales values
- Services turnover (consumer services, professional and financial services, and other services)
- Manufacturing output (domestic markets, export markets)
- Construction output
- Investment intentions (manufacturing and services)

(1) For a discussion of the Bank of England's approach to data uncertainty, see Cunningham and Jeffery (2007).

Filling information gaps

Agents play an important role in filling information gaps in a range of topics. They do so primarily through collecting intelligence in their regular meetings with contacts, but also through their surveys on topics of special interest to the MPC. For example, the Agents have recently made significant contributions to the Bank's understanding of the following issues:

Inwards migration

Agents reported the rapid growth in the supply of migrant labour well ahead of it being evident in official data. Their identification of this significant addition to the total labour supply was an important input to the MPC's assessment of the inflation outlook.

Credit conditions

Immediately following the onset of the recent financial turmoil, a key question was the extent to which companies were being affected by tighter credit conditions. Little information was available initially, and early data related to providers rather than users of credit. The Agents monitored their contacts' exposure to changes in credit conditions, along with their actual and predicted responses. They established that most companies were not directly affected by tighter conditions in the initial phases of the credit tightening, but there was some evidence of reduced investment intentions due to concern about the effect of financial turmoil on demand.

Factors weighing on employment growth

For much of 2007, there was evidence that the economy was experiencing capacity pressures. But companies were not responding by adding to employment to an extent the Bank had expected. The Bank was interested in whether the earlier surge in energy and other inputs costs was playing a role. Agents found that this effect had played some role, though recruitment difficulties and increases in productivity were the key factors weighing on employment growth.

Costs and prices
- Costs (materials and imported finished goods)
- Manufacturers' domestic output prices
- Retail prices (goods and services)
- Business-to-business services prices
- Total labour costs per employee (manufacturing and services)
- Pre-tax profitability (manufacturing and services)

Factor utilisation
- Employment intentions (manufacturing, business services and consumer services)
- Recruitment difficulties
- Capacity constraints (manufacturing and services)

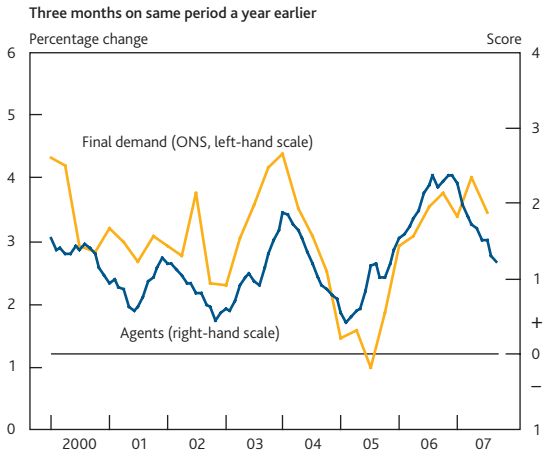
Scores relate to the level of a variable in the past three months compared with the same period a year earlier,(1) though there are a few exceptions.(2) The score for each variable ranges from -5 to +5, with +5 indicating a rapidly rising level, 0 indicating an unchanged level and -5 indicating a rapidly falling level. Comparison with levels a year earlier controls for variations in conditions that are seasonal rather than economically important.

The process of assigning a score imparts discipline to the intelligence-gathering process. It encourages Agents to collect information about a range of key economic variables, and to consider carefully the momentum in them. Scoring also provides a vehicle for synthesising a large amount of information into a whole-economy view. With scores for 25 variables now well established, the Bank has been combining weighted averages of sectoral components of a given variable to infer a whole-economy score for that variable. Other scores have been combined to infer scores for various types of aggregate expenditure and output. (For details of these 'composite scores', see the Annex.)

The composite scores can only approximate true whole-economy aggregates, as not all relevant components of a variable are subject to scoring. In particular, stocks, imports and service exports are not included in the score for aggregate demand, while primary industries and utilities are excluded from aggregate output. Nonetheless, they provide a useful 'broad-brush' view, making it easier to relate the economic intelligence obtained from companies to judgements about developments in economic activity. Examples of composite scores for aggregate demand and output are shown in **Charts 1** and **2**, and track the broad trends in official data fairly well.

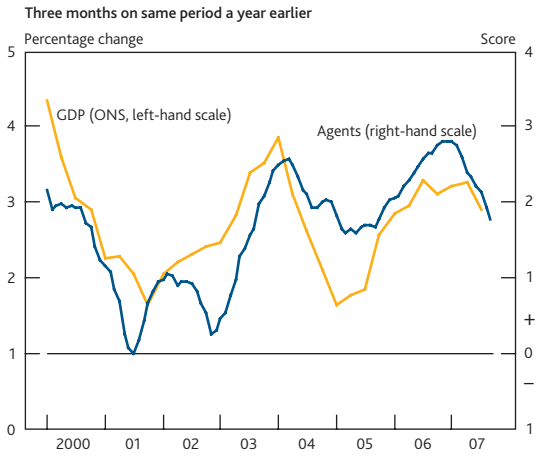
(1) The scores are based on information collected over the past three months, rather than a single month's meetings with contacts. As such, they draw on a larger sample of evidence, and are better placed to track underlying economic trends than if they were based solely on potentially noisy monthly information.
(2) Exceptions are recruitment difficulties and capacity constraints, which are not considered in terms of an annual change in levels, but the current level relative to normal.

Chart 1 Aggregate demand



Note: For definition of Agents' aggregate demand score see the Annex.

Chart 2 Aggregate output



Note: For definition of Agents' aggregate output score see the Annex.

How do Agents' scores differ from business surveys?

Given the array of scores now available, how do scores differ from responses that are readily obtainable from business surveys? Certainly, they lack the benefit of the large sample sizes of the major business surveys. The key difference between Agents' scores and business surveys is, however, the properties of the information on which they are both based. An Agents' score is primarily informed by an interview, rather than a questionnaire, as is the case for a business survey. Since Agents engage contacts face-to-face at their workplace, they can observe their economic environment directly. This provides scope for dialogue and clarification, and enhances the accuracy and detail of the information reported. Furthermore, contacts have been cultivated over time so that Agents have access to the opinions of decision-makers in an organisation, whereas the expertise of a survey respondent is not always known. But perhaps more importantly, there are fairly stable relationships between the Agents and their contacts as interviewers and interviewees tend to be paired through time. And with a large share of visits in any given month being with contacts Agents have spoken to at the same time a year earlier, the information set has features of a 'matched sample' (where respondents are the same between reporting periods). Consequently, a change in an Agents' score should primarily reflect changes in underlying economic conditions rather than differences in reporting behaviour or other sources of noise that might stem from relatively small sample size.

Agents' scores have the additional advantage of timeliness, being available immediately at the end of a reference period, ahead of comparable surveys and around three months ahead of comparable National Accounts estimates. Also helpful is the fact that Agents' scores comprise regional components, as this allows the Bank to judge how geographically widespread an economic development might be.

But Agents' scores are only one indicator from a large set of information that has been collected, rather than the main set of information, as is the case for a survey. As a result, the scores are accompanied by the insights of the individual contacts, or of the Agents themselves who observe themes emerging in reported conditions. This insight allows for an explanation of the drivers of change, companies' behaviour, their expectations and perceptions of risk. Such qualitative information plays an important role in the Bank's assessment of economic conditions. So for all these reasons, the Bank considers the Agents' scores along with a range of business surveys and official data when forming its best judgement about the true rate of growth in key economic variables.(1)

How useful are the scores?

How can the usefulness of the Agents' scores be judged? Because the key benefit of the Agents' intelligence lies in the qualitative responses to interviews, it is not necessary for the scores to outperform other business surveys in a statistical sense. Nonetheless, for the scores to have value, it is important that they meet certain minimum conditions. They should be well correlated with key economic indicators and they should capture turning points. In other words, a score should provide a credible 'early-warning' signal of changes in economic conditions.

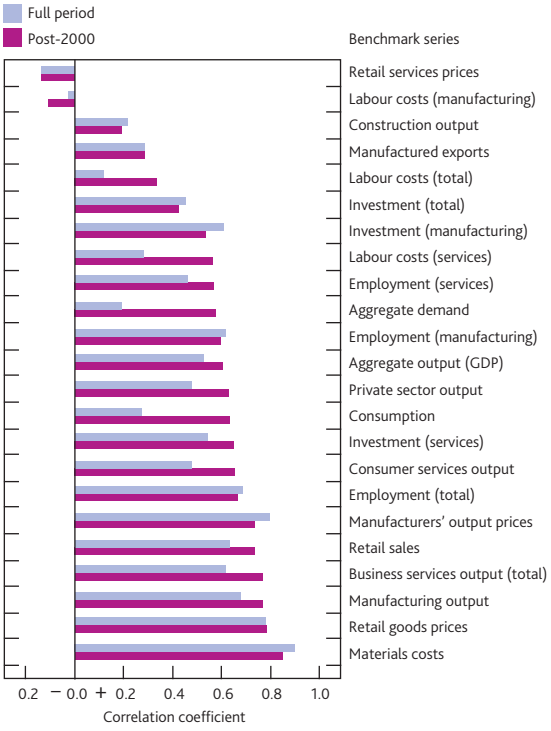
So in the first instance scores are compared with corresponding published data and the correlation between them is examined; the sample period covers the full history of the scores. In the sections that follow, the type of signal provided by an Agents' score is then looked at more closely. For the purpose of this analysis, it is assumed that the corresponding ONS data represent the true growth in a variable.

(1) The true value of a series is initially unobservable due to a lack of appropriate data, creating a role for other sources of information, including Agents' scores, when forming judgements about its behaviour. See Cunningham and Jeffery (2007).

Simple correlations

As Agents' scores are for conditions in the past three months compared with the same period a year earlier, they are compared with percentage changes in ONS data over the same time frame. Correlations are performed over the full sample period for which scores and corresponding ONS data are available, and for the period since 2000. (This subsample is considered because when scoring first commenced in mid-1997, not all Agencies were established and the process of scoring was still being refined.) Leads and lags of Agents' scores are also considered and the results are detailed in the Annex, with the highest correlations shown in **Chart 3**. The performance of the scores by this simple metric of correlation is varied. On average, though, the correlations with ONS data are favourable, especially in the post-2000 period. At around one half, the average correlation generally accords with that found for business surveys.(1) And there is a subset of Agents' scores for which there is high comovement with ONS data.

Chart 3 Correlations between Agents' scores and ONS data



Note: The full period sample varies across series, but is most often from mid-1997 to December 2007. For details see the Annex. The highest correlation is shown.

Importantly, strong correlations are found for various series that help inform an understanding of fluctuations in activity. This is so for service sector output, an area for which there are limited timely published indicators. It is also true for output in interest rate-sensitive industries (such as retail trade) and expenditure classes (such as business investment). Consistent with this, healthy correlations can be observed for scores relating to aggregate demand and output, at least in the post-2000 period. Furthermore, correlations are high for some prices, notably input and output prices in the goods sector, helping inform assessments of upstream inflationary pressures. Given the information needs of a central bank, these outcomes are desirable. Of course, it is also desirable that scores have been compiled for those variables for which there are no official data. Some of these variables — such as capacity utilisation — help in assessing inflationary pressures, making information about them particularly useful to a central bank.

Where correlations between Agents' scores and ONS data are below average, it is important to consider why this might be. In some instances, there may be challenging information requirements for Agents to assign a score.(2) In other cases, there may be conceptual differences between the definitions of the variables scored by Agents and official data.(3) Correlations can also be sensitive to sample periods and the existence of turning points in the data. Indeed, for a series in which there have been few major turning points, a low correlation may not preclude a score being a useful predictor of movements in official data in some future period. Moreover, official data may themselves be poorly measured, or subject to revision. So other metrics of performance should be considered in addition to simple correlations.

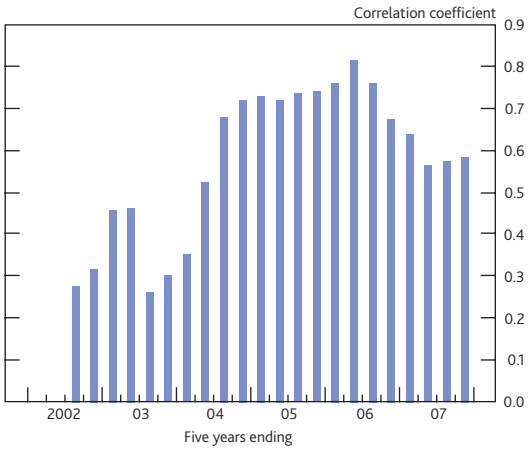
A closer look at comovement

Improving through time

Given the sensitivity of correlations to the sample period, one question is whether Agents' scores have become more useful indicators of official data through time. This may reflect 'learning by doing' as Agents refine their approach to scoring, or simply reflect the opportunity to capture major swings in a

Chart 4 Consumption correlations over time

Agents' scores and ONS data



(1) For example, the correlation between ONS data and Agents' scores over the period from 1997 is similar to that between ONS data and business surveys for services output, manufacturing output, business investment and retail sales.
(2) Prices in the services sector are a case in point, given the difficulties in defining the unit of output to be priced and appropriate adjustments for quality. In fact, these are challenging issues for statisticians generally. See Diewert (2003).
(3) This is so for total labour costs which are defined more broadly than official data on earnings.

given variable. Many scores have seen an increase in comovement. This is apparent for scores relating to consumption, where early scores displayed little positive comovement with published data. This stemmed from the Agents' initial focus on retail trade rather than broader indicators of consumption. Subsequently, however, Agents' scores and official consumption data have displayed a much closer correlation (**Chart 4**). Consequently, more confidence can be placed in the signal this composite score affords about aggregate activity.

Reducing data uncertainty

When assessing the usefulness of Agents' scores as timely indicators of trends in official data, it also matters that some official data are characterised by systematic patterns of revisions (Cunningham and Jeffery (2007)). Given that these revisions can occur in successive periods, there is a risk that initial releases of official data can give a misleading signal about the degree of momentum in a variable for some time. So a useful exercise is to consider whether Agents' scores are better at predicting mature vintages of data than early releases.

Comparing correlations between Agents' scores and each vintage of corresponding National Accounts data, it appears that Agents' scores can more usefully predict mature vintages of output data than initial data.(1) This can be demonstrated by taking a series of rolling five-year windows in which the correlation between the Agents' score is compared with both the first available vintage of output data and the most mature output data currently available (that is, data which have been balanced through at least two *Blue Books*). The earlier the period, the closer the revision process is to completion. As shown in **Chart 5**, the correlations between the Agents' scores and private sector output growth in the National Accounts are reasonably high, with this correlation generally increasing through time. Strikingly, the correlations with more mature vintage data are higher than with the first vintage, particularly in the early periods. So the signal from the Agents' scores of aggregate output would have provided a better signal of momentum in private sector output than the published data of the day indicated.

Looking at the individual industry level, the ability of the Agents' scores to predict mature vintage data is particularly evident in business services, a large sector of the economy that is known to be difficult to measure and for which data uncertainty remains high (**Chart 6**).(2) Indeed, this is a good example of the idea that when a variable is difficult to measure, there is merit in obtaining economic intelligence directly from participants in that industry. This form of intelligence is especially useful in the current conjuncture where financial turmoil is likely to have had its most pronounced effect on activity in the service sector, the results of which will not be confirmed in official data for a considerable period.

Chart 5 Private sector output growth

Correlations between Agents' scores and first and last vintages of ONS data

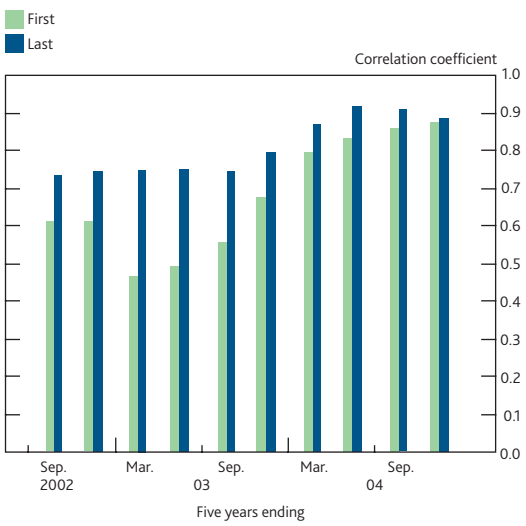
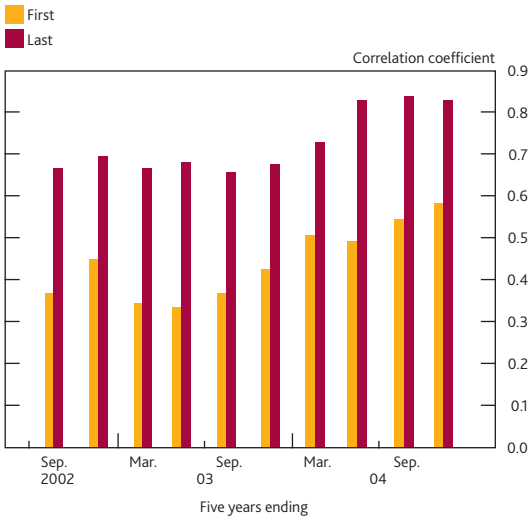


Chart 6 Business service sector output growth

Correlations between Agents' scores and first and last vintages of ONS data



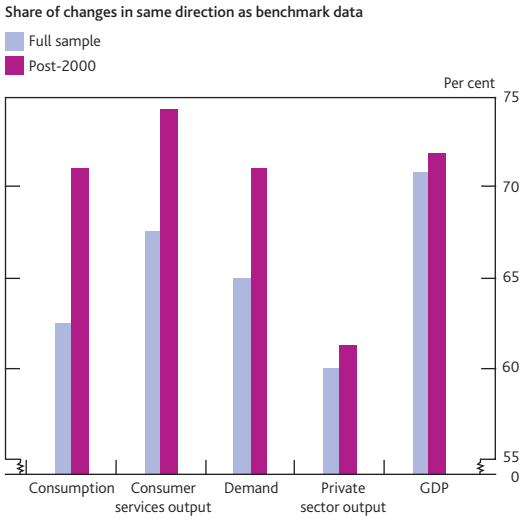
Capturing turning points

Another important issue is whether scores have directional accuracy so that they can meaningfully capture turning points. The precise relationship between a score and official data is of less interest to a central bank than whether the score provides a useful signal about a possible change in economic conditions, particularly an extreme event. While correlations are the most commonly used guide here, it is also instructive to look at other indicators that suggest this ability.

(1) For expenditure variables, however, there is little difference in the correlations between early and mature vintages.
(2) For a discussion of how uncertainty about estimates of service sector output persists through the cycle of revisions, see Ashley *et al* (2005), page 27.

One simple approach to gauge the directional accuracy of the scores is to compare the sign of the change in a score with that in a benchmark series (considered most accurately to capture growth in the variable). The higher the share of changes in both series that are of the same sign, the greater the directional accuracy of the scores, so that the greater will be the similarity in the profile of the series. The sign of changes in scores and benchmark data were compared for demand, output and price variables. Around 60% of the time, an Agents' score and a benchmark variable move in the same direction, month to month (or quarter to quarter). This is also true for some scores that did not display especially high correlations. Interestingly, for the composite scores on aggregate expenditure and output, basic directional accuracy is even greater than for other series (**Chart 7**).(1)

Chart 7 Profile of Agents' scores against benchmark series



A further test of directional accuracy is whether the actual peaks and troughs in Agents' scores and benchmark data coincide. The history of the Agents' scores is fairly short with respect to such a test. So a simple approach is considered. Rather than focus on major turning points, of which there are few, local maxima and minima in selected Agents' scores and corresponding ONS data are identified and compared.(2) Consistent with their relatively high directional accuracy, the Agents' scores identify a high share of turning points evident in the benchmark data. They also identify slightly more turning points than in the benchmark data, and so may occasionally provide false signals. So a signal to noise ratio is relevant. It is defined here simply as the total number of turning points identified relative to the number of false turning points. This ratio clearly exceeds unity and in some cases is quite high (**Table A**). Furthermore, a reasonably high share of turning points in Agents' scores occurs within the same six-month window as official data. This is a desirable outcome given the timeliness of Agents' scores relative to the benchmark data.

Table A Indicators of turning points in selected variables

Benchmark series	Total number of peaks and troughs in Agents' scores *(a)*	Number of major false signals *(b)*	Signal to noise ratio *(a)/(b)*	Share of turning points in same six-month window
Output	8	1	8	1
Retail sales	10	2	5	0.9
Materials costs	9	2	4.5	0.7
Consumption	8	2	4	1
Consumer services	8	2	4	0.7
Aggregate demand	8	2	4	0.5
Private sector output	8	2	4	0.8
Manufacturing output	8	2	4	0.8
Output prices	8	2	4	0.4
Construction output	11	3	3.7	0.8
Business services output	8	3	2.7	0.6
Retail goods prices	9	4	2.3	0.8
Total labour costs	6	4	1.5	0.3

Future work

The Bank is currently investigating ways of further improving the Agents' ability to capture and synthesise the insights of economic decision-makers in large companies across the United Kingdom. Large companies have a disproportionate effect on economic activity and their decisions can influence those of other firms. They also tend to be key drivers of change in the functioning of the economy and have well-developed views about the outlook. So capturing information from these influential firms can usefully inform policymakers' assessment of economic conditions. The Agents are ensuring that their approach to gathering economic intelligence from large companies is more comprehensive and systematic so that the benefits of relationships with such contacts are enhanced. In particular, they are grouping information according to companies' specific economic characteristics so that economic questions could be answered more precisely, and the scope for analysis broadened.

A further example of work that builds on relationships is the participation of Agents' contacts in the Bank's major pricing survey, currently in the field. This survey, the second in ten years, seeks to improve understanding of the inflation process since the adoption of inflation targeting. Using a sample of well-established contacts who are also decision-makers enables extraction of deeper insights into pricing behaviour than would otherwise be the case.

(1) The increase in directional accuracy is likely to have been enhanced by the fact that benchmark data are measured on a quarterly basis, as quarterly data series have smoother profiles than monthly series.
(2) The focus is on those variables with a reasonable correlation with ONS data and where there is a particular benefit to policymakers of timely identification of turning points.

Conclusions

The economic intelligence gathered by the Agents is a valuable part of the suite of information considered by the MPC. By drawing on the expertise and experience of contacts, it helps fill information gaps about economic developments. It gives insights into the nature of change, why it is occurring, and the extent of such change. Agents' judgements about the extent of change are captured in their scores. After a decade of scoring, relationships between these scores and other data can be more clearly established. For the most part, Agents' scores display useful comovement with benchmark series that has tended to increase through time. In some cases, they have displayed an ability to predict revision, with higher correlations evident with mature vintages of data. Importantly, they also have a tendency to capture turning points. These quantitative indicators, combined with the richness of the accompanying qualitative information, equip the Bank with an additional set of information as it makes policy decisions in an environment of uncertainty.

Annex
Correlations

Table A1 Correlations between Agents' scores and ONS data

Score	Related ONS variable	Data frequency	Start date	Contemporaneous correlation	Highest correlation	Number of periods by which scores lead (+)/lag (-)
Demand and output						
Consumption						
Retail sales values	Retail sales values	M	July 1997	0.63	0.63	1
Consumer services turnover	Consumer services output	Q	Sep. 1997	0.44	0.48	1
Weighted average	Consumption	Q	Sep. 1997	0.27	0.27	0
Business services turnover	Business services output	Q	Sep. 1997	0.54	0.62	1
Professional and financial	Finance, real estate, business	Q	Mar. 2005	0.13	0.60	1
Other	Transport and communications	Q	Mar. 2005	0.71	0.78	-1
Investment intentions						
Manufacturing	Manufacturing business investment	Q	Sep. 1997	0.48	0.61	2
Services	Services business investment	Q	Sep. 1997	0.37	0.55	2
Weighted average	Business investment	Q	Sep. 1997	0.34	0.45	2
Manufacturing						
Domestic	Manufacturing output	Q	Sep. 1997	0.68	0.68	0
Exports	Manufacturing exports	Q	Dec. 1999	0.26	0.29	-1
Construction	Construction output	Q	Sep. 1997	0.11	0.22	-1
Aggregate demand	Total domestic expenditure	Q	Sep. 1997	0.04	0.19	2
Aggregate output	GDP	Q	Sep. 1997	0.53	0.53	0
	GDP backcast	Q	Sep. 1997	0.63	0.63	0
	Private sector output	Q	Sep. 1997	0.48	0.48	0
Costs and prices						
Materials costs	Manufacturing input prices	M	July 1997	0.90	0.90	-1
Costs of imported finished goods	Imported finished goods	M	Jan. 2005	0.26	0.39	-2
Total labour costs per employee						
Manufacturing	Manufacturing AEI (including bonuses)	M	June 1998	-0.13	-0.02	-2
Services	Services AEI (including bonuses)	M	June 1998	0.26	0.28	-2
Weighted average	Whole-economy AEI (including bonuses)	M	June 1998	0.11	0.12	-1
	Private sector AEI (including bonuses)	M	June 1998	0.20	0.21	-1
Manufacturers' domestic prices	Manufacturing output prices	M	July 1997	0.78	0.80	-2
Retail goods prices	CPI goods prices	M	May 2000	0.76	0.78	-2
Retail services prices	CPI services prices	M	May 2000	-0.21	-0.13	2
Labour market						
Employment intentions						
Manufacturing	Manufacturing workforce jobs	Q	Sep. 1997	0.37	0.62	2
Business services	Business services workforce jobs	Q	Mar. 2005	-0.93	-0.40	-2
Consumer services	Consumer services workforce jobs	Q	Mar. 2005	0.46	0.94	2
Services	Services workforce jobs	Q	Sep. 1997	0.46	0.46	0
Weighted average total	Workforce jobs	Q	Sep. 1997	0.69	0.69	2

Note: Where ONS data are quarterly, the Agents' score in the end month of each quarter has been used.

Data issues affecting correlations

Sample length

Agents' scores were only introduced for some variables in 2005 so the sample period is too short to properly gauge relationships (see sectoral subcategories of service sector turnover, investment intentions, employment intentions and imported finished goods prices).

Definitional differences

Sometimes definitions of a variable differ between Agents' scores and corresponding ONS variables. This is most evident for labour costs where Agents score a broader range of wage and non-wage factors than captured in most published measures of aggregate earnings. In other cases, the Agents' score relates to intentions over the next twelve months (investment) or over the next six months (employment and capacity pressures) and so should have a leading relationship with ONS variables.

Vintages of data

Correlations are calculated against current vintages of data with the exception of GDP where the Agents' score is also compared with growth in the central case of the Bank's backcast of GDP, which represents the Bank's best judgement of what GDP will be when the process of revision is complete. See pages 24–25 of the August 2007 *Inflation Report*.

Composite scores

Demand and output

- Consumption
  Weighted average of scores for retail sales and consumer services[a]
- Investment intentions
  Weighted average of scores for manufacturing and service sector investment[b]
- Aggregate demand
  Weighted average of scores for retail sales, consumer services, manufacturing investment, services investment and manufacturing exports[a]
- Aggregate output
  Weighted average of scores for output in manufacturing, construction, consumer services, professional and business services and other services[c]

Costs and prices

- Pre-tax profitability
  Weighted average of scores for manufacturing and services profitability[c]
- Total labour costs per employee
  Weighted average of scores for manufacturing and services labour costs[d]

Labour market

- Employment intentions
  Weighted average of scores for employment intentions in manufacturing, business services and consumer services[d]

Factor utilisation

- Capacity constraints
  Weighted average of scores for capacity pressures in manufacturing and services[c]

(a) Weights proportional to expenditure shares in the National Accounts.
(b) Weights proportional to shares of business investment.
(c) Weights proportional to shares of output in the National Accounts.
(d) Weights proportional to shares of jobs.

References

Ashley, J, Driver, R, Hayes, S and Jeffery, C (2005), 'Dealing with data uncertainty', *Bank of England Quarterly Bulletin*, Spring, pages 23–29.

Beverly, J (1997), 'The Bank's regional Agencies', *Bank of England Quarterly Bulletin*, November, pages 424–27.

Cunningham, C and Jeffery, C (2007), 'Extracting a better signal from uncertain data', *Bank of England Quarterly Bulletin*, Vol. 47, No. 3, pages 364–75.

Diewert, E (2003), 'Services and the new economy: data needs and challenges', *University of British Columbia Working Paper No. 03–09*.

Eckersley, P and Webber, P (2003), 'The Bank's regional Agencies', *Bank of England Quarterly Bulletin*, Spring, pages 92–96.

Ellis, C and Pike, T (2005), 'Introducing the Agents' scores', *Bank of England Quarterly Bulletin*, Winter, pages 424–30.

Jenkins, P and Longworth, D (2002), 'Monetary policy and uncertainty', *Bank of Canada Quarterly Review*, Summer, pages 3–10.

Macklem, T (2002), 'Information and analysis for monetary policy: coming to a decision', *Bank of Canada Quarterly Review*, Summer, pages 11–18.

Stevens, G (2006), 'The conduct of monetary policy', presentation to the Anika Foundation and Australian Business Economists, Sydney, 13 July.

The impact of low-cost economies on UK import prices

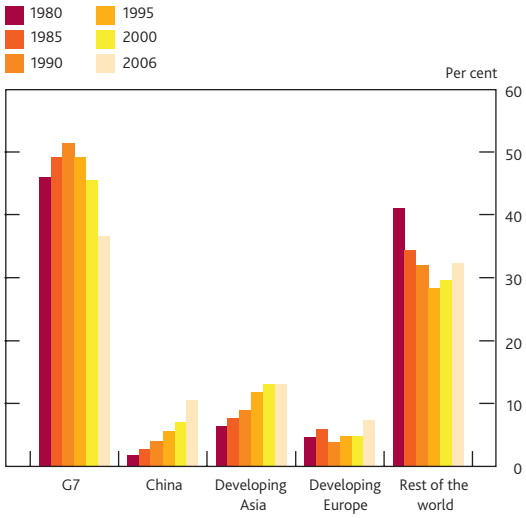
By Conall Mac Coille of the Bank's Structural Economic Analysis Division.

The share of UK imports from developing countries has increased sharply in recent years. Using measures of bilateral trade prices, this article suggests that increased sourcing from low-cost economies has put significant downward pressure on the relative price of UK goods imports. However, this effect may have dissipated over time as the prices of UK imports from low-cost economies have risen more rapidly than in the past and developing economies' increasing demand for raw materials has contributed to higher oil and commodities prices.

Introduction

The sharp expansion of exports from China and other developing economies in recent years (**Chart 1**) has been attributed to: reductions in legal barriers to trade; transitions towards market-orientated policies; and relatively low costs of production. The increasing importance of developing economies within world trade has been identified as one factor that may have pushed down on global and UK trade prices. This article examines how important these effects may have been for the United Kingdom.

Chart 1 Share of world trade(a)



Source: IMF Direction of Trade Statistics.

(a) The shares are calculated from nominal US dollar values. Developing Asia excludes China.

A key point in considering these channels is that aggregate UK consumer price inflation is determined by UK monetary policy in the medium to long run. And even in the short run there is a wide range of other, potentially offsetting, effects on aggregate inflation. Hence, increased sourcing of imports from developing economies has probably been associated with movements in the relative prices of some traded goods rather than any sustained effect on aggregate inflation. Nevertheless, it is important for central banks to understand movements in relative prices to assess their potential influence on aggregate inflation in the short run.(1)

In the past, analysis of UK trade prices has been hampered by the lack of available data. Price measures for goods imported into the United Kingdom from specific trading partners are not published. So it has not been possible to decompose aggregate import prices, in an accounting sense, into contributions from different trading partners. This article describes new measures of bilateral trade prices which allow such an accounting decomposition.

The second section discusses the many channels through which globalisation may have affected the UK economy and trade prices. The third section describes how a rising proportion of imports from low-cost economies may have reduced UK import prices. The fourth section measures the impact using bilateral trade price measures. The fifth section considers disaggregated data to analyse which categories of goods imports may have experienced the largest relative price falls. The sixth section concludes.

Channels through which globalisation may have affected the United Kingdom

One explanation for the sharp expansion of developing economy exports is the reduction in legal barriers to trade. Over the past two decades the process of global trade liberalisation has been facilitated by transitions towards

(1) For example, see Kamin, S, Marazzi, M and Schindler, J W (2004), 'Is China 'exporting deflation'?'.

market-orientated policies in many developing economies. Other key developments in international trade relations include the European Single Market programme, the accession of new EU member states, China's entry to the World Trade Organisation in 2001 and the completion of the Agreement on Textiles and Clothing (ATC) in 2005.

The integration of developing economies into international trade has been characterised as an increase in the effective global labour force and an improvement in labour productivity in developing economies following from the new production opportunities. Many macroeconomic models suggest that such changes should put downward pressure on the prices of tradable goods and services. However, there are several channels through which these changes in the global economy could affect prices in the United Kingdom.

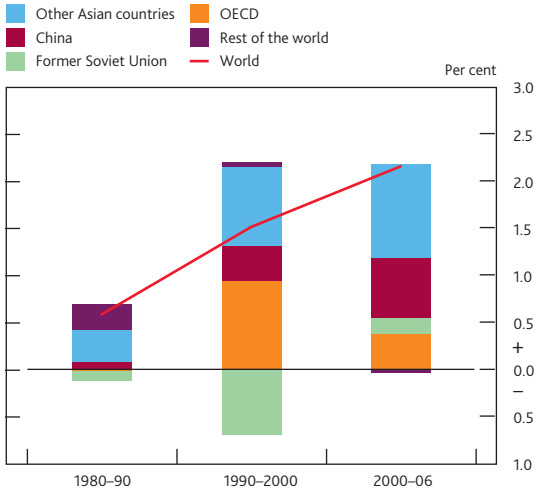
Increased competition in global markets from developing economies may have led UK firms, and exporters in other advanced economies, to lower their mark-ups over costs. Globalisation pressures may also work through the domestic labour market. As global trade becomes more integrated, employees and companies may take more account of lower labour costs in other countries when bargaining for wages. For example, the potential for UK firms to relocate production abroad may restrain wage demands and hence costs. Globalisation may also affect domestic prices by raising productivity and hence lowering unit labour costs: increased trade allows countries to concentrate their resources in the sectors in which they are relatively more efficient, for example by relocating inefficient processes abroad, so that overall labour productivity growth increases. And increased competition may raise firms' incentives to innovate.

A full discussion of these channels is beyond the scope of this article.(1) But a key channel through which globalisation may have affected the UK economy is through lower imported goods prices as companies have increasingly been able to access the cheapest goods on world markets.

That said, the integration of developing economies into the global economy is likely to have put upward pressure on other domestic prices. Increased demand for raw materials from developing economies as they expand production has put upward pressure on the prices of oil and commodities imported into the United Kingdom. Indeed, **Chart 2** illustrates the increasingly important contribution of developing economies to world oil demand over the recent past.(2)

Another potential offset to cheaper import prices comes from the boost to real incomes that consumers of cheaper imports enjoy. As the prices of some imports fall, consumers have more income to spend on domestically produced goods and services. And the prices of these goods and services are likely to rise in response to increased demand, offsetting the impact

Chart 2 Contributions to average annual oil consumption growth(a)



Source: US Energy Information Administration.

(a) Consumption is measured in volumes. The 'other Asian countries' group excludes Japan and South Korea which are members of the OECD, and China. The group includes India, Taiwan and Hong Kong in addition to other Asian countries.

of lower import prices on aggregate inflation. The impact of any movement in import prices on other prices will also depend on households' expectations about the future. For example, if people expect the fall in import prices to be permanent, or that import prices will continue falling, they may bring forward consumption as they expect their real incomes to be persistently higher in the future. Again, this extra demand would offset any downward pressure on aggregate prices. In the medium term, inflation is determined by monetary policy. And UK monetary policy would react to any shock to import prices, and the related expected changes in other relative prices, to ensure UK CPI inflation remained close to target in the medium term.

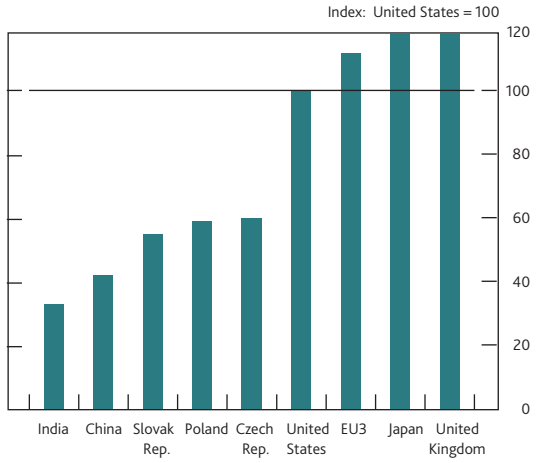
The impact on UK import prices

How much cheaper are goods imported from developing economies likely to be? **Chart 3** illustrates that overall price levels are low in India, China and eastern European countries relative to the prices of similar goods in developed economies after accounting for exchange rate differences.

Differences in the prices of traded goods may be less marked: in the long run, competition should ensure that the prices of similar traded goods sourced from different countries converge, in common currency terms. But at shorter horizons, price differentials between different countries can persist, even for traded goods. Such price differences are more likely where trade barriers prevent firms and consumers from taking

(1) See for example IMF (2006), 'How has globalization affected inflation?' and IMF (2007), 'The globalization of labor'.
(2) See 'Developments in primary commodity prices', November 2007 *Inflation Report*, page 34.

Chart 3 Relative price levels in 2005[a]

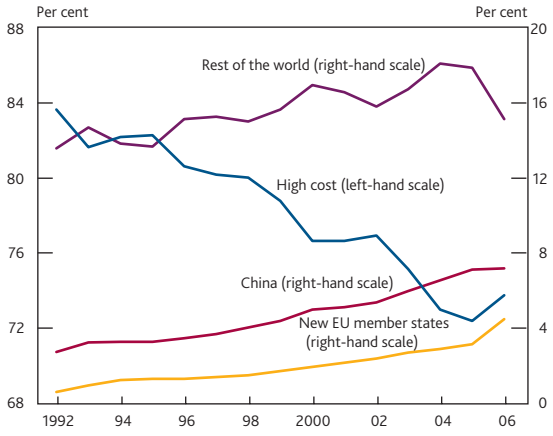


Source: World Bank International Comparison Program.

(a) The comparisons are made using nominal exchange rates. The EU3 figure is an average of France, Germany and Italy. The goods compared include a broad range of consumer goods and also capital and government expenditures.

advantage of lower production costs in developing economies. But **Chart 4** illustrates that over the past ten years the United Kingdom has seen substantial substitution towards goods sourced from lower-cost economies such as China and the new EU member states.

Chart 4 UK goods import shares[a]



Source: ONS *Pink Book* (2007).

(a) The 'high-cost' country grouping is defined as: Australia, Canada, the EU15 countries, Japan, New Zealand, Norway, Switzerland and the United States. The 'new member states' include Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia. The 'rest of the world' is defined as a residual relative to total UK imports. These same country groups are illustrated in **Charts 5** and **6** and **Table A**. The shares are calculated in nominal £ terms.

Equation **(1)** describes, in an accounting sense, the potential impact of the increasing share of low-cost imports on UK import prices. Aggregate import price inflation (π_{MP}) is a function of the inflation rate of goods imported from high-cost countries (π_{HC}) the change in the share of low-cost countries in total imports (ΔS_{LC}) the extent of the price-level differences ($P_{HC} - P_{LC}$), and relative price movements ($\Delta P_{HC} - \Delta P_{LC}$), between goods imported from high and low-cost countries, where P indicates the price level. Here, all inflation and price levels are in sterling rather than foreign currency terms.

$$\pi_{MP} = f\left(\pi_{HC}, \Delta S_{LC}, \left(P_{HC} - P_{LC}\right), \left(\Delta P_{HC} - \Delta P_{LC}\right)\right) \quad (1)$$

The import price inflation rate is depressed over time as imports with a low price level replace similar goods with a high price level. The magnitude of this 'share' effect within product categories depends upon the extent of price-level differentials between the high and low-cost countries and how quickly low-cost countries increase their share of UK imports.

The final term in equation **(1)** captures relative price movements between goods imported from low and high-cost countries. For example, if the prices of goods imported from low-cost countries are rising faster than those from the high-cost countries, this 'price' effect will push up on UK import prices.(1)

The magnitude and sign of these effects may change over time and potentially offset each other. For example, if the rising share of goods from developing economies in UK imports has accelerated over time the 'share' effect may become more pronounced. That is, there might be greater downward pressure on UK import prices over time from substitution towards cheaper goods within product categories. In contrast, if inflationary pressure in developing economies has picked up in recent years the 'price' effect may have increasingly pushed up on UK import price inflation. Of course, movements in sterling exchange rates have the potential to offset such pressures. Hence, this article analyses the sterling prices of manufactured goods imported from different countries.

Assessing the magnitude of these effects has been the focus of several recent studies. Nickell (2005) calculated that the 'share' effect accounted on average for a 0.5 percentage point reduction in a UK-weighted measure of annual world trade price inflation over the period 2000–05. Pain *et al* (2006) argued that developing economy imports reduced US inflation (measured by the domestic demand deflator) by 0.1 percentage points on average over 2001–05 and by 0.3 percentage points for the euro area over the same period. Using a similar method to this article, a recent European Central Bank study found that the increase in import penetration from low-cost countries may have dampened annual euro-area import price inflation for manufactured goods by 2 percentage points each year over the period 1995–2004.(2) In the next section the evidence on 'share' and 'price' effects from low-cost countries on UK import prices is discussed.

(1) A more formal description of these effects is provided in the appendix to this article.
(2) 'Globalisation, trade and the euro area macroeconomy', *ECB Monthly Bulletin*, January 2008.

Measuring the impact of low-cost economies on UK import prices

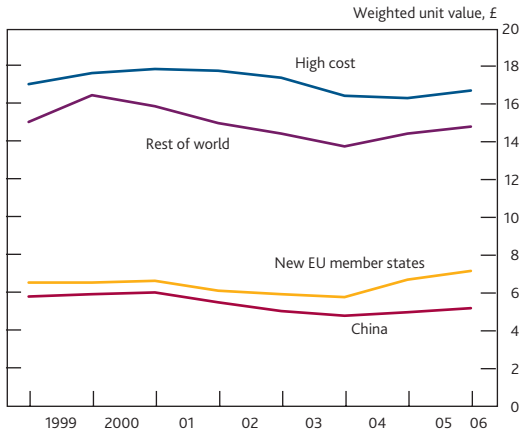
Previous analysis of UK trade prices has been hampered by the lack of available data. The Office for National Statistics (ONS) measures aggregate trade prices but does not publish measures disaggregated by individual trading partners.(1) Furthermore, due to measurement limitations, the ONS data may not fully capture the impact of substitution towards cheaper goods and services, ie the 'share' effect, on import price inflation.(2) In this case, true UK import price inflation may have been weaker than indicated by the official data.

In the absence of direct survey data on bilateral trade prices, proxies for the price of imported goods can be constructed from unit values data collected by Her Majesty's Revenue and Customs (HMRC).(3) Unit values are derived by dividing the sterling value of imported goods by their quantity or weight. There are several caveats to using unit values as a proxy for trade prices. First, unlike the consumer prices index, unit values are not derived from direct surveys of prices and are therefore less reliable. Second, unit values should only be compared for narrowly defined product categories as comparing unit values at an aggregated level risks confusing price changes with changes in the composition of imported goods. This is a drawback to this method, as arguably many — perhaps most — categories of goods do not have identical compositions between countries. Clearly, the more detailed the level of disaggregation, the less of a problem this is; although even the lowest categories may well differ between countries. A related, third, point is that no adjustment for quality improvements is made. The proxy measure for the UK import price of manufactured goods discussed in this article is derived from nearly 2,200 distinct product categories in 35 categories for each of 32 of the United Kingdom's trading partners.(4)

Chart 5 illustrates the price levels (unit values) of UK manufactured goods imports sourced from different countries. The 'high-cost' countries account for around three quarters of UK manufactured goods imports. The proxy measure of manufactured goods imports from the new EU member states and China were 42% and 30% respectively of the 'high-cost' price in 2006. This suggests that, in an accounting sense, the increasing import share of low-cost economies may have depressed UK import price inflation. That is, the share effect may have been negative in recent years.

Chart 6 illustrates the inflation rates of UK import prices for high and low-cost countries using the same data as **Chart 5**. Import price inflation from all economies picked up between 2004 and 2006. The import price inflation rate for manufactured goods from China rose to close to 5% in 2006. Noticeably, import price inflation from low-cost countries was

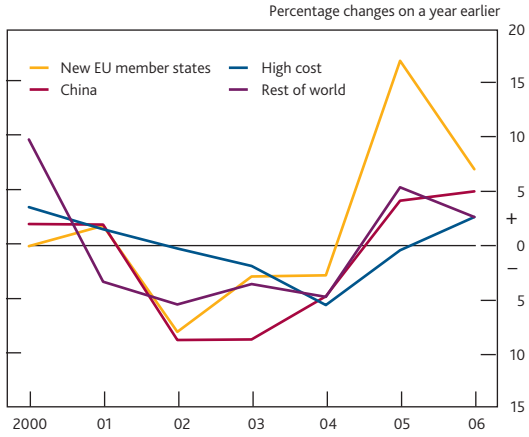
Chart 5 A measure of price levels for UK manufactured goods imports(a)



Sources: HMRC and Bank calculations.

(a) The country groupings are the same as those used in **Chart 4**.

Chart 6 Manufactured goods import price inflation(a)



Sources: HMRC and Bank calculations.

below that of high-cost economies during 2000–03, but was higher in 2003–06. This suggests that the 'price' effect has pushed up on UK import prices in recent years.

One possibility is that these apparent differences across countries may to some extent reflect the composition of trade. That is, if the United Kingdom tends to import more expensive items (eg motor cars) with a common price on world markets from high-cost countries and cheaper goods (eg clothing and footwear) from developing economies. Hence, the next section of the article discusses evidence that even for similar categories of specific manufactured goods, imports from China tend to be cheaper.

(1) The ONS do provide a decomposition of aggregate goods imports into those goods from EU and non-EU countries.
(2) This is because it is difficult to measure the impact on aggregate import prices when goods imported from one country are replaced by similar cheaper goods from another country. See 'Box 3, 'An example of measurement challenges exacerbated by globalisation: the case of 'phantom GDP'', *ONS Economic and Labour Market Review*, September 2007.
(3) The data are available from the HMRC website at www.uktradeinfo.com.
(4) See the appendix for details of the construction of these aggregate measures.

Table A provides an accounting decomposition of UK manufactured goods import price inflation. The figures here are the average accounting contributions across 35 manufactured goods sectors, weighted according to their aggregate nominal shares of UK manufactured goods imports. Together the share and price effects from the new EU member states, China and rest of the world are estimated using this technique, to have pushed down on import price inflation for manufactured goods by 0.7 percentage points on average across sectors and over 2000–06 (row (1)). The increasing share of imports from China contributed -0.5 percentage points on average, and that of the new EU member states -0.2 percentage points on average (row (2)).

Table A Average contribution across sectors to UK manufactured goods annual import price inflation

	Average 2000–06
(1) Aggregate low-cost effect (= 2 + 3)	**-0.7**
of which:	
New EU member states	-0.2
China	-0.5
Rest of the world	-0.1
(2) Low-cost share effect	**-0.6**
of which:	
New EU member states	-0.2
China	-0.5
Rest of the world	0.1
(3) Low-cost price effect	**-0.2**
of which:	
New EU member states	0.0
China	0.0
Rest of the world	-0.2

Sources: HMRC and Bank calculations.

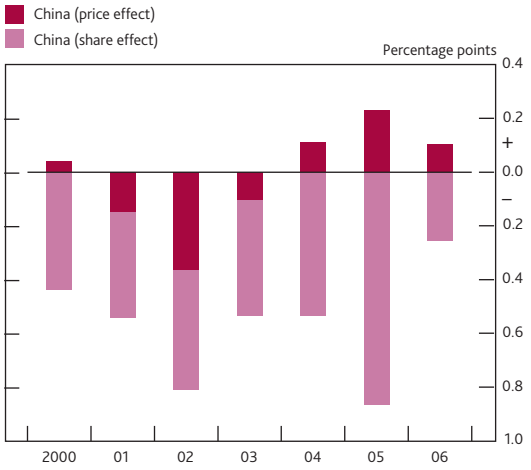
It is important to remember that these contributions may have varied over time. **Chart 7** illustrates the average contribution of China to UK import price inflation for manufactured goods over time. The share effect has remained negative as the share of China in UK imports has increased. In contrast, the price effect turned from negative to positive in 2004 and thereafter.

In summary, the evidence from unit values data suggests that increases in the share of imports from low-cost economies have pushed down on the relative price of UK imports, in an accounting sense, though this has been offset at times by more rapid inflation in import prices from these economies.

Evidence at the disaggregated level

The previous section described the possible downward impact of a rising share of UK imports from low-cost economies on the aggregate price of UK imports of manufactured goods. However, the increasing share of China has been concentrated in specific categories of manufactured goods. And the share

Chart 7 Average contribution to UK manufactured goods import price inflation



Sources: HMRC and Bank calculations.

of China in UK services imports remains very low.[1] Hence, any downward impact on aggregate import prices from low-cost economies is likely to have reflected declines in the relative price of specific types of imported manufactured goods and increases in the relative price of other goods and services.

Table B shows that China has increased its share of UK manufactured goods imports most sharply in those sectors with a relatively low technological content and high labour intensity of production, such as clothing, footwear and furniture. With China now accounting for large shares of UK imports in these sectors, there may be less potential for China to continue increasing its share of UK imports in the low technology sectors rapidly. However, there is evidence that China has increased the technological intensity of its exports over time.[2] As a result, China has also increased its share in some of the sectors with a higher technological content such as office and data processing equipment, telecommunications and sound recording equipment and electrical machinery. These sectors accounted for around a quarter of UK manufactured good imports in value terms in 2006.

Table B also shows that in the product categories where China has increased its share of UK imports most sharply, Chinese prices tend to be lower than similar categories of goods imported from the G7 economies. This is consistent with evidence from the World Bank and other sources that wages and costs are lower in common currency terms in developing economies. That said, these apparent price differences could partially reflect differences in quality not captured by unit values data.

(1) In 2006, the share of China in UK services imports was 0.8%.
(2) See 'Globalisation, trade and the euro area macroeconomy', *ECB Monthly Bulletin*, January 2008.

Table B Changes in China's import share and relative prices

	Change in China's share of UK imports for each sector 1999–2006	Relative price of imports from China against G7 average in 1999
	Percentage points	Per cent
Furniture	18.3	43
Footwear	13.4	45
Metal manufactures	10.4	33
Cork and wood manufactures	10.4	93
Textiles	9.0	71
Office and data processing equipment	8.7	15
Clothing	8.6	46
Prefabricated buildings and their manufactures	8.3	29
Travel goods	8.1	29
Miscellaneous manufactured articles	7.7	12
Electrical machinery	6.9	12
Leather manufactures	6.5	26
Rubber manufactures	5.4	58
Telecommunications and sound recording equipment	4.4	20

Sources: HMRC Trade Database and Bank calculations.

Although the impact of increases in the trade share of China has most probably lead to changes in the relative import prices for specific goods categories, there may not have necessarily been corresponding changes in relative prices within the CPI basket. For example, UK importers could in the short run have absorbed some or all of the lower import prices in higher mark-ups leaving their retail prices unchanged.

If UK firms have reduced their retail prices for those categories of goods where China has increased its share of UK imports most sharply, this effect may not have pushed down on the aggregate CPI inflation rate. As noted earlier, if the price of clothing and footwear has fallen in response to increased import sourcing from China, this will have increased the proportion of income UK consumers can spend on other goods and services in the CPI basket. And these prices may have increased in response to higher demand. In summary, increased sourcing of imports from low-cost economies is likely to have led to movements in relative prices rather than sustained effects on aggregate inflation, which is determined by UK monetary policy in the medium to long run.

Conclusion

This article has discussed whether greater sourcing of imports from low-cost economies has reduced UK import prices over the recent past.

Detailed bilateral measures of trade prices suggest that goods imported from China and new EU member states cost less than similar goods imported from traditional trading partners. So, in an accounting sense, increases in the import share of China, other Asian economies and new EU member states may have reduced annual manufactured goods import price inflation by 0.7 percentage points on average over the period 2000–06. However, this effect may have dissipated over time as the price inflation rate of Chinese imports has picked up.

Increased sourcing of imports from China has been concentrated in specific categories of manufactured goods. These categories include labour-intensive goods, such as clothing and footwear, but also more technology-intensive goods. This is consistent with evidence that China has increasingly concentrated in labour-intensive assembly processes for goods with a high technological content.

The overall UK inflation rate is determined by UK monetary policy in the medium to long run. Falling import prices may have pushed down on aggregate inflation in the short run but the overall impact will have crucially depended on the monetary policy response in addition to a plethora of other channels through which trade liberalisation and globalisation may have affected the UK and global economy.(1) Furthermore, the expansion of exports from developing economies has been associated with a range of effects on the global economy such as increased demand for oil and commodities. Hence, increased import sourcing from China and other developing economies is likely to have led to movements in relative prices rather than any sustained impact on aggregate inflation.

(1) For example, see Bernanke, B (2005), 'The global saving glut and the US current account deficit'.

Appendix

To construct price measures of UK manufactured goods imports on a bilateral basis, data were obtained from the Her Majesty's Revenue and Customs (HMRC) Trade Database.(1) Bilateral data for sterling values and volumes of UK imports for manufactured goods product groups were acquired over the period 1999–2006 from each country. The product groups are defined according to the Standard International Trade Classification (SITC) definitions. In particular, data were acquired for each five-digit sector corresponding to the SITC groups five to eight. That is, those groups that represent semi-manufactured and finished manufactured products.

In calculating bilateral trade prices in **Charts 5** and **6**, for each country group '*j*' the aggregate UK import price in the initial year $t = 0$ is defined as a geometric average

$$p_{j,0} = \prod_i \prod_k p_{ik,0}^{\alpha_{ik,0}} \qquad (1)$$

for each country '*i*' and five-digit sector '*k*'. That is, the weighted average of the unit values of each five-digit SITC classification in each country included in the country group. Here α is the value share of imports in each sector from each country in total UK imports from the country group $j = \{$China, new EU member states, rest of the world$\}$. For subsequent years ($t > 0$) the UK import price from country group *j* is defined as

$$p_{j,t} = p_{j,t-1}\pi_{j,t} \qquad (2)$$

where $$\pi_t = \frac{\prod_i \prod_k p_{ik,t}^{\alpha_{ik,t-1}}}{\prod_i \prod_k p_{ik,t-1}^{\alpha_{ik,t-1}}}$$

The decomposition illustrated in **Table A** of the impact of low-cost countries on UK manufactured goods import price inflation is carried out on a sectoral basis for each of the 35 manufactured goods sectors defined according to the two-digit SITC classifications.

The UK import price 'p_t' for each sector is derived as a weighted average of the prices of goods imported from each country group.

$$p_t = \sum_j \alpha_{j,t} p_{j,t} + \left(1 - \sum_j \alpha_{j,t}\right) p_{HC,t} \qquad (3)$$

where $\alpha_{j,t}$ is the value share of country group *j* in total UK imports and $p_{j,t}$ is the unit value for each country group *j* in that sector: and $p_{HC,t}$ is the unit value of the high-cost countries.(2)

For each sector the impact of low-cost economies is split into two effects. The UK import price inflation rate (for each sector) is given by:

$$\frac{\Delta p}{p_{t-1}} = \sum_j \left[\frac{p_{j,t} - p_{HC,t}}{p_{t-1}} \Delta\alpha_{j,t}\right] + \sum_j \alpha_{t-1}\left[\frac{\Delta p_{j,t} - \Delta p_{HC,t}}{p_{t-1}}\right] + \frac{\Delta p_{HC,t}}{p_{t-1}} \qquad (4)$$

The first term on the right-hand side of equation **(4)** is the 'share' effect. That is, the downward impact on the UK import price from low-cost countries as they increase their import share.

The second term represents the 'price' effect. If the UK import price of country group *j* rises by less than the reference 'high-cost' countries this has a negative impact on the UK import price.

The third term represents the remaining part of UK import price inflation due to changes in import prices from high-cost countries.

The aggregate figures for 'share', 'price' and 'high-cost' effects reported in **Table A** are weighted arithmetic averages across the sectors for each country group. Here, the weights for each sector are the nominal share in the preceding year of that sector in total UK manufactured goods imports.

(1) The underlying data are available from the HMRC website www.uktradeinfo.com.
(2) The 'high-cost' country grouping is defined as: Australia, Canada, the EU15 countries, Japan, New Zealand, Norway, Switzerland and the United States. The 'new member states' include Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia. The 'rest of the world' is defined as a residual relative to total UK imports.

References

Bank of England (2007), *Inflation Report*, November.

Bernanke, B (2005), 'The global saving glut and the US current account deficit', April, remarks at the Homer Jones Lecture, St Louis, Missouri.

ECB (2008), 'Globalisation, trade and the euro area macroeconomy', *Monthly Bulletin*, January.

IMF (2006), 'How has globalization affected inflation?', Chapter III, *IMF World Economic Outlook*, April.

IMF (2007), 'The globalization of labor', Chapter 5, *IMF World Economic Outlook*, April.

Kamin, S, Marazzi, M and Schindler, J W (2004), 'Is China 'exporting deflation'?', Board of Governors of the Federal Reserve System *International Finance Discussion Paper No. 791*.

Nickell, S (2005), 'Why has inflation been so low since 1999?', www.bankofengland.co.uk/publications/speeches/2005/sninflation050127.pdf.

Office for National Statistics (2007), *Economic and Labour Market Review*, September.

Office for National Statistics (2007), 'United Kingdom, Balance of Payments', *The Pink Book*.

Pain, N, Koske, I and Sollie, M (2006), 'Globalisation and inflation in OECD economies', *OECD Economics Department Working Papers No. 524*.

The Society of Business Economists' survey on MPC communications

By Tim Taylor and Iain de Weymarn of the Bank's Monetary Assessment and Strategy Division and Bronwyn Curtis, Chairman of the Society of Business Economists.

This article reports the results of the Society of Business Economists' (SBE)[1] survey of its members' views on MPC communications. The survey found that, when forming a view about interest rate prospects, SBE members looked first at the macroeconomic data. Communications by the MPC were the next most important input. Overall, a large majority of respondents (87%) found MPC communications either 'helpful' or 'very helpful'. But there was some room for improvement. For example, the results suggested that the MPC could have done a better job of explaining how it responded to developments in the data. The enhanced coverage of risks and identification of key forthcoming data releases in recent *Inflation Reports* should help to address this issue. But the MPC's communication strategy continues to evolve, and the survey results will be a useful input to that process.

Introduction

Effective communication is at the heart of successful monetary policy. The interest rates that impact most on the spending decisions of firms and households (such as mortgage rates) are not directly controlled by the MPC. Instead they depend on, among other things, the path that Bank Rate is expected to follow over the future. For these interest rates to respond appropriately to news, market participants need to understand both the way that the MPC sets interest rates, and the news to which it is likely to respond (the so-called monetary policy reaction function). The MPC therefore places great emphasis on explaining its interest rate decisions. Minutes of its policy meetings are published each month; the underlying analysis and projections are reported in the quarterly *Inflation Report*; and individual members regularly elaborate on their views in speeches and parliamentary testimony.

But how effective are these communications? The Bank of England asked the SBE to conduct a survey of its members' views as part of its continuous efforts to monitor and improve its monetary policy communication strategy.[2] The survey's twin aims were to discover what kind of information was of most use to private sector economists in trying to anticipate the path of interest rates; and to find out how MPC communications were perceived as part of that process.

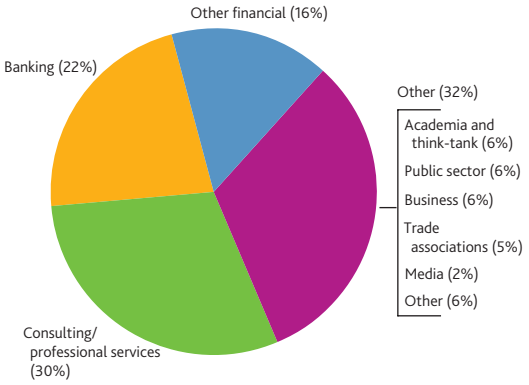
About the survey

The survey was conducted between 12 and 29 March 2007 by the British Market Research Bureau (BMRB), on behalf of the SBE and the Bank of England.[3] After an initial inquiry, 354 SBE members agreed to participate. They were invited by email to complete an anonymous questionnaire, hosted on a website designed for the purpose. 141 responses were received, a response rate of 40%. A full list of the questions, together with the aggregated results and the underlying (anonymous) individual response data are available on the Bank's website.[4]

The SBE draws its membership from the ranks of professional economists across a wide range of organisations. Just under one third of respondents worked in professional services, and just under two fifths in either banking or other financial occupations (**Chart 1**). While MPC communications are aimed at a diverse audience, SBE members are representative of an important constituency: indeed, 88% of respondents reported that it was 'reasonably' or 'very' important to form a view of interest rate prospects as part of their job.

(1) The Society of Business Economists is the leading industry association for UK business economists.
(2) Previous Bank of England studies have investigated how financial markets respond to MPC communications and policy decisions — see for example Reeves and Sawicki (2005) and Bell and Windle (2005).
(3) The results were previewed in King (2007).
(4) www.bankofengland.co.uk/publications/quarterlybulletin/sbesurvey2007.xls.

Chart 1 Composition of respondents[a]



(a) Excludes two 'Do not wish to answer' responses.

What did the survey find about how interest rate expectations are formed?

The idea that the MPC responds to developments in the economy appeared to be well understood by economists. Respondents were asked to indicate the usefulness of four broad categories of information in forming their view of interest rate prospects — data, MPC communications, views of other commentators, and other — by allocating a total of 100 points across these categories. Data were by some distance the most useful input in forming views about interest rate prospects, especially at longer horizons (**Chart 2**).

A range of data was considered useful in informing views of interest rates at both three-month and 12 to 18-month horizons (**Chart 3**). Official data on real activity and costs and prices, survey data, and data on asset prices and financial institutions' balance sheets all received more than 15 points on average out of 100 at both horizons.

The usefulness of the various MPC communication channels varied by horizon (**Chart 4**). Understanding differences of view among Committee members appeared to be an important part of assessing near-term rate prospects: respondents found the minutes and the vote more useful for forming views of interest rates at short horizons than at longer horizons. But for rates 12–18 months ahead, the MPC's collective assessment of the outlook, as reported in the *Inflation Report* and the accompanying press conference, carried most weight.

This pattern is consistent with the idea that MPC members may differ in their assessment of the conjuncture and outlook, influencing their view of the appropriate level of interest rates in the near term; but that these differences contain less information for interest rates further ahead, because they will typically be resolved as new data become available.

Chart 2 What types of information were useful in forming a view of rate prospects at three-month and 12 to 18-month horizons?[a]

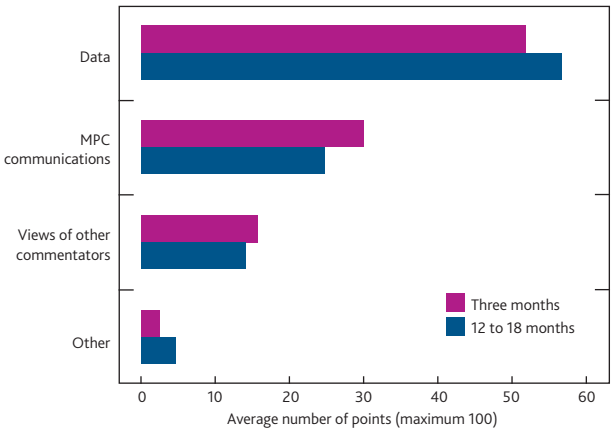


Chart 3 Which types of data were useful in forming a view of rate prospects at three-month and 12 to 18-month horizons?[a]

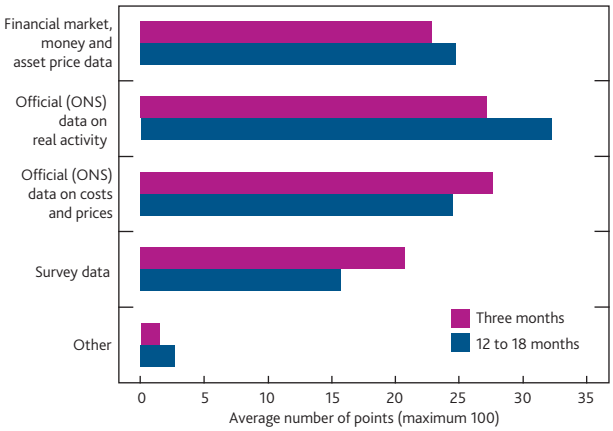
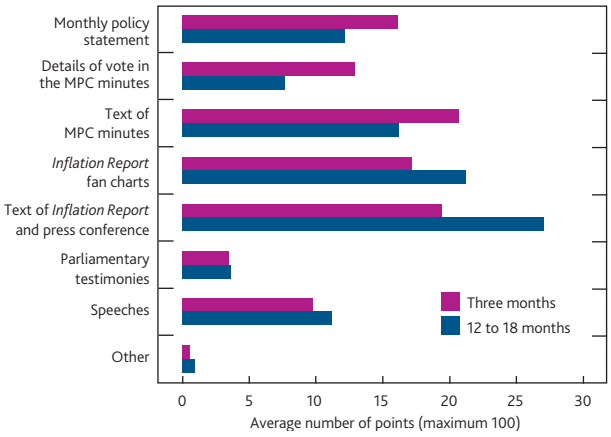


Chart 4 Which types of MPC communication were useful in forming a view of rate prospects at three-month and 12 to 18-month horizons?[a]

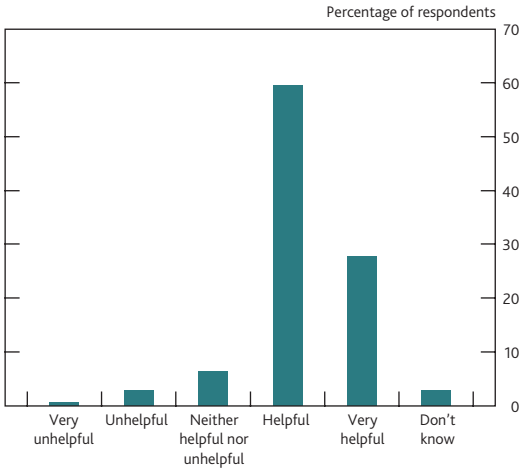


(a) Respondents were asked to allocate 100 points across the available answer categories. The bars in these charts report the average number of points allocated to a category. Respondents for whom it was 'Not at all important' to form a view of interest rate prospects as part of their job could choose not to answer these questions. Only respondents allocating at least 25 points to 'data' in **Chart 2** were invited to answer the more specific questions about types of data in **Chart 3**; and likewise only those allocating at least 25 points to 'MPC communications' in **Chart 2** were asked to answer the more detailed questions on types of MPC communications in **Chart 4**. The number of respondents for each question was as follows (percentage of total respondents reported in parentheses): **Chart 2**: 132 (94%) for 'three-month horizon' and '12 to 18-month horizon'. **Chart 3**: 126 (89%) for 'three-month horizon'; 122 (87%) for '12 to 18-month horizon'. **Chart 4**: 94 (67%) for 'three-month horizon' (excluding one 'Don't know'); 62 (44%) for '12 to 18-month horizon' (excluding two 'Don't knows').

What was the perception of MPC communications?

The key aim of monetary policy communication is to explain the reasons for monetary policy decisions. Building understanding of how monetary policy operates enables markets, businesses and households to anticipate the path for policy, and also to adjust those expectations in response to new information. Overall, a large majority of respondents (87%) found MPC communications either 'helpful' or 'very helpful' (**Chart 5**).

Chart 5 Overall, how helpful were MPC communications?



The survey's detailed assessment of the effectiveness of MPC communications was broken into three parts. First, how well did the MPC get across its interpretation of developments in the data? Second, did it explain how policy actions were linked to the data? And third, were its communications useful for forming a view about the path for rates?

The survey responses showed that the MPC was thought to do a good job of getting across its interpretation of the latest data (**Chart 6**). It was seen as a little less successful at communicating how it responded to these data (the bars on the left-hand side of **Chart 7** are larger than those on the left-hand side of **Chart 6**), suggesting that there was room for improvement in communicating the way policy actions were linked to the data. Nonetheless, over 40% of respondents judged MPC communications to be 'very' or 'extremely' useful for forming a view of near-term rates, compared to 18% judging it 'not very' or 'not at all' useful (**Chart 8**).

Chart 6 How useful were MPC communications for forming views of how MPC interpreted the latest data?

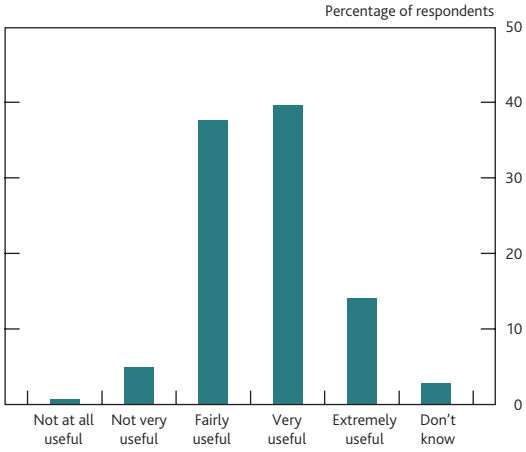


Chart 7 How useful were MPC communications for forming a view of how MPC responded to the latest data?

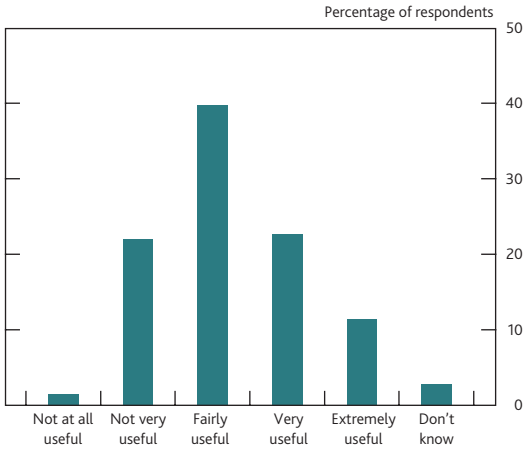
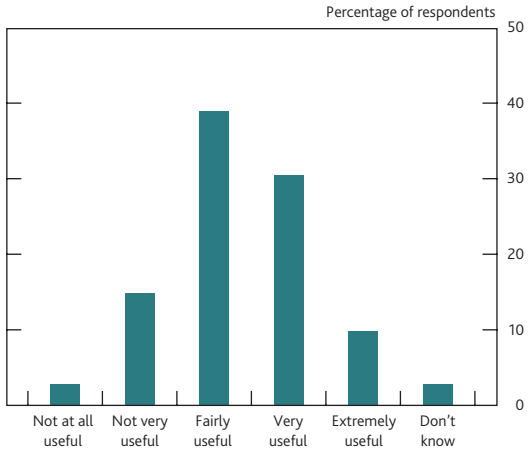


Chart 8 How useful were MPC communications for forming a view of near-term rates?



The MPC places considerable weight on explaining the outlook for the economy in its quarterly *Inflation Report*. A key component of this analysis is the identification of the main risks around the most likely outcome. But did the MPC strike the right balance between backward-looking and forward-looking analysis; and between describing its central projection and the risks around it? Evidence from the survey showed that a substantial majority of respondents thought the balance to be about right (**Charts 9** and **10**). But among the remainder, there was an appetite for more forward-looking

Chart 9 The balance of MPC communication was:

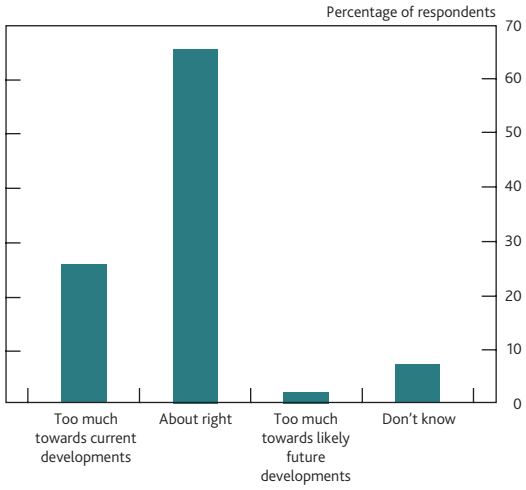
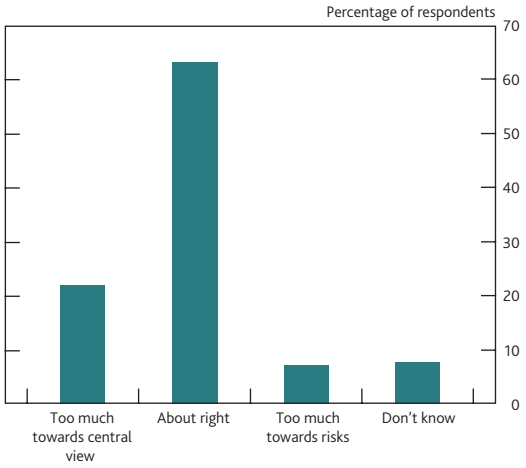


Chart 10 The balance of MPC communication was:



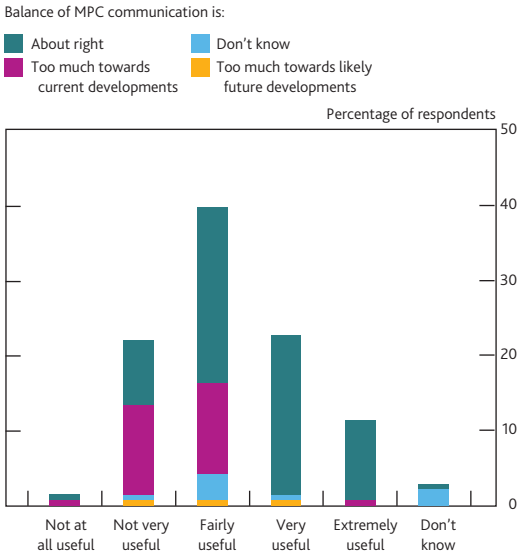
rather than conjunctural analysis, and greater emphasis on risks.

What lessons can be learnt from the survey?

The survey provided some clues about how MPC communications could better meet the needs of its users. Some SBE members thought there was room for improvement in the MPC's communication about the way policy actions related to the data; and there was a desire to see more communication about the outlook, including the risks. Taking these together, one possible interpretation was that providing more information on the outlook and the risks would have helped to make the link between policy and evolving data clearer.

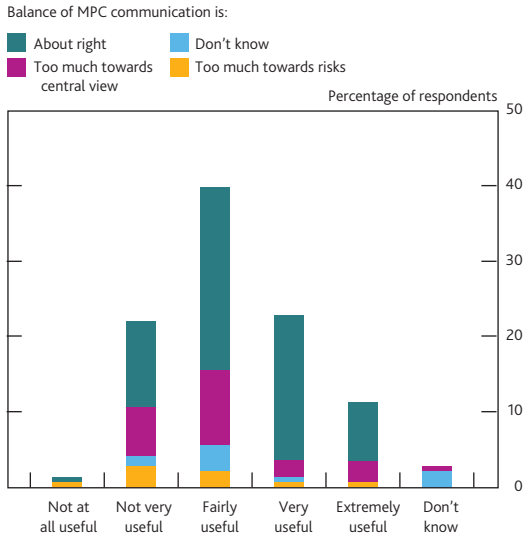
An analysis of individual responses provided some tentative evidence consistent with this story. The minority of respondents who found MPC communications 'not very' useful in forming views of how the Committee reacted to the latest data was also more likely than average to think that the balance lay too much towards communication about current developments rather than the outlook. This is captured in **Chart 11**, which provides a breakdown of the information in **Chart 7** according to how respondents viewed the balance of MPC communication. The magenta component — indicating that the balance was too much towards communicating about current developments — features strongly in the second bar from the left. Likewise, respondents who did not find MPC communications useful in forming views of how the MPC

Chart 11 Breakdown of Chart 7 by respondents' views of balance between explaining current or future developments[a]



(a) To construct this chart, respondents are divided into groups exactly as in **Chart 7**. Then the bars are subdivided according to respondents' views on the balance of communication. For example, of the 22% of respondents who found MPC communications 'not very useful' in forming views of how the MPC responded to latest data, a little over half thought communication was focused too much on current developments (represented by the magenta segment of the second bar on the chart).

Chart 12 Breakdown of Chart 7 by respondents' views of balance between communication about central view or risks[a]



(a) This chart is drawn in the same way as **Chart 11** (see footnote to that chart), except that the bars are subdivided according to respondents' views on the balance of communication between risks and the central view.

reacted to latest data also tended to think that it could usefully have focused more on the risks (**Chart 12**).

Changes in MPC communications since the survey

MPC communications have continued to evolve since the survey was conducted in March last year, and the survey has been a valuable input to the MPC's thinking. While that process is ongoing, two changes have already been made that should help to address issues raised by the survey results.

First, the discussion of the outlook and the risks in Section 5 of the *Inflation Report* is now structured around the economic issues that are the source of key uncertainties. For example, in the February 2008 *Report* the risks to inflation were discussed in the context of uncertainty about: the extent of the short-term rise in inflation; the prospects for input prices; the extent to which inflation expectations might remain elevated; and the responsiveness of wages and prices to developments elsewhere in the economy. In this way the MPC has sought to provide greater clarity about the main risks to the outlook, and the way in which they might influence inflation if they materialised.

The second change is that the MPC has provided greater guidance on the forthcoming data it expects will help resolve the key uncertainties, and will therefore be of particular importance to monetary policy deliberations in the following months. For example, the MPC stated in the February *Inflation Report* that, in judging the balance of risks to the near-term inflation outlook, it would be monitoring data on global commodity prices, UK import prices and the exchange rate. The MPC's judgement on whether inflation expectations might remain elevated would depend on surveys of household inflation expectations and companies' pricing intentions, and wages and earnings data.

Taken together, highlighting the contingencies on which the outlook and therefore future policy depends, and highlighting the data most likely to help resolve these uncertainties should make the link between policy and the evolving data clearer.

Conclusion

The SBE survey aimed to explore how economists formed views about the likely path of interest rates. It found that SBE members looked first to the data when forming their view of interest rates, consistent with the fact that monetary policy itself responds to developments in the data. MPC communications were the next most important input for economists in forming expectations of interest rates. The *Inflation Report* carried most weight in assessing the prospects for interest rates a year or more ahead, while the minutes were more important in assessing near-term rate prospects. A large majority of the respondents found MPC communications overall either 'fairly', 'very' or 'extremely' useful. Nevertheless, the MPC is continually striving to improve its communications. The survey has been an important input to the MPC's thinking in this regard. Indeed, the changes in the discussion of the outlook and the risks in the MPC's communications that have occurred since the survey was conducted are consistent with the message taken from the survey results. The MPC will continue to look for ways to improve all aspects of its communications in order to enhance the transparency of the monetary policy process.

References

Bell, J and Windle, R (2005), 'Monetary policy news and market reaction to the *Inflation Report* and MPC *Minutes*', *Bank of England Quarterly Bulletin*, Summer, pages 169–78.

King, M (2007), 'The MPC ten years on', lecture delivered to the Society of Business Economists on 2 May.

Reeves, R and Sawicki, M (2005), 'Do financial markets react to Bank of England communication?', *Bank of England Quarterly Bulletin*, Winter, pages 431–39.

Risks and efficiency gains of a tiered structure in large-value payments: a simulation approach

Summary of Working Paper no. 337 Ana Lasaosa and Merxe Tudela

Only a few banks are direct members of the Clearing House Automated Payment System (CHAPS), the UK large-value payment system. The vast majority of banks access the system indirectly as second-tier banks, through any of the few direct members (settlement banks). We describe a system in which a very small proportion of banks are direct members as a highly tiered system. The degree of tiering affects both how risky and how efficient the UK system is. Recent research has classified the various risks and benefits of tiering in large-value payments, but much less progress has been made in quantifying these risks and benefits. This paper seeks to fill this gap. It does not attempt to establish the relationship between normal and stressed liquidity needs, or how liquidity insurance should be regulated.

In order to gauge how the degree of tiering in CHAPS affects risks and benefits, we need to be able to vary the degree of tiering while holding other factors constant. A simulation approach allows us to do this. We create artificial versions of CHAPS where we increase the degree of tiering by reducing the number of direct members. We then use the simulation results to quantify the impact of tiering on concentration risk (a large settlement bank being a potential single point of failure), on credit risk (how exposed settlement banks are to second-tier banks) and on how much liquidity the system needs for it to operate.

The results show that, in a more tiered system, concentration risk would rise substantially. The credit risk incurred by direct members extending unsecured intraday overdrafts to their customer banks for their payments business would not be substantial under normal circumstances. The likelihood of contagion of credit problems to the broader financial system would be remote in our more tiered system. More importantly, our analysis has shown that the increase in credit risk brought to the system by settlement banks leaving CHAPS bears little relationship to the values settled by each individual bank. The key determining factor of the size of settlement banks' intraday credit exposures to second-tier banks is the timing of intraday payments of second-tier banks — a variable that central banks do not observe directly.

Increasing the degree of tiering in CHAPS leads to substantial savings in the amount of liquid assets that settlement banks need to post every day. Only a small proportion of these savings are due to settlement banks settling payments across their own books. Moreover, the clear relationship between changes in values settled and liquidity needs shown by our simulations make it possible to project what would happen if current second-tier banks joined CHAPS as direct members. We estimate that the liquidity needs could increase by £8 billion in aggregate if as many as five large banks (in terms of values of payments processed) joined CHAPS — the opposite case to the one analysed so far. While this figure is significant, it is only a fraction of the £17 billion spare liquidity posted on average in the system as a whole every day.

Monetary policy shifts and inflation dynamics

Summary of Working Paper no. 338 Paolo Surico

Several researchers working on the macroeconomics of inflation have recently suggested that inflation persistence — the tendency for inflation to change only sluggishly — was very apparent in the past, but is now much reduced or absent. In the United States, the high-persistence period was in the 1970s, while for the United Kingdom it was before 1992. There is independent evidence that these periods were ones where monetary policy was relatively weak in the response to inflation.

This paper investigates the relationship between the monetary policy regime (and in particular the way in which interest rates respond to inflation) and the properties of the inflation process through the lens of the New Keynesian Phillips Curve (NKPC). Specifically, we ask what are the consequences of pooling observations from different policy regimes for the estimates of the NKPC and for the estimates of the reduced-form process of inflation (ie a backward-looking specification). This is an important policy issue, because the degree of persistence of inflation at the Phillips curve level has an impact on the appropriate monetary policy reaction. It is crucial for policymakers to know how important this is.

Using artificial data simulated from a sticky price model, this paper shows that the estimates of a NKPC featuring both forward and backward-looking components are severely biased downward when two conditions are met. First, the data are generated under a passive monetary policy regime, which is a regime where the nominal interest rate is not moved sufficiently in response to movements in inflation. Second, the empirical analysis, as is the case for the estimates currently available in the literature, neglects the possibility of a passive policy regime and hence implicitly limits the solution of the model to the case in which monetary policy is active. In the passive monetary policy case, the hypothesis of no backward-looking component is strongly rejected in spite of the fact that the data generating process does not exhibit any exogenous or endogenous persistence. The slope of the Phillips curve takes a value that is not statistically different from zero. Moreover, the sum of the autoregressive coefficients in the reduced-form process of inflation is close to one and, most importantly, is significantly different from the value of zero that would emerge in the unique rational expectations equilibrium (ie determinacy). In contrast, when the analysis is restricted to determinacy the estimates on the artificial data match the 'true' coefficients of the model which have been used to generate such artificial data.

Following the literature, determinacy is defined as the unique rational expectation equilibrium. This equilibrium is characterised by the private sector's expectations that whenever actual inflation differs from target the monetary authorities will take the appropriate actions to bring it back immediately. Indeterminacy, in contrast, can be associated with several possible outcomes for inflation and output gap. It is worth emphasising, however, that indeterminacy does *not* imply an explosive path for inflation; rather it implies that the private sectors hold the expectations that the gap between actual inflation and its target value will persist for some time in the future.

The results presented here suggest some caution is needed when interpreting the estimates of the structural NKPC obtained using a pool of observations that mixes different monetary policy regimes. The reason is that inference can be distorted in an important dimension if the econometrician does not recognise that at some points in time monetary policy may be reacting weakly to movements in inflation. In particular, it is possible to introduce additional elements of persistence that are not present in the data generating process of inflation and thus are not an intrinsic, structural feature of the economy. This result can thus provide a rationale for the empirical regularity that inflation persistence coincides with specific monetary policy regimes.

The integrated impact of credit and interest rate risk on banks: an economic value and capital adequacy perspective

Summary of Working Paper no. 339 Mathias Drehmann, Steffen Sorensen and Marco Stringa

Credit and interest rate risk are two of the most important sources of risk for commercial banks. Credit and interest rate risk reflect the possibility, respectively, of a borrower failing to repay her debt and of a fall in a bank's profitability due to a change in interest rates. While banks and regulators are aware of the importance of both risks, they tend to manage these risks separately. However, credit risk and interest rate risk are intrinsically related to each other and not separable. And ignoring this interdependence may potentially have relevant implications for banks' stability, especially during severe downturns.

In this paper we propose a general framework to measure the combined impact of interest rate and credit shocks on banks' economic value and profitability. In line with the literature, this framework incorporates the integrated impact of credit and interest rate risk on banks' assets. But liabilities and off balance sheet items also need to be taken into account to obtain a complete picture of the risks faced by a bank. For example, a bank subjected to a downgrade may face higher funding costs, which may adversely affect the banks' profitability. Hence, we model the whole portfolio.

The proposed framework also accounts for the asset-liability repricing mismatch. This mismatch is the result of one of the defining functions of the banking system: borrowing money at short maturities to lend to households and companies at longer maturities. This mismatch is the key source of interest rate risk for commercial banks as changes in the default-free interest rates tend to feed through more quickly on interest paid on liabilities than interest earned on assets. As a result, net interest income may decrease following an interest rates rise unless the bank has fully hedged this risk through, for example, off balance sheet items. Hence the need to include these instruments.

But net interest income is also affected by credit risk. This is because credit spreads, ie the compensation for credit risk, can be adjusted to reflect changes in the banks' own or borrowers' credit risk. And the timing of such an adjustment depends also on the above repricing mismatch. We capture both effects when modelling the bank's net interest income.

Our framework also captures other forms of interaction between credit and interest rate risk. For example, we do not only capture the direct impact of changes in macroeconomic variables, such as unemployment, on the possibility of borrowers defaulting, but also their indirect impact via potential changes in default-free interest rates.

We use two conditions to measure a bank's exposure to credit and interest rate risk. We first look at banks' economic value — the economic value condition. This provides a long-term view of banks' health based on the risk-adjusted present value of future net cash flows. This necessitates a framework which takes account of the above-mentioned repricing mismatch and the complex interdependence of interest rates and credit risk. And contrary to Basel II and standard credit portfolio models, the proposed economic value condition does not only capture default risk but all sources of credit risk, including changes in the value of net assets due to movements in credit spreads.

The economic value condition is not a sufficient metric to assess banks' exposure to credit and interest rate risk. For example, a particular path of profits may lead a bank to be undercapitalised in the short run because of severe losses which are outweighed by future profits. From an economic value perspective this bank would be solvent but because of market or regulatory constraints the bank may find it difficult to continue to operate. Therefore our second condition — the capital adequacy condition — aims to estimate whether a bank would be sufficiently well capitalised in the short to medium term by projecting the bank's net profits and capital requirements.

We apply the framework to assess the exposure to credit and interest rate risk of a hypothetical but realistic bank in a severe macro-stress scenario. This scenario implies, among other changes, a sharp rise in the risk-free yield curve. The stability of the bank is not threatened in the stress scenario as both the economic value and capital adequacy conditions hold. But the simulation confirms that interest rate and credit risk have to be assessed simultaneously as well as jointly for the whole portfolio.

During the first year in the stress scenario, the bank experiences not only an increase in bad loans, but also a fall in net interest income. The latter is due to the compression of margins between short-term borrowing and long-term lending. The negative impact of rising bad loans is partially offset once the bank starts to reprice assets, reflecting both the change in the risk-free yield curve and the deterioration in credit quality. Were — as would be the case for most stress tests routinely run — net interest income not to be taken into account in our stress scenario, the hypothetical bank would underestimate the fall in net profits in the first year, but overestimate it in the third year.

Financial innovation, macroeconomic stability and systemic crises

Summary of Working Paper no. 340 Prasanna Gai, Sujit Kapadia, Stephen Millard and Ander Perez

The financial system has been changing rapidly in recent years. Resale markets for capital have deepened, and sophisticated financial products and contracts, such as credit derivatives and asset-backed securities, have mushroomed. At the same time, macroeconomic volatility has fallen in developed countries. This paper examines the implications of these developments for the likelihood and potential scale of system-wide financial crises.

We develop a theoretical model of system-wide crises in which instability is associated with distress selling of assets (the forced selling of assets at a low price). The set-up attempts to capture the key features of intermediation in the modern financial system. Though the model also applies to traditional banks, it is especially relevant to the activities of hedge funds, private equity firms, and other non-bank financial institutions.

Consumers channel funds through financial intermediaries to firms who manage investment projects in the productive sectors of the economy. Intermediaries have financial control over projects and form equity-type contracts with consumers. But these contracts are subject to potential default. This imposes financial constraints on them which limit the ability of intermediaries to insure against bad outcomes for investment projects.

Our results suggest that if an adverse economy-wide shock hits the productive sectors, intermediaries may be forced to sell assets to less-productive sectors of the economy to remain solvent. This distress selling causes the asset price to fall. In turn, this creates a feedback to net worth which affects the balance sheets of all intermediaries, potentially leading to further asset sales. Since intermediaries do not account for the effect of their own sales on asset prices, the allocation of resources implied by the market is inefficient. For sufficiently severe shocks, this spillover effect is capable of generating a system-wide financial crisis that may be self-fulfilling.

The model suggests that recent developments in the financial system may have made crises less likely as they widen access to liquidity and allow assets to be traded more easily. But by relaxing financial constraints facing borrowers, they imply that, should a crisis occur, its impact could be more severe than previously. We demonstrate how these effects may be reinforced by greater macroeconomic stability. As would be expected, our model predicts that reductions in volatility make crises less likely since severe shocks occur less frequently. However, greater stability also makes mild downturns less likely. As a result, consumers are more willing to lend, allowing intermediaries to increase their borrowing and investment in firms. But if a crisis does then ensue, losses will be greater. Overall, our findings thus make clear how financial innovation and increased macroeconomic stability may serve to reduce the likelihood of crises in developed countries, but increase their potential impact.

Evolving international inflation dynamics: evidence from a time-varying dynamic factor model

Summary of Working Paper no. 341 Haroon Mumtaz and Paolo Surico

Several industrialised countries have had a similar inflation experience over the past 30 years: inflation was typically high and volatile during the second half of the 1970s and the first half of the 1980s but low and stable in the most recent period. National inflation rates have moved together for most of the sample with the notable exception of the years between 1975 and 1987. These observations suggest the following question: how has comovement of inflation rates evolved over time?

This paper uses a statistical model to describe the comovement in inflation across countries and to investigate if the degree of comovement has changed across time. Our estimates suggest that there was a significant decline in the level, persistence and volatility of inflation across our sample of countries. We find that this historical decline in the level and persistence of inflation was common across most G7 countries, Australia, New Zealand and Spain — ie this decline coincided with an increase in comovement in inflation rates as identified by our statistical model.

To interpret further our results, we discuss a number of possible reasons behind the decline in the level and persistence of inflation and the increase in comovement of inflation. Candidate explanations of the former include: an improvement in monetary policy; an improvement in fiscal policy; an increase in productivity and the onset of globalisation. The increase in comovement may be the result of a change in the practice of monetary policy that occurred over a similar period in most countries in our sample and/or the onset of globalisation.

That elusive elasticity and the ubiquitous bias: is panel data a panacea?

Summary of Working Paper no. 342 James Smith

The elasticity of substitution between capital and labour — a measure of the ease with which capital can be substituted for labour in the production process — is often assumed to be one. This is a standard simplifying assumption. But empirical studies frequently find that this elasticity takes a smaller value. Recent work, based on capital demand equations for the United States and Canada, has found that the elasticity may indeed be close to one — or perhaps even larger. The aim of this paper is to test whether applying a similar approach to UK data will yield similar results.

We start with a simple linear relationship between the optimal capital-output ratio and the real user cost of capital. But, because it is costly for firms to change the amount of capital they employ (for example because it takes time to learn how to use new machinery), we interpret this relationship as a long-run phenomenon. However, estimating a long-run relationship of this kind can lead to biased estimates. To ameliorate the influence of these biases analysis for the United States and Canada have applied methods based on the use of a single time series. In this paper we extend this approach in two important ways: first by exploiting variation across industries (panel estimation); and second by exploiting variation in the elasticity of substitution across different physical capital assets.

Given the flexibility of our theoretical framework, and the robustness of the different estimators we use, we are in a position to provide a sound statistical investigation of the possibility of a unit elasticity in UK data. So what do our results tell us? Estimates for the elasticity of substitution based on aggregate data are very similar to those found in previous studies for the United Kingdom: close to 0:4. Do these results simply reflect methodological differences in constructing UK data? By matching UK data as closely as possible to the data used in those studies we are able to eliminate this possibility. However aggregation biases could still affect our estimates. In addition, a single time series may not be enough to purge our estimates of the biases inherent in estimating this long-run relationship. To address these possibilities we use panel data. We find that, once we account for some of the problems commonly encountered when using dynamic panel methods, our estimates are close to the benchmark estimate using aggregate data. Thus we can provide a strong rejection of a unit elasticity of substitution between capital and labour in UK data.

Efficient frameworks for sovereign borrowing

Summary of Working Paper no. 343 Gregor Irwin and Gregory Thwaites

There is no supranational authority that can enforce sovereign debt contracts. Consequently, the decision by a government to default on its debts is often as much a question of willingness to pay as it is of ability to pay. Debt restructurings, which change both the size and the timing of payments made to creditors, are therefore brought about through negotiation between the parties to the contract, rather than by court adjudication. When a sovereign decides whether to default it has to weigh the benefit against the cost. The main benefit comes in the form of a reduced repayment, which is often referred to in understated terms as a 'haircut' for creditors. The cost comes in a number of different forms, such as loss of reputation, or loss of current and future access to private capital markets. Moreover, sovereign default is often associated with costly currency crises and banking crises. The multiple costs of default, and the partial extent of the haircut that can be achieved in practice, both serve to limit the incentive that the sovereign has to default and underpin the very existence of sovereign debt markets.

National and international policymakers have some control *ex ante* over the size and form of the cost of default and the distribution of bargaining power in the event of a default. This paper presents a theoretical model of strategic default to assess how policymakers should exercise their control over these levers. We consider a world in which the sovereign issues fixed interest debt to finance an investment with uncertain returns. After both the productivity of the investment and the resulting income stream are known, the sovereign must decide whether to repay the debt in full, or to seek a restructuring. If the sovereign takes the second option we assume it must pay a deadweight cost, to reflect the loss of reputation and the economic disruption that ensues following a default. It must then negotiate over the size of the haircut, which is ultimately determined by the distribution of bargaining power. These factors — the deadweight cost and the distribution of bargaining power following a default — are the two key dimensions by which the 'framework for sovereign borrowing' is characterised in our model. We assess the welfare-maximising values for both these policy parameters.

We find that, if there are no restrictions on the distribution of the bargaining power, the deadweight costs of default should be driven to zero. Both deadweight costs and the need to settle with creditors can dissuade a debtor from defaulting. However, the latter is more efficient, as resources denied to the debtor are reallocated to creditors rather than being destroyed.

Assuming creditors are competitive and risk-neutral, this should benefit the debtor through lower interest rates. If the debtor is risk-averse, then in the event of a restructuring the optimal outcome requires bargaining power to be shared between the debtor and its creditors. This is because shifting bargaining power to creditors has two conflicting effects on the debtor's welfare. On the one hand, by dissuading default and lowering interest rates, it allows a sovereign to borrow more at a lower cost. But on the other, if creditors capture too much of the available resources after a default, the risk-sharing benefit of default is diminished, as creditors receive additional resources from the debtor when the latter needs them most. The optimal regime should balance this tension.

In constrained policy settings we find that, whenever welfare can be raised by marginally *increasing* the deadweight costs of default, welfare is also improved by shifting bargaining power to creditors. It follows that for any given value of the deadweight cost, if bargaining power is optimally allocated between the parties, it must be welfare-improving to reduce the deadweight cost. Moreover, starting from any situation where the welfare impact of marginally raising the deadweight cost is positive, there is always a step increase in the allocation of the bargaining power to creditors which is sufficient to ensure that the impact of raising the deadweight cost becomes negative. Taken together, these results mean that, so long as creditor bargaining power can be increased, *lower* deadweight costs can always raise social welfare *ex ante*.

The analysis shows that, once debt has been contracted, the debtor's trade-off between creditor bargaining power and deadweight costs changes fundamentally. With the interest rate on debt fixed, the incentives of the debtor change so that it no longer cares whether, after a default, resources are transferred to creditors or are wasted in the form of deadweight costs. There is therefore a need to design mechanisms that allow debtors to commit to the *ex-ante* optimal combination of policy parameters.

In sum, these results suggest that domestic and international policymakers should pay careful attention to the impact of their policies, not just on the deadweight costs of default, but also on the allocation of bargaining power in the event of a restructuring. The final result, in particular, suggests that in equilibrium the deadweight costs of default may tend to be too high, and the allocation of bargaining power inefficiently skewed towards the debtor. A challenge for all policymakers, therefore, is to find credible policies that can both reduce deadweight costs and shift bargaining power towards creditors. In due course this should raise welfare.

International monetary co-operation in a world of imperfect information

Summary of Working Paper no. 344 Kang Yong Tan and Misa Tanaka

This paper examines the role of information sharing in a two-country open economy general equilibrium model. In our analysis, central banks cannot observe productivity shocks abroad. Introducing imperfect information in this way allows us to separate the welfare gains from two different types of international monetary co-operation: gains from information sharing between central banks, and gains from setting co-ordinated monetary policy rules under perfect information.

There are three key findings from our analysis. First, setting a self-oriented monetary policy rule which responds to unexpected shocks in a predictable manner leads to welfare gains, even if central banks do not have perfect information about the world economy. Second, we find that better information about the state of the world economy has ambiguous welfare implications in this stylised model. On the one hand, better information allows policymakers to respond appropriately to common shocks; but on the other hand, because the better information allows policymakers to respond to a wider set of shocks, this can generate spillover effects which are not necessarily internalised. Third, our simulations show that gains from international monetary co-ordination under perfect information are greatest when productivity shocks are negatively correlated between countries.

On the basis of our model, we conclude that information sharing between central banks, by itself, does not necessarily guarantee welfare improvement. But information sharing does allow policymakers to respond appropriately to common shocks.

Summary statistics of option-implied probability density functions and their properties

Summary of Working Paper no. 345 Damien Lynch and Nikolaos Panigirtzoglou

Financial markets can provide policymakers with timely information about aggregate market expectations of future asset prices and returns. Options, which give investors the right, without obligation, to buy/sell assets in the future, possess information about the likelihood that market participants attach to alternative future outcomes for asset prices. The previous decade has seen much development in the methods of extraction of distributions of the probabilities that market participants attach to future asset prices from options prices. Time series of the statistics that summarise these 'option-implied distributions' can be examined to consider the behaviour of market views over time.

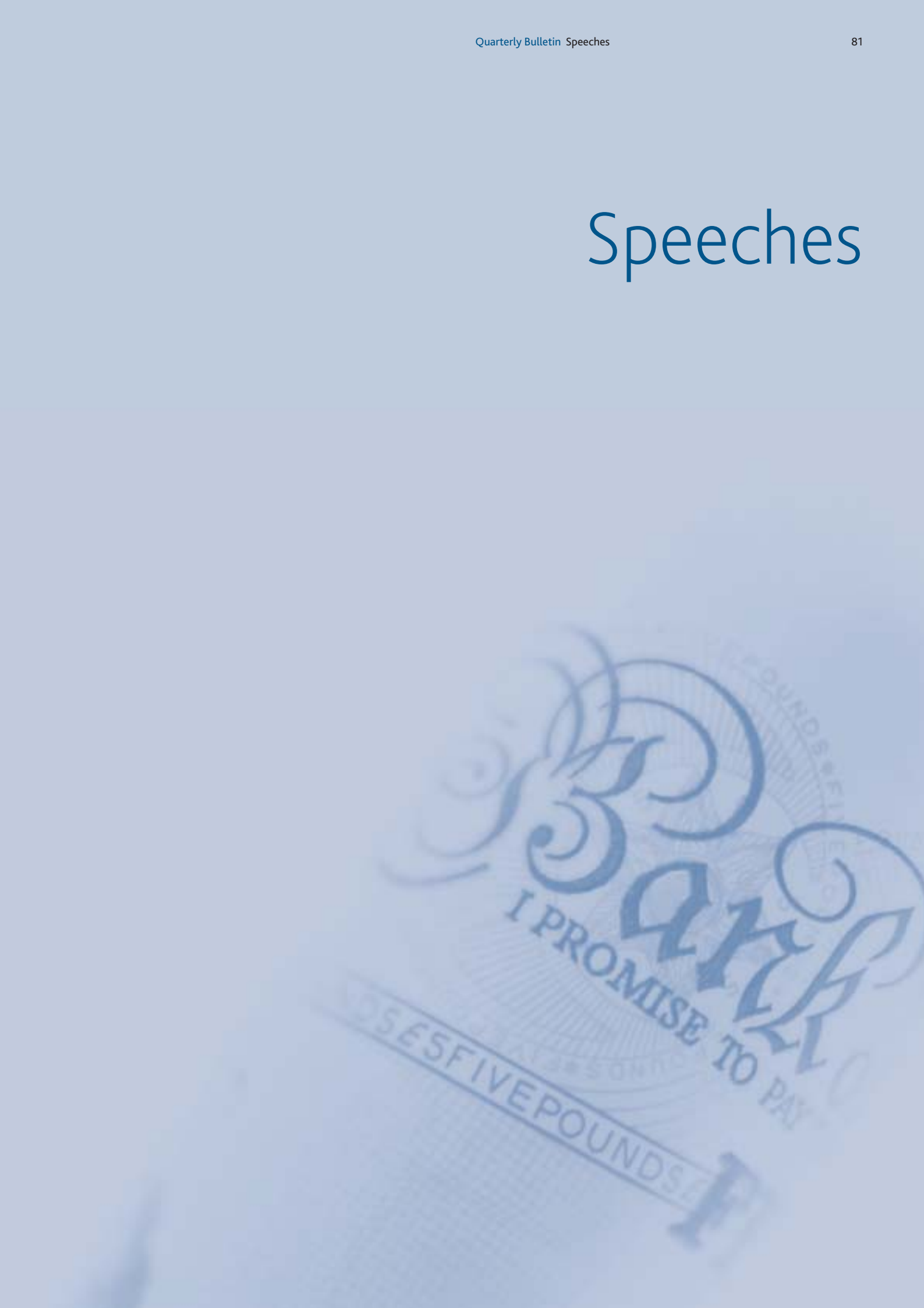
The focus of this paper is on the properties of these summary statistics for option-implied probability density functions (pdfs). These statistics provide us with various measures of aggregate expected uncertainty, asymmetry (or balances of risk) and expectations of extreme movements. We estimate a daily time series of option-implied pdfs (in terms of logarithmic changes in asset prices) and their summary statistics for various equity indices (FTSE 100 and S&P 500) and interest rates (three-month sterling Libor and Eurodollar). The series begin in 1985 for S&P 500 and three-month eurodollar interest rate futures; 1987 for three-month sterling interest rate futures; and in 1992 for FTSE 100.

We found that markets reacted to, but did not predict, the major episodes of financial crisis since the mid-1980s. The implied summary statistics were found to be highly persistent suggesting the impact of shocks on market views does not die away quickly. A shock to market beliefs can be expected to persist for about 60 weeks for equity indices and 30 weeks for interest rates. Interestingly, there was little extra information to be gleaned from the implied pdf summary statistics, as opposed to non pdf based measures such as the 'at-the-money' implied volatility and 'risk reversal', about views of expected uncertainty and asymmetry. But this was not the case for measures of expectations of extreme movements in asset returns where the statistics from the implied pdfs differed from other standard market measures/indicators of expectations of extreme market moves.

Potential relations were investigated between the estimated summary statistics, both within and across asset classes, and between UK and US markets. Implied uncertainty about equity returns was found to significantly influence absolute equity returns and tends to lead perceptions about asymmetry and extreme equity index movements. In contrast, implied uncertainty for interest rates was found to both influence, and respond to, changes in interest rates. Internationally, expected uncertainty was found to be strongly correlated between the United Kingdom and the United States, for both equity and interest rate markets. Implied balances of risk about future US interest rates were found to influence those of UK interest rates. And uncertainty about US equity returns tended to influence implied views about balances of risk and expectations of extreme moves in UK equity returns.

Finally, we related the summary statistics to other financial and economic variables such as output, investment, inflation, aggregate equity market earnings, corporate spreads (an indicator of the prospects for corporate default) and the slope of the yield curve (an indicator for the market outlook for economic activity and/or expectations of future inflation). The slope of the yield curve had a causal effect on interest rate uncertainty, and, in the United States, corporate credit spreads tended to lead implied uncertainty about equity returns. There was no incremental predictive power in option-implied summary statistics for economic variables beyond that in past values of the macroeconomic variables themselves, and past returns on the underlying financial asset. However, the data sample we examined is relatively short, covering just one business cycle in the case of the United States. Similarly for the United Kingdom, data for FTSE 100 implied pdfs were only available from 1992. Ideally, a more complete assessment of the information content of options prices for future economic conditions would require a data sample covering a number of business cycles.

Speeches



The Governor's speech[1] in Bristol

It is four months since Northern Rock came to the Bank of England for support. And the headlines continue to be dominated by its fate. Northern Rock, however, is not the epicentre of the present global banking crisis. That lies in the very substantial losses made by many banks in the main financial centres as a result of the collapse of the US sub-prime mortgage market.

Those losses, and the fear of future losses on a wider range of loans, pose a threat to the ability of the banking system to finance continued economic growth — the so-called credit crunch. Concerns about the implications of a credit crunch, not only for the health of the United States but for the world economy, lie behind the sharp falls in global equity markets over the past week. So the next year will pose economic challenges for all of us — more so than at any time since the Bank of England was given its independence in 1997.

Both industrialised and emerging market economies have been affected by the fall in asset prices but conditions vary across countries. It is striking that the banking crisis originated at the heart of the world's major financial centres. And the country most severely affected is the United States where the Federal Reserve today cut interest rates by 75 basis points — the largest reduction since August 1982 — to mitigate 'increasing downside risks to growth'. The contraction in the US housing market has deepened and unemployment there is rising.

I want tonight to explain the nature of the challenges facing us and why many of them originate outside our shores. Exactly 500 years before the Bank of England was given its independence, an Italian migrant who had made his home in Bristol, Giovanni Caboto, or John Cabot as he was known, set sail from this great city in May 1497 and became the first European to land on the North American mainland since the Vikings. A seafaring voyage like Cabot's is a good analogy for the challenges facing the British economy, which will have to navigate some distinctly choppy waters in 2008.

The challenge to the Monetary Policy Committee's ability to navigate our way through the next year reflects two strong economic winds; one from the west and one from the east. They correspond to what economists call demand and supply shocks. The former is the credit crunch which has blown across the Atlantic, and threatens a sharp slowing in output growth. The latter is the rise in energy and food prices, reflecting continued strong growth in Asia, that, together with rising import prices, threaten to lift inflation noticeably above target in the coming months. These two winds have stirred up the water through which the UK economy must pass.

The westerly gale first hit us in August as developments in the US mortgage market led to turmoil in global financial markets. For some years, banks were able to borrow cheaply in world capital markets to expand their lending. They packaged the resulting loans and sold assets backed by those loans to capital market investors. They were able to do that because some investors had failed to adjust to lower rates of return caused by high savings in emerging economies and low inflation at home. Those investors engaged in a 'search for yield' by buying risky assets without always understanding fully the risks attached to them. Families and businesses had access to more finance at lower cost. That was most obvious in the growth of the US sub-prime mortgage market, where the potential problem of lending to people who could not repay when the interest rate was reset on their floating-rate mortgages was becoming only too clear. In the United Kingdom too, borrowing and spending growth were strong and inflationary pressures built up.

But in August all that changed dramatically. Rising default rates in the US mortgage market led investors around the world to question whether they were being adequately compensated for the risks they were bearing on a wide range of assets — not just those associated with sub-prime mortgages. The prices of those assets fell, and markets closed for a range of complex credit instruments.

As I said two years ago, 'risk premia have become unusually compressed and the expansion of money and credit may have encouraged investors to take on more risk than hitherto without demanding a higher return. It is questionable whether such behaviour can persist'. And, as we have seen, it hasn't. The repricing of risk that is still continuing is not a process that we should try to reverse.

Adjustment to this has been painful for banks in the major financial centres in two ways. First, with some asset markets

(1) Given at a dinner hosted by the IoD South West and the CBI at the Ashton Gate Stadium, Bristol on 22 January 2008. This speech can be found on the Bank's website at www.bankofengland.co.uk/publications/speeches/2008/speech333.pdf.

closed, banks found funding more difficult. Some needed to finance loans they had made but had then expected to package up and sell. Others needed to finance off balance sheet investment vehicles that were no longer able to fund themselves.

At the outset of the crisis, banks were concerned to protect their liquidity position. But increasingly, attention has turned to a second, more fundamental concern. As a range of asset prices fell, banks began to report large losses. Uncertainty about the scale and location of losses led to concerns about the adequacy of bank capital and hence the ability of the banking system to finance continued economic expansion. At the end of last year, sentiment in financial markets worsened markedly. So in mid-December, central banks around the world announced a co-ordinated set of actions in money markets. These were designed to boost confidence by demonstrating that we were conscious of the risks of a credit crunch.

Since those actions, conditions in money markets have eased considerably. The benchmark three-month interbank lending rate has fallen by around 75 basis points relative to expected policy rates. But conditions are not yet back to normal and remain fragile. Although central banks can and will respond to the consequences of strains in the banking system for their economies, the solution to the underlying problem does not rest with them but with the banks and financial markets themselves. Banks must reveal losses promptly, and, most importantly, raise new capital where necessary.

But these developments in financial markets and the banking system have started to affect activity in the economy more widely. Interest rates charged to both households and companies have risen relative to Bank Rate, reversing the relative fall in the year or so before last August. And our own survey of credit conditions last month revealed that lenders intend to tighten conditions further this year. This tightening is unlikely to be short-lived.

Tighter conditions will discourage borrowing to finance spending on residential and commercial property, on business investment and on consumption. The impact on property prices is already clearly visible. Commercial property prices have fallen by 12% since the middle of last year. And, after rising sharply earlier in 2007, house prices stagnated in the final quarter. Although there is a considerable stock of equity in owner-occupied housing, with banks tightening the supply of both secured and unsecured credit, consumers will find it more difficult to borrow to finance spending. So in 2008 it is likely that a less buoyant housing market will go hand in hand with slower growth of consumer spending.

Tighter credit conditions mean that, as a nation, we are likely to save more of our income this year than in the recent past. In the short run, that will slow economic activity, possibly quite sharply. And there is a risk that weaker activity and lower asset prices could result in another round of losses for banks and a further tightening of credit conditions.

The adjustment which not only the British but the world economy is experiencing is necessary as the imbalances, between spending and saving and between domestic demand and trade, unwind. As part of a longer-run rebalancing of the UK economy, an increase in our national saving rate, both private and public, is necessary. The low level of national saving is apparent from the current account deficit — our new net borrowing from overseas — which in the third quarter of last year was, relative to GDP, the biggest in the past 50 years and the largest in the G7. It is possible to run a current account deficit for a considerable period. Australia, for example, has done so in every year since 1974. But our own position is becoming more difficult. For some years we have been able to finance current account deficits by borrowing, often through banks, at unusually low interest rates on world capital markets. Such borrowing is now becoming more expensive. Unless we spend less and save more, our current account position will deteriorate.

If we are to raise our national saving rate without overall demand, output and employment suffering in the medium term, we will need to export more and import less. Such a rebalancing is helped by the fall in sterling's effective exchange rate. Sterling has fallen, against a trade-weighted basket of currencies by almost 10% since August. And financial markets are pricing in a significant probability of a further decline in the exchange rate during this year.

A lower average level of the exchange rate can, by supporting overall economic activity, help protect us from the worst effects of the wind blowing across the Atlantic. But, by pushing up import prices, it will exacerbate the impact of the other wind now buffeting the UK economy, which comes from the east — the inflationary effect of higher energy and food prices. Strong growth of demand, particularly from China, India and other emerging markets in Asia, has been a key driver of the sustained rises in commodity prices over recent years, most notably oil prices.

Inflation has picked up in the industrialised world. It is now 3.1% in the euro area and 4.1% in the United States. And although consumer price inflation here is close to target at 2.1%, three developments now threaten to push it significantly above target this year. First, oil prices are around $90 a barrel, although they have fallen back in recent days. In August, the price was $70. Second, oil price increases have been accompanied by rising gas prices in wholesale markets. And this month we have seen announcements from suppliers of increases in household gas and electricity bills of the order of 15%. Third, world food prices have risen sharply as a result of

strong demand growth on the one hand and poor harvests from South Australia to North Carolina on the other. Food prices on world markets are a third higher than they were six months ago, and that has been feeding through to prices in the shops. Food price inflation in our own consumer prices index reached almost 6% in December.

So 2008 is likely to see higher energy prices, higher food prices and, with a lower exchange rate, higher import prices, pushing inflation above the 2% target. It is possible that inflation could rise to the level at which I would need to write an open letter of explanation, possibly more than one, to the Chancellor. Although there is little we can do now to avoid some rise in inflation this year, the task of the Monetary Policy Committee is to ensure that it is short-lived. If inflation expectations were to pick up in the wake of a rise in inflation this year, then only a more prolonged slowdown would allow inflation to return to target. But if the rise in inflation does not affect longer-term expectations, then inflation could start to fall back towards the end of the year.

We are determined to keep inflation on track to meet the 2% target in the medium term. When the Monetary Policy Committee sets Bank Rate, it has to balance the risk that a sharp slowing in activity, by creating a margin of spare capacity, would pull inflation below the target, against the risk that, without such a margin of spare capacity, higher inflation in the short term might have a tendency to persist. So we face a difficult balancing act in the course of 2008. But we start the year from a position in which Bank Rate, at 5.5%, is probably bearing down on demand.

After a decade and more of a non-inflationary consistently expansionary (nice) economy, a phrase I coined in 2003, we moved to a somewhat bumpier but still rather stable path, which I described the following year as the not-so-bad period. You might think we have now entered a not-so-good period. To put it bluntly, this year we are probably facing a period of above-target inflation and a marked slowing in growth.

Although we have little control over the strength of the economic winds buffeting our economy, our framework of inflation targeting does, as I said in my first speech as Governor almost five years ago, provide a seaworthy vessel. We cannot avoid some volatility in the short run and it is important that everyone understands the limits to the ability of central banks to smooth the economy. But, by keeping our eye firmly on the need to keep inflation close to target in the medium term, we can reach the calmer waters of low inflation, steady growth and a better balanced economy. And our policy framework will, I hope, allow you not to be overwhelmed by the headlines and to focus on what really matters for our future prosperity — the successful running of your own businesses.

The impact of the financial market disruption on the UK economy

In this speech,[1] Sir John Gieve, Deputy Governor for financial stability, discusses the recent financial market disruption, its impact on the UK economy, and the increase in immediate inflation pressures from energy and food. He argues that in some ways the case for easing has been greatly strengthened by the disruption in global credit markets and in the banking system which brings a risk of a deeper downturn. However, he also notes that there has been a big rise in the world prices of oil and food and that is being amplified in the United Kingdom by a fall in sterling, which is likely to raise the inflation rate well above target in the coming months. He concludes by explaining that in reaching decisions, the MPC always looks not just at the central projection for the economy but at the risks on either side. That requires not just difficult judgements but careful explanation in the months ahead.

Introduction

These are testing times for the MPC.

The latest official figures for growth confirm the strength of the economy in 2007 Q3 with above-trend growth in domestic demand and a growing current account deficit. But the evidence from surveys and other timely indicators is that growth is slowing quite sharply now, in part because of the rises in interest rates last year. That in itself might justify a progressive shift in policy — from restrictive to a more neutral stance. And the case for easing has been greatly strengthened by the disruption in global credit markets and in our own banking system which brings a risk of a deeper downturn.

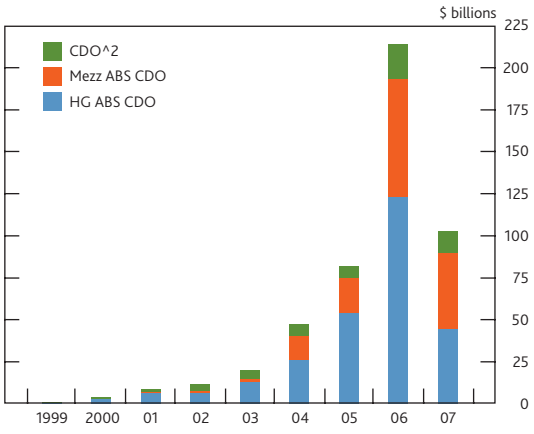
However we have also seen a big rise in the world prices of oil and food. That is being amplified in the United Kingdom by a fall in sterling and is now coming through in our food, petrol, gas and electricity prices. These are likely to raise our inflation rate well above target in the coming months at a time when short-term inflation expectations remain uncomfortably high.

This combination of upside and downside risks complicates our task of keeping inflation on track to meet the 2% target.

Financial market disruption

The disruption of credit and money markets was set off by a deterioration in the US sub-prime housing market. This started to show up in increasing provisions in the 2006 accounts of banks which held them on balance sheet in a traditional way. But impairment charges of that sort would not have occasioned such ferment in international markets. That was the result of the impact on the new markets for structured credit such as collateralised debt obligations (CDOs)[2] (**Chart 1**), which had developed to meet investors' demand for higher yield. As forecasts of US sub-prime defaults mounted, it became clear that such products had introduced opacity and uncertainty into both the distribution and scale of losses.

Chart 1 ABS CDO issuance

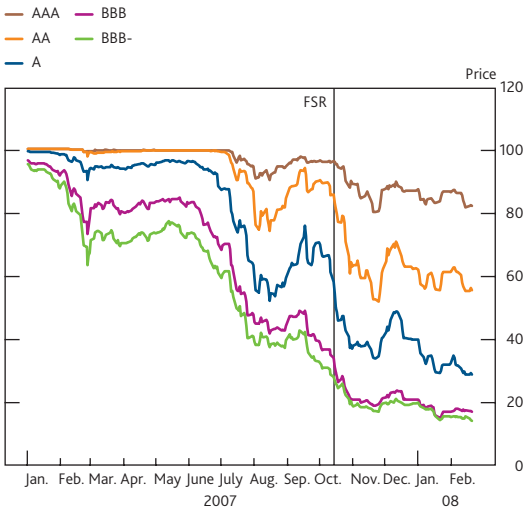


Source: Citi.

(1) Given to the London Chamber of Commerce and Industry on 17 January 2008. This speech can be found on the Bank's website at www.bankofengland.co.uk/publications/speeches/2008/speech332.pdf.

(2) CDOs are securities backed by a portfolio of fixed-income assets that are issued in tranches of varying seniority. As default losses accrue to the underlying portfolio they are applied to the securities in reverse order of seniority. The main types of CDOs are those based on portfolios of leveraged bank loans (CLOs) and asset-backed securities (ABS CDOs).

Chart 2 Prices of US sub-prime mortgage credit default swaps[a]



Source: Bank calculations.

(a) ABX.HE 2006 H2. Each index references 20 home equity loan (HEL) ABS of indicated rating issued in 2006 H1. Sub-prime loans form the vast majority of the collateral backing HEL ABS.

The crisis played itself out in a number of 'lurches', which were reflected in the movements in the ABX indices[1] (**Chart 2**):

- although the problems of the sub-prime market were obvious in mid-2006, it wasn't until January/February 2007 that the rising defaults led to mark downs in indices valuing the riskier tranches of the structured products and difficulties at a number of US sub-prime originators;

- in June, as losses began to appear in highly rated tranches of so-called mezzanine CDOs, two heavily exposed Bear Stearns hedge funds collapsed; the rating agencies began to review their methodologies and started to downgrade securities, some by several notches;

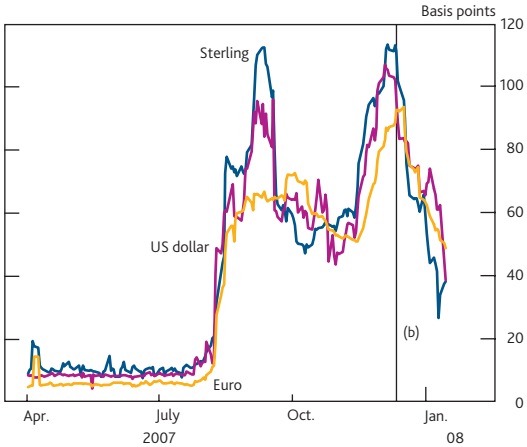
- at the end of July, structured investment vehicles (SIVs)[2] sponsored by IKB reported losses on sub-prime mortgage exposures and failed to raise funding in the commercial paper market, and in early August BNP Paribas temporarily suspended redemptions from a number of money market funds because of valuation problems; this provoked an 'investors' strike' on mortgage-backed securities and the commercial paper that funded off balance sheet vehicles holding them; in turn this led banks to hoard liquidity against potential calls on their committed lines, to a marked tightening of interbank markets and funding pressures on banks, including, of course, Northern Rock; and

- after a brief lull in October, renewed doubts about the scale of the losses in the big international banks led to concerns about counterparty risk and sparked a renewed squeeze in the money markets with Libor spreads climbing back to levels experienced in August.

There are many lessons for markets and the authorities from this turmoil. First, it underlined the critical importance of liquidity in managing and regulating banks. Second, it showed up the limitations of the models which underpin the valuation and rating of structured products and the excessive weight that had been given to them not just by the naive or unwary, but by some of the most sophisticated players in financial markets (including many of the sponsoring banks who underestimated the risks they were running in retaining super senior tranches). Third, it illuminated the adverse incentives that had been allowed to develop in the distribution chain for credit products including the strong incentives for originators to put quantity above quality, for the rating agencies to expand their scope as widely as possible, and for banks to use off balance sheet vehicles to finance structured credits. It may also reveal some flaws in the compensation schemes in banks. In some cases these incentives arose despite regulation, in others they were the consequence of faults in the regulatory system. Finally, it showed again how measures of risk used by companies and regulators can be procyclical, encouraging more risk-taking at the top of the cycle and potentially exacerbating the downswing.

In the past few weeks, markets have been calmer. Liquidity pressures in short-term funding markets have eased, helped in part by the co-ordinated action by central banks to address elevated funding rates over the year end (**Chart 3**). And, as losses have been declared it has proved possible for a number of firms such as Citigroup, Merrill Lynch and UBS to attract new capital including from sovereign wealth funds.

Chart 3 Three-month Libor spreads over expected policy rates[a]



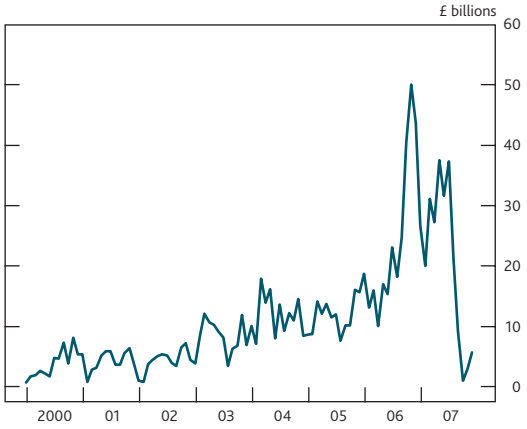
Source: Bloomberg.

(a) Three-month Libor spreads over three-month overnight index swap rates.
(b) Co-ordinated central bank measures announced (12 December 2007).

(1) The ABX indices are baskets of 20 credit default swaps that provide insurance against default losses on securities of a given rating and vintage of issuance that are backed by home equity loans. The home equity loan category comprises mainly of sub-prime first mortgages, but also second mortgages, mortgages with high loan to value ratios and home equity lines of credit.
(2) SIVs are funds that issue short-term securities in order to invest in longer-term securities. The latter have typically comprised mainly of mortgage-backed securities and other asset-backed securities. Banks' sponsored SIVs are managed by banks.

It is too early to declare the problem solved. The longer-term bank funding markets remain relatively illiquid, many securitisation markets remain effectively closed (**Chart 4**), and general market sentiment remains fragile. Only a part of the total losses on sub-prime have yet been declared and not all the questions about the future of SIVs or the capitalisation of monoline insurers have yet been answered. The sub-prime chapter will not be closed for some months yet and there are still risks of reignition of the acute money market conditions we saw last month.

Chart 4 RMBS issuance by all UK resident issuers



Note: Data to end-December 2007.

Source: Dealogic.

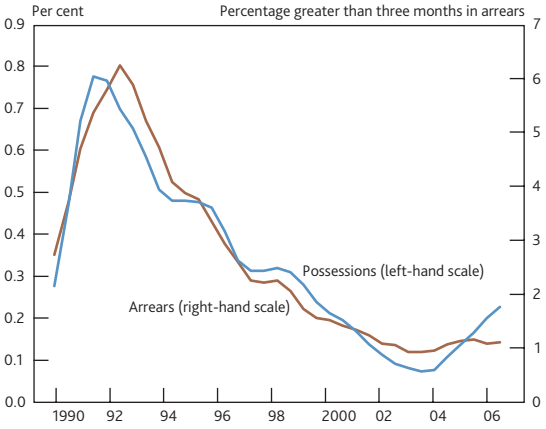
But there are grounds for hope that we are reaching the end of the beginning at least and that the key challenge is moving from stabilising the financial markets themselves to dealing with the impact on the wider economy.

Macroeconomic impact

Judging that impact is not easy. Banking crises have typically reflected macroeconomic difficulties at home. Banks have lent too much and too cheaply at the top of the cycle and have then suffered from defaults when policy tightened and unemployment and failures increased. The most recent example in the UK banking sector was during the recession of the early 1990s when the major banks wrote-off about 2.5% of their domestic loan book and tightened credit conditions, thus exacerbating the fall in property prices and in confidence. It has been estimated that the effect of the tightening of credit conditions was to reduce UK output in 1991 by almost 2% relative to what it would otherwise have been.(1) Of course, there was little monetary policy could do at that time to offset these effects because of sterling's ERM membership.

But the current crisis does not follow that pattern. It has come at a time when the performance of the UK economy has been unusually good. Over the past fifteen years the economy has experienced the most stable macroeconomic conditions on record with steady growth, low inflation and a declining trend in unemployment.(2) For the most part the underlying balance sheet position of households and firms is robust and most indicators of financial fragility such as mortgage arrears, repossessions and corporate insolvencies are at low levels (**Chart 5**).

Chart 5 Mortgage arrears and possessions rates



Note: Backcast data before 1994.

Source: Council of Mortgage Lenders.

So the question is whether we can reverse into macroeconomic trouble starting from a banking crisis with its origins in the US housing market. Of course a marked slowdown in the United States will diminish directly part of our exports. But two domestic transmission channels to consumption and investment will determine the size of the overall impact on our economy:

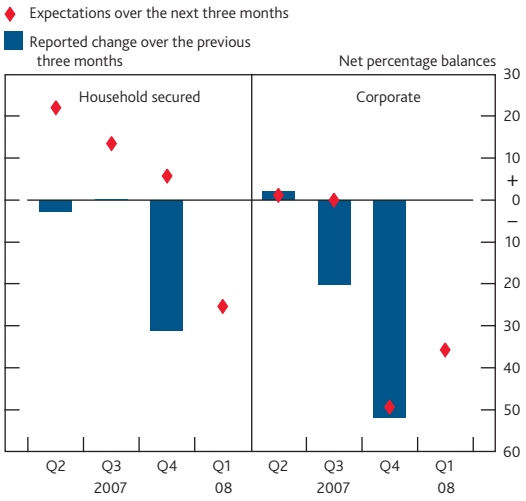
- the effects of credit constraints; and
- impact on expectations and confidence.

Credit constraints

With their own funding rates increasing and a reduction in their ability to distribute risk through securitisation, there is now clear evidence that UK lenders have begun to tighten lending conditions for households and firms. The Bank's *Credit Conditions Survey* (*CCS*) of major UK lenders has identified a change in behaviour since the summer.(3) Contrary to earlier expectations, lenders reported that the availability of secured credit to households had reduced noticeably over the three months to mid-December (**Chart 6**). Corporate credit availability was also reported to have been reduced significantly over the same period. A further reduction in the

(1) Young, G (1996), 'The influence of financial intermediaries on the behaviour of the UK economy', *NIESR Occasional Paper no. 50*.
(2) This is discussed in detail in the Bank's memorandum to the House of Commons Treasury Committee's inquiry into 'The Monetary Policy Committee of the Bank of England: ten years on', *Bank of England Quarterly Bulletin*, 2007, Vol. 47, No. 1, pages 24–38.
(3) *Credit Conditions Survey*, available at www.bankofengland.co.uk/publications/other/monetary/creditconditions.htm.

Chart 6 Household secured and corporate credit availability

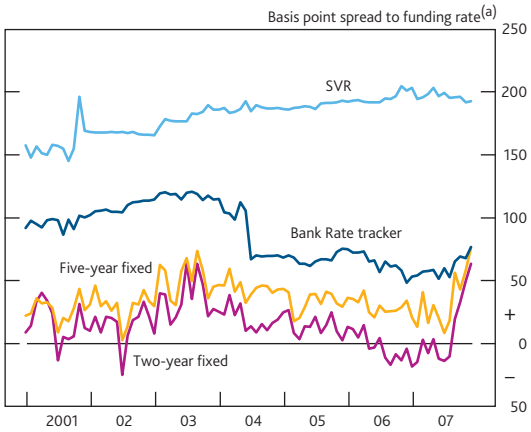


Source: Bank of England *Credit Conditions Survey*.

general availability of credit was expected over the next three months.

The survey suggests that lenders are both raising the price of borrowing and reducing the range of people and firms they are prepared to lend to. There has been a pickup in the average spread of quoted mortgage rates over the appropriate funding rate in recent months (**Chart 7**). There has also been a fall in the number of mortgage products available for credit-impaired borrowers (**Chart 8**).

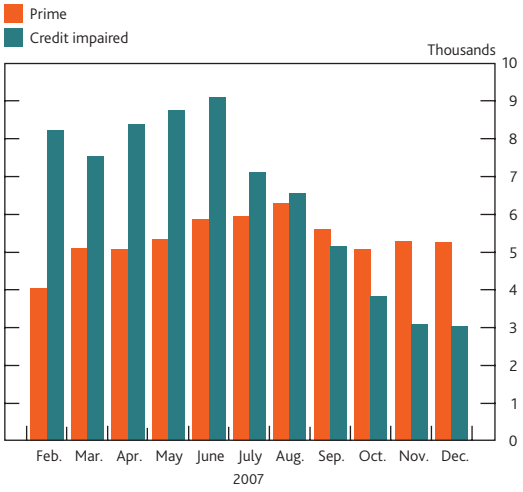
Chart 7 Quoted mortgage spreads



(a) Standard variable rate (SVR) mortgages spread over one-month lag of Bank Rate; tracker mortgages spread over Bank Rate; two-year and five-year fixed-rate mortgages spread over one month lag of two and five-year swap rates.

The first impact of the tightening in secured credit conditions is being felt in the property markets and lower demand for assets but there will also be direct effects on activity. Although only a minority of households may be credit constrained they are probably sufficient in number to depress household spending somewhat, possibly reversing a little of

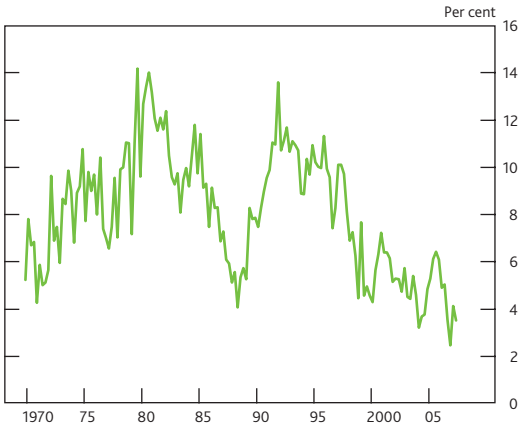
Chart 8 Mortgage product availability



Source: MoneyFacts.

the decline in the saving ratio seen since the early 1990s (**Chart 9**). In a similar way a tightening of corporate lending conditions will affect some companies' investment. *The Deloitte CFO Survey* taken in early December finds that 20% of firms expect the recent credit market events to have a negative impact on their capital spending in 2008.(1)

Chart 9 Household saving ratio



This tightening of credit conditions would be exacerbated by any further weakening in the financial position of banks due to a slowdown in the wider economy. Slower growth and a rise in unemployment in particular would lead to higher loan defaults. There are signs that this is already happening in consumer lending in the United States. Weakening property prices would reduce the amount that lenders could realise in the event of default. With pressures on their capital and new capital expensive where it is available, banks are likely to attempt to increase their margins and to slow down new

(1) *The Deloitte CFO Survey: Benchmarking Corporate Financial Attitudes*, 4 January 2008.

lending, thereby reducing their capital requirements, for example by tightening non-price terms and conditions on new loans.

One factor which regulators are watching carefully at present is the impact of the shift this month to the Basel II system of capital requirements for European banks. While Basel II improves on its predecessor and removes many undesirable incentives, it retains some procyclical features and any transition needs to be managed carefully.(1)

The impact on expectations and confidence

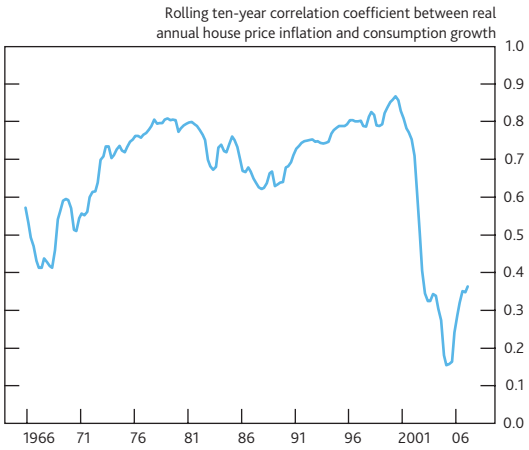
The other channel by which the financial market turbulence is likely to have macroeconomic effects is by prompting more cautious behaviour by households and firms. This might simply reflect uncertainty about the future. Firms may temporarily postpone investment because of greater uncertainty about the future path of demand. We saw an effect like this after 9/11 for example. But it might also reflect a revision by households and firms about the sustainable path of income and wealth in the coming years. The change in expectations may reflect the higher costs of borrowing and a higher risk of unemployment.

Again a reduction in confidence about future growth may lead directly to lower consumption and investment. It is also likely to affect equity and property markets. Potential buyers may decide to wait before purchasing if they sense that there is a chance that prices may fall. Such behaviour can be self-fulfilling.

There is no doubt that the housing market has been weakening significantly in recent months and the trend is more advanced still in commercial property markets where prices are falling rapidly. It is widely assumed that weakening property prices will also depress consumption. The Bank has tended to be sceptical of this mechanism.(2) While property prices and spending tend to move together, that doesn't prove that one causes the other. Both may result from changes in income and expectations of future income.(3) Indeed, in the same way as you can't have your cake and eat it, it is not clear that a general increase in house prices does create extra spending power for the population as a whole. Owners who expect to remain in their current house for a long time cannot also spend their housing wealth and the benefits to those trading down are broadly offset by the costs to those trading up. While older owners may be richer and believe they can support a more expensive lifestyle, the rise in prices will show through in higher rents and larger deposits for those wanting to get on the ladder.

But even if there is not a strong causal connection between house prices and consumption through a wealth channel, there may nevertheless be a significant collateral channel. When house prices fall, the amount of housing equity and hence collateral at homeowners' disposal decreases. This will tend to delay spending as lenders are willing to lend less or lend on less favourable terms to those who have little or no housing equity. That channel should have become less important in recent years. This is because most homeowners have substantial equity in their homes which would not be materially affected by relatively modest changes in house prices.(4) This may help to account for a decline in the correlation between real house price growth and consumption since the beginning of the decade (**Chart 10**).

Chart 10 Correlation between growth in house prices and consumption



Source: Bank calculations.

An analogous collateral channel may operate in the corporate sector. Declines in commercial property prices will weaken corporate balance sheets and this could affect corporate spending if lenders raise the cost of borrowing to affected companies. This effect is likely to be particularly pronounced among commercial real estate companies.

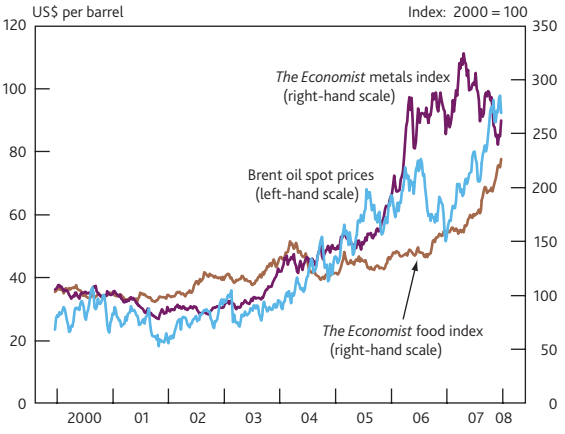
Inflation and energy prices

In these ways the losses in credit markets are already contributing to slowing growth; the questions are by how much and for how long? The danger that they could turn a necessary modest slowdown into a deeper and more painful downturn is clear and, of course, that would dampen inflationary pressures. That was a key factor in my decision to vote for a cut in rates in November and December.

(1) Benford, J and Nier, E (2007), 'Monitoring cyclicality of Basel II capital requirements', Bank of England *Financial Stability Paper No. 3*, December.
(2) This view is discussed fully in Benito, A, Thompson, J, Waldron, M and Wood, R (2006), 'House prices and consumer spending', *Bank of England Quarterly Bulletin*, Summer, pages 142–54.
(3) Some household-level evidence for this view is given by Attanasio, O, Blow, L, Hamilton, R and Leicester, A (2005), 'Consumption, house prices and expectations', *Bank of England Working Paper no. 271*.
(4) Evidence on housing equity is presented in Waldron, M and Young, G (2007), 'Household debt and spending: results from the 2007 NMG Research survey', *Bank of England Quarterly Bulletin*, Vol. 47, No. 4, pages 512–21.

But the current situation is complicated by emerging upside pressures on prices. This inflationary pressure is coming largely from outside the United Kingdom, reflecting in part increased demand from countries like China where output growth has been both rapid and commodity intensive. That has led to renewed strength in commodity prices (**Chart 11**), with oil rising as high as $100 a barrel and some agricultural foods reaching record highs in dollar terms. This has already increased the prices of imported goods, and that effect has been amplified recently by the fall in sterling. In turn, it is putting upward pressure on the sterling prices set by domestic producers for crude oil and wholesale gas and electricity. And, in contrast to the past, demand from emerging economies may mean that commodity prices prove resilient to slowing growth in the industrialised economies.

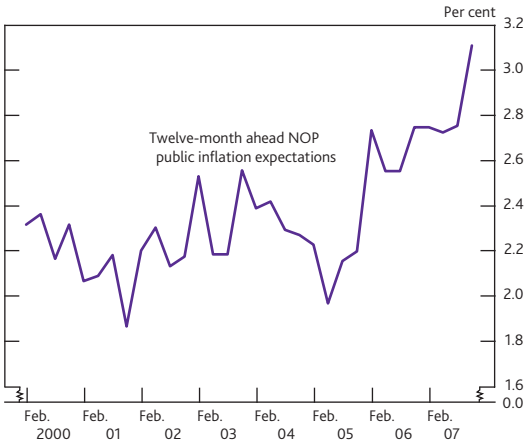
Chart 11 Commodity prices



Sources: Thomson Datastream and Bank calculations.

The appropriate monetary policy reaction to upside pressures on prices coming from outside the economy (such as an energy price shock) depends on how households and businesses react to that shock — in other words, on so-called 'second-round' effects. A key determinant of those effects will be the impact on inflation expectations. If households' and businesses' expectations of future inflation rise following the initial price shock, pressures for compensating rises in wages and prices are much more likely. Inflation expectations are difficult to measure, but surveys of households' expectations have picked up since early 2005 (**Chart 12**). This partly reflects the rise in inflation during 2005–06. But expectations have remained elevated during 2007 despite the easing in inflation in the second half of the year.

Chart 12 General public inflation expectations



Source: Bank of England/NOP public attitudes to inflation survey.

Conclusion

After a long period of stability, we have experienced a major financial shock that has reverberated through the banking sector in all the advanced economies. It has calmed recently, but we should expect a prolonged period of discomfort for individual banks and the financial system as a whole. Unusually, this shock was not the result of bad loans at home but it will have an impact on growth through tighter credit constraints and by influencing expectations and confidence. We cannot be sure how large those effects will be but they pose a serious downside risk to growth. To make matters more difficult, we face a sharp rise in inflation in coming months as a result of rising commodity prices worldwide and a fall in our exchange rate.

In reaching our decisions, the MPC always looks not just at the central projection for the economy but at the risks on either side. That will require not just difficult judgements but careful explanation in the months ahead.

The return of the credit cycle: old lessons in new markets

In this speech,[1] Sir John Gieve, Deputy Governor for financial stability, highlights the return of the credit cycle and how some old lessons have re-emerged in the new credit markets. He notes that as in previous banking cycles, a period of strong growth, low interest rates and rapid increases in asset prices lead to overconfidence and bad lending at the top of the cycle; defaults, deleveraging and retrenchment follow in the downswing. But the way this old story has unfolded through the new credit markets has sprung some unpleasant surprises, including the speed with which losses in just one market in one country — the housing market in the United States — have disrupted wider credit markets in all advanced economies. After analysing the events of the past seven months, he concludes that authorities need to consider again how far the regulatory regime for capital and liquidity can be made countercyclical, to create a system which raises requirements as the boom gathers pace in order to dampen the upswing and create additional headroom for losses as the cycle turns — if this is not possible an alternative may be to require larger capital and liquidity buffers across the whole cycle.

Introduction

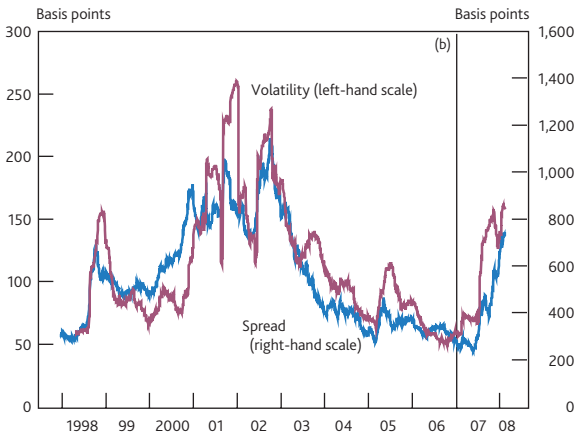
The turmoil in credit markets since August has been novel in some ways; but in others, the longer it has gone on the more familiar it has seemed. It has been looking less and less like the crystallisation of a 'tail' risk — the 'unprecedented and unforeseeable' event described by Northern Rock directors — and more and more like the unwinding of a wider credit boom during which risk premia had become unsustainably compressed. The excesses may have been most obvious in the complexities of structured credit and the sub-prime sector but they have not been confined to them.

As in previous banking cycles, a period of strong growth, low interest rates and rapid increases in asset prices lead to overconfidence and bad lending at the top of the cycle; defaults, deleveraging and retrenchment follow in the downswing. But the way this old story has unfolded through the new credit markets has sprung some unpleasant surprises, including the speed with which losses in just one market in one country — the housing market in the United States — have disrupted wider credit markets in all advanced economies.

The upswing — a new structure of banking

The roots of the problem lay in the so-called 'great stability' of steady growth and inflation and in particular the past five years of persistently low nominal interest rates.

Chart 1 Corporate high-yield credit spreads: levels and volatility[a]



Sources: Merrill Lynch and Bank calculations.

(a) Option-adjusted spreads over government bond yields and 90-day annualised historical volatilities.
(b) 31 December 2006.

The confidence born of that stability was combined with an increased institutional demand for fixed income and heightened international competition among the largest banks to develop scale. That led to a remarkable decline in corporate investment yields which was matched, and for a while seemed justified, by declining volatility (see **Chart 1** which shows the

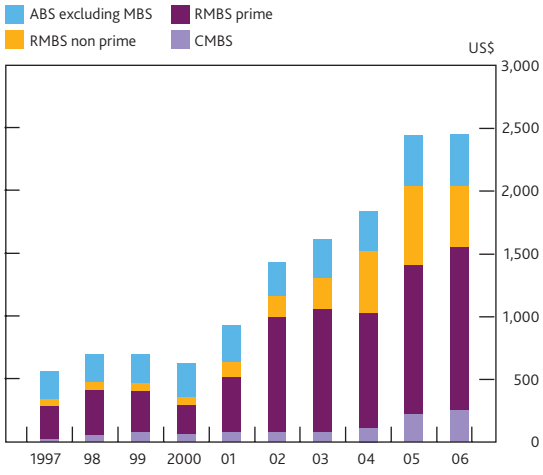
(1) Given at the Euromoney Bond Investors Congress on 27 February 2008. This speech can be found on the Bank's website at www.bankofengland.co.uk/publications/speeches/2008/speech338.pdf.

spreads and volatility of high-yield bonds).[1] And it put pressure on investors to find new ways of generating returns from credit. At the same time advances in IT and financial modelling allowed the development of new derivatives, and the slicing, dicing and recombining of credits in new structured credit instruments.

The search for yield would have made the US sub-prime mortgage market attractive to many investors. What made it irresistible was the financial engineering that offered high yields with high credit ratings.

The success of structured credit created a huge demand for the raw material of these products in particular sub-prime mortgages (**Chart 2**). It allowed banks to move increasingly from the traditional 'lend and hold' model towards an 'originate and distribute' model. This boosted the supply of credit and allowed risk to be more widely dispersed across the system as a whole. But it also involved a long chain of participants from the original lenders to end-investors. Investors at the end of this chain, who bore the final risk, had less information about the underlying quality of loans than those at the start and became very dependent on rating agencies and their models. It also reduced the incentives on originators to assess and monitor credit risk carefully.

Chart 2 Global RMBS, CMBS and ABS issuance



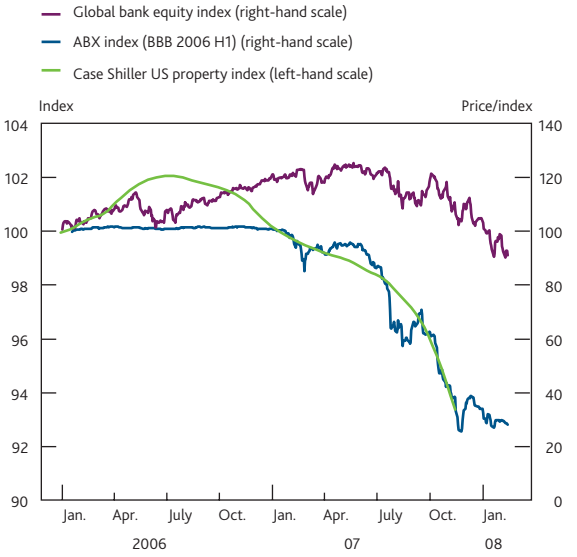
Source: Dealogic.

The downswing — how the crisis unfolded

Growing problems in the sub-prime market started the downswing. **Chart 3** compares the path of US housing prices with the price of the triple-B ABX index (which captures the cost of insuring against default losses on sub-prime mortgages) and bank equity prices:

- As you can see, the US housing market began to turn down in mid-2006; and banks holding sub-prime loans on balance sheet began to make provisions at that point.
- But it wasn't until early in 2007 that rising defaults led to markdowns in even the riskier tranches of sub-prime backed securities.
- Last summer, problems at Bear Stearns, IKB and BNP Paribas brought home to investors the market risks they were running and led to an 'investors' strike' on mortgage-backed securities and asset-backed commercial paper.
- That in turn led banks to hoard liquidity; interbank markets spreads rose and volumes fell beyond the very short term; Northern Rock ran out of road, and bank equity prices began to drop.

Chart 3 Housing problems spread to banks[a]



Sources: JPMorgan Chase & Co. and Thomson Datastream.

(a) Equity and property indices rebased to January 2006 = 100.

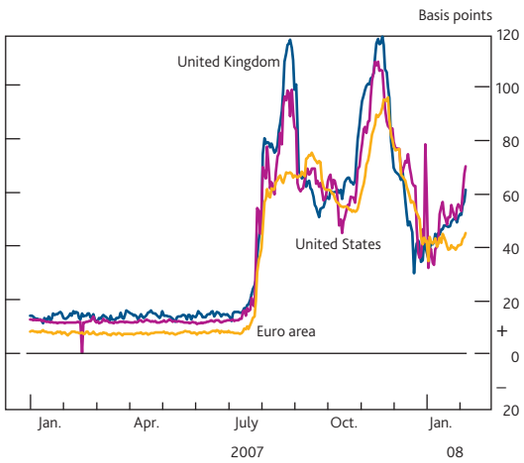
- For a few weeks in October the market thought the worst was over but the publication of Q3 results renewed fears about the scale of bank losses which sparked a new squeeze in the money markets and a further sharp fall in bank share prices towards the end of the year.
- Co-ordinated action by central banks helped to ease the short-term funding pressures at the year end (**Chart 4**); and hopes rose that the acute phase was over as banks declared their losses and, where necessary, managed to attract new capital including from sovereign wealth funds.

Where we are now

But markets have remained difficult in the New Year. While Libor spreads have not returned to the levels of early

(1) The vertical line represents the end of 2006.

Chart 4 Three-month Libor spreads over expected policy rates[a]



Source: Bloomberg.

(a) Three-month Libor spreads over three-month overnight index swap (OIS) rates.

December, money markets are sticky. Corporate bond and credit default swap rates have continued to climb, leveraged loan prices are dropping quickly, securitisation markets remain largely closed and the CDS and equity prices for banks continue to deteriorate.

This continuing strain reflects three main factors.

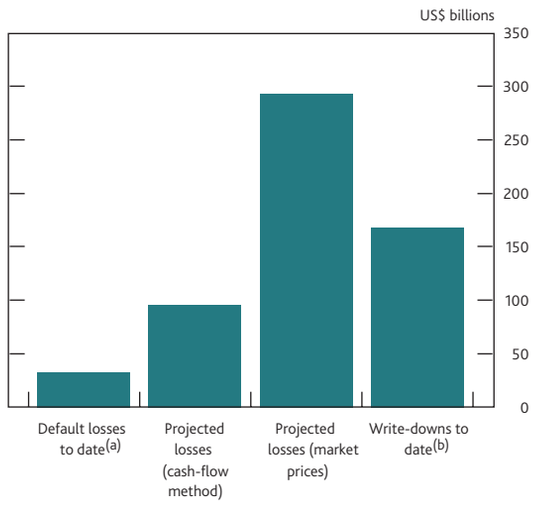
First, it reflects fears about the future path of the economy especially in the United States and the scale of new losses that may bring — not just in housing, but also in other forms of lending.

Second, however, there is continuing uncertainty about the scale and distribution of losses that have already occurred:

- To illustrate the uncertainty on overall scale, **Chart 5** sets out different estimates of sub-prime losses based on different estimation methods. First, given the length of the foreclosure process, realised losses on the sub-prime mortgages which underpin securities may not total much more than US$30 billion so far. Second, if projecting forward the rate at which delinquencies are cumulating on recent vintages of sub-prime mortgages, we can estimate that losses on the securitised loans might ultimately exceed US$150 billion. Third, using the sub-prime ABX indices to 'mark-to-market' sub-prime securities, can produce figures of US$300 to US$400 billion. Against these figures, international banks have so far announced write-downs (net of hedging) of US$100 to US$150 billion.

- Although these are huge numbers, they amount to less than 1% of the assets of the large complex financial institutions (LCFIs) in the United States and Europe. In relation to GDP, even the higher estimates would be comparable to the losses in the Savings and Loans crisis.[1]

Chart 5 Sub-prime mortgage losses



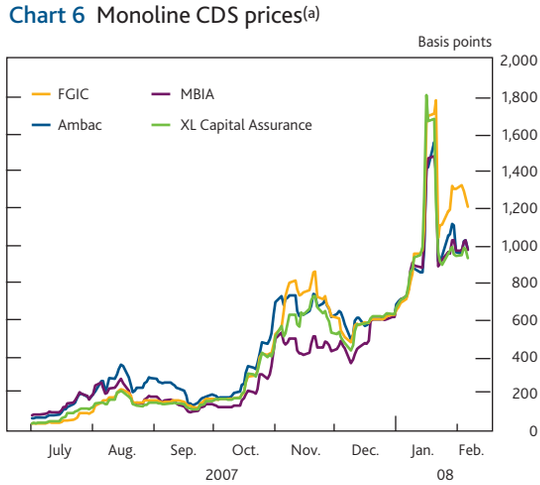
Note: The last two columns of the chart were transposed in the print version. The version above is correct.

Sources: Bloomberg, banks' financial statements and Bank calculations.

(a) Estimated default losses to date on sub-prime securities based on cumulative delinquency rates.
(b) Net of hedging.

- But the securitisation model has not just made it difficult to scale the problem; it has added a large measure of uncertainty and opacity to the distribution of losses and that is a key factor in the continued reluctance to lend and the closure of most ABS markets. The current worries on the future of the monoline bond insurers reflected in their CDS prices in **Chart 6** are exacerbating the uncertainties about individual banks' exposures.

Chart 6 Monoline CDS prices[a]



Sources: Bank of England, Barclays Capital, Goldman Sachs, IMF and Moodys.

(a) Average of bid and offer premia of five-year senior debt CDS contracts.

The third factor is the dislocation of the investor base for ABS. Since the summer many of the main buyers of ABS have withdrawn from the market. The conduits and SIVs are greatly diminished where they are not being wound up altogether.

(1) Arguably the cash-flow projection of losses of $150 billion comes closest to the sort of provisions banks would be making if the loans had been held on their banking books rather than securitised and sold on. On that basis the losses currently projected would be only 50% of the Savings and Loans losses as a share of US GDP.

And the money market and other funds that stepped away from these off balance sheet vehicles are not willing at least yet to buy ABS directly. Finding new homes for these securities is bound to take time. So long as there are known to be reluctant holders, even long-term real money investors will tend to hold back to see whether prices are driven lower in coming months by forced sales. On the other side many issuers are reluctant to accept the prices on offer today since they could become benchmarks for the future.

Lessons from the crisis

The story is far from over but it is still possible to identify some lessons. The past seven months have taught market participants a lot about the risks and limitations of the new markets and their business models; their responses will be the most powerful force for change. On the official side, a recent consultative document has set out proposed responses by the UK tripartite authorities.(1) Internationally, the Financial Stability Forum (FSF), which draws together central banks, supervisors and finance ministries from the main financial centres, is co-ordinating an action plan for authorities to develop and implement recommendations across a number of areas (**Chart 7**).(2)

Chart 7 Key strands of FSF work

- Supervisory framework and oversight
  - Capital arrangements
  - Liquidity buffers
  - Risk management practices
  - Off balance sheet activities
- Underpinnings of the originate and distribute model
- Uses and role of credit ratings
- Market transparency
- Supervisory and regulatory responsiveness to risks
- Authorities' ability to respond to crises

Source: Financial Stability Forum.

Among the key lessons are:

- the critical importance of liquidity, alongside capital, in managing and regulating banks;
- the limitations of the models which underpin the valuation and rating of structured products;
- the importance of disclosure on risk exposures and valuation practices for the maintenance of confidence and effective market functioning in times of stress;
- the need to alter the adverse incentives that had developed in the distribution chain for mortgages including for originators to maximise the volume of loans, for the rating agencies to expand their scope as widely as possible, and for banks to use off balance sheet vehicles; and
- improving crisis management arrangements, including the process for providing liquidity to institutions under stress and for restructuring weak and failing banks.

Measuring and adjusting for risk

The focus of this work is the recent structural changes in banking and credit markets and ways to prevent those making the financial system more prone or less resilient to large cyclical swings.

That is important. But we have been here before. It is not so long since a vast amount of work was set in train in the wake of the LTCM crisis in 1998 and again after the dotcom boom blew out. While each crisis has its own idiosyncrasies there are common elements and they too need to be addressed.

In my view the key lies in the measurement of risk and the repeated inclination to under price risks at the top of the cycle and thus take comfort from exaggerated estimates of risk-adjusted returns; and the corollary, a tendency to over price risk as the cycle swings down.

At the macro level it is hard to assess what is a warranted rise in asset prices and what an unsustainable boom; in regulation it has proved hard to design systems which adjust appropriately for the cycle, never mind which effectively lean against it; and at the micro level firms find it difficult to measure the risks in their strategies and to base their targets and incentive systems on risk-adjusted returns.

We must try to align incentives between actual risk and return by improving risk management practices (for example on off balance sheet activities) and rectifying the revealed weaknesses in the originate to distribute model whether in the US mortgage market, in valuation practices or in the use of rating agencies. But we know that many of the incentive problems are deeply embedded — after all, asymmetry is inherent in any limited liability arrangement. The protection of depositors is well established. And it is hard for firms to take account of the collective implications for the credit cycle of their individual behaviours.

(1) See 'Financial stability and depositor protection: strengthening the framework', Consultation Document, January 2008, www.bankofengland.co.uk/publications/financialstabilityanddepositorprotection080130.pdf.
(2) Private sector initiatives have also been launched. There are European industry plans to compile information on a variety of instruments including ABCP, ABS and CDO and to disseminate this to investors and other interested parties on a regular basis. See 'Summary of European Industry Commitments to the European Commission regarding Transparency in the European Securitisation Market' (www.europeansecuritisation.com/Industry-letter-08Feb08.pdf). The Institute of International Finance (IIF) also has an active agenda of work, covering risk management, liquidity, valuation, ratings, and transparency (see www.iif.com/press/press+releases+2007/press+46.php).

Of course there is a role for monetary policy in smoothing the cycle but it has to address the whole economy and not just the financial sector. So we need also to consider again how far we can make our regulatory regime for capital and liquidity countercyclical — that is create a system which raises requirements as the boom gathers pace in order to dampen the upswing and create additional headroom for losses as the cycle turns. Basel II is a step in the right direction in many ways, particularly in its treatment of off balance sheet vehicles and in stimulating improved risk management systems, but it still has known procyclical features which we need to address. If we cannot do so effectively an alternative may be to require larger capital and liquidity buffers across the whole cycle.

The past seven months have been testimony to Mark Twain's comment that 'history doesn't repeat itself but it does sometimes rhyme'. The structured credit markets and the growth of 'originate and distribute' banking have amplified the turmoil in credit markets in recent months. But under the new clothes, the old credit cycle is still recognisable. It is important we learn the lessons about the new credit instruments and markets. But we also need to address again the roots of the credit cycle.

Money and credit: banking and the macroeconomy

In this speech,[1] Paul Tucker, Executive Director for Markets and Monetary Policy Committee member, sets out some thoughts on why money and credit matter for monetary policy making. Though particularly relevant given the current turmoil in banking and capital markets, and in understanding his recent votes on the Monetary Policy Committee, his remarks are set against a backdrop of a decade of change in the structure of those markets. He describes how these structural changes have, in turn, altered both the demand for, and supplies of, money and credit; and challenges the view that the financial system has two independent engines, banking and capital markets. In considering the impact of developments in money and credit supplies on the real economy and for monetary policy, he argues that policymakers need to distinguish changes in broad money from changes in credit; to understand the connections between the two; and within credit, to be clear about developments in total credit versus bank lending alone. Further, following the sort of adverse developments in credit conditions experienced recently, he cautions against policymakers allowing vicious circles to take hold in which tighter liquidity/financial conditions and slower aggregate demand feed back on each other. Finally, he stresses the need for the central banking community to understand, and so to have data illuminating, the underlying drivers of credit expansions and their macroeconomic implications if it is to avoid the difficulties of relying entirely on 'mopping up' after 'bubbles' and if it is to guard against the risk of one imbalance leading to another.

Each month the MPC sets a policy rate, Bank Rate, that will prevail until our next policy meeting. But no one — here today, in the market, or on the Committee — thinks that setting the overnight money market rate for the coming 30 days can be enough to steer demand conditions and maintain stable inflation. Rather, policy works on the basis of expectations of the path of the Bank Rate in the future, and of how our policy settings will vary according to economic conditions: the so-called 'reaction function'.

Perceptions of the reaction function therefore matter a lot and a great deal of effort goes into being transparent about the three inputs: the Committee's objective; the MPC's views on the shocks to demand and supply affecting the economy; and our views on how the economy works and how our policy settings affect it. This conference is focused on one important element of this: the role of financial markets in the setting and transmission of monetary policy. That is covered in the Bank's publications on how the economy works, including the Committee's 1999 paper on the Monetary Transmission Mechanism (MTM), and books describing the models used in forecasting.[2] But those high-level descriptions miss out an awful lot about how the real and financial parts of the economy connect. Financial variables are limited to the short-term interest rate, the exchange rate, and equities. Nothing on the role of long-maturity interest rates, or on credit spreads and risk premia — which misses out a whole universe of financial asset prices. Very little on credit more generally. Next to nothing on money. And nothing at all on the role of bank intermediation.

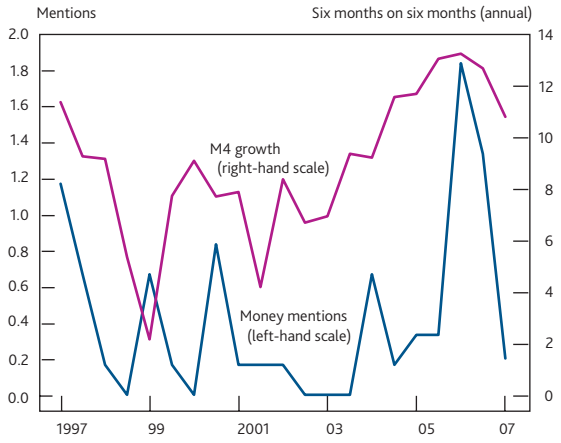
These gaps were perhaps underlined by a degree of confusion among commentators about the way in which Money and Credit featured somewhat more prominently in the

The final sentence of the print version summary incorrectly reads '... if it is to avoid the difficulties of relying entirely on 'mopping up' with 'bubbles' and if it is to guard against the risk of one imbalance leading to another.' The text above is correct.

(1) Given at the Monetary Policy and the Markets Conference on 13 December 2007. This speech can be found on the Bank's website at www.bankofengland.co.uk/publications/speeches/2007/speech331.pdf. My thanks for comments and/or for background work to Peter Andrews, Charlie Bean, Tim Besley, Roger Clews, Andy Haldane, Colin Miles, James Proudman and Iain de Weymarn. Special thanks to Alex Haberis and Jing Yang. For comments and background work to Damien Lynch. And for secretarial support to Sandra Bannister and Cheryl Feeney.

(2) *The transmission mechanism of monetary policy*, a paper by the Monetary Policy Committee at the Bank of England, April 1999 and Harrison, R, Nikolov, K, Quinn, M, Ramsay, G, Scott, A and Thomas, R (2005), *The Bank of England Quarterly Model*, Bank of England. The Bank's wider 'suite of models' does include richer asset price channels.

Chart 1 Money mentions[a] in MPC minutes and money growth



(a) Number of mentions of 'money' in 'Immediate policy decision' section of MPC minutes.

Committee's discussions during the back end of 2006 and into this year (**Chart 1**). With both having been strong for a while, some asked whether this marked some kind of change in the reaction function, implying a greater stress on nominal variables.

Given the near identity of deposits and bank lending, Money and Credit are often used almost inseparably, even interchangeably, with wider measures of non-bank credit looked at only when assessing the health of corporate and household sector balance sheets. But in some circumstances one can do better to approach things the other way round, starting with general credit conditions, examining the interactions of non-bank and bank lending, and then broad money as a (partial) counterpart to M4L. My remarks today will follow that structure, which will provide a framework for some observations about the current tightening in credit conditions, as well as about the preceding expansion.

Credit

Credit is, of course, vital to any economy, enabling households and firms to make choices about whether to bring forward or defer spending from income. There are conditions in which it would play no active role, passively reflecting cyclical fluctuations in output, employment and inflation. In a world of more or less complete transparency between borrowers and lenders, very low transactions costs, and very low risk aversion, access to credit would not be rationed; and *ex-ante* yields on financial assets, including loans and bonds, would not embody risk premia. So if households and firms wanted to bring forward spending in the face of shocks to the economy, they would be able to do so restricted only by their need to remain solvent.

But nobody believes that that is a description of the real world in which households and companies manage their affairs. Both are, to a greater or lesser degree, rationed in their access to credit, given that borrowers know a great deal more about their conditions and prospects than do risk-averse lenders, and that lenders face obstacles in ensuring that borrowers honour their contracts.(1) The availability, price and terms of credit — whether unsecured or secured — will be sensitive to a range of factors, including assessments of the idiosyncratic risks of a particular borrower, and the risks common across borrowers. Variations in these factors give rise to the possibility of a credit cycle.

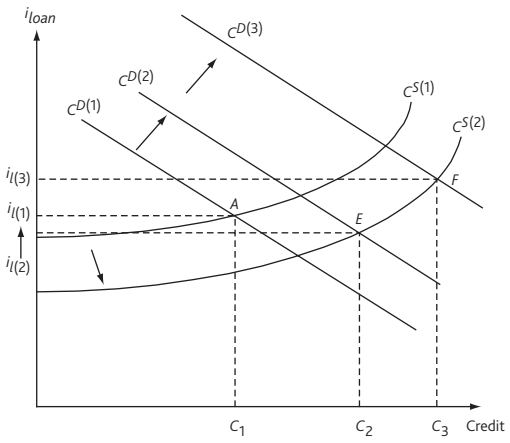
A borrower's ability to pledge collateral can help to overcome the problems of 'asymmetric information' and enforceability, by evidencing its net worth and giving it a continuing stake in its contract with the lender. This can give rise to the so-called 'financial accelerator' channel of the MTM, in which monetary policy works partly by affecting lending terms through its effect on asset values and so the net worth of borrowers.(2)

But credit conditions also depend on the access to credit of the lenders themselves. There is an important distinction here between intermediation across bank balance sheets and via the capital markets, although as I shall describe it turns out to be blurred.

Total credit: capital markets and securitisation

For the moment, I shall put that distinction to one side in order to focus on total credit. A series of environmental changes over the past decade or so have affected the quantity and price of credit generally. Greater macroeconomic stability, and perceptions that it will persist more or less uninterrupted, probably increased the supply of credit; and by reducing risk premia, may have increased demand too (**Diagram A**).

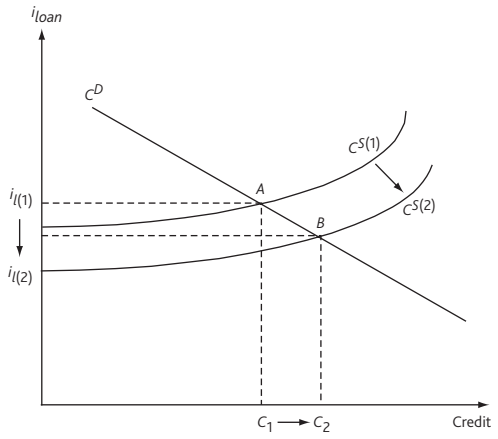
Diagram A Shifts in both supply of credit ($C^{S(1)} \rightarrow C^{S(2)}$) and demand for credit ($C^{D(1)} \rightarrow C^{D(2)}/C^{D(3)}$)



(1) Stiglitz, J E and Weiss, A (1981), 'Credit rationing in markets with imperfect information', *The American Economic Review*, Vol. 71, No. 3, pages 393–410.
(2) Bernanke, B and Gertler, M (1989), 'Agency cost, net worth, and business fluctuations', *The American Economic Review*, March, Vol. 79, No. 1, pages 14–31.

Other developments are more likely to have worked purely through credit supply. The most obvious is the growth of instruments such as credit derivatives and securitisation, associated with an increased role for rating agencies in monitoring credit risk. This was in effect a shock to technology, making portfolios transferable. By offering the prospect of better meeting desired risk profiles and by separating origination from investment, it has brought more non-bank financial institutions, and so more capital resources, into the credit markets, increasing the supply of credit (**Diagram B**).

Diagram B Shifts in supply of credit ($C^{S(1)} \rightarrow C^{S(2)}$), unchanged demand ($C^D$)



This seems to have been borne out in the significant shift in actual credit quantities and prices up to the middle of this year.

In the United Kingdom, non-bank lenders have accounted for a greater share of credit extension to both the household and corporate sectors (**Charts 2–4**).

A lot of that has been securitised (**Chart 5**). For the household sector, spreads on securitised portfolios of both secured and unsecured credit fell between 2003 and 2005 (**Chart 6**). That will have contributed to the fall in effective rates on the underlying mortgages and personal loans (**Chart 7**).

The same broad picture holds for the corporate sector (**Chart 8**). An illustrative decomposition suggests that, especially for sub-investment grade borrowers, the compression of spreads could not be explained solely by reduced compensation for default risk, with the excess possibly reflecting lower liquidity premia (**Chart 9**).(1)

These falls in spreads were material relative to the changes in the MPC's Bank Rate and to the risk-free yield curve. For example, in the latest 'policy cycle', we increased Bank Rate by 125 basis points over eleven months from August 2006. During that period, effective rates on new mortgages rose by closer to 50 basis points. In other words, from around 2003, monetary policy needed to take account of a progressive loosening of credit conditions.

The tables have now turned. Spreads have risen; the issuance of securitised portfolios of household loans has collapsed; corporate bond issuance has fallen (**Charts 10–11**). It is pretty clear that, for the time being, there has been an adverse shift in the supply of credit from the non-banking sector. In part, that seems to be due to investors becoming less confident that they can base decisions about exposures to complex credit portfolios on rating agency ratings; this is akin to lenders deciding that their monitoring of risk was less good than they thought. In part, it is due to various types of non-bank investor in credit finding themselves facing actual or incipient liquidity pressures. Both as cause and effect, liquidity in the capital markets is impaired. This is apparent in the opening up of a so-called 'negative basis' between the spreads on corporate bond and on equivalent credit default swaps, which unbundle the transfer of credit risk from the provision of funds and so are less affected by liquidity hoarding (**Chart 12**).

A twin-engine financial system?

At various times over the past decade or so, it had been argued(2) that the macroeconomy as a whole should be more resilient to shocks to a financial system with 'twin engines' — combining capital markets with banking system intermediation of savings and credit. The argument is that when the capital markets are impaired, banking can take more of the burden, and *vice versa*. I have a good deal of sympathy for this view — but not for all circumstances. It rather overstates the independence of capital markets and banking, as recent developments graphically demonstrate.

First, whether through financing the purchase of credit assets by leveraged funds or warehousing portfolios prior to sale or providing 'liquidity lines' to conduits and other investment vehicles, the banking system puts its capital and liquidity behind the distribution of credit risk to the wider asset manager universe. As the official sector stressed over recent years, it is important to be clear about the circumstances in which risk can flow back to the banking system.(3)

Second, the 'twin-engines' view draws too absolute a line between banks and non-bank financial intermediaries. Alongside other asset managers, banks have been material investors in securitised credit. In some respects, it may be more useful to distinguish between intermediaries on the basis of whether they undertake some combination of maturity transformation, leveraging their balance sheets, and

(1) See Webber, L and Churm, R (2007), 'Decomposing corporate bond spreads', *Bank of England Quarterly Bulletin*, Vol. 47, No. 4, pages 533–41.
(2) Alan Greenspan made this point a few times.
(3) For example see Tucker, P M W (2007), 'A perspective on recent monetary and financial system developments', speech at Merrill Lynch Conference on Hedge Funds, *Bank of England Quarterly Bulletin*, Vol. 47, No. 2, pages 310–16.

Chart 2 Total credit to UK households

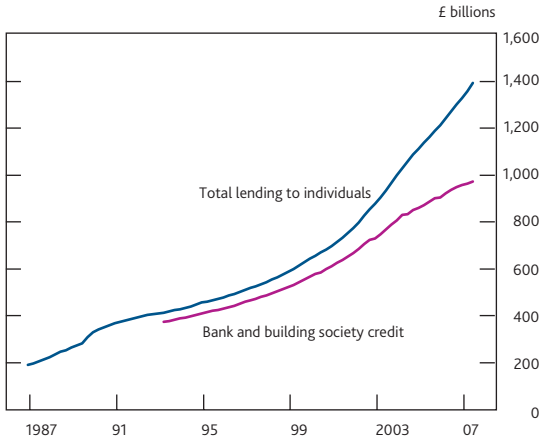


Chart 3 Total credit to UK private non-financial companies

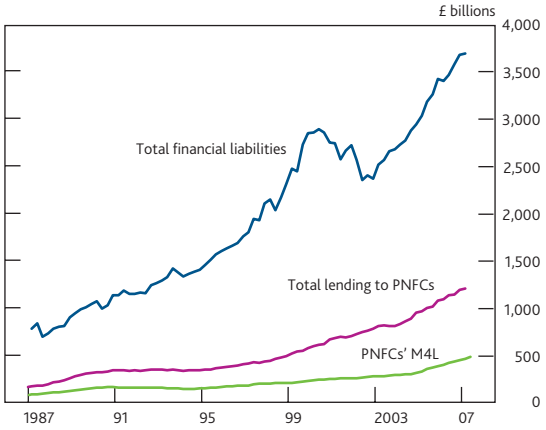


Chart 4 Shares of total lending to UK households

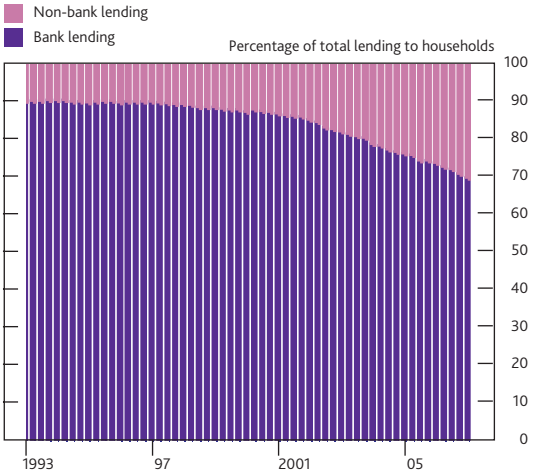


Chart 5 Securitisations relative to stock of M4 lending

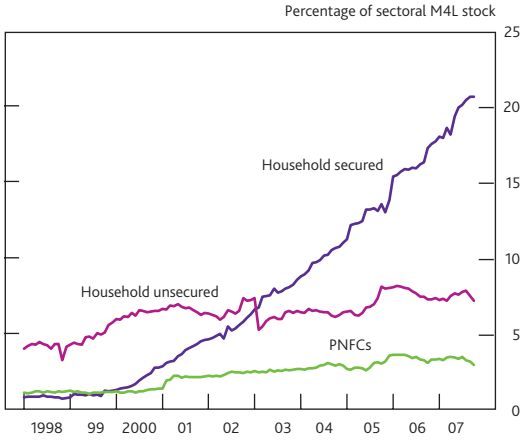
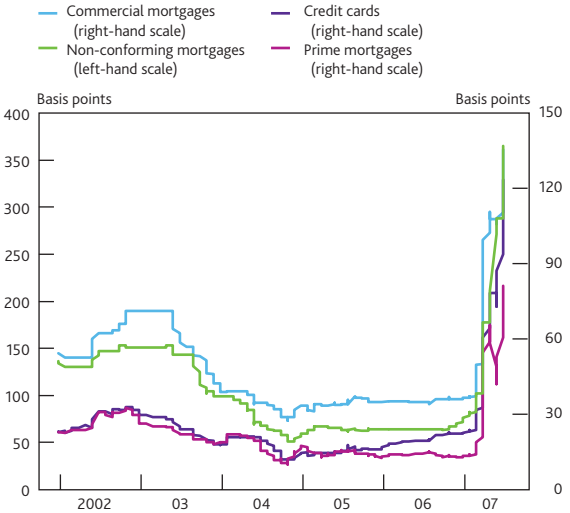


Chart 6 UK household sector asset-backed security spreads



Note: Weighted averages of AAA, AA, A and BBB five-year spreads for prime and commercial mortgages and of AAA, A and BBB five-year spreads for credit cards and non-confirming mortgages.

Source: LehmansLive.

Chart 7 Spread of effective mortgage and personal loan rate (new business) to Bank Rate

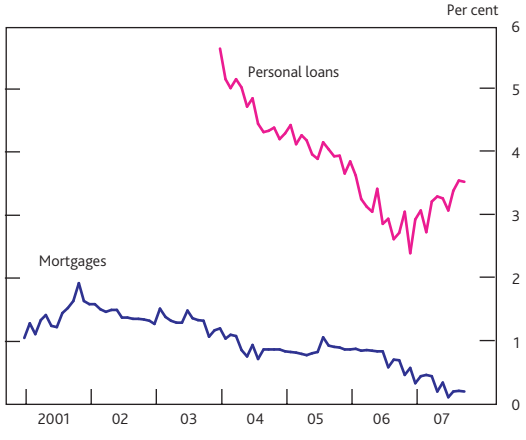
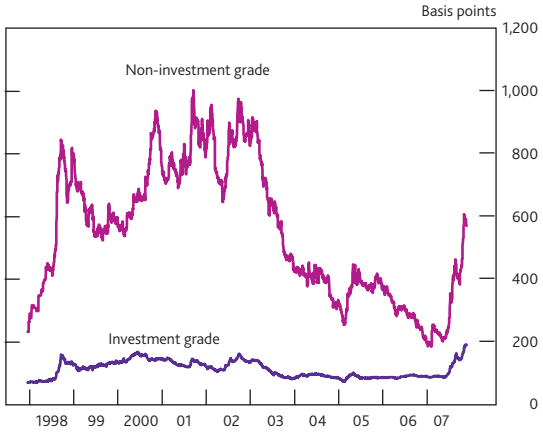
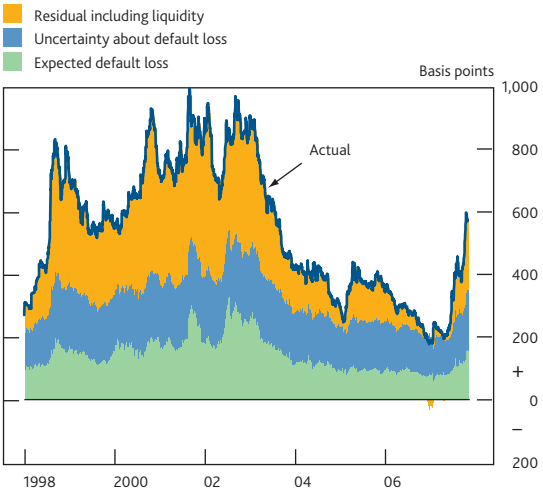


Chart 8 UK corporate bond spreads



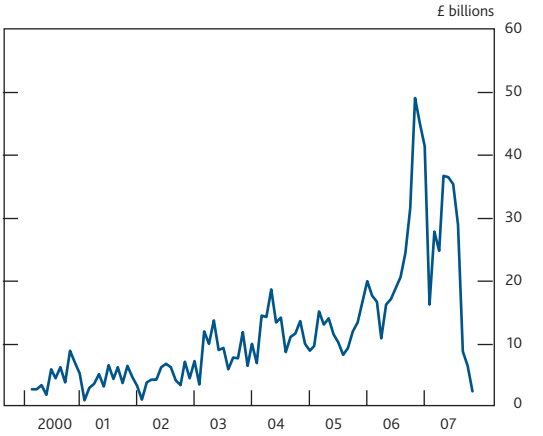
Sources: Bank of England and Bloomberg.

Chart 9 Decomposition of UK non-investment grade corporate bond spreads



Sources: Bank of England and Bloomberg.

Chart 10 Issuance of UK residential mortgage-backed securities



Source: Dealogic.

Chart 11 Gross corporate bond issuance by UK private non-financial companies (all currencies)

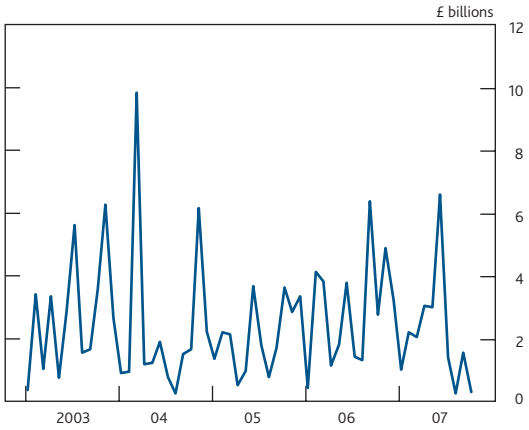
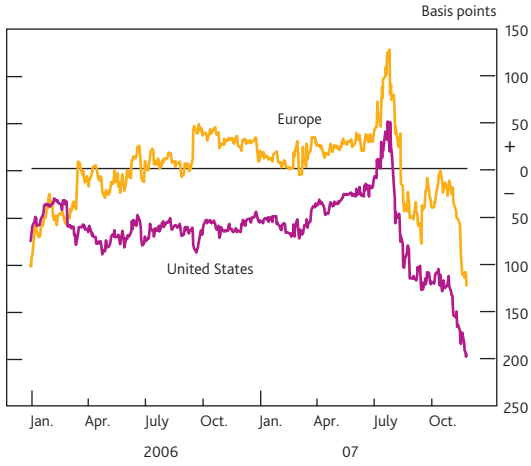


Chart 12 Basis between credit spreads on bonds and credit default swaps



Note: The difference between: US CDX crossover index and a BB-rated US corporate bond index; and European iTraxx crossover index and a European BB-B rated corporate bond index. This is because the iTraxx crossover index has a lower average rating than the CDX crossover.

Sources: JPMorgan Chase & Co. and Merrill Lynch.

mark-to-market valuations. Banks are not alone in having these characteristics, and so there can be common shocks to bank and non-bank investors. In a recent series of papers,(1) Hyun Shin has argued that balance sheet management of this kind amplifies the credit cycle. That sounds like the 'financial accelerator' model, except that Shin's position is that the outcomes can exceed those warranted by fundamentals. His argument is that in the upswing of a business cycle, the rise in asset values increases the accounting net worth of banks and other intermediaries, enabling them to leverage up their

(1) Tobias, A and Shin, H S (2007), 'Liquidity, monetary policy and financial cycles', paper prepared for *Current Issues in Economics and Finance*. Tobias, A and Shin, H S (2007), 'Liquidity and financial cycles', paper presented at the 6th BIS annual conference on *Financial System and Macroeconomic Resilience*. Analytically, the argument, as summarised in the main text, needs to be supplemented with a mechanism that somehow impedes checks and balances from preventing the overshooting of fundamentals.

balance sheets. This expands credit; and increases the liquidity in capital markets, reducing liquidity premia embodied in asset prices; and so on. And when the music stops, the process can be reversed as falls in asset values, leverage and liquidity feed on each other. (For Shin, the villain is mark-to-market accounting, although I would not want its virtues in reducing forbearance to be overlooked.)

Third, the 'twin-engines' view may place insufficient weight on banks having remained the principal originators of credit, given that small firms and households cannot issue bonds directly into the capital markets. It has been argued that the growth of markets for securitising loan portfolios made banks less relevant to overall credit conditions, and so to the business cycle, because a bank's ability to originate credit becomes less intimately bound up with its own financial strength.(1) But if, as currently, the capital markets' appetite for securitised credit diminishes, a larger proportion of loans will after all remain on the balance sheets of banks.

All this brings back into focus the potential macroeconomic relevance of bank lending.

Bank lending

The economic literature on the 'bank lending' channel of the MTM explores the conditions under which a tightening of monetary policy causes the terms on bank lending to tighten over and above the increase in risk-free short-term real rates. The literature has typically assumed (i) that a monetary policy tightening is effected by the central bank withdrawing reserves from the system (or slowing the pace of reserves injection); (ii) that banks are required to hold a proportion of transactions deposits in reserves, so that reduced reserves provision entails slower deposit growth; and (iii) that they do not have unrestricted access to liabilities that are not subject to reserves requirements, and so cannot fill the gap left by slower deposit growth and must, instead, slow loan growth, which they do by tightening credit conditions.(2) The first two steps seem archaic. We effect monetary policy changes by controlling the price not the quantity of central bank money in the system; and, in the United Kingdom, banks choose their own reserves targets rather than having them determined by a balance sheet ratio of some kind.

But the third plank in these models — restricted access to non-deposit liabilities, whether capital like or not — plainly is still relevant today. In a world of asymmetric information, banks do not have unrestricted access to resources, and we do not believe that a bank's lending behaviour is invariant to its capital gearing or to the composition of its liabilities.(3) We do, therefore, face questions about the extent to which a shock to banks' liquidity or capital resources can bring about a shift in credit conditions with macroeconomic effects that, other things being equal, monetary policy should seek to offset in order to maintain aggregate demand in line with aggregate supply.

Over the past fifteen years or so, when banks have seemed anything but restricted, easier access to liquidity or capital may have brought about a progressive relaxation of bank lending conditions. That this featured in commentary on monetary policy rather less than the recent manifest tightening may say no more than that sharp contractions attract more attention than gradual expansions. In a similar vein, on the whole, research does better at identifying these 'credit channel' mechanisms in the context of particular stressed episodes than in longer-run averages.(4)

Be that as it may, it is beyond doubt that there has recently been an adverse shock to bank balance sheets — involving capital, liquidity, and a potent 'asymmetric' information mechanism affecting a wide range of banks. I will pick out four elements in the story, involving liquidity, counterparty credit risk and capital.

First, near closure of the capital markets for leveraged loans, conduit and SIV commercial paper, and RMBS has left banks whose business model is 'originate and distribute' unexpectedly holding on to loans and, in addition, facing the prospect of having to take assets back on to their balance sheets. The consequent reintermediation is a hit to both capital ratios and liquidity, as the banks have bigger books to fund. For these reasons alone, big picture, banks responded from August onwards by tightening loan terms and hoarding liquidity.

But the story does not end there. The second element is that access to resources (uninsured deposits) from outside the banking sector has become more restricted since the summer. While the new risk-transfer instruments have plainly dispersed risks, lack of *ex-ante* disclosure left market participants highly uncertain about the scale and distribution of losses across the banking sector itself. On top of that, open-ended investment vehicles that have (or may have) themselves invested in structured finance paper have felt compelled to preserve liquidity, to guard against redemption risk. And one significant source of demand for bank hybrid capital instruments over the past half-decade or so, the SIVs, has been turned off due to

(1) Loutskina, E and Strahan, P E (2006), 'Securitisation and the declining impact of bank finance on loan supply: evidence from mortgage acceptance rates', *National Bureau of Economic Research Working Paper No. 11983*. And Estrella, A (2002), 'Securitization and the efficacy of monetary policy', *Economic Policy Review*, Vol. 8, No. 1.

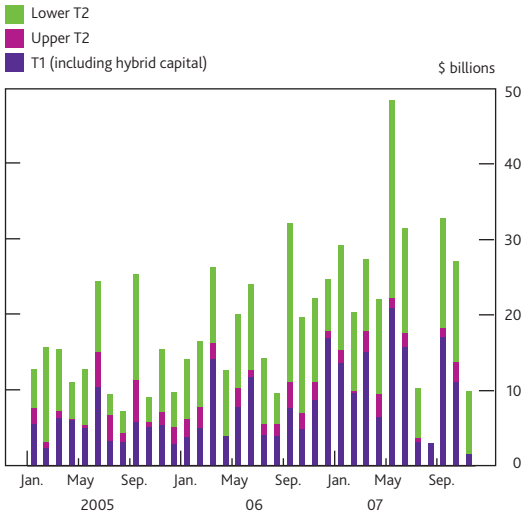
(2) For an overview of early work see Kashyap, A K and Stein, J C (1994), 'Monetary policy and bank lending', in Mankiw, N G (ed), *Monetary policy, studies in business cycles*, Vol. 29, pages 221–56.

(3) In a Modigliani-Miller world of perfect capital markets, a bank's overall cost of funds is independent of its capital and funding structure. As a result the level of bank capital and the balance of wholesale and retail funding are not relevant to bank lending decisions and so do not affect the monetary transmission mechanism.

(4) Bernanke, B S and Lown, C S (1991), 'The credit crunch', *Brookings Papers on Economic Activity*, No. 2, pages 204–39.

their own funding problems. Taken together, the upshot for the banking system has been a shortening in the maturity of wholesale deposits, and an intermittent tightening of access to hybrid capital instruments (**Chart 13**).

Chart 13 Global capital issuance by tier



Source: Dealogic.

Coming on top of an involuntary increase in risk-weighted assets and reduced access to term liquidity, the third component of the shock, apparent since late autumn, has been some actual impairment of capital resources. Large banks especially have progressively written down the values of structured finance assets, reflecting deterioration in the underlying position of the US household sector and in the values of a wide range of leveraged instruments. But the adjustment is drawn out, partly due to uncertainty about appropriate mark-to-market valuations given the impaired liquidity in ABS markets. To avoid this process amplifying the credit cycle,(1) some replenishment of common equity may be needed, and has already begun.

The fourth element in the story, under way since August, has been distributional. Banks relatively reliant on wholesale funding have bid up for funds. But doing so has been taken as an adverse signal, prompting further rationing of wholesale money market lending at term maturities and potentially deterring the strong from entering the market; this is what is known as a 'lemons' problem.(2) In the United Kingdom, since August, mortgage approvals and secured lending have declined by more at the medium-sized mortgage banks and specialist lenders than at the largest UK banks, partly due to Northern Rock (**Charts 14–15**). This was symmetric. Their mortgage portfolios grew faster over the previous years. All told, this looks like a manifestation of the Kashyap and Stein finding, in various non-UK settings, that lending is more cyclically variable at banks that start off with weaker balance sheets;(3) or, as I would prefer to put it, with concentrated income streams and/or funding sources.

Chart 14 UK mortgage approvals

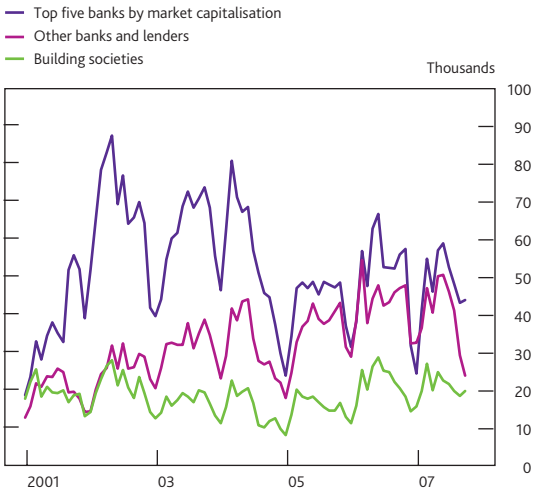
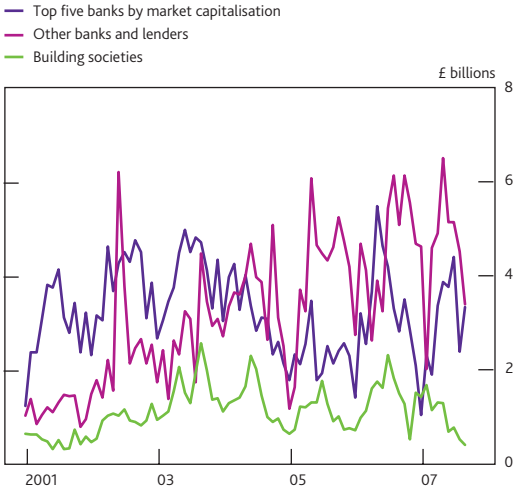


Chart 15 UK net secured lending to households



Won't the macroeconomic effect of this be dampened by the bigger and more diversified banks picking up the slack? It is important to distinguish the longer term from the near term.

The longer-term impact will depend on whether the structure of the industry shifts. The securitisation boom seems to have altered the terms of trade in UK banking for a while. By reducing reliance on retail deposits, it reduced barriers to

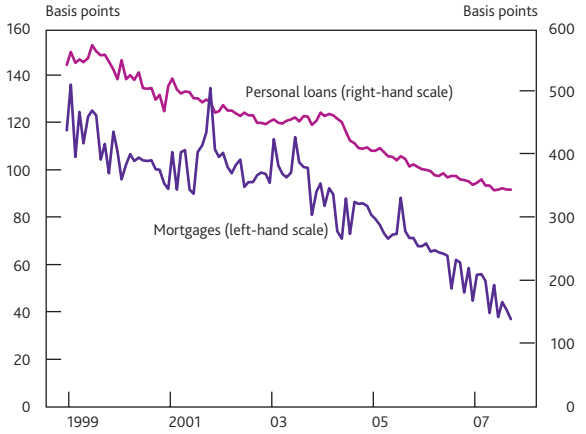
(1) Van den Heuvel, S J (2002), 'Does bank capital matter for monetary transmission?', Federal Reserve Bank of New York, *Economic Policy Review*, May.

(2) Akerlof, G A (1970), 'The market for 'lemons': quality uncertainty and the market mechanism', *Quarterly Journal of Economics*, Vol. 84, No. 3, pages 488–500. A market for 'lemons' issue arises when informational deficiencies give rise to uncertainty about the true quality of a product. In such circumstances, buyers choose to pay only average prices for goods that carry the risk of sellers overstating their true quality. As a result, sellers of good products, having little incentive to participate in such markets, are driven out by those sellers of poor-quality products. The most common example of the problem is the market for used new cars. Rationing in the interbank markets is discussed by Freixas, X and Jorge, J (2007) in 'The role of interbank markets in monetary policy: a model with rationing', Universitat Pompeu Fabra, *Economics Working Papers*.

(3) Kashyap, A K and Stein, J C (2000), 'What do a million observations say about the transmission of monetary policy?', *The American Economic Review*, Vol. 90, No. 3, pages 407–28.

entry. Lenders' margins fell (**Chart 16**), and credit conditions in the UK mortgage market eased. Conversely, the painful reminder that undiversified funding and income sources may leave a bank unusually vulnerable will probably bring about another shock to the structure of the market. The persistent tightening in mortgage credit that that would bring was a factor in the MPC's November projections.

Chart 16 Lenders' margins on UK mortgages



Note: Spreads of effective rates on stocks of lending over appropriate funding costs.

In the near term, the extent to which the big or more diversified banks fill the gap will depend on the extent to which they too preserve capital and liquidity in the face of the harsh environment I have described.

Money, or bank intermediation

So far I have focused entirely on credit. Where does this leave money (or Money), the starting point for much traditional monetary analysis?

Well, much that I have said about banks — their capacity, in the short run, to lever up their balance sheets and expand credit at will; their role in providing liquidity insurance to investment vehicles and corporates — turns precisely on their liabilities being money. And for this reason, banks are after all decisively different from other intermediaries.

As transactions balances and so the means of exchange in our payments system, the moneyness of bank deposits lies at the core of credit intermediation. Subject only but crucially to confidence in their soundness, banks extend credit by simply increasing the borrowing customer's current account, which can be paid away to wherever the borrower wants by the bank 'writing a cheque on itself'. That is, banks extend credit by creating money. This 'money creation' process is constrained: by their need to manage the liquidity risk — from the withdrawal of deposits and the draw-down of back-up lines — to which it exposes them.(1) Adequate capital and liquidity, including for stressed circumstances, are the essential ingredients for maintaining confidence.(2)

If that excursion into the realm of financial stability appears to have drifted away from the immediate issue of Money, it is because the health of bank balance sheets is relevant to both the demand for money and its supply, even if this is apparent only occasionally.

Charles Goodhart has already, and very usefully, stressed the importance of recovering the notion of shocks to the supply of broad money.(3) In the main, however, in terms of the underlying drivers, we are talking here of shifts in the supply of broad money caused by shocks to the supply of bank lending: banks create money by extending credit (**Diagram C**). And as discussed earlier, key drivers in terms of bank balance sheet growth include the variables that underpin bankers' confidence in borrowers; and, conversely, confidence in banks themselves. It should come as no surprise that the 'credit channel' macroeconomic literature converged with bankers in focusing on the tangible collateral available from borrowers, and on their own capital and liquidity (which includes the *ex-ante* and *ex-post* terms on which they have access to central bank reserves).

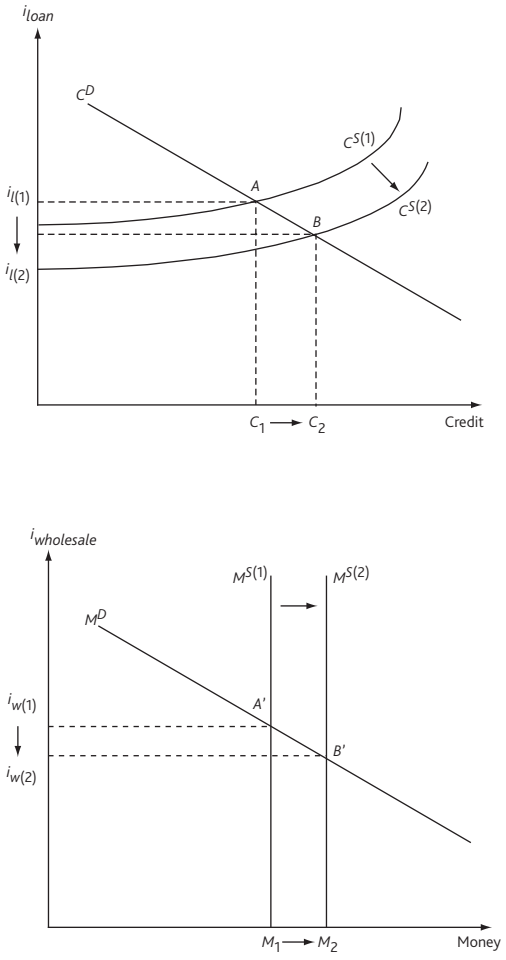
Some important things can be said about this account of shifts in the supply of broad money.

First, in contrast to the textbook account of shocks to the Money supply via the proverbial helicopter drop of base money (pound notes), firms and households are not caught in a bind where, in aggregate, they are forced to hold the increased supply of broad money, even if it exceeds demand. Following a shock to the supply of credit, in which some people or companies become less credit constrained, it will be open to others to reduce their existing borrowing as the extra money circulates around the economy via the purchase of goods, services and financial assets.

Second, and more important, the shocks to credit supply are, in themselves, real not nominal shocks. And like other real shocks, causing changes in the balance of Aggregate Demand and Aggregate Supply, there is a nominal effect only if monetary policy does not respond via alterations to the path of short-term interest rates to keep the economy on a stable path and in line with the inflation target.

(1) See Kashyap, A K, Rajan, R and Stein, J C (2002), 'Banks as liquidity providers: an explanation for the coexistence of lending and deposit-taking', *The Journal of Finance*, Vol. 57, No. 1, pages 33–73.
(2) Acharya, V V, Shin, H S and Yorulmazer, T (2007), 'Fire sales, foreign entry and bank liquidity', *CEPR Discussion Paper no. 6309*.
(3) See Goodhart, C A E (2007), 'Whatever became of the monetary aggregates?', Peston Lecture at Queen Mary College, London; King, M A (2007), 'The MPC ten years on', lecture to the Society of Business Economists, *Bank of England Quarterly Bulletin*, Vol. 47, No. 2, pages 272–85; and Tucker, P M W (2007), 'Central banking and political economy: the example of the United Kingdom's Monetary Policy Committee', speech at the Inflation Targeting, Central Bank Independence and Transparency Conference, Cambridge, *Bank of England Quarterly Bulletin*, Vol. 47, No. 3, pages 445–52.

Diagram C Shifts in supply of credit ($C^{S(1)} \rightarrow C^{S(2)}$) and money supply

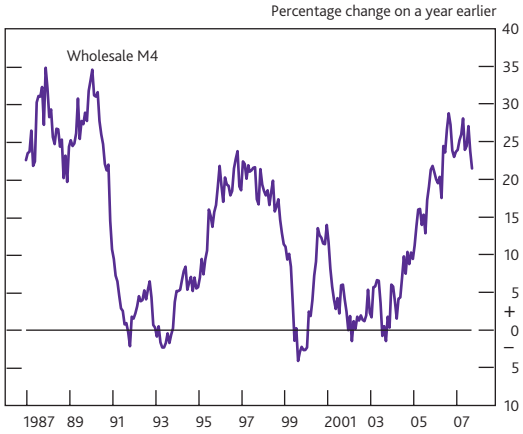


Absent an appropriate policy response, the easing in monetary conditions would in time feed into inflation through an expansion of nominal spending. In the first instance, the expansion of 'liquidity' represented by faster money growth may sometimes work through asset prices. That is because with imperfect substitution between different kinds of financial assets, relative risk premia may be altered, which in turn may affect borrowing conditions in capital markets.(1)

With an appropriate policy response, what should we expect to see in bank balance sheets, in broad money growth, following a credit-supply shock? It might be that the path for broad money should be unaltered in the medium term. In other words, a persistent acceleration (or deceleration) of M4 would be indicative of a nominal shock, jeopardising achievement of the inflation target. The world is not so simple, however. The underlying drivers of the change in the supply of bank lending, and so in broad money, may also bring about shifts in the demand for money, validating a different level for real money balances — perhaps most obviously, if investment and so the economy's productive capacity were affected.

For some underlying shocks, it is probably better to think about the effects on banking intermediation rather than simply on bank lending. Faced with a change in their costs and opportunities, bankers might sometimes be able to adjust the terms on either their assets or their liabilities (or both). Currently, banks have incurred an adverse shock to their wholesale funding (**Chart 17**). The evidence so far suggests that, as well as tightening terms for borrowers, they are improving rates offered on retail deposits.

Chart 17 UK wholesale M4 growth



Where does that leave us on Money? It is clear enough from the long-run relationship between money growth and inflation that prolonged shifts in money growth can be an amber light (**Chart 18**). And possible liquidity effects mean that, through risk premia, shifts in the quantity of money may feed back into financial asset markets and so into broader credit conditions. But there are no 'easy wins' when it comes to analysing Money demand and supply.(2)

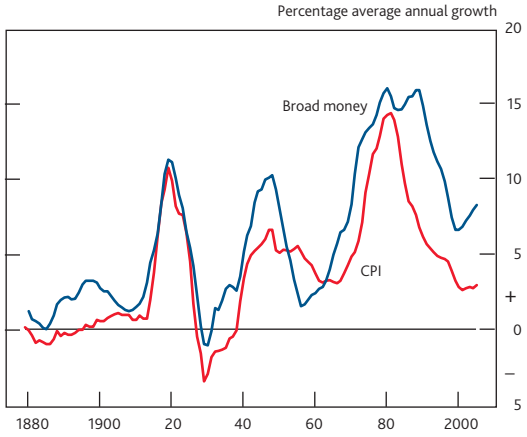
Money and credit in the current conjuncture

Those challenges are certainly apparent right now. Judging from a combination of market intelligence, surveys and prices, there is no doubt that credit conditions for both households

(1) There is an echo here of a channel stressed by Brunner and Meltzer, but with the impulse coming from the central bank's short-term interest rate rather than the quantity of reserves, and the transmission into risk premia and so other asset prices coming via the expected path of the policy rate and broad money rather than via narrow money. See Brunner, K and Meltzer, A (1993), 'The monetary mechanism: markets for assets', second Raffaele Mattioli Lecture in *Money and the economy: issues in monetary analysis*, CUP, reprinted 1997.

(2) Perhaps nothing illustrates this as cleanly as the advent of credit derivatives. Derivatives of any kind unbundle funding (and so liquidity risk) from the underlying risk to which an agent is seeking exposure via a particular contract. So a credit derivative unbundles credit risk from funding. This further complicates interpretation of the bank lending data (M4L). Imagine that, due to their customer networks and screening capability, banks originate all credit, but that they use credit default swaps to shed a great portion of the credit risk via CDS to non-bank financial institutions. In the limit, this would be a world in which M4L correctly measured (bank) lending and M4 was one useful measure of 'liquidity'. But it would also be a world in which shocks to credit conditions from capital and risk appetite worked largely through non-bank lenders, and in which shocks to liquidity worked largely through depositor confidence in the banking system. In the real world, this story underlines the need to look at total credit, and to analyse the monetary data with finesse.

Chart 18 Ten-year rolling averages of UK broad money growth and inflation



Sources: Capie, F and Webber, A (1985), 'A monetary history of the United Kingdom, 1870–1982', and ONS.

and firms have tightened materially. The Bank's new *Credit Conditions Survey*, published for the first time in September, recorded a clear tightening in availability of credit to corporates over the previous quarter. A month later, a mini survey unsurprisingly revealed tighter conditions for households too.(1) Spreads on corporate and household credit are already higher across the board; and for risky borrowers, financing costs have risen notwithstanding the fall in risk-free yields.

Since August, the MPC has stressed, however, that it will not be sufficient in these circumstances to look solely at the price of credit, as there could be increased quantity rationing. The standard view is that households and small firms are more likely to be adversely affected in such circumstances than large firms, which typically have greater access to capital markets. But as this disturbance affected the wholesale loan markets, we will need to monitor conditions for corporate bond and loan issuance. Indeed, we will need to look at total credit, and carefully across different sectors to track the impact of the tightening. But timely and rich data are available on just bank lending. And interpreting them is not straightforward given the nature of the shock to the system. If reintermediation is significant, banks will be taking back on to their balance sheets conduit and investment vehicle paper or just holding onto loans for longer than usual before they can be sold onto the capital markets. It cannot be ruled out that, for a while, the M4L growth rate may deceive as to the underlying pace of credit expansion in the economy.

That is important because, in a nutshell, the turmoil in financial markets is not just a 'City' event. How potent it will be macroeconomically will depend on how long current conditions persist, and the feedback loop between the financial economy and the real economy.

As to its persistence, necessary conditions for an alleviation of the current strains in credit markets are probably at least twofold. First, that the US housing and household debt markets stabilise. Second, that banks and other financial intermediaries recognise impairments to asset values, so that uncertainties about counterparty credit risks begin to reduce.

On the financial-real economy interaction, we must try to avoid a vicious circle in which tighter liquidity conditions, lower asset values, impaired capital resources, reduced credit supply, and slower aggregate demand feed back on each other. A variety of policy responses are possible. The announcement yesterday by central banks of co-ordinated action via term auctions to alleviate pressure in financing markets is directed at that. Second, regulatory authorities around the world are monitoring banks' liquidity and capital positions, including in the context of Basel II. And, third, monetary policy also can in principle play a role, through what is effectively a 'financial accelerator' working through bank balance sheets, where that is consistent with maintaining stable inflation in the medium term.

In the United Kingdom, the starting point has been robust domestic demand; the leveraged buyout sector aside, generally healthy corporate balance sheets; somewhat more vulnerable household balance sheets;(2) and potentially stretched commercial and residential property prices.

At the Committee's November meeting, I explored the case for an 'insurance cut' addressed to the downside risks from tightening credit conditions. The case for such a cut was strengthened by Bank Rate, at 5¾%, standing at a level that was most probably mildly restrictive. But that had to be weighed against the upward pressures on inflation stemming largely from the rise in energy and other commodity prices. Our November projections seemed to me likely to validate the expectation already embodied in the money market curve that Bank Rate would over time be lowered, representing some offset to the tightening in liquidity and credit premia. That being so, on balance, I concluded that an immediate cut was not necessary; and that 'no change' would give the Committee a valuable opportunity to explain in the *Inflation Report* the implications of both the credit and commodity shocks, underlining that the Committee remains focused on anchoring inflation expectations and so achieving the inflation target over the medium term.

Looking ahead, I noted the importance of distinguishing between, on the one hand, the passing through into the

(1) See the Bank of England's *Inflation Report*, November 2007, Section 1 on 'Money and asset prices', pages 16–17.
(2) '…households have increased their debt…more debt unavoidably leaves them more vulnerable to bad luck, eg adverse economic shocks', Tucker, P M W (2003), 'Credit conditions and monetary policy', speech at the Leeds Financial Services Initiative, *Bank of England Quarterly Bulletin*, Autumn, page 373.

macroeconomy of the shocks that had already occurred to credit conditions and to commodity prices; and, on the other hand, the possibility of new shocks on either or both fronts.

That was my starting point for our December meeting, the minutes of which will be published next week.

Summary and conclusions

Let me try to pull together some of my central themes.

I have stressed that we should take care to avoid talking about money when we mean credit. In a similar spirit, we should be clear when we mean total credit and when bank lending, but without assuming the two are divorced.

I have also stressed the need for attention to the underlying drivers of credit conditions throughout the economic cycle. In today's financial system, we may well need richer data on credit quantities and flows outside the banking sector, perhaps along the lines of the US *Flow of Funds* statistics. The Bank's new *Credit Conditions Survey* is also designed to give us better qualitative information to put alongside the quantity and price data. Even so, as with asset prices more generally, we will sometimes find it hard to distinguish between changes in credit conditions warranted by fundamentals and those that are not. Failure to recognise fundamentally warranted and sustainable shifts would deplete welfare. But it is distinctly uncomfortable for the world's central banks to rely entirely on mopping up after a bubble bursts: one imbalance can lead to another.(1) The central banking community does not yet have a satisfactory way through this dilemma.

And Money? It occupies one end of the liquidity spectrum, and so changes in the quantity of money might potentially affect risk premia, and so credit conditions more generally. Gauging that is a formidable challenge. As an input to policy, there is just no alternative to getting one's hands dirty in analysing the monetary data. With an institutional rather than functional definition of broad money, special care is needed not to be misled by shifts in the demand for money from the plethora of non-bank financial institutions. This is important if we are to use money as an indicator of nominal trends alongside survey and financial market based measures of inflation expectations.

That brings me back to where I began: with our policy reaction function. Occasionally the markets will be surprised by our policy decisions. But we should do all we can to avoid confusion about how we think about the economy and about monetary policy strategy. In the spring, my own view of the signals from broad money had not altered materially. So today I have tried to explain how I think about money, credit and the connections between them. That has provided a framework for some observations on the current conjuncture, underlining the need for careful attention to conditions in the banking system. Central banks should be, and need to be, well placed to undertake that analysis, which has rarely been more important than now.

(1) I argued this in Tucker, P M W (2006), 'Reflections on operating inflation targeting', speech at the Chicago Graduate School of Business, *Bank of England Quarterly Bulletin*, Summer, page 220.

Financial markets and household consumption

In this speech,[1] Professor Tim Besley,[2] a member of the Monetary Policy Committee, reports on research on the relationship between consumption growth and access to finance for UK households. Professor Besley argues that improved access to financial markets over the past 20 years has allowed consumers to smooth expenditures associated with purchases of durable goods, such as housing, and has allowed for greater opportunities for borrowing and/or for saving. He presents a specific quantitative measure of the terms on which households have accessed the credit market over 31 years — the Household External Finance (HEF) index. Periods of credit market tightness, as measured by high values of the HEF index, are associated with periods of weak consumption growth. He notes that the HEF index seems to play a role in explaining household consumption alongside other traditional variables, and that these relationships are most prevalent among younger households. He concludes that considerable weight should be placed on conditions in financial markets in understanding the transmission of monetary policy to the real economy. But there is a great deal of uncertainty, and depending on how credit market conditions stabilise, this may have only a temporary effect on consumption growth.

Ladies and Gentlemen, thank you for coming. It is a great pleasure to be addressing you here at the IFS with which I am proud to have had a long-standing association as a Research Fellow. The IFS provides formidable commentaries on economic policy issues in the United Kingdom and brings to bear the best economic analysis and evidence to issues that it studies. When it comes to formulating policy, I am firmly of the view that there is no substitute for a good balance of economic analysis and evidence.

Recent events are making the job of the MPC extremely challenging. As you are well aware, the UK economy has in the past few months experienced significant shocks with implications for both inflation and activity. Rising energy and food prices, along with a lower exchange rate, will increase inflation in the near term. At the same time, recent turmoil in financial markets is resulting in tighter credit conditions. This is leading to a weaker picture for world growth which, along with its direct effect on the United Kingdom, is posing a downside risk to growth in demand and output. Responding to either of these events on its own would be challenging. But the combination creates extra complications with which we are now coming to terms. Against this background, the MPC decided on a 25 basis points cut in Bank Rate at its meeting of 7 February. The *Inflation Report*, published last Wednesday, elucidated the current best collective judgement of the MPC and the minutes to be published next Wednesday will explain further the thinking of the Committee at its last meeting.

The shocks to the UK economy that I have just described have created a challenge to policy. As a member of the MPC, I will be trying to judge what level of Bank Rate is needed, in line with our mandate, to achieve the inflation target of 2% CPI inflation in the medium term. Among other things, this will mean forming a judgement on how conditions in financial markets are affecting the real economy.

Many commentaries on these issues offer qualitative judgements about the effect of either shock described above on inflation and output growth. But in making monetary policy work, it is necessary to go beyond this and to form quantitative judgements to get a feel for the balance of risks. While we are confronted with large amounts of data on a wide variety of indicators on an almost daily basis, the difficult job is to analyse and process this to form a coherent view of where the economy is heading. A key judgement is when and whether a piece of data coming from any particular source contains sufficient news to challenge one's view about the outlook for the economy. The MPC process makes much use of economic models and quantitative analysis as a guide to its decision-making. As an academic economist, I am used to

(1) Given at the Institute for Fiscal Studies (IFS), London on 18 February 2008. This speech can be found on the Bank's website at www.bankofengland.co.uk/publications/speeches/2008/speech334.pdf.

(2) I would like to thank Charlie Bean, Andrew Holder, Neil Meads, Sally Reid, Nicola Scott, Paolo Surico and Garry Young for comments and assistance. The views expressed are my own and do not necessarily reflect those of the Bank of England or other members of the Monetary Policy Committee.

formulating and estimating quantitative models that allow us to think about policy issues.

Today, I would like to report on some research that I have been doing with Neil Meads and Paolo Surico who are staff members in the External MPC Unit at the Bank of England.(1) The results that I am discussing today are helping to shape my view of how developments in financial markets are likely to affect the path of household consumption in the next year or so.

Before turning to what we have found, it will be useful to discuss some background issues in order to set the scene for the work that we have been doing.

The economic theory of consumption smoothing says that consumers will wish to manage any mismatch between their desired pattern of consumption and earnings. For example, consumers who anticipate a rising income profile may wish to borrow early in life (external finance) and save later in anticipation of retirement (internal finance). Access to financial markets also allows consumers to smooth expenditures associated with purchases of durable goods such as housing. The development of financial markets has allowed for greater opportunities for borrowing and/or better opportunities for saving. Over the past 20 years or so, such opportunities have expanded and have been made available to a wider group of households.

Focusing on the past ten years, credit conditions to households do appear to have relaxed rather markedly. Given developments in the wider economy over this period, this qualitative picture makes sense. The economy has been remarkably stable. The fall in unemployment from 7.2% in 1997 to 4.7% in 2005 reduced a key risk from lending to households. Low nominal interest rates against the backdrop of low and stable inflation reduced carrying costs of a given loan. Greater securitisation in the market for asset-backed securities and structured credit products allowed the possibility of greater risk-sharing from a given lending portfolio. There has also been increased competition among lenders which may have driven down margins and made credit terms more attractive to borrowers.

The consequences of relaxed credit conditions are reflected in what happened to the price and quantity of credit over this period. This is illustrated in **Charts 1** and **2**. The first shows that the quantity of both secured and unsecured debt, relative to disposable income, increased over this period. The second shows that, for mortgages, the spread between borrowing rates and Libor diminished, up to the summer of 2007. At the same time, household net financial assets have largely kept pace with increasing debt levels over the recent past (**Chart 3**). Nonetheless, over this period, concerns about the aggregate level of household indebtedness have been voiced frequently. However, the aggregate values are probably not very helpful in assessing the full macroeconomic risks associated with these developments, which depend on the proportion of borrowers at the riskier end of the spectrum.

Chart 1 Household debt to income ratios

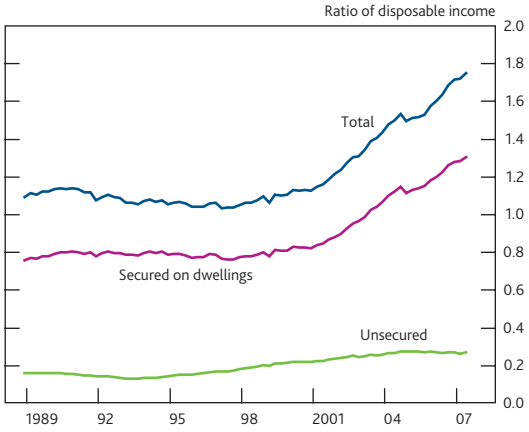


Chart 2 Change in borrowing rate spreads since 2001

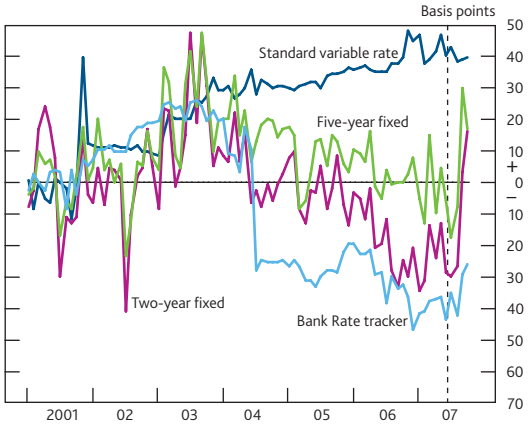
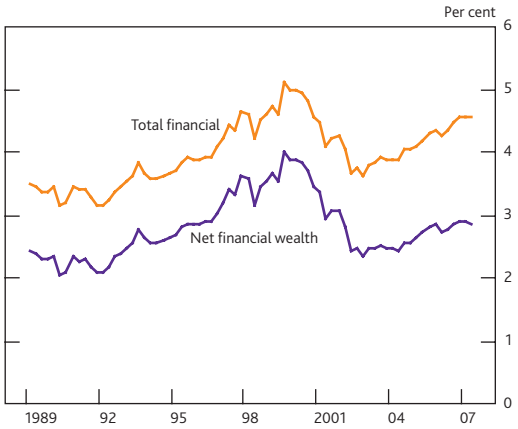


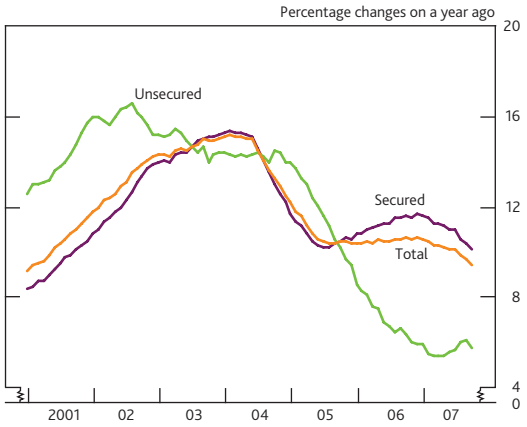
Chart 3 Financial and housing wealth to income ratios



(1) See Besley, T, Meads, N and Surico, P (2008), *Household external finance and consumption*, available at www.bankofengland.co.uk/publications/speeches/2008/speech334paper.pdf.

The developments in financial markets that I have described were the backdrop to the early period of my membership of the MPC. The rapid expansion of credit and increases in a wide variety of asset prices in part underpinned my judgement that we needed to raise rates quite quickly to lean against such developments in order to meet the inflation target in the medium term. I claim no special prescience — puzzlement at the compression of risk premia in a variety of financial markets had been a frequent refrain of central bankers (including the Bank of England) throughout this period. Some reappraisal of risk was, however, already taking place as evidenced in the fall in the rate of growth of unsecured lending from mid-2005 onwards depicted in **Chart 4**.

Chart 4 Secured and unsecured lending growth



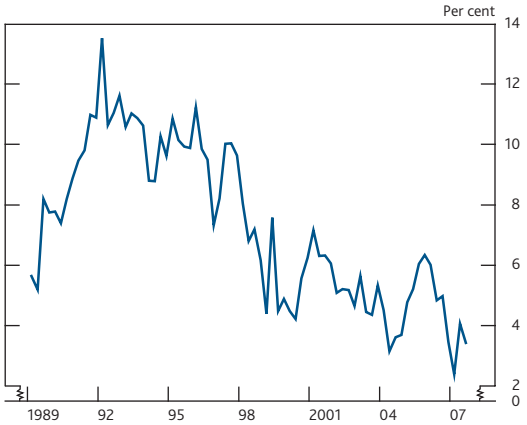
Since the middle of last summer, there has been a more general reappraisal of risk in financial markets whose consequences are still working through to households and businesses. One consequence of the disruption that this has created is that markets for asset-backed securities in the United Kingdom have all but closed. Spreads have widened, at first to reflect a liquidity premium but latterly to reflect increased credit risk.

The Bank's *Credit Conditions Survey* for 2007 Q4 confirmed that these developments are likely to worsen the prices and quantities of credit available to households in the United Kingdom.(1) But it is very difficult to judge what the path of adjustment might be and what kind of 'normal' market conditions will emerge in the end. But it seems like a fair judgement that a return to the conditions seen for secured lending in the first half of 2007 is not imminent.

The period of relaxed credit conditions that I have described also saw robust consumption growth. The flip side of this is the fairly persistent fall in the household savings rate over this period, as shown in **Chart 5**. This had reached 3.4% in 2007 down from 9.4% in 1997.

Among the motives for saving is as a precautionary measure against unforeseen future events. By substituting for precautionary savings, increased economic stability and the ability to access credit may well have contributed to the fall in the saving ratio. For example, flexible mortgage lending to homeowners with significant housing equity may allow access to housing equity in times of need. Thus, there is a plausible economic story linking credit availability and consumption growth over the period in question.

Chart 5 Household saving to income ratio



In the research that we have been doing, we attempt to quantify how much of the consumption growth that we have seen in the United Kingdom can be attributed to better household access to external finance. Previous work in this area has been hampered by the difficulty of finding a suitable measure of household access to external finance. We follow an idea of the Oxford-based economist — John Muellbauer — who together with his co-authors has used data from mortgage lending to create a measure of credit conditions.(2) However, the measure that we extract from the data is rather different from theirs.

The underlying source of data is the Survey of Mortgage Lenders, which contains information on an average of 40,000 randomly selected borrowers per year over the period 1975–2005.

Our measure of household access to external finance is created in two steps. At step one, we look at the average relationship between the spread over Bank Rate that an individual pays on their mortgage when they take it out. This spread can be interpreted as a risk premium, telling us how much the lender demands as compensation for risk in order to lend to any particular borrower. We find, consistent with conventional wisdom, that individuals pay a smaller spread if their income is higher and they have more collateral. We also find that regional house price developments affect the spread

(1) Available at www.bankofengland.co.uk/publications/other/monetary/creditconditions.htm.
(2) See Fernandez-Corugedo, E and Muellbauer, J (2006), 'Consumer credit conditions in the United Kingdom', *Bank of England Working Paper no. 314*.

with higher house prices being associated with a lower spread, other things being equal.

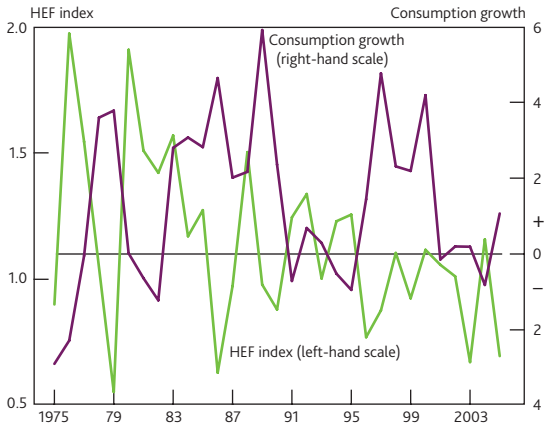
Our second step is to focus in on borrowers who have 'above average spread' mortgage deals in the following specific sense — given their characteristics such as age, income and collateral, they face an interest rate spread on their mortgage which is higher than the spread faced by an individual with characteristics equal to the average of the population of borrowers. Since 'above average spread' borrowers are among those who appear riskier, their mortgage terms may be more indicative of the lender's willingness to tolerate risky lending than the terms of lending to average borrowers. In fact, we take only the top 10% of borrowers on this basis and look at their spread relative to Bank Rate. However, the main findings of the research are robust if we set the threshold to capture the top 25%. We call this measure the Household External Finance (HEF) index. It gives a specific quantitative measure of the terms on which households can access the credit market over a period of 31 years.

The useful thing about having this measure is that we can ask whether the terms of household credit access have influenced consumption growth over this period. For this, we use data from the Family Expenditure Survey (FES), which covers a randomly selected sample of around 7,000 British households per year over a longer period than that covered by the SML.(1)

The reason we use FES rather than ONS consumption data is that these are data on households and thus they allow us to look at how different cohorts of households respond to the HEF index as well as looking at aggregate consumption. However, today I will focus on the aggregate results and only mention the cohort level results in passing.(2)

Chart 6 graphs the HEF index against aggregate FES consumption growth over the time period. If the information contained in the HEF index is relevant to explaining consumption growth, we should expect that when the interest rate spread is high then credit conditions are tougher so that riskier households face higher-than-usual borrowing rates and hence may find it more difficult to smooth consumption from one year to another. The general sense that one gets from **Chart 6** is that periods of credit market tightness, as measured by high values of the HEF index, are indeed associated with periods of weak consumption growth.

Chart 6 HEF index and aggregate FES consumption growth

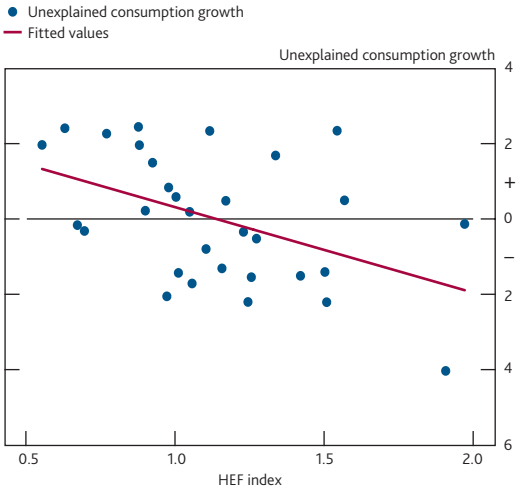


But in looking at the relationship between consumption growth and the HEF index it would be wise to control for other factors that could be relevant in shaping consumption growth over this period — these might include changes in income, real interest rates and house prices. One can also use more or less sophisticated econometric methods to study the relationship to worry about the exact specification.

The bottom line that emerges is that the HEF index does seem to play a role in explaining household consumption alongside the more standard variables. This relationship is highly statistically significant and robust to a wide variety of specifications. Moreover, the effect is quantitatively important with a one standard deviation change in the HEF index being associated, on average across households, with a change in the annual growth rate of consumption between 0.7% and 1.5%.

A further sense of this can be gained by looking at **Chart 7** which plots the component of consumption growth not predicted from more standard variables against the HEF index. The straight line illustrates the partial regression relationship between these two variables which is downward sloping.

Chart 7 Contribution of HEF index to aggregate FES consumption growth



When we look at different birth cohorts, we find that these relationships are most prevalent among younger households. However, we find little evidence that there is any different

(1) We look specifically at data on non-durable consumption. We are particularly grateful to Andrew Leicester from the IFS for initial help with these data.
(2) See our paper for details.

impact of credit conditions, measured through the HEF index, on the consumption of homeowners and renters.

So what do I conclude from this and how can it be useful in shaping my assessment of the future?

First, the work does provide a quantitative assessment of the proposition that there is a link between availability of household external finance and the buoyancy of consumption growth.

While the results from this work are based on historical relationships, they suggest implications for future consumption growth. With credit conditions tightening, we might expect a significant reduction in consumption growth over the coming months.

The following illustrative calculation gives a feel for how much of the decline in savings that we have observed might be explained by more relaxed credit conditions. Suppose the Libor spread increased by 20 basis points over a year. This implies an increase in the HEF index of 0.3, which according to a one standard error around the estimates of column (2) in Table 2 of our paper brings about a reduction in consumption growth between 0.7% and 1.5% per annum. If we assume that all other variables, including income, remain equal to their historical values, then the saving rate would be between 4.1% and 4.9% compared to the value of 3.4% observed in 2007. Thus our estimates suggest that credit conditions can be a quantitatively significant determinant of savings.

These findings are consistent with the view that households will rebuild their savings over the medium term. Depending on how credit market conditions stabilise, this may have only a temporary effect on consumption growth. However, there is a great deal of uncertainty.

The research that I have reported today is only a small part of a larger picture. There are many aspects of the relationship between financial conditions and the real economy, each of which needs to be assessed on its own merits in order to take a view of how financial market conditions will act upon the economy.

Debates about monetary policy tend to reveal a wide variety of opinions on how much weight should be placed on financial conditions in the monetary transmission mechanism. My time on the MPC, before and after the events of last summer, has reinforced my view that considerable weight should be placed on conditions in financial markets in understanding the transmission of monetary policy to the real economy. The MPC sets Bank Rate. But the impact that the level of Bank Rate has on activity will depend, to some extent, on the conditions that obtain in financial markets. Judging whether a given level of Bank Rate is restrictive depends importantly upon the conditions that prevail in financial markets at the time.

The research that I have reported on today further reinforces this view. Our HEF index gives a specific condition that one might look at to assess conditions in financial markets and their likely effect on consumption growth apart from standard indicators such as the level of interest rates and the growth of disposable income.

In conclusion, let me return to the prospects for policy in the difficult period ahead. As a member of the MPC, I will continue to monitor all aspects of the economy affecting inflation and output growth. Meeting the inflation target in the medium term will continue to anchor my voting decisions. I make a month-by-month assessment of the balance of risks created by above-target inflation in the near term against a backdrop of softer prospects for demand and output growth. It is important in doing so to remain forward looking and to bring to bear the best evidence and analysis.

Appendices

Bank of England speeches

Speeches made by Bank personnel since publication of the previous *Bulletin* are listed below.

The return of the credit cycle: old lessons in new markets

(Reproduced on pages 91–95 of this *Bulletin*.)
Speech by Sir John Gieve at the Euromoney Bond Investors Congress in London on 27 February 2008.

www.bankofengland.co.uk/publications/speeches/2008/speech338.pdf

The state of the economy

Speech by Rachel Lomax to the Institute of Economic Affairs 25th Anniversary Conference on 26 February 2008.

www.bankofengland.co.uk/publications/speeches/2008/speech337.pdf

How big is the risk of recession?

Speech by Andrew Sentance to the Devon and Cornwall Business Council in Exeter on 21 February 2008.

www.bankofengland.co.uk/publications/speeches/2008/speech336.pdf

Policy dilemmas

Speech given by Kate Barker at the North Staffordshire Chamber President's Dinner on 19 February 2008.

www.bankofengland.co.uk/publications/speeches/2008/speech335.pdf

Financial markets and household consumption

(Reproduced on pages 107–11 of this *Bulletin*.)
Speech given by Tim Besley at the Institute for Fiscal Studies in London on 18 February 2008.

www.bankofengland.co.uk/publications/speeches/2008/speech334.pdf

Household external finance and consumption

Accompanying paper.

www.bankofengland.co.uk/publications/speeches/2008/speech334paper.pdf

The Governor's speech in Bristol

(Reproduced on pages 82–84 of this *Bulletin*.)
Given at a dinner hosted by the IoD South West and the CBI at the Ashton Gate Stadium, Bristol on 22 January 2008.

www.bankofengland.co.uk/publications/speeches/2008/speech333.pdf

The impact of the financial market disruption on the UK economy

(Reproduced on pages 85–90 of this *Bulletin*.)
Speech given by Sir John Gieve to the London Chamber of Commerce and Industry on 17 January 2008.

www.bankofengland.co.uk/publications/speeches/2008/speech332.pdf

Money and credit: banking and the macroeconomy

(Reproduced on pages 96–106 of this *Bulletin*.)
Speech given by Paul Tucker at the Monetary Policy and the Markets Conference, London on 13 December 2007.

www.bankofengland.co.uk/publications/speeches/2007/speech331.pdf

Contents of recent Quarterly Bulletins

The articles and speeches that have been published recently in the *Quarterly Bulletin* are listed below. Articles from November 1998 onwards are available on the Bank's website at:

www.bankofengland/publications/quarterlybulletin/index.htm.

Articles and speeches

Speeches are indicated by (S)

Autumn 2005

- Assessing the MPC's fan charts
- Long-run evidence on money growth and inflation
- The determination of UK corporate capital gearing
- Publication of narrow money data: the implications of money market reform
- The Governor's speech at Salts Mill, Bradford (S)
- The Governor's speech at the Mansion House (S)
- Monetary policy making: fact and fiction (S)

Winter 2005

- Introducing the Agents' scores
- Do financial markets react to Bank of England communication?
- Financial stability, monetary stability and public policy
- Share prices and the value of workers
- Stabilising short-term interest rates
- The Governor's speech to the CBI North East annual dinner (S)
- UK monetary policy: the international context (S)
- Economic stability and the business climate (S)
- Challenging times for monetary policy (S)
- Monetary policy challenges facing a new MPC member (S)

Spring 2006

- New information from inflation swaps and index-linked bonds
- The distribution of assets, income and liabilities across UK households: results from the 2005 NMG Research survey
- Understanding the term structure of swap spreads
- The information content of aggregate data on financial futures positions
- The forward market for oil
- The Governor's speech in Ashford, Kent (S)
- Reform of the International Monetary Fund (S)
- Global financial imbalances (S)
- Monetary policy, demand and inflation (S)
- Has oil lost the capacity to shock? (S)

Summer 2006

- House prices and consumer spending
- Investing in inventories
- Cost-benefit analysis of monetary and financial statistics
- Public attitudes to inflation
- The Centre for Central Banking Studies
- A review of the work of the London Foreign Exchange Joint Standing Committee in 2005
- Uncertainty, the implementation of monetary policy, and the management of risk (S)
- Reflections on operating inflation targeting (S)
- Cost pressures and the UK inflation outlook (S)
- The UK current account deficit and all that (S)
- A shift in the balance of risks (S)
- What do we now know about currency unions? (S)

2006 Q3

- The UK international investment position
- Costs of sovereign default
- UK export performance by industry
- The Governor's speech in Edinburgh, Scotland (S)
- The Governor's speech at the Mansion House (S)
- Stability and change (S)
- Financial system risks in the United Kingdom (S)

2006 Q4

- The economic characteristics of immigrants and their impact on supply
- Recent developments in sterling inflation-linked markets
- The state of British household finances: results from the 2006 NMG Research survey
- Measuring market sector activity in the United Kingdom
- The Governor's speech at the Great Hall, Winchester (S)
- Trusting in money: from Kirkcaldy to the MPC (S)
- The Governor's speech to the Black Country business awards dinner (S)
- International monetary stability — can the IMF make a difference? (S)
- The puzzle of UK business investment (S)
- Hedge funds and financial stability (S)
- Practical issues in preparing for cross-border financial crises (S)
- Reflections on my first four votes on the MPC (S)
- Prudential regulation, risk management and systemic stability (S)
- Globalisation and inflation (S)

2007 Q1

- The Monetary Policy Committee of the Bank of England: ten years on

- The macroeconomic impact of globalisation: theory and evidence
- The macroeconomic impact of international migration
- Potential employment in the UK economy
- The role of household debt and balance sheets in the monetary transmission mechanism
- Gauging capacity pressures within businesses
- Through the looking glass: reform of the international institutions (S)
- The Governor's speech to the Birmingham Chamber of Commerce Annual Banquet (S)
- Perspectives on current monetary policy (S)
- The MPC comes of age (S)
- Pricing for perfection (S)
- Risks to the commercial property market and financial stability (S)
- Macro, asset price, and financial system uncertainties (S)
- The impact of the recent migration from Eastern Europe on the UK economy (S)
- Inflation and the supply side of the UK economy (S)
- Inflation and the service sector (S)
- Recent developments in the UK labour market (S)

2007 Q2

- Public attitudes to inflation and interest rates
- National saving
- Understanding investment better: insights from recent research
- Financial globalisation, external balance sheets and economic adjustment
- A review of the work of the London Foreign Exchange Joint Standing Committee in 2006
- The MPC ten years on (S)
- The City's growth: the crest of a wave or swimming with the stream? (S)
- The changing pattern of savings: implications for growth and inflation (S)
- Interest rate changes — too many or too few? (S)
- A perspective on recent monetary and financial system developments (S)
- Recent developments in the UK economy: the economics of walking about (S)

2007 Q3

- Extracting a better signal from uncertain data
- Interpreting movements in broad money
- The Bank of England Credit Conditions Survey
- Proposals to modify the measurement of broad money in the United Kingdom: a user consultation
- The Governor's speech to CBI Wales/CBI Cymru, Cardiff (S)
- The Governor's speech at the Mansion House (S)
- London, money and the UK economy (S)
- Uncertainty, policy and financial markets (S)
- Central banking and political economy: the example of the United Kingdom's Monetary Policy Committee (S)
- Promoting financial system resilience in modern global capital markets: some issues (S)
- UK monetary policy: good for business? (S)
- Consumption and interest rates (S)

2007 Q4

- Household debt and spending: results from the 2007 NMG Research survey
- The macroeconomic impact of higher energy prices on the UK economy
- Decomposing corporate bond spreads
- The foreign exchange and over-the-counter derivatives markets in the United Kingdom
- The Governor's speech in Northern Ireland (S)
- Current monetary policy issues (S)
- The global economy and UK inflation (S)
- Trends in European labour markets and preferences over unemployment and inflation (S)
- Fear, unemployment and migration (S)
- Risk, uncertainty and monetary policy (S)
- New markets and new demands: challenges for central banks in the wholesale market infrastructure (S)
- A tale of two shocks: global challenges for UK monetary policy (S)

2008 Q1

- Capital inflows into EMEs since the millennium: risks and the potential impact of a reversal
- Recent developments in portfolio insurance
- The Agents' scores: a review
- The impact of low-cost economies on UK import prices
- The Society of Business Economists' survey on MPC communications
- The Governor's speech in Bristol (S)
- The impact of the financial market disruption on the UK economy (S)
- The return of the credit cycle: old lessons in new markets (S)
- Money and credit: banking and the macroeconomy (S)
- Financial markets and household consumption (S)

Bank of England publications

The Bank of England publishes information on all aspects of its work in many formats. Listed below are some of the main Bank of England publications. For a full list, please refer to our website:

www.bankofengland.co.uk/publications/index.htm.

Working papers

An up-to-date list of working papers is maintained on the Bank of England's website at:

www.bankofengland.co.uk/publications/workingpapers/index.htm

where abstracts of all papers may be found. Papers published since January 1997 are available in full, in portable document format (PDF).

No. 338 Monetary policy shifts and inflation dynamics (January 2008)
Paolo Surico

No. 339 The integrated impact of credit and interest rate risk on banks: an economic value and capital adequacy perspective (January 2008)
Mathias Drehmann, Steffen Sorensen and Marco Stringa

No. 340 Financial innovation, macroeconomic stability and systemic crises (February 2008)
Prasanna Gai, Sujit Kapadia, Stephen Millard and Ander Perez

No. 341 Evolving international inflation dynamics: evidence from a time-varying dynamic factor model (February 2008)
Haroon Mumtaz and Paolo Surico

No. 342 That elusive elasticity and the ubiquitous bias: is panel data a panacea? (February 2008)
James Smith

No. 343 Efficient frameworks for sovereign borrowing (March 2008)
Gregor Irwin and Gregory Thwaites

No. 344 International monetary co-operation in a world of imperfect information (March 2008)
Kang Yong Tan and Misa Tanaka

No. 345 Summary statistics of option-implied probability density functions and their properties (March 2008)
Damien Lynch and Nikolaos Panigirtzoglou

External MPC Unit discussion papers

The MPC Unit discussion paper series reports on research carried out by, or under supervision of, the external members of the Monetary Policy Committee. Papers are available from the Bank's website at:

www.bankofengland.co.uk/publications/externalmpcpapers/index.htm.

The following papers have been published recently:

No. 19 Monetary policy and data uncertainty: a case study of distribution, hotels and catering growth (December 2007)
Lavan Mahadeva

No. 20 Insiders versus outsiders in monetary policy-making (December 2007)
Timothy Besley, Neil Meads and Paolo Surico

No. 21 The behaviour of the MPC: gradualism, inaction and individual voting patterns (January 2008)
Charlotta Groth and Tracy Wheeler

No. 22 Has trade with China affected UK inflation? (February 2008)
Tracy Wheeler

Monetary and Financial Statistics

Monetary and Financial Statistics (*Bankstats*) contains detailed information on money and lending, monetary and financial institutions' balance sheets, banks' income and expenditure, analyses of bank deposits and lending, external business of banks, public sector debt, money markets, issues of securities, financial derivatives, interest and exchange rates, explanatory notes to tables and occasional related articles.

Bankstats is published on a monthly basis, free of charge, on the Bank's website at:

www.bankofengland.co.uk/statistics/ms/current/index.htm.

Following user consultation, printed editions of *Bankstats*, which were previously published twice a year in January and July, have been discontinued since July 2006.

Further details are available from: Leslie Lambert, Monetary and Financial Statistics Division, Bank of England: telephone 020 7601 4544; fax 020 7601 3208; email leslie.lambert@bankofengland.co.uk.

Articles that have been published in recent issues of *Monetary and Financial Statistics* can also be found on the Bank's website at:

www.bankofengland.co.uk/statistics/ms/articles.htm.

Financial Stability Report

The *Financial Stability Report* is published twice a year in April and October. Its purpose is to encourage informed debate on financial stability; survey potential risks to financial stability; and analyse ways to promote and maintain a stable financial system. The Bank of England intends this publication to be read by those who are responsible for, or have interest in, maintaining and promoting financial stability at a national or international level. It is of especial interest to policymakers in the United Kingdom and abroad; international financial institutions; academics; journalists; market infrastructure providers; and financial market participants. It is available at a charge, from Publications Group, Bank of England, Threadneedle Street, London, EC2R 8AH and on the Bank's website at:

www.bankofengland.co.uk/publications/fsr/index.htm.

Payment Systems Oversight Report

The *Payment Systems Oversight Report* provides an account of how the Bank is discharging its responsibility for oversight of UK payment systems. Published annually, the *Oversight Report* sets out the Bank's assessment of key systems against the benchmark standards for payment system risk management provided by the internationally adopted Core Principles for Systemically Important Payment Systems, as well as current issues and priorities in reducing systemic risk in payment systems. Copies are available on the Bank's website at:

www.bankofengland.co.uk/publications/psor/index.htm.

Handbooks in central banking

The series of *Handbooks in central banking* provide concise, balanced and accessible overviews of key central banking topics. The *Handbooks* have been developed from study materials, research and training carried out by the Bank's Centre for Central Banking Studies (CCBS). The *Handbooks* are therefore targeted primarily at central bankers, but are likely to be of interest to all those interested in the various technical and analytical aspects of central banking. The series also includes lecture and research publications, which are aimed at the more specialist reader. All the *Handbooks* are available via the Bank's website at:

www.bankofengland.co.uk/education/ccbs/handbooks/index.htm.

The framework for the Bank of England's operations in the sterling money markets (the 'Red Book')

The 'Red Book' describes the Bank of England's framework for its operations in the sterling money markets, which is designed to implement the interest rate decisions of the Monetary Policy Committee (MPC) while meeting the liquidity needs, and so contributing to the stability of, the banking system as a whole. It also sets out the Bank's specific objectives for the framework, and how it delivers those objectives. The framework was introduced in May 2006. The 'Red Book' is available at:

www.bankofengland.co.uk/markets/money/publications/redbookjan08.pdf.

The Bank of England Quarterly Model

The Bank of England Quarterly Model, published in January 2005, contains details of the new macroeconomic model developed for use in preparing the Monetary Policy Committee's quarterly economic projections, together with a commentary on the motivation for the new model and the economic modelling approaches underlying it.

www.bankofengland.co.uk/publications/other/beqm/index.htm.

Cost-benefit analysis of monetary and financial statistics

The handbook describes a cost-benefit analysis (CBA) framework that has been developed within the Bank to ensure a fair balance between the benefits derived from good-quality statistics and the costs that are borne by reporting banks. Although CBA is a well-established approach in other contexts, it has not often been applied to statistical provision, so techniques have had to be adapted for application to the Bank's monetary and financial statistics. The handbook also discusses how the application of CBA has enabled cuts in both the amount and the complexity of information that is required from reporting banks.

www.bankofengland.co.uk/statistics/about/cba.htm.

Credit Conditions Survey

As part of its mission to maintain monetary stability and financial stability, the Bank needs to understand trends and developments in credit conditions. This survey for bank and non-bank lenders is an input to this work. Lenders are asked about the past three months and the coming three months. The survey covers secured and unsecured lending to households and small businesses; and lending to non-financial corporations, and to non-bank financial firms.

www.bankofengland.co.uk/publications/other/monetary/creditconditions.htm.

Quarterly Bulletin

The *Quarterly Bulletin* provides regular commentary on market developments and UK monetary policy operations. It also contains research and analysis and reports on a wide range of topical economic and financial issues, both domestic and international.

Summary pages of the *Bulletin* from February 1994, giving a brief description of each of the articles, are available on the Bank's website at:

www.bankofengland.co.uk/publications/quarterlybulletin/index.htm.

Individual articles from May 1994 are also available at the same address.

The *Bulletin* is also available from National Archive Publishing Company: enquiries from customers in Japan and North and South America should be addressed to ProQuest Information and Learning, 300 North Zeeb Road, PO Box 998, Ann Arbor, Michigan 48106–0998, United States of America; customers from all other countries should apply to The Quorum, Barnwell Road, Cambridge, CB5 8SW, telephone 01223 215512.

Bound volumes of the *Quarterly Bulletin* (in reprint form for the period 1960–85) can be obtained from Schmidt Periodicals GmbH, Ortsteil Dettendorf, D-83075 Bad Feilnbach, Germany, at a price of €105 per volume or €2,510 per set.

Inflation Report

The Bank's quarterly *Inflation Report* sets out the detailed economic analysis and inflation projections on which the Bank's Monetary Policy Committee bases its interest rate decisions, and presents an assessment of the prospects for UK inflation over the following two years. The *Inflation Report* is available at:

www.bankofengland.co.uk/publications/inflationreport/index.htm.

The *Report* starts with an overview of economic developments; this is followed by five sections:

- analysis of money and asset prices;
- analysis of demand;
- analysis of output and supply;
- analysis of costs and prices; and
- assessment of the medium-term inflation prospects and risks.

Publication dates

Copies of the *Quarterly Bulletin, Inflation Report* and *Financial Stability Report* can be bought separately, or as combined packages for a discounted rate. Current prices are shown overleaf. Publication dates for 2008 are as follows:

Quarterly Bulletin

Q1	17 March
Q2	16 June
Q3	22 September
Q4	15 December

Inflation Report

February	13 February
May	14 May
August	13 August
November	12 November

Financial Stability Report

24 April
23 October

Quarterly Bulletin, Inflation Report and Financial Stability Report subscription details

Copies of the *Quarterly Bulletin* (*QB*), *Inflation Report* (*IR*) and *Financial Stability Report* (*FSR*) can be bought separately, or as combined packages for a discounted rate. Subscriptions for a full year are also available at a discount. The prices are set out below:

Destination	2008					
	QB, IR and *FSR* package	*QB* and *IR* package	*IR* and *FSR* package	*QB* only	*IR* only	*FSR* only
United Kingdom						
First class/collection[1]	£31.50	£27.00	£13.50	£21.00	£10.50	£5.25
Students/schools (concessionary rate UK only)	*£10.50*	*£9.00*	*£4.50*	*£7.00*	*£3.50*	*£1.75*
Academics (concessionary rate UK only)	*£21.00*	*£18.00*	*£9.00*	*£14.00*	*£7.00*	*£3.50*
Rest of Europe						
Letter service	£38.50	£33.00	£17.00	£25.00	£13.00	£6.50
Outside Europe						
Surface mail	£38.50	£33.00	£17.00	£25.00	£13.00	£6.50
Air mail	£50.00	£43.00	£21.50	£34.00	£17.00	£8.50

(1) Subscribers who wish to collect their copy (copies) of the *Bulletin, Inflation Report* and/or *Financial Stability Report* may make arrangements to do so by writing to the address given below. Copies will be available to personal callers at the Bank from 10.30 am on the day of issue and from 8.30 am on the following day.

Readers who wish to become **regular subscribers**, or who wish to purchase single copies, should send to the Bank, at the address given below, the appropriate remittance, payable to the Bank of England, together with full address details, including the name or position of recipients in companies or institutions. If you wish to pay by **Visa, MasterCard, Maestro** or **Delta**, please telephone +44 (0)20 7601 4030. Existing subscribers will be invited to renew their subscriptions automatically. Copies can also be obtained over the counter at the Bank's front entrance.

The **concessionary** rates for the *Quarterly Bulletin*, *Inflation Report* and *Financial Stability Report* are noted above in *italics*. Academics at UK institutions of further and higher education are entitled to a concessionary rate. They should apply on their institution's notepaper, giving details of their current post. **Students and secondary schools** in the United Kingdom are also entitled to a concessionary rate. Requests for concessionary copies should be accompanied by an explanatory letter; students should provide details of their course and the institution at which they are studying.

These publications are available from Publications Group, Bank of England, Threadneedle Street, London, EC2R 8AH; telephone +44 (0)20 7601 4030; fax +44 (0)20 7601 3298; email mapublications@bankofengland.co.uk or fsrenquiries@bankofengland.co.uk.

General enquiries about the Bank of England should be made to +44 (0)20 7601 4878.
The Bank of England's website is at www.bankofengland.co.uk.

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