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THE NARRATIVE APPROACH FOR THE IDENTIFICATION OF MONETARY POLICY SHOCKS IN A SMALL OPEN ECONOMY

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ABSTRACT

This paper reviews 22 years of UK monetary policy in the pre-inflation targeting period (1971-1992) using official record from the Bank of England Quarterly Bulletin. A transparent definition of policy episodes is used. The empirical analysis shows that output displays the usual hump-shaped response after a shock to the policy indicator. All variables display theory-consistent behaviour. Monetary policy and exchange rate volatility are found to cause substantial output fluctuation in a four year horizon. The "narrative model" extended to a small open economy compares well with a structural VAR.

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1. Introduction

The core issue of this paper is to study the effects on economic activity of monetary policy shocks, but also to give some insight into the transmission mechanism and the connection between monetary policy and financial markets, by examining effects on further variables, like short- and long-term interest rates, monetary aggregates, the exchange rate etc.

The effects of monetary policy are examined in recent years in the framework of structural VAR models. This methodology is appealing because results in the form of impulse responses of variables to a policy shock provide many insights in an easily readable form. However, it comes at the cost of the imposition of disputable restrictions for the identification of policy shocks. The narrative approach aims to circumvent "statistical" identification problems faced by the structural VAR literature, while keeping the expositional framework. Identification of policy episodes relies exclusively on the study of monetary policy record. A policy dummy capturing systematic shifts of policy is constructed and an unrestricted VAR framework is used to estimate the effects of a policy shock on other variables.

This paper aims to develop the narrative approach[1] framework in three ways. The first is its extension to an open economy with the choice of the UK. All studies using the narrative approach refer so far to the United States. Thus an evaluation of the approach by a comparison of cross-country results has not, so far, been possible. This comparison becomes even more compelling since the United States is a large closed economy whose monetary policy decisions are not guided by external goals. For monetary authorities in small open economies, it is a luxury to ignore developments abroad when taking policy decisions, especially against the background of increasing international capital flows. The definition of policy shocks is therefore adjusted to take account of possible exchange rate related inflationary pressures.

The second contribution relates to the attempt to improve the narrative approach methodology by choosing a transparent definition of policy episodes, consisting of four clear and easily verifiable preconditions. This aims at deflecting somewhat the usual criticism of the approach, namely that it is too judgmental.

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[1] The term dates back to Romer and Romer (1989) although the methodology was used in Friedman and Schwartz (1963).

Finally, the use of a step-dummy instead of an impulse dummy for monetary policy episodes is a technical improvement to the framework, which allows for the duration of an episode to be taken into account – central banks rarely enact a policy change in one go.

The narrative methodology is applied to the UK from 1971, when "Competition and Credit Control" was introduced until 1992, when the UK abandoned the Exchange Rate Mechanism. This period is characterised by monetary control arrangements through intermediate targets and it ends before the shift to direct inflation targeting which was introduced in 1992 and is still in place. In Part 2 the literature on the narrative approach is reviewed. After a brief overview of the UK monetary policy framework and few methodological notes, policy episodes that occurred during the period are discussed in Part 3. In Part 4 empirical results for the effects of monetary policy are considered. Shocks to the policy dummy appear to give theory-consistent results (persistent fall in prices and money, hump-shaped response of output with a slow recovery pace). Monetary policy appears to cause substantial fluctuations in output in a four-year horizon. The exchange rate, which shows persistent appreciation in the aftermath of a policy shock, appears to be the major source of fluctuations in output in a four-year-horizon. These results are remarkably robust to a number of specifications. Finally, Part 5 concludes.

2. Review of the literature

The issue of estimating the effects of negative, i.e. restrictive, monetary policy has received a lot of attention in the literature. Romer and Romer (1989) claimed that it is possible to estimate the effects of negative policy shocks on output, because the intention of the authorities when they shift to a more restrictive policy is to reduce inflation. On the contrary, when monetary authorities shift to a less restrictive policy this is done to support economic activity. But because the economy possesses self-recovery mechanisms it is difficult to discern the part of the increase in economic activity due exclusively to monetary policy. Therefore they identify only restrictive policy shocks. This is the common case in the literature for the additional reason that the available econometric tools cannot estimate at the same time positive and negative shocks.

Two main methodologies are used to study the effects of restrictive monetary policy: the empirical and the narrative. The empirical literature[2] starts from the principle that systematic monetary policy is endogenous and therefore the only way to identify the effects of monetary policy is to isolate exogenous monetary policy shocks and estimate their impact on a number of endogenous variables. This is usually done in the context of structural VAR models. To do this a monetary policy reaction function needs to be specified. The specification of a policy reaction function poses some problems. Monetary authorities look at a range of indicators, whose relative weight might change from one meeting of the decision-making bodies to the next. Moreover, the mismatch between current data used at the time of a decision and revised data available to the analyst, when estimating a policy rule, might be a source of considerable bias.

An alternative way to explore the effects of monetary policy is to use official record (monetary policy minutes, press releases, reports) to identify distinct shifts in monetary policy and understand the intentions of the monetary authorities. Using this methodology a monetary policy indicator can be constructed. Including such an indicator in an unrestricted VAR model, the intervention rate or any other intervention instrument is purged from systematic policy responses, so that shocks to the intervention rate can be considered as exogenous policy shocks. The narrative approach is not free from caveats. As a matter of fact its most obvious relative advantage, i.e. the room for judgment it leaves to the researcher and the possibility to cross-check a variety of pieces of evidence, has been stressed as a potential disadvantage. This can be eliminated if a clear definition of policy shocks is used to limit the scope for arbitrary classifications.

Moreover, the mapping of a complex concept like a "monetary policy episode" into a dummy variable means a substantial loss of information in the estimation of possible effects of *systematic* monetary policy. Shocks differ in intensity and duration and this affects the results they produce. Therefore, the effects of systematic policy based on the narrative approach should be interpreted with caution.

To tackle the question of arbitrariness, different definitions of monetary policy shocks have been used in previous literature. Friedman and Schwartz (1963) define a

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[2] A good review of this literature can be found in Christiano et al. (1999).

monetary policy shock (or a *"crucial experiment"*) as any *"policy steps of major magnitude which cannot be regarded as necessary or inevitable economic consequences of contemporary changes in money income and prices"*. It follows that for them monetary shocks characterize situations in which a monetary policy action was unexpected (too much exaggerated or not enough pronounced) given available signals about general economic conditions.

Romer and Romer (1989) identify as a monetary policy shock any contractionary policy change which the Fed undertakes with the intention of reducing inflation, even though acknowledging the fact that it will lead to a "growth recession".

Potts and Luckett (1978) created a binary measure of monetary policy (0 – tight, 1 – easy) depending on whether the intention of the Fed was to slow down or boost economic activity. Finally,[3] Boschen and Mills (1991, 1995) generated a discrete measure of monetary policy stance taking five different values {-2, -1, 0, 1, 2}, where -2 indicates a very tight policy stance, while 2 indicates a very loose policy stance. Like the Romer dates, their indicator is based on Federal Open Market Committee (FOMC) minutes, but it is a more informative measure of monetary policy, since it differentiates the stance according not only to direction but also size.

Christiano, Eichenbaum and Evans (1999) compare the Boschen and Mills index and the Romer dates as indicators of monetary policy to the federal funds rate that has also been proposed in the literature (see Bernanke and Blinder, 1992). They find that the qualitative results of a shock to the latter two indicators are quite similar, although the estimation of responses to Romer dates is not as accurate (possibly due to the existence of only very few such dates) and they seem to exacerbate the response of output to a monetary policy shock. The Boschen and Mills index-shocks on the other hand cause delayed responses compared to the other two measures and give rise to a price puzzle, which casts some doubt on the identification scheme generating them. Indeed Boschen and Mills do not distinguish between endogenous responses to the economic situation and exogenous disturbances.

The literature on the narrative approach has so far been restricted to an analysis of the US monetary policy. A particularity of the US is that it is a large

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[3] Other monetary policy indicators for the US have been constructed by Poole (1971), Uselton (1974) Kimelman (1981). In a more recent paper Romer and Romer (2004) use information about the targeted Federal Funds Rate to overcome the difficulty arising from discrepancies between monetary policy intentions and actions.

economy, whose currency is used as an international reserve currency and as a global means of financial transactions. The policy of the Fed is not driven by exchange rate considerations and the Fed does not have to follow policy moves by other central banks. This is, however, not the case for a small open economy.

In a small open economy the exchange rate, representing the external value of a currency, is another means available to monetary authorities for the implementation of their policy. At the same time it operates as a constraint on policy: in small open economies, especially when no exchange controls apply, interest rate differentials cannot be sustained for a long time without exchange rate fluctuations, which themselves can affect the course of the economy.

As a constraint on policy the exchange rate determines how much capital inflow will be available to finance a current account deficit at a given international interest rate structure. The exchange rate as a transmission mechanism of policy works through the current account. A depreciation leads (at least in the short-term) to an improvement in the current account and supports aggregate demand, just as a fall in interest rates or an increase in the money supply leads to an increase in aggregate demand through domestic channels. Therefore the external as well as the internal value of the currency becomes relevant. The importance of the exchange rate as an indicator of monetary policy stance is reflected in the construction of monetary conditions indexes.[4] When a currency depreciates the MCI points to a looser policy stance because the depreciation can lead to expansion of output through its effect on the current account. This in turn can lead to increased inflationary pressures. But it also creates inflationary pressures directly through higher import prices. Similarly the appreciation of a currency depresses exports and aggregate demand (and therefore indirectly it dampens inflationary pressures) but it also helps in keeping inflation low as it makes imports cheaper. Thus, it makes sense to consider the exchange rate in a small open economy transmission mechanism.

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[4] The monetary conditions index (MCI) is constructed as a weighted average of the change in interest rates and the change in the exchange rate, where the weights reflect the relative effects of interest rates and exchange rates on aggregate demand. By some central banks (e.g. the Bank of Canada) it is used as an operational target.

3. Identification of monetary policy shocks

3.1. The Bank of England and the conduct of monetary policy

As already noted, the period with which this paper is concerned is marked by four distinct changes in the monetary policy framework in the UK, which reflected both the changing global economic environment and a change in views about the goals and conduct of monetary policy. Until 1971, UK monetary policy relied predominantly on direct lending controls. In 1971, these were abolished and a more market-oriented policy framework based on lending ceilings for the banking system as a whole was introduced. This change was partly reversed at end-1973 when the Corset (an indirect type of lending ceilings) was put in place. In 1976, monetary targets were introduced, which were replaced by an increasing focus on exchange rates in 1987 and an explicit intermediate exchange rate target in 1990. Finally, in 1992, after the exchange rate turbulence, the ERM was abandoned and inflation targeting was adopted. As a matter of convenience the period under review is divided in what follows in three sub-periods: 1971-1975, 1976-1986 and 1987-1992, the four milestones being the abolition of direct lending controls, the introduction of a monetary target, the (unofficial – in the beginning) introduction of an exchange rate target and the launch of inflation targeting.[5]

3.1.1 First period: 1971-1975

In the period up to 1971 the role and conduct of monetary policy reflected the broad ideas laid down in the Radcliffe Report (1959). Monetary policy was considered primarily as a means of demand management. Its effectiveness was thought to depend on the extent to which it could cause changes in the relative structure of interest rates due to portfolio shifts. In the end monetary policy was thought of as affecting market liquidity and, consequently, economic activity.

From 1965 until 1971, the operation of monetary policy was based on direct lending controls, which were implemented by means of precise lending ceilings for individual financial institutions. The operational framework of monetary policy in this period was complemented by the cash and liquidity ratios, which applied to London and Scottish clearing banks. The authorities could make liquidity ratios vary by

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[5] The "Corset" (1973-1980) does not qualify as a sub-period of its own, as it was more a measure taken to correct the weaknesses of the monetary policy strategy, than a change of the strategy *per se*.

calling upon the clearing banks for Special Deposits. This allowed them better control over both the availability of bank funds for loans and the short-term interest rates. London and Scottish clearing banks also agreed to pay a fixed rate on deposits and adhered to a minimum rate charged on advances.

Lending controls, in combination with the other institutional provisions, induced credit rationing on behalf of the banks and hence prevented lending rates from assuming a market-clearing role. Moreover, due to controls on bank lending borrowers were redirected to other, not necessarily more efficient, finance sources which were not subject to control, so that a process of disintermediation took place. Therefore, they were thought of as not only impeding competition between banks, but also creating distortions in the financial system in general.

In 1971 a document published by the Bank of England ("Competition and Credit Control") marked a significant change of attitude as to the way monetary policy should be implemented. Three major reforms were staged on this occasion:

– Direct lending controls were abolished in an attempt to lift barriers in the banking system competition. However, between 1973 and 1980 an alternative system of controls called "the Corset" was occasionally put in place to slow down the expansion of bank lending when there was deemed to be excess liquidity in the economy.[6] The "Corset" provided for a maximum allowed growth of banks' interest-bearing liabilities. In case the limit was exceeded, banks were required to place an increasing ratio of their excess liabilities in non-interest bearing deposits with the Bank of England. The "Corset" allowed for transfers of deposits between banks, so that the maximum limit of deposits growth applied for the banking system as a whole and not for individual banks.

– The Bank of England sought to influence broad money and hence its counterpart, total bank lending, by varying the base rate. This represents a change in the practices of the Bank of England, since, instead of manipulating banks' assets, it shifted to controlling banks' liabilities. Given an exogenous money supply controlled by the central bank, changes in interest rates would change money demand and

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[6] The Corset ("supplementary special deposits scheme") was put in place three times: December 1973 – February 1975, November 1976 – August 1977 and June 1978 – June 1980.

consequently the amount of money held by the public. In order for such a *liquidity effect* to exist there must be some substitutes for money.[7]

−   A minimum reserves ratio was introduced. Banks were required to hold 12.5 per cent of their sterling liabilities with the Bank of England in a special form of liquid assets. The Bank of England could convert these assets to cash by lending to the banks or through open market operations. In addition the Bank of England could ask banks at any time to place "Special Deposits" with it. Special Deposits in effect allowed the Bank to vary the minimum reserves ratio and affect the liquidity condition of banks.

To sum up, the changes in the operation of monetary policy in 1971 were in the direction of enhancing banking system competition and affecting banks' resources (deposits) rather than their uses (lending).

3.1.2 Second period: 1976-1986

From July 1976 the Bank of England started publishing targets for the growth rate of broad money (£M3).[8] The targets referred to the next financial year. For 1976 a specific target, for following years target ranges were published. Towards the end of the period also medium-term targets were set, covering a time span of three years in total. Later on, from March 1982, targets for narrow money (M1) and very broad money (PSL2) were also published. Finally, from March 1984 targets for the monetary base (M0) were introduced.

In publishing an official target for the rate of growth of broad money the aim was to tie down the expectations of market participants as to the evolution of the instrument of monetary policy, i.e. the Bank rate. Furthermore, in the context of high inflation the monetary targets as an intermediate target of policy lent credibility to the anti-inflationary commitment of the Bank. The monetary targets were met only 5 times in this 11 year period. Especially after 1983 and until 1987 monetary growth

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[7] If money has no substitutes then its interest rate elasticity will be zero and the rate of interest will not appear in the money demand function (this is the extreme monetarist case).

[8] The monetary aggregates published by the Bank of England include the following:
   −   M0 (monetary base): notes and coin
   −   M1 (narrow money): M0 + sight deposits at banks
   −   £M3, M3 after 1987 (broad money): M1 + time deposits at banks
   −   PSL2, M5 after 1987 (very broad money): £M3 + deposits with building societies – long-term deposits with building societies + other short-term £-denominated assets held by the public – other adjustments.

was much more rapid than the targets set by the Bank of England. This excess growth seemed to be driven mainly by a rapid growth in (non-interest-bearing) sight deposits held with banks. In fact towards the end of the period target ranges for sterling M3 were suspended twice, in October 1985 and October 1986.

The publication of monetary growth targets represented a major shift of focus of monetary policy. The attempt to control the growth rate of monetary aggregates as a means of controlling inflation was based on the idea that inflation is a monetary phenomenon. Consequently, this change in the monetary policy framework of the UK, which began in the previous period and was completed in this period, represented a shift away from viewing monetary policy as a form of demand management to a more monetarist view of the economy.

3.1.3 Third period: 1987-1992

The policy framework with intermediate monetary targets has not proved to be successful in an environment of changing financial structures and behaviour, which undermined the stability of the money demand. Despite the fact that the primary objective of monetary policy, i.e. combating inflation, was met, with inflation falling from above 20% in mid-70s to below 10% by 1982, the Bank of England failed to meet the intermediate targets. This combined with the frequent revision of the target and even the redefinition of the aggregate targeted, in turn created confusion and uncertainty.[9] Through the first half of the 1980s it became clear that increasing weight was given to exchange rate developments in the determination of monetary policy.

In the 1987 Budget no broad monetary target was set for the following financial year. Instead domestic monetary policy increasingly focused on the exchange rate of the pound, especially after the Louvre Accord of the G-6 in February 1987, according to which stability between key exchange rates was to be preserved. Between March 1987 and March 1988 an unofficial cap of DM 3.00/sterling was put

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[9] As Governor Leigh-Pemberton emphasized in the 1992 Loughborough University Banking Lecture:
> "…One might think that this would not have mattered if the final objective was being achieved. In one sense this is right. The problem was that our repeated failure to achieve the intermediate targets undermined public confidence in the policy framework as a whole, including our continuing commitment to low inflation, and that clearly was important given that the final objective was to reduce uncertainty about the future."

in place.[10] Finally an exchange rate target was adopted *de jure* as a nominal anchor when the sterling joined the ERM in October 1990. This happened at a time when European countries imported credibility for their counter-inflationary policies by tying their currencies to the D-Mark, given the German tradition of low inflation.

However, soon domestic economic conditions in the UK started to diverge from those in Germany and the pound could only be held in the corridor defined by the ERM through strong intervention in the exchange market. In September 1992 the UK, unable to sustain increasing downward pressure on the pound, abandoned the ERM and adopted a policy framework of immediate inflation targeting based on an inflation forecast prepared by the Bank of England.

3.2. Definition of policy episodes

To proceed with the identification of policy episodes, it is essential to put down a definition, which, on the one hand, excludes cases of market-led changes to interest rates or liquidity and, on the other hand, does not fail to include all those policy actions which constituted restrictive shifts of monetary policy. The narrative approach as said involves a great deal of personal judgment by the researcher. Therefore a sound definition of policy episodes not only helps in the process of their identification but it can also help discharge criticism of bias.

In what follows the focus shall be on the identification of periods when monetary policy turned more restrictive with the intention of reducing inflation. From identifying such episodes there are some answers to be got to interesting questions. Most importantly to the questions of a) whether monetary policy affects output (as a by-product of reducing inflation) and if so, whether the effects are long-lasting or temporary; b) whether the hyperactivity of monetary authorities themselves causes swings in economic activity; and c) whether, to what extent and with what lags, monetary policy affects prices.

There are four basic common characteristics about such episodes that we identify: a) there is a large increase in central bank rates; b) the adjustment to a higher level of interest rates is gradual and long-lasting; c) additional restrictive policy measures are taken; and d) there are statements by bank officials that the aim of the

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[10] See Temperton (1991). The existence of the cap is implied by Bank of England interventions in exchange markets whenever the DM/sterling exchange rate was approaching the limit.

policy shift is to reduce inflationary pressures resulting from the domestic monetary situation or from exchange rate instability. An increase in the official rates alone cannot be an indicator of a systematic policy tightening, since increasingly throughout the period official rates respond to market conditions. The last three characteristics are used to ensure that policy changes are not temporary, but stem from the determination of the authorities to enact a shift in the course of the economy to fulfil their objectives. Especially the last two features of the definition are used to "refine" the selection of policy episodes. In a sense they help define a lower limit to the two "quantitative" criteria, i.e. the duration and the size of the increase in interest rates.

Evidence on monetary policy episodes is found in the Quarterly Bulletin of the Bank of England, which, besides the regular economic and monetary analysis and the analysis of financial markets, includes articles on topical issues and speeches by Bank officials. The most interesting speech from a monetary policy perspective is the Mansion House speech, delivered by the Governor at the annual dinner (usually every October) of the Lord Mayor of the City of London to the members of the financial community. It is customary on this occasion for the Governor to outline the reasons for the policy stance followed by the Bank in the previous year and the prospects for the following.

Study of statements by Bank officials or excerpts from the Quarterly Bulletin explaining the reasons that led to action suggests that during the 22 years under review the Bank of England usually resorted to interest rate increases (frequently accompanied by additional measures in the money market) for three types of reasons: First, because the domestic monetary conditions were considered as fostering inflationary pressures. Second, because exchange rate weakness was interpreted as resulting from a loose monetary policy stance and could cause inflationary pressures. Third, because of sterling weakness caused by external factors, e.g. the strength of the dollar, developments in oil prices or global financial markets turbulences, which made temporary increases of the interest rates inevitable.[11] The former two sources of policy action characterize policy episodes, while the third leads to policy shocks.

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[11] Goodhart and Temperton (1982) identify sources of exchange rate volatility in the 1979-1981, e.g. domestic monetary conditions, monetary conditions in the USA and oil price dynamics, and found that in this period the appreciation of the sterling was driven mainly by domestic monetary situation. In fact monetary policy became more accommodative between July 1980 and August 1981.

3.3. Identification of policy episodes: 1971-1992

In the period under review there are four cases of policy tightening, which can be identified as policy episodes based on the definition given above.

- June 1972-December 1973: an increase of 8 percentage points

- April to October 1976: an increase of 6 percentage points.

- November 1977 to November 1979: an increase of 12 percentage points.

- June 1988 to September 1990: an increase of 7 percentage points.

In all of these cases interest rates increased sharply and over a fairly long period of time (sometimes short spells of falling rates are included, but the trend of the interest rates is rising). The characteristics of each policy episode and the reasons which led the monetary authorities to take corrective action are discussed below. It should be noted that the duration of the interest rate increases need not necessarily coincide with the duration of the policy episode, because of the potential for the monetary authorities to take additional measures or because interest rate increases in the beginning or the end of the period can be due to other factors unrelated with the objectives of monetary policy.

June 1972-December 1973:[12] At the beginning of the 1970s and about a year after the abolition of lending controls it had become clear to the authorities that there was excess liquidity in the market and that there was a need for higher interest rates. But due to the weak state of the economy, an increase in interest rates did not come until June 1972, when a run on sterling caused by expectations of a deteriorating external position of the UK led the Bank of England to raise the Bank rate by 1 percentage point (22 June). Sterling, which at this point was participating in the European Community intervention mechanism (the "snake"), was left to float freely the next day, while extra exchange controls were put in place. Due to severe pressures on banks' liquidity, the Bank installed a facility for the purchase and resale of short-dated gilts.

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[12] This could be divided into two separates episodes (June to December 1972 and May to December 1973) but empirical results are robust to such a modification.

In August 1972, when it was clear that the expansionary fiscal policy stance along with the acceleration in bank lending after the abolition of lending controls had caused undesirably loose monetary conditions, the Bank issued qualitative guidance to banks regarding their lending. Between October and December 1972 the Bank intervened on several occasions in the Treasury Bill market to raise the Treasury Bill rate. The restrictive nature of the Bank's policy in this period was underlined by their decision to suspend the Minimum Lending Rate (MLR) formula and raise the MLR by 1.75 percentage points in November 1972. The total increase in the MLR in this seven-month period was 4 percentage points. In addition to the interest rate increases the Bank made two calls for special deposits amounting to 3% of banks' liabilities. These measures were intended to absorb increased liquidity resulting from an expansive fiscal policy stance and to slow down bank lending. Therefore it can be said that this seven-month period in 1972 constitutes a policy episode.

In the first half of 1973 the monetary authorities considered that the measures taken in the last seven months were sufficient or even more restrictive than necessary and slightly relaxed policy with the intention of correcting their previous stance, while remaining restrictive. But in late-May and June 1973, the effective exchange rate of the sterling depreciated again, as a deterioration of the external position of the UK was widely expected. Between July and November 1973 the Bank raised the MLR by 5.5 percentage points on three occasions[13] and made another two calls for special deposits amounting to an additional 3% of banks' eligible liabilities. Moreover the Bank issued qualitative guidance for banks' lending business and imposed a ceiling on the interest rate paid by banks for new small deposits to reduce the funds available to them for lending. In December the Corset was introduced with a grace period up until July 1974. Hire-purchase term controls were also reintroduced and banks were asked to apply similar terms to consumer lending. These measures were severely restrictive and aimed at reducing both sides of banks' balance sheets. The introduction of the Corset in particular and the other additional measures taken in December suggest that the authorities desired to control the pace of credit expansion by banks but they were no longer willing to allow interest rates to rise beyond the level they stood at in December 1973. Therefore this month signifies the end of this round of *active* policy tightening.

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[13] There was only a temporary easing of 25 basis points in October.

April to November 1976: Between March and April 1976 nervousness in the markets ahead of the Budget and the change of prime minister put sterling under pressure despite the narrowing of the current account deficit. It depreciated by almost 7% in two months. Official intervention in foreign exchange markets had eroded the Bank's reserves and negotiations for an IMF loan started. The Bank reacted to the erosion of the value of the currency, which undermined the combat of inflation, raising the minimum lending rate by 6 percentage points between end-April and early-October 1976. The relevant increase in the *ex post* real interest rate was far higher, reaching more than 8 percentage points. In July money targets were introduced for the first time and monetary policy was assigned a more prominent role in the combat of inflation (as part of the plan to meet the terms for the IMF loan). In September and October calls for special deposits amounting to a total of 3% of banks' eligible liabilities were made. Both calls followed the suspension of the MLR formula and sharp increases in the MLR (by 1.5 percentage points in September and by 2 percentage points in October). Finally, the Corset, which had been deactivated in February 1975, was reintroduced in November 1976. It should be noted that, like in the previous policy episode, the monetary authorities first proceeded with interest rate increases and when the interest rate level was deemed too high for it to be increased further they took alternative measures.

Although the need to preserve the exchange rate of sterling appears to have been the major preoccupation of the Bank of England which led to the increase in interest rates in 1976, the increase was appropriate also given domestic monetary conditions. The Bank needed to convince economic agents about its commitment to keep money growth within the published range and inflation low. Therefore, this episode constitutes a policy episode of the sort that we are trying to identify in this paper.

November 1977 to November 1979: In the course of 1977 substantial inflows into sterling had pushed sterling market rates down to the lowest levels since 1971. At the same time the Government's intervention in foreign exchange markets led to excess increases in the money stock. Thus the authorities were faced with two conflicting objectives: keeping the exchange rate of sterling from further appreciating and keeping money growth under control. The decision taken in October 1977 to allow sterling to move more freely meant that the Bank could keep interest rates high

even with foreign exchange inflows. Thus, in November 1977 a series of increases in the minimum lending rate started, which, with small interruptions, lasted until the end of 1979. The increase in the MLR in November 1977 reflected the wide-spread view that with the relaxation of external pressures on sterling and money stock rising faster than the target, a higher interest rate level would be appropriate.

In the period from April 1978 until February 1979 the Bank used a series of measures (interest rates increases, qualitative guidance to banks, the Corset) to contain the rate of growth of the money supply which had overshot its target. Fiscal policy had been rather loose with a high public sector borrowing requirement leading to a rapid increase in sterling M3. The total increase in the MLR from November 1977 until February 1979 amounted to 9 percentage points. A temporary relaxation in interest rates was recorded in the pre-election period of March-May 1979 due to an improvement in confidence and significant capital inflows. However, the authorities were reluctant to allow interest rates to fall too much. Moreover, throughout that period the Corset was active. Therefore, this short interval is not treated separately. Until June 1979, when a new round of interest rate increases began, the interest rate was still 5.5 percentage points higher than before the tightening.

In a second stage the Bank tightened further its monetary policy in June 1979. This round of policy tightening lasted until November 1979. The objective this time was explicitly stated to be the combat of inflation. Moreover, in the pursuit of this objective the Bank was not reluctant anymore to sacrifice economic growth, i.e. the goal was to shift aggregate demand back.

In conclusion, the period from November 1977 until November 1979 is a rather long spell of restrictive policy. The reason for this was the determination of the monetary authorities to combat inflation by reducing the rate of monetary expansion and the rate of growth of demand.

June 1988-September 1990: The appreciation of sterling due to the weakening of the dollar and the need to provide liquidity after the stock market upheaval in October 1987, led to inappropriately (as was retrospectively judged by the monetary authorities) low interest rates in the first half of 1988. But by June a new round of policy tightening began in view of the emerging setback in the process of achieving lower inflation. Against a background of strong domestic demand, even in the

aftermath of the stock market crash, the economy was deemed to be growing at an unsustainable pace and a backward shift in aggregate demand to restrain inflationary pressures was considered appropriate. Although signs of overheating were evident even earlier (and were in fact underestimated, as statistical evidence published throughout 1989 proved) the policy actions were delayed by the strength of the sterling.

This round of policy tightening is characterised by its long duration, which demonstrates the determination of the authorities to enforce an adjustment to lower inflation rates. Although the last increase in the policy rate was recorded in October 1989 (a total increase of 7.5 percentage points), it took another year until interest rates came back on a downward course. In October 1990 the Bank of England cut its policy rate by 1 percentage point in the event of sterling ERM entry. The rate remained unchanged at this slightly lower level until February 1991 when it resumed a downward path.

3.4 Discussion of non-policy episodes

Among the periods of increasing interest rates mentioned there are a few short spells of tight policy, which bear some of the common characteristics of policy episodes but have not been classified as such. These are periods during which the increase in interest rates was market-driven or the Bank was forced to act against its own assessment on the inflation outlook. Apart from official statements which suggest that the increase in interest rates was not necessary to reduce inflationary pressures, the Bank did not undertake any further measures of restrictive policy on these occasions and soon after the turbulence which caused them was over, the policy actions were fully reversed. Several such examples from the period under review are discussed.

Apart from the 1975 incident all other non-policy episodes took place in the 1980s. A general observation for this latter period should be made. In many instances financial market pressures which forced the Bank to accept higher interest rates were out of their immediate control. However, uncertainty in UK financial markets must have been fostered by an ambiguity regarding the targets of monetary policy, which undermined confidence in the commitment to contain inflation. Already in the early 1980s it had become clear that the monetary authorities were looking increasingly at

the exchange rate and less so at monetary aggregates as an input to policy decisions. This was done more by necessity rather than choice since it was widely recognized that there were extensive distortions in monetary aggregates caused on the one hand by innovations and changes in financial structures, which obscured the boundaries of "money", and, on the other hand, by industrial disputes. However, increased reliance on the exchange rate against a background of erratic movements in international exchange markets became itself a source of confusion. In this environment the abolition of the MLR and the adoption of a more market-based approach for the determination of short-term rates might have deprived the markets of a direct signalling device of the intentions of the monetary authorities. On the contrary there is a strong impression on many occasions that the monetary authorities were following market signals (or were unable to reliably resist market pressures) instead.

May-October 1975: In 1975 the UK economy was in deep recession. At the same time inflation, although on a declining trend due to the Government's pay policy, hovered around 20% hampering its international competitiveness. There was a favourable interest rate differential between the UK and other major economies due to the expansive policies led abroad. But in May, foreign monetary authorities started raising interest rates and the UK authorities in order to preserve the interest rate differential allowed interest rates to rise by 2.5 percentage points between May and October 1975. No additional policy measures were taken in the same direction. This move took place at a point in time when recession was keeping the growth of both bank lending and money within target. Moreover, the authorities did not wish to depress further the economy. Since the policy actions were not consistent with the domestic monetary situation the Bank intervened to lower interest rates immediately after external pressures subsided. Therefore, this incident is not included as a policy episode for the purposes of this paper.

August-October 1981: From end-August until end-October 1981 the UK authorities allowed interest rates to increase by a total of 3.125 percentage points. The increase in interest rates was mainly market-driven. In the summer of 1981 the Bank was confronted with increasing uneasiness in the markets owing mostly to the tight policy being implemented in the US, which left UK interest rates at a disadvantage. This resulted in fears of a further weakening of sterling, while at the same time the evolution of monetary growth was obscured by Civil Service dispute-related

distortions. The Bank allowed a relatively moderate increase in interest rates, but leant against further pressures as soon as the US rates started easing. It should be noted that in August 1981 the Bank changed its money market operations. It abandoned the announcement of the MLR and replaced discount lending with open market operations. The Bank would conduct these operations with reference to a non-disclosed interest rate band to permit greater flexibility in the determination of short-term interest rates. Therefore slight moves of interest rates in both directions should not necessarily be interpreted as policy-induced.

This period of increasing interest rates is too short to be characterised as a monetary policy episode and the increase too limited, especially given the change in the Bank's money market intervention techniques to introduce greater flexibility in short-term rates. Moreover, the fact that the authorities did not take any further measures to re-inforce the rise in interest rates and that instead they allowed for their quick deceleration once market sentiment was restored allows the conclusion to be drawn that this was a market-driven change and it should not be characterised as a policy episode.

November 1982-January 1983: This period constitutes a short interval of rising interest rates mostly due to uncertainty in exchange markets which led to temporary pressures on sterling. This happened against a background of generally balanced monetary conditions and a favourable domestic environment for policy. Inflation had resumed its falling path and domestic demand appeared strong, while the PSBR turned out unexpectedly low, money grew within target and bank lending had eased off. In January and March the Bank intervened in the money market to ease banks' liquidity pressures and short-term rates fell again in March 1983.

May, July 1984: A small interest rate increase in May 1984 was prompted by rising uncertainty triggered by fiscal and other developments in the US, which undermined confidence. However, after this increase the Bank *"leant against the subsequent spasmodically strong upward market pressures with the aim of moderating the rise in interest rates"*. Towards the end of June after some technical adjustments in its dealing rates which could have triggered pressures for further upward pressure on interest rates the Bank made an official statement that there was *"no need on monetary policy grounds for any general increase in the level of domestic interest rates"* [QB, vol. 24, p. 322].

The official dealing rates increased twice more in July driven mostly by the need to support market confidence, which was weak due to mixed monetary developments. *"The authorities acted to resist the resulting upward pressure on interest rates, as they had in earlier months, but the strength of the pressure was such that there were nevertheless sharp and unwelcome increases in interest rates and bond yields in July"* [QB, vol. 24, p. 318].

January 1985: The weakness of sterling, reflecting the strength of the dollar and concerns about a possible fall in dollar oil prices rather than loose monetary conditions, prompted a market-driven increase in interest rates on 14 January. The interest rates increased further on 28 January reflecting concerns about oil price developments in view of the OPEC meeting. *"The authorities considered that to have sought to resist these pressures would have unsettled the markets further, and risked accelerating monetary growth"* [QB, vol. 25, p. 25]. The total increase in the Bank's dealing rate in January 1985 was almost 4.5 percentage points. However, the short period of this policy change and the fact that the Bank did not take any additional restrictive measures and that interest rates decreased after market confidence was restored supports the decision not to include it in the list of policy episodes.

January 1986: Again financial market turbulence caused by falling oil prices and a prospect for a weakening of sterling led the Bank to raise interest rates by 1 percentage point in January 1986. However, as pressures for a further tightening of interest rates continued building up, the Bank signalled *"that this was not the official stance"* [QB, vol. 26, p. 28]. The increase in short-term interest rates was reversed soon after.

October 1986: Against the background of market expectations of rising interest rates primarily due to sterling weakness (related to oil price developments) and concerns about money and credit growth, the Bank attempted to reassure markets by an interest rate increase of 1 percentage point in October 1986, but resisted a further increase which was not deemed appropriate for monetary policy reasons. At his annual Mansion House speech the Governor of the Bank of England noted about the financial market turbulences in 1986: *"Recently there has been heavy speculation against sterling at a time of particular uncertainty about the outcome of meetings relating to interest rates abroad and oil prices. As in January we have refused to be rushed into hasty policy decisions by this period of market turbulence, and have acted*

to moderate the more erratic movements in both the domestic and foreign exchange markets" [QB, vol. 26, p. 509].

August 1987: The strength of sterling in 1987 had led the Bank to accept lower interest rates than would be justified by domestic monetary considerations. The monetary authorities took advantage by *"the weaker tone of the markets in late July/early August* [which] *presented the opportunity to raise interest rates without prompting renewed upward pressure on sterling"* [QB, vol. 27, p. 503]. This was an one-off increase of 1 percentage point which does not represent a shift in monetary policy but an adjustment to a more appropriate stance. Therefore it is not included as a policy episode.

4. Empirical evidence

In this part the effects of monetary policy shocks on a series of macroeconomic variables are investigated. First, some informal evidence is presented and then, following the standard procedure in this literature, a VAR analysis is performed. Monthly data for the period 1970:1-1992:12 are used.[14] The series included in various versions ot the VAR presented are the bank intervention rate, the Treasury Bill rate, the long-term interest rate and the USD exchange rate, as well as log-levels of the index of production, the retail price index, M0,[15] and the nominal effective exchange rate index. All VARs include lags of the oil price index to control for the effects of the two oil price shocks.

4.1 Informal evidence

The graphical representation of a number of key variables in Graphs 1 through 4 sheds some light both on the reasons behind the launch of restrictive policy and on

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[14] See data appendix for a description of the variables.

[15] Broader monetary aggregates, e.g. sterling M3 or even M4, would of course be a better choice, but they are not available for the whole sample period. Although the choice of M0, i.e. a narrow monetary aggregate, might have some qualifications there are two studies, one by Nelson (2000) and one by Janssen (1998) which rationalize its use in a baseline VAR. Nelson used M0 for the time period 1961-1999 to show that the money stock provides information about economic activity not present in short-term real interest rates. This would be a reason to include M0 in a VAR study of the UK transmission mechanism. Janssen estimates a money demand for M0 for the period 1972-1997 using an error-correction model. Even without including proxies for financial innovation the model passes the specification tests which are standard in this literature and establishes a long-run cointegrating relationship between M0 and key economic variables, among which output. Moreover, since 1984 M0 was an officially targeted aggregate.

the effects of such policy on output and inflation. Shaded areas correspond to the restrictive policy episodes identified in the previous part.

In Graph 1 the Bank's intervention rate is sketched along with an *ex post* real interest rate, which equals the intervention rate minus the realised annual inflation rate. The four policy episodes correspond to significant increases in both real[16] and nominal intervention rates. It is also possible to see two cases of significant rate increases (in 1981 and 1984-85), which, for reasons mentioned in the previous part, were not identified as policy episodes. This stresses the advantage of the narrative approach compared to one which uses the Bank intervention rate to identify policy shocks: not every increase in interest rates is meant to be a shift to more restrictive policy. It should also be noted that for most of the 1980s the real interest rate was on an upward course, because after the disinflation attempt of the end-1970s inflation declined faster than interest rates.

The annual inflation rate is sketched in Graph 2. The first point to note from this Graph is that all four policy episodes occurred when inflation was on a strong upward course. What is even more interesting is that the policy episodes ended before the peak in inflation was reached and inflation fell sharply only with a lag. The lags between the end of the policy episode and the fall in inflation become shorter as we move towards the end of the period under review.[17] Apart from the obvious policy lags, this observation would be consistent with a gradual gain of credibility which made policy more effective in reducing inflation. Alternatively it could mean that with the passage of time the authorities became more committed to combatting inflation and would not ease policy until its effects on costs and prices became evident. It is also remarkable that every single disinflation occurred after a policy episode in the period under review.

In Graph 3 the sterling effective exchange rate is sketched against the annual growth rate of M0. From the Graph it is possible to see that in all four episodes the very beginning of the episode is marked by a downturn of the effective exchange rate index. Especially the 1976 episode was preceded by a long period of sterling

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[16] The one exception is the significant fall in the ex post real interest rate recorded in 1979 (during the third episode) due to the acceleration of inflation during that year because of an increase in VAT.
[17] 20 months in the first episode (but the oil price shock of 1973 has to be taken account of), 8 months in the second and 6 months in the third, while in the last spell the start in the decline of inflation coincided with the end of the policy episode.

depreciation. It is also interesting to note the behaviour of money aggregates during the policy episodes in the period 1976-87, when the Bank pursued a monetary target and of the exchange rate in the policy episode of the last period (1987-1992), when the Bank pursued an exchange rate target. From the Graph it can be seen that the 1976 policy episode occurred at a time when both money and the exchange rate were pointing to loose monetary policy. The sterling had depreciated considerably in the previous two years. Once again it is confirmed that exchange rate concerns were the driving force behind this policy episode. The second policy episode of this period seems to be driven more by domestic monetary conditions (as confirmed by the statements of Bank officials), since money growth in previous months had accelerated, while the exchange rate was fairly stable or even on an appreciating course. The policy episode in the period of exchange rate targeting on the other hand happened at a time when sterling was appreciating. Therefore it can be said that it was not clearly driven by either the domestic monetary situation or by exchange rate concerns. The increase in inflation as shown in Graph 2 was most probably the direct driving force behind this round of policy tightening.

In Graph 4 the index of production is sketched along with its trend and cyclical components as estimated by a Hodrick-Prescott filter (λ=14400). The first important observation is that every decline in the trend of the index of production is preceded by a policy episode. In the period under review there are three declines in the trend to be seen, one in 1974-1975, one in 1979-1981 and one from 1989 until the end of the sample. In all three cases policy episodes occurred around the peak of a cycle. Only the policy episode in 1976 did not affect the trend of the index of production. This could be related to the fact that the duration of restrictive policy was in this case relatively small. In all four policy episodes the cyclical part of the index of production records a significant fall of between 5 and 10 per cent following the policy episode. This observation leads to the conclusion that all policy episodes affect the cyclical component of output, but the most severe ones also lead to a decline in the trend of output.

4.2 VAR analysis

The above analysis is just indicative. In this section a more thorough analysis of the effects of monetary policy shocks is presented on the basis of the VAR methodology, which is the most common framework for the identification of

monetary policy shocks and the study of their effects. In an unrestricted VAR each variable is predetermined, i.e. it is determined by lags of itself and all other variables in the system:

$$Z_t = B_1 Z_{t-1} + B_2 Z_{t-2} + ... + B_k Z_{t-k} + u_t \tag{1}$$

It is assumed that the error terms might be contemporaneously correlated but they are serially uncorrelated. As a result of this assumption combined with the presence of the same regressors on all equations in the system the OLS estimate of the coefficients in (1) is consistent.

The system presented in equation (1) does not impose any constraints on the contemporaneous correlations between endogenous variables. It is a set of reduced form equations, a representation of the end-result of a number of interactions between variables. Therefore its estimation gives little information about the transmission of policy shocks. For this reason structural VAR models are formulated as follows:

$$A_0 X_t = A_1 X_{t-1} + A_2 X_{t-2} + \cdots + A_k X_{t-k} + \varepsilon_t \tag{2}$$

where A_0 characterises the contemporaneous correlations among variables. Once a sufficient number of restrictions has been imposed on these correlations it is possible to identify a structure in the system (i.e. to recover the matrix A_0 from the estimates of B_i's) and then the equations in the system obtain an economic meaning. The issue of identification is intricately linked with what is probably the most important question in the study of monetary policy VAR models, namely the modelling of the monetary policy rule. There are various identification schemes used in the literature.[18]

The usual criticisms of structural VAR models are: first, that the answers they give about the transmission of monetary policy depend crucially on the identification scheme chosen; second, that they usually use as a monetary policy indicator a variable, like an intervention rate or a monetary aggregate, which can move for reasons other than monetary policy shocks; and, third, that they must specify a form for the monetary policy rule over long time periods, while monetary policy rules vary over time and sometimes involve structures much more complicated than the ones captured in the linear equations of VAR models.

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[18] For a review of the relevant literature, see Christiano, Eichenbaum and Evans (1999).

The relative merit of the narrative approach is that, having already identified the monetary policy episodes without recourse to a monetary policy reaction function, one can forecast the effects of a policy shock, by simply estimating an unrestricted VAR or by imposing minimal structure.

4.2.1 Results from a Choleski decomposition

For the following VAR analysis a policy dummy is constructed, which takes the value 1 when there is a systematic monetary policy tightening, i.e. an increase of interest rates of some magnitude, over a long period of time, with the intention of reducing inflation or inflationary pressures and which is accompanied by some further measures to the same end. The index takes the value 0, either in periods of accomodative monetary policy or in periods when interest rates are raised temporarily for other reasons apart from the intention of reducing inflation. This is in contrast to the Romer dummy which takes the value 1 only on the impact period of a shift in monetary policy. This adjustment makes the policy dummy informative in terms of the duration of restrictive policy. Once systematic policy has been controlled for by the inclusion of the policy dummy, a monetary policy shock is captured as a shock to the intervention rate. This is because any increase of the interest rate not related to systematic responses of monetary policy to economic conditions must be exogenous. Innovations to the baserate equation represent exogenous policy shocks, because they are purged from systematic restrictive policy through the inclusion of the policy dummy in the model.

The main results presented are impulse responses based on a Choleski factorisation. This is recursive in the sense that each variable responds contemporaneously only to shocks to variables which are ordered above it. In the baseline model the policy index is placed first and the baserate second. However, alternative orderings of the two variables produced identical results. The ordering of the rest of the variables is also of no importance. In fact random rearrangement of the remaining four variables produced qualitatively as well as quantitatively unchanged results.

The 48-month impulse responses of all variables in the baseline VAR model to a one-standard deviation shock to the intervention rate are presented in the second row of Graph 5. The variables included in the VAR model are the policy episodes

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indicator, the Bank intervention rate, M0 as a money indicator, the retail price index, the index of production and the nominal effective exchange rate index. Lags of the oil price index are also included as exogenous variables. All variables apart from the policy episode indicator and the interest rate are in log-levels. Thirteen lags of endogenous variables and the oil price index have been included in the model to account for possible seasonality which can be present even after seasonal adjustment of the data.

The first row represents effects of systematic monetary policy. These should be interpreted with great caution as systematic policy has been codified into a binary variable, so that the intensity of the various episodes of policy tightening is not taken into account. However a few interesting results come up. First, the duration of a round of policy tightening in the sample is about 10 months (that is the horizon for which the policy dummy is significantly above zero). This is effected by a steady increase in the bank intervention rate for more than six months after the initial shock. Then the intervention rate decelerates gradually, but it returns to pre-shock levels roughly one and a half years after the shock. These findings are consistent with the interpretation of the shock as a systematic policy shift. Another interesting result is that industrial production, inflation and the money stock, all increase initially before falling after some 10 months. This finding can be explained by the fact that systematic policy as discussed in the previous part has been triggered in the period under review by increases in these three variables. After roughly a year industrial production, retail prices and narrow money start decelerating, but it takes even longer for them to fall statistically significant to below pre-shock levels. The exchange rate depreciates in response to a shock to the policy index up until a year after the shock, then appreciates slowly and rises above its level at the time of the shock roughly two years after the start of the policy tightening. The initial depreciation is again probably related to the fact that in the period under review the Bank launched rounds of policy tightening when the sterling was depreciating or for fear of inflationary pressures which eroded the external value of the currency. The sterling then appreciates after the effects of monetary policy tightening in terms of combating inflation become visible.

However, systematic policy as argued in the literature is endogenous: it responds to the same variables that we would like to measure its effect on. For this reason, the second row of Graph 5 shows the response of all variables to exogenous

policy shocks as captured by one-standard-deviation shocks to the base rate. Such a positive shock of about 50 basis points to the base rate will bring about a decline in industrial production for about 18 months after the shock, after which it slowly returns to pre-shock levels. Retail prices respond with a delay to fall statistically significant to below pre-shock levels about a year after the initial shock. The fall in prices is persistent. Narrow money also falls for about two years after which it starts increasing again very slowly. The exchange rate shows a significant and perisistent appreciation as domestic assets become more attractive, in line with findings in structural open economy VAR models (e.g. Eichenbaum and Evans, 1995). Finally it should be noted that the response of the policy index after a restrictive policy shock is negative. This is not surprising given the fact that an exogenous policy shock, not supported by general domestic economic conditions will be reversed by the pursuit of accommodative policy, when the reasons for the sudden increases of the interest rate disappear. This is also due to a technical reason. The dummy takes the value 0 not only when monetary policy turns accommodative, but also when there is a policy shock, because 1's are reserved only for periods of systematic policy. If there is a policy shock at a time when the dummy was 0, then it remains 0, but if it was 1, then it will fall down to zero. Therefore we have a decline on the policy index as a response to a positive base rate shock.

Further interesting results come from the forecast error decomposition of industrial production. This shows that up to 25% of output fluctuations in a horizon of two years can be explained by interest rate shocks. This is a large estimate providing some evidence that policy shocks can cause large exogenous swings in output. After two years a rising share of output fluctuations can be explained by exchange rate shocks. This share reaches 42% in a four-year horizon.

4.2.2 Robustness analysis

A series of robustness tests are undertaken to check whether these results are compromised by the choice of variables or policy episodes. These are presented in Graphs 6 through 9.

Graph 6 presents impulse responses from a VAR model in which the Treasury bill rate (as a short-term rate) has been used instead of the Bank intervention rate. The results remain virtually unchanged. This is also the case in Graph 7, where a long-

term interest rate has been included in the VAR model as a further endogenous variable. The response of the long-term interest rate to the policy shock is as expected an increase on impact of a smaller magnitude than the increase in the base rate. The long-term interest rate returns to pre-shock levels only few months after the shock.

Graph 8 presents results for a VAR model where the nominal effective exchange rate has been replaced with the US dollar exchange rate. Two main differences come up. First, the retail price index increases in the first six months after a policy shock and then decelerates, arriving to below pre-shock levels about two years after the initial shock. A possible reason could be that oil prices are quoted in US dollars. After both oil price shocks the UK was relatively protected against inflationary pressures by a strong sterling, so that controlling for the dollar exchange rate the oil-related inflationary pressures are possibly exacerbated. A second interesting difference is that there is no persistent appreciation of sterling against the US dollar. Here again a possible explanation would be that policy shocks identified might be a response to increases in interest rates abroad, more specifically in the United States. If the Bank of England raised interest rates in response to a rate increase in the US, then there would be no scope for a persistent appreciation of the sterling against the dollar.

Finally the results of one more specification, in which the policy dummy excludes the 1976 episode, are reported in Graph 9. There are two reasons why the 1976 episode might be questioned. It was not only the shortest of the four policy episodes identified, but it was also clearly driven by growing exchange rate pressures at a time when there was not equally clear and compelling evidence from the domestic front. The impulse responses plotted in the first column of Graph 7 confirm that the results of the baseline model are not driven by the inclusion of the 1976 episode. Exclusion of the episode makes hardly any difference to the shape of the impulse responses.

4.2.3 Comparison with alternative models

A final test for the policy indicator identified using the narrative approach would be to compare its effects with those of other measures of policy shocks proposed in the literature. For this purpose a structural open economy VAR model is estimated and the responses of all variables to a one-standard-deviation shock are

presented in Graph 10. The matrix of contemporaneous correlations and the vector of structural innovations are given below:

$$A_0 = \begin{bmatrix} 1 & \alpha_{12} & 0 & 0 & \alpha_{15} \\ \alpha_{21} & 1 & \alpha_{23} & \alpha_{24} & 0 \\ 0 & 0 & 1 & \alpha_{34} & 0 \\ 0 & 0 & 0 & 1 & 0 \\ \alpha_{51} & \alpha_{52} & \alpha_{53} & \alpha_{54} & 1 \end{bmatrix}, \quad \varepsilon_t = \begin{bmatrix} \varepsilon_r \\ \varepsilon_m \\ \varepsilon_p \\ \varepsilon_y \\ \varepsilon_{xr} \end{bmatrix}$$

The first row of A_0 represents the policy rule. Monetary authorities respond contemporaneously to news about money and the exchange rate, but not to output or prices. This is consistent with information lags in monetary policy. The second row follows standard money demand specifications, i.e. the demand for money depends on interest rates, income and prices. Prices are only allowed to respond contemporaneously to output shocks, output responds only with a lag to all endogenous variables, while the exchange rate which is a continuous financial market variable responds contemporaneously to all available information. ε_r is the shock to the intervention rate equation, which is considered to be the policy shock, ε_m is the shock to money, representing the money demand, ε_p represents a shock to the price level, ε_y is an output shock and ε_{xr} is a shock to the exchange rate. This model is a short version of the open economy model presented in Kim and Roubini (2000).

The impulse responses to a policy shock captured as a one-standard-deviation innovation to the interest rate, are presented in Graph 10. They are qualitatively and quantitatively similar to those produced by the use of the policy index. The only differences are a slightly more delayed response of prices, which start declining more than a year after the initial shock, and a greater persistence of the appreciation of the sterling. Moreover, the variance decomposition shows that the shares of variation to industrial production due to policy and exchange rate shocks are somewhat smaller (around 22% in a four year horizon), while an equally large share (24%) can be explained by price shocks. In general, however, the comparison between a structural VAR and the "narrative" model, indicates that identification of policy shocks on the basis of the narrative approach works well.

Mountford (2002) has estimated a structural VAR for the UK using the Uhlig (2001) sign restriction methodology for identification. Here again the monetary policy

shock is captured by a shock to the interest rate equation. His results show a much smaller effect of monetary policy on output: policy shocks account for only 5% of output fluctuations in the short- and long-run. However, he also shows that a shock to the interest rate causes a rather long-lived response of GDP, which does not return to its pre-shock levels up to 10 years after the shock.

5. Conclusions

In this paper the narrative approach developed by Romer and Romer (1989) is adapted so that it can be applied to a small open economy. The United Kingdom is an interesting case study, as over the years both the monetary policy framework and the monetary policy strategy changed to take account of changes in financial structures and advances of economic thought regarding the role of monetary policy. Under changing monetary regimes identification of monetary policy shocks using a structural VAR model is questioned. The study of policy record provides a more informative tool for the understanding of the actions of monetary authorities.

Two characteristics of monetary policy actions are unchanged throughout the sample period. First, monetary authorities launched restrictive policy only in periods when aggregate demand was growing. Second, in deciding about the launch of a restrictive policy both domestic monetary considerations and exchange rate developments were taken into account.

An evaluation of the effects of monetary policy shocks with the use of an unrestricted VAR confirms the stylised facts regarding their transmission. The shock dies out after a bit more than a year and it causes a persistent decrease in the monetary base and retail prices, a hump-shaped response of output with the maximum effect about two years after the initial shock, while the exchange rate appreciates persistently. These results are broadly unchanged in the robustness analysis. An important result comes from the variance decomposition of output, which shows that up to 25% of output fluctuations in a 4-year horizon are due to monetary policy shocks.

The study of UK monetary policy in this paper is confined to the period prior to inflation targeting. Using the narrative approach to study inflation targeting is a further step towards understanding monetary policy in the country and an interesting

comparison regarding the efficiency and the effects of policy in the two periods can be made. This is left for future work.

A further extension of this methodology would be to apply it to check the effects of positive, i.e. expansionary, monetary policy and figure out whether there is a case for asymmetries.

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DATA APPENDIX

Y_t: Log-level of the index of production data for statbase. Contains index data (2001=100) for total production (Mining & Quarrying, Manufacturing and Electricity/Gas/Water). Source: Office for National Statistics.

P_t: Log-level of the Retail Prices Index (1987=100). Source: Office for National Statistics. Index levels are available since January 1976. But 12-month changes of the index are available since 1948. The index level has been calculated back to 1971.

I_t: This is the Bank intervention rate monthly average (business days only). Until September 1972 the bank rate is reported. This was replaced by a minimum lending rate in October 1972. The latter was replaced by the minimum band 1 dealing rate (which is a discount rate), since 20 August 1981.

$M0_t$: The log-level of the narrow money aggregate M0 (average monthly amount outstanding), which includes total sterling notes and coin in circulation outside the Bank of England and operational deposits of banks with the Bank of England. The data are seasonally adjusted. Source: Bank of England.

XR_t: The monthly average of the effective exchange rate index (1990=100). Source: Bank of England.

CP_t: The average crude price index composed by the UK brent (light), Dubai (medium) and West Texas Intermediate, equally weighted.

MP_t: The monetary policy index, where a 1 is put in all months where monetary policy was actively restrictive (i.e. June 1972-December 1973, April-November 1976, November 1977-November 1979 and June 1988-September 1990) and a 0 otherwise.

$TBrate_t$: Series 11260C..ZF... (Treasury bill rate) from the IFS statistics.

$Bondyield_t$: Series 11261...ZF... (Govt Bond Yield: Long-Term) from the IFS statistics.

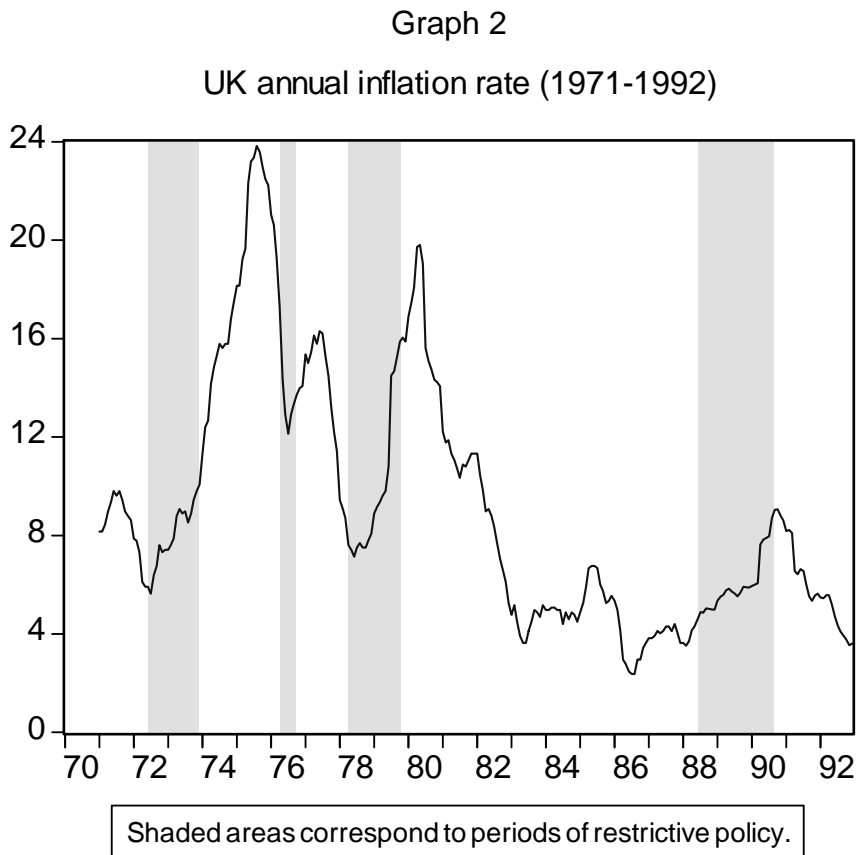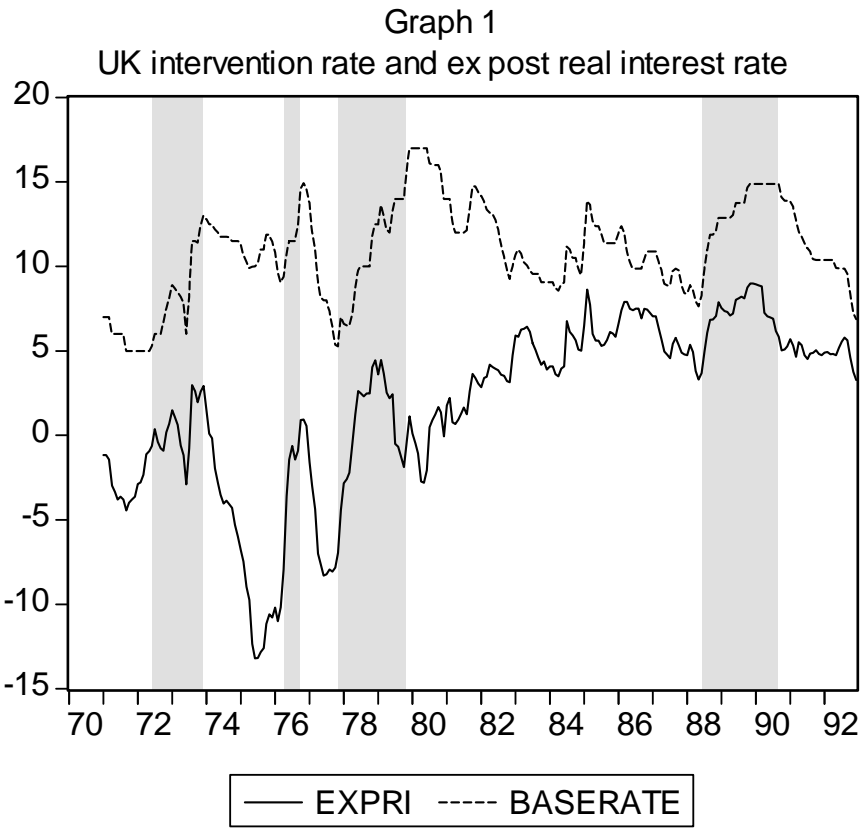**Table 1: Selection of official statements on the reasons for policy actions**

Period	Statements
June 1972 - December 1973	*"The move was seen as consistent with the official monetary policy objective of restraining the growth in the money stock – which was currently very rapid – to a rate which was adequate, but not excessive, to finance the 5% annual rate of expansion in real output expected at the time of the Budget."* [QB, vol. 12, p. 315] *"...we did then* [end of the second quarter of 1972] *shift sharply to a considerably more restrictive policy ... However, I am not confident that we have now done enough to ensure that monetary expansion will moderate to the desired extent in coming months. There are certain features ahead..., which could lead to a renewed acceleration in monetary expansion. We will need to be vigilant and active to prevent this."* [QB, vol. 12, p. 517] *"There was no case for a further fall in the rate for balance of payments reasons and it would have worked against the Government's anti-inflationary measures. We therefore called for further Special Deposits which, together with some expenditure of exchange, brought about a sharp upward shift in short-term rates in London. The shift achieved our primary objective of stabilizing the sterling exchange rate and was also, in my judgment, appropriate to the domestic situation where a more restrictive policy was required. ...For moderation in the rate of growth of the economy and in the pace of inflation requires moderation in the pace of monetary expansion"* [QB, vol. 13, p. 476]. *"The tightening of monetary policy in November* [1973] *followed other adjustments of policy undertaken in the light of the needs of the economy at that stage ...it was made clear that the aim of the government policy ...was to secure continuing expansion at a more moderate and sustainable rate ...the further large call for Special Deposits should help to moderate monetary expansion and an unduly rapid growth of bank lending."* [QB, vol. 13, p. 417].
April- November 1976	*"... to restrain the growth of bank lending to the private sector within the bounds set by the 12% target; and to secure adequate official sales of public sector debt to the general public, so as to neutralise the creation of liquidity arising from the public sector deficit and thereby also moderate the rate of monetary expansion... The current stance of monetary policy will have to continue for the time being. But it is far from costless, and if interest rates remain so high for long, they will begin to be a powerful deterrent to investment, only now showing signs of recovery"* [QB, vol. 16, p. 454]. *"Our greatest requirement is that we should put a stop to the debilitating erosion in the value of our currency, external and internal"* [QB, vol. 16, p. 454].

Table 1 (continued)

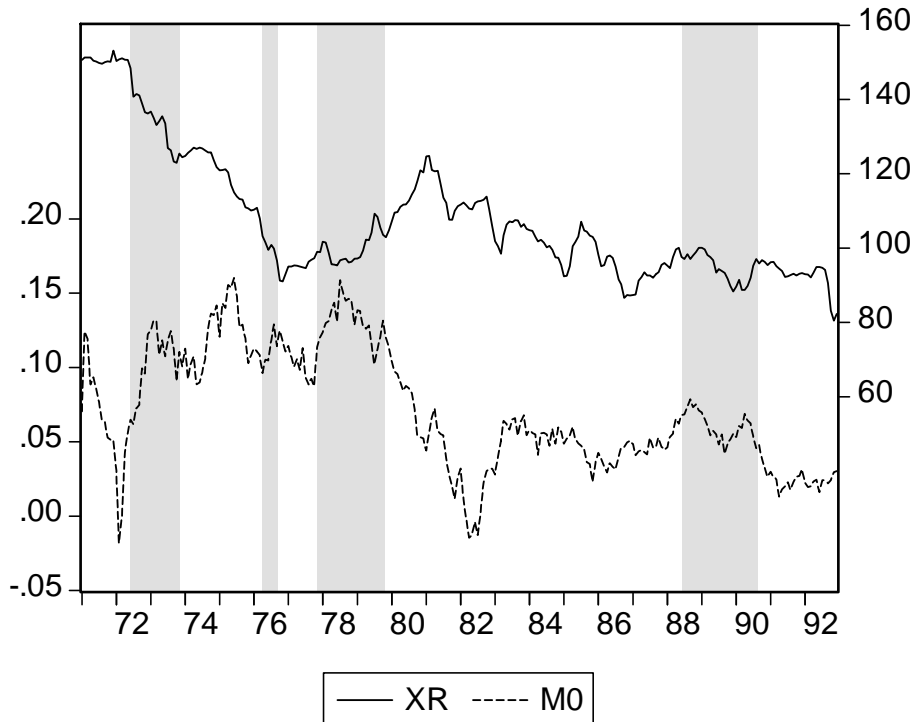| November 1977 - November 1979	*"The action taken underlines the determination of the authorities to maintain firm monetary control"* [QB, vol. 18, p. 502]. *"Some argue that we are free to choose between defeating inflation and satisfactory growth. My case is that we no longer have such a choice. Inflation has got far too serious. Until we have got inflation under control, we cannot secure satisfactory economic growth. It might be possible to achieve a short-term spurt in activity. But while inflation persists at anything like its present pace, fiscal or other means of demand stimulus are unlikely to produce sustainable gains in activity and employment. They would, however, undoubtedly exacerbate inflationary pressure"* [QB, vol. 19, issue 4, p. 407].
June 1988- September 1990	Policy actions in the summer of 1988 intended to give *"the clear message that monetary policy was directed at achieving a slowdown in the growth of domestic demand and at restraining inflationary pressures"* [QB, vol. 28, p. 485]. *"...fears of recession gave way to a realisation that growth, in particular of domestic demand here, was continuing at an unexpected and unsustainable rate, and that monetary policy should be tightened to head off growing inflationary pressures"* [QB, vol. 28, p. 507]. *"the strength of sterling at the beginning of this year ...delayed the appropriate rise in interest rates"* [QB, vol. 28, p. 507].

Table 2: Variance decomposition of the policy indicator and the monthly percentage change in the index of production

BASELINE MODEL

Average of periods	Variance decomposition of IP					
	PS	*BASERATE*	*M0*	*RPI*	*IP*	*XR*
1-3	0.67	0.54	0.98	0.08	97.68	0.05
4-6	0.64	0.73	4.34	0.25	92.99	1.06
7-9	2.24	3.84	7.67	0.23	82.94	3.08
10-12	5.00	7.50	8.13	0.87	70.94	7.55
13-15	4.90	14.91	7.49	0.96	60.06	11.68
16-18	4.26	22.48	6.68	0.93	51.88	13.77
19-21	4.24	25.15	6.15	2.27	47.75	14.43
22-24	4.88	25.65	5.83	3.34	45.45	14.85
25-30	5.28	25.04	5.53	4.19	42.64	17.33
31-36	6.37	21.90	4.86	4.60	37.79	24.48
37-42	6.41	18.52	4.16	5.09	32.20	33.62
43-48	5.83	16.14	3.64	5.44	28.60	40.36

STRUCTURAL MODEL

Average of periods	Variance decomposition of IP				
	BASERATE	*M0*	*RPI*	*IP*	*XR*
1-3	1.18	2.26	0.11	96.28	0.16
4-6	2.26	10.86	1.04	84.73	1.12
7-9	8.72	9.68	1.94	71.37	8.29
10-12	16.80	8.29	2.86	58.83	13.23
13-15	18.53	9.02	5.68	49.75	17.03
16-18	18.90	9.56	8.16	41.60	21.79
19-21	17.86	10.62	10.46	36.48	24.57
22-24	16.57	11.11	11.08	33.41	27.83
25-30	15.95	11.58	12.46	30.60	29.41
31-36	17.06	11.38	15.18	28.28	28.10
37-42	19.91	9.93	19.35	25.75	25.05
43-48	21.74	8.16	24.31	23.34	22.45

Graph 1
UK intervention rate and ex post real interest rate

EXPRI ----- BASERATE

Graph 2

UK annual inflation rate (1971-1992)

Shaded areas correspond to periods of restrictive policy.
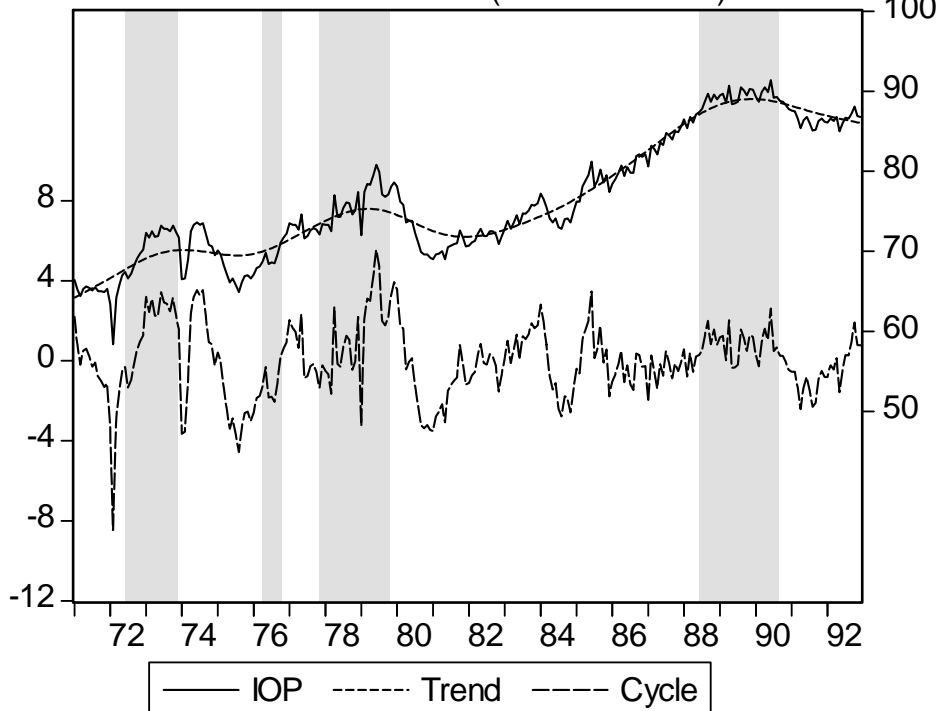
Graph 3
Evolution of nominal effective exchange rate and annual growth of M0

XR —— M0 -----

Graph 4

Index of production (actual, trend and cyclical component)*
Hodrick-Prescott Filter (lambda=14400)

IOP —— Trend ------- Cycle -----

*Shaded areas represent monetary policy episodes

Graph 5: Baseline model
Choleski ordering: PS, baserate, M0, RPI, IP, XR
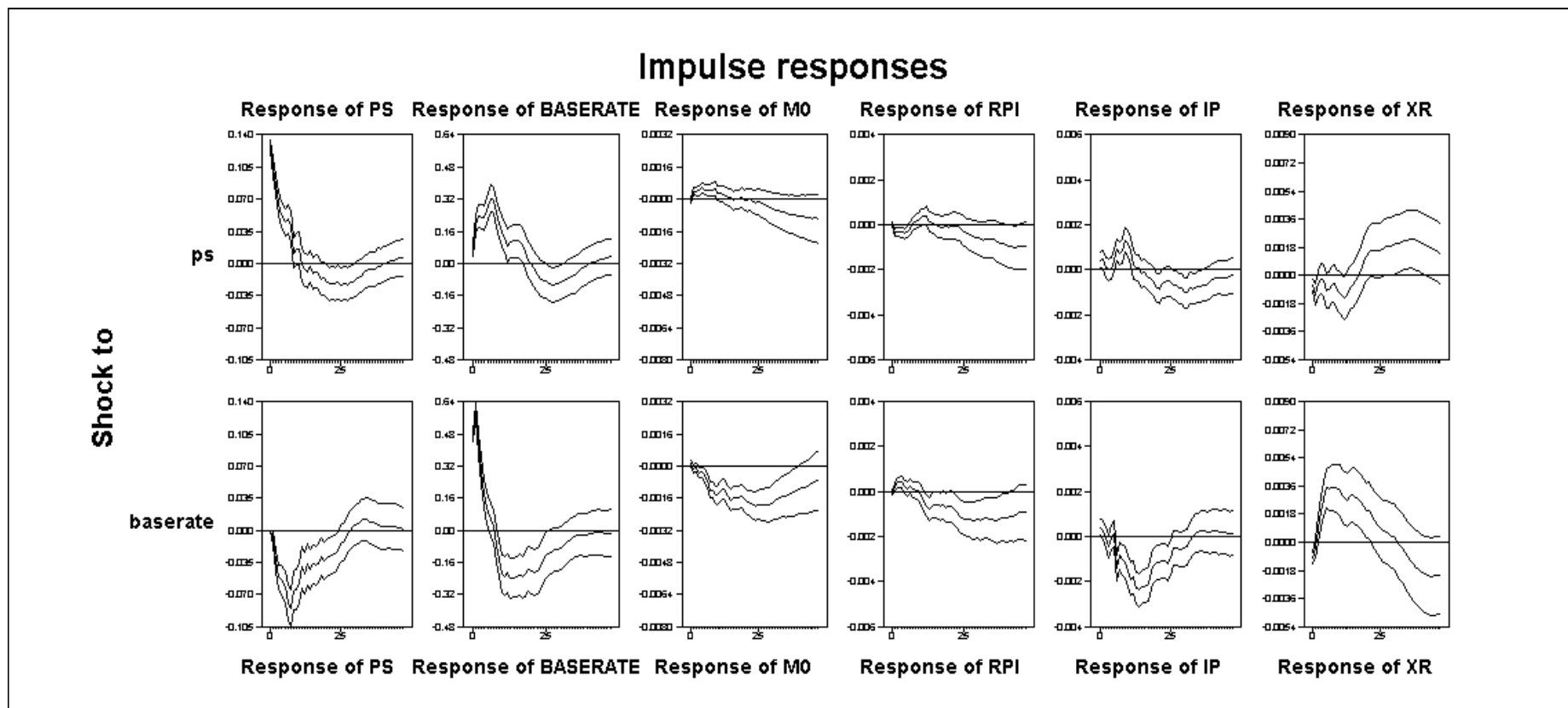
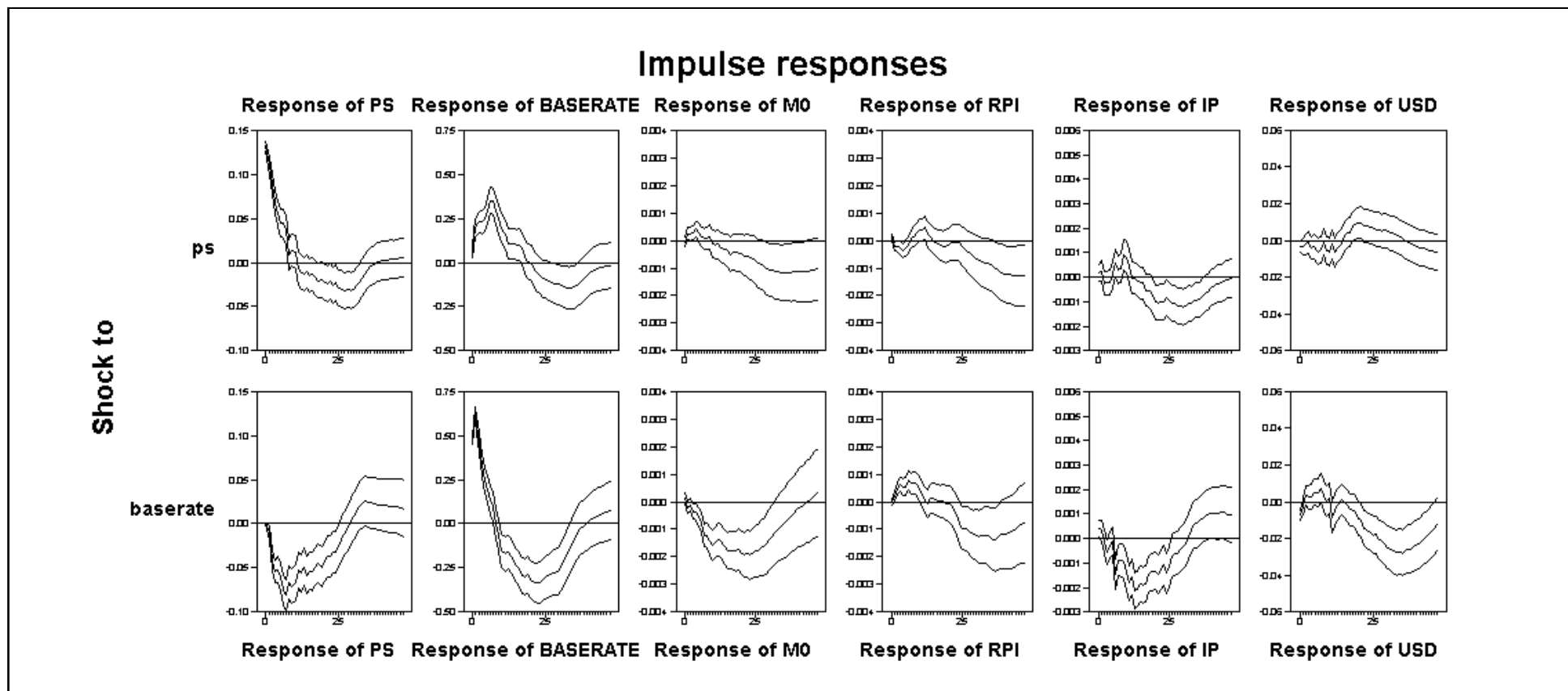**Graph 6: Model with TB-rate instead of baserate**
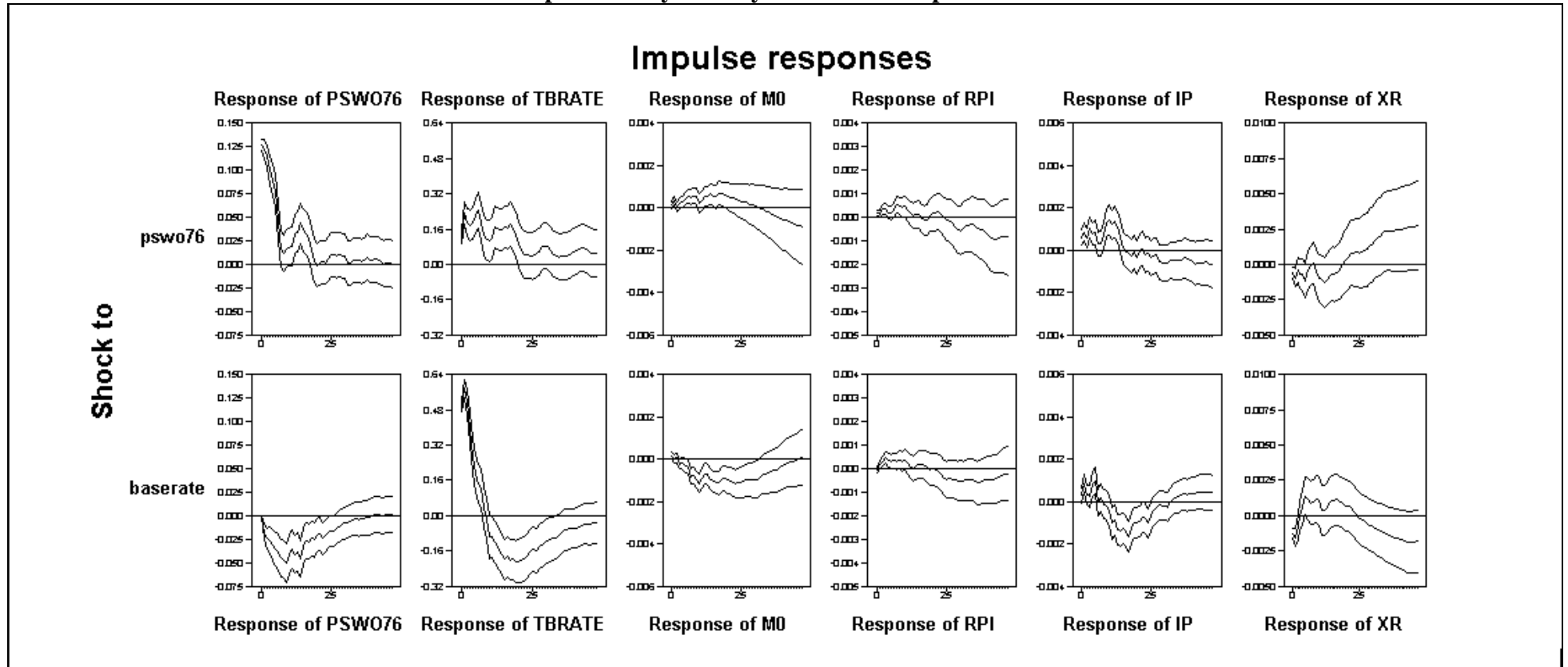

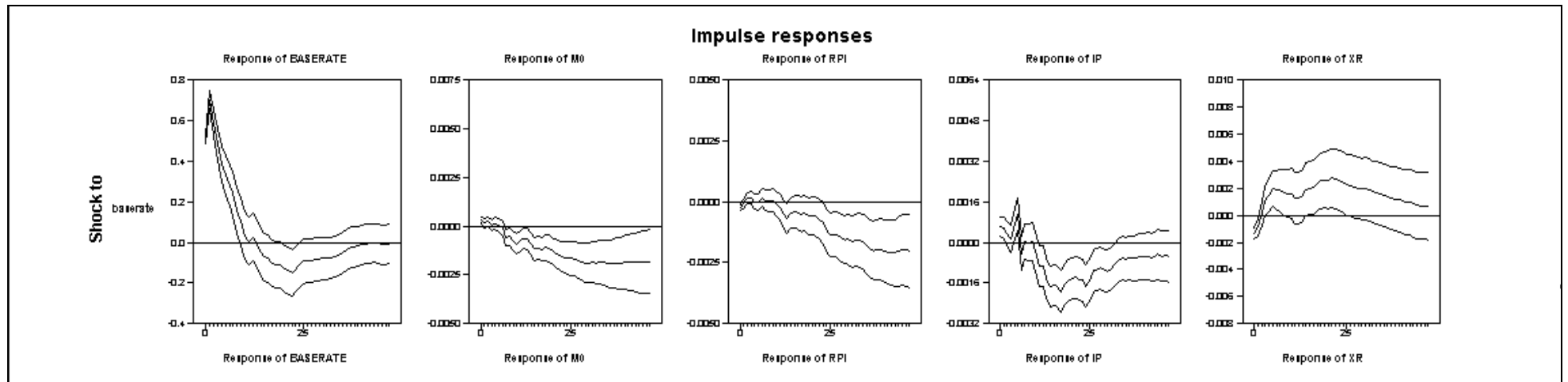Impulse responses
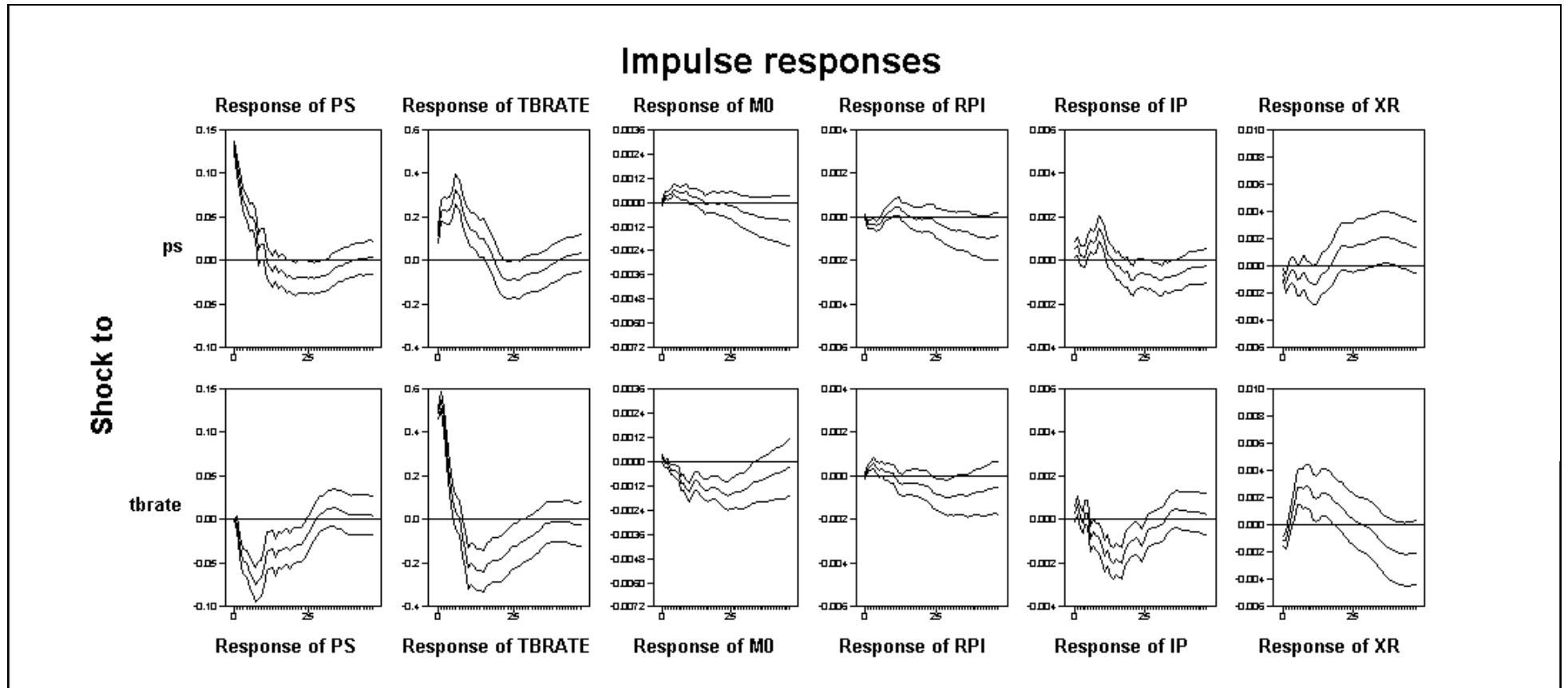
Graph 7: Inclusion of long-term rate
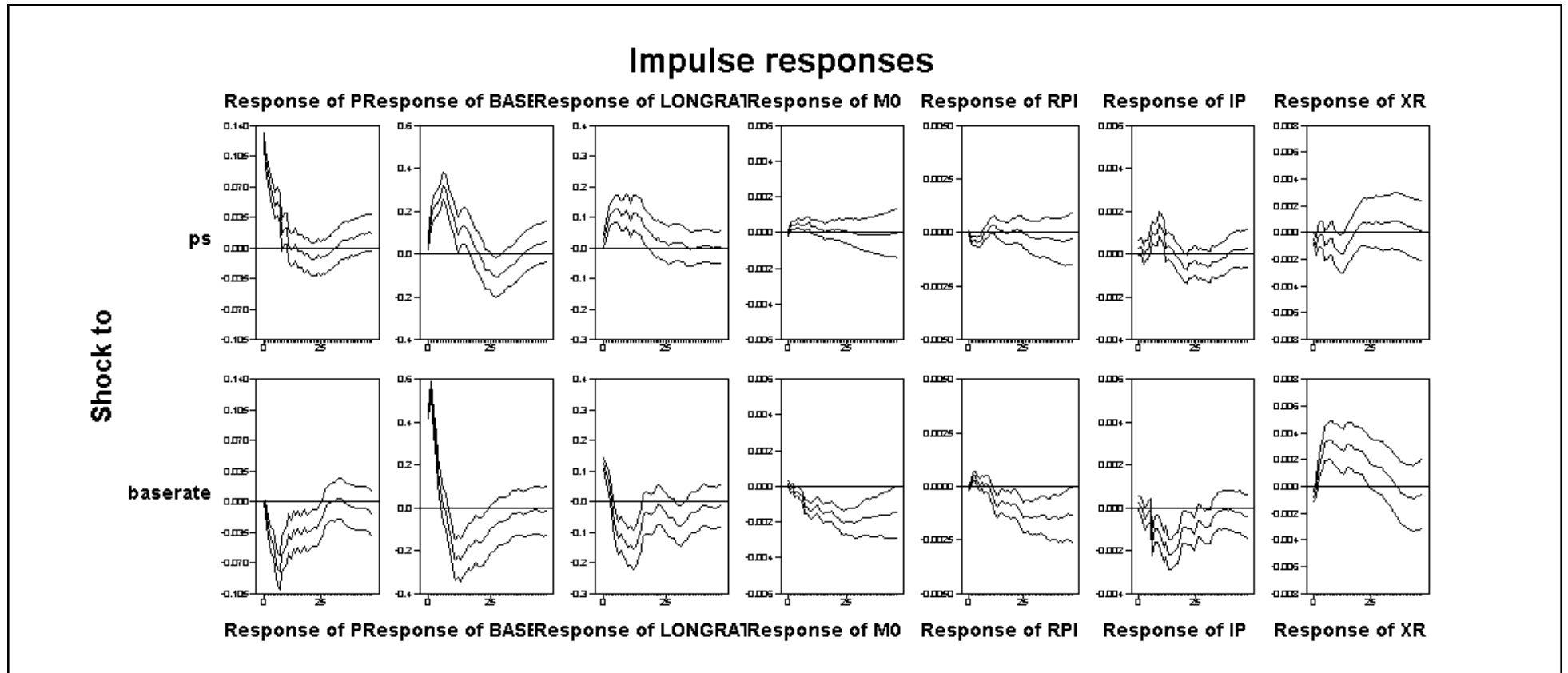
Graph 8: USD exchange rate instead of nominal effective exchange rate

Graph 9: Policy dummy without 1976-episode

Graph 10: Structural model

Impulse responses

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