



Kim Abildgren

Danmarks Nationalbank 1818-2018

DANMARKS
NATIONALBANK
200 YEARS

2018

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Danmarks Nationalbank 1818-2018



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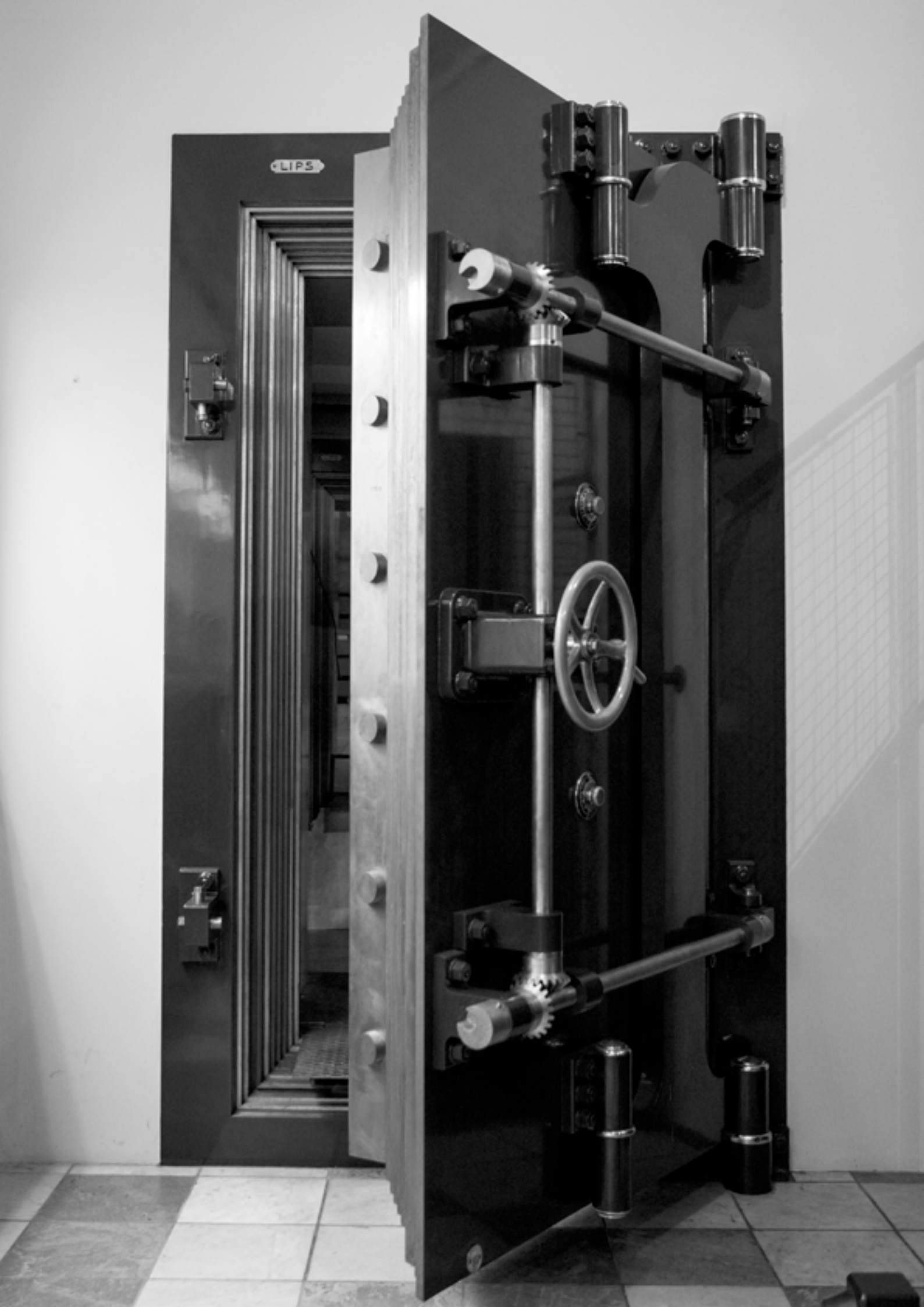
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Preface

Danmarks Nationalbank's 200-year history has been characterised by long periods of a robust economy, but also by dramatic episodes during which the stability of prices, payment systems and the financial sector have been jeopardised. This anniversary book provides a brief overview of Danmarks Nationalbank's 200-year history, stressing the elements that are particularly relevant for today's readers.

The establishment of Danmarks Nationalbank – or Nationalbanken i København, as it was called then – in 1818 was a result of an extensive crisis in the monetary system in the wake of the period of high inflation and the massive government finance problems during the Napoleonic Wars.

In the first half of the 19th century, Danmarks Nationalbank had focus on restoring the monetary system. It succeeded, and prices subsequently remained stable until the outbreak of World War I. From around the mid-19th century, Denmark followed first the silver standard and later the gold standard. This meant fixed exchange rates against the currencies of many other countries adhering to the same standards.

In the second half of the 19th century, the basic structure of the financial system we know today emerged, with private financial institutions playing a central role in terms of extending credit and offering savings products. But the second half of the 19th century and the early 20th century also brought the first banking crises and a need to regulate the financial sector.

The 1920s saw a crisis in the Danish banking sector, and in the early 1930s, the international gold standard system collapsed. However, Denmark upheld its long-standing fixed exchange rate policy tradition. In the second half of the 1930s, Denmark pursued a fixed exchange rate policy against the pound sterling. After World War II, the framework for the fixed exchange rate policy was first the international dollar-based Bretton Woods system and later the European exchange rate cooperation.

In the first three decades after World War II, the financial sector was characterised by stability. The same could not be said about prices. This situation culminated in the late 1970s and early 1980s, when inflation reached double-digit rates and government budget deficits and current account deficits were massive.

In the 1980s, price stability was restored thanks to a notable shift in economy policy towards more stability-oriented fiscal policy and a consistent fixed exchange rate policy, first against the German D-mark and later against the euro. In the last 30 years, inflation has been low. All the same, this period has also seen banking crises and a need to impose new rules on the financial sector. In addition, payment systems have undergone marked transformations and are now based on complex IT systems with resultant new types of risk.

The book targets a wide audience and is richly illustrated. At Danmarks Nationalbank's website, you will find not only the electronic version of the book, but also a web appendix with literature.

The anniversary book was prepared by Kim Abildgren. A number of external persons have contributed with valuable comments on the draft for the whole book or parts of it. They are Øyvind Eitrheim, Jan Fredrik Qvigstad, Gitte Keinicke Staghøj and Frank Øland. Furthermore, many employees of Danmarks Nationalbank have made a huge contribution by commenting on the draft and assisting with administration, archive and library searches, linguistic editing, graphical layout and verification of the contents of the book.

Copenhagen, 4 July 2018

Birth of Danmarks Nationalbank

Danmarks Nationalbank was established in 1818 with the aim of rebuilding the monetary system. Since then, its objective has been to ensure stable prices, a stable financial system and safe and secure payments.

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Chapter 1

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Bombardment of Copenhagen in 1807

After the British bombardment of Copenhagen in 1807, Denmark sided with France in the Napoleonic Wars. The considerable war expenditure and decline in government revenue were to a large extent covered by printing more money. This led to very high inflation and de facto collapse of Denmark's currency system.

State bankruptcy and a chaotic monetary system

Fiscal policy ran wild during the Napoleonic Wars in the early 1800s, and the enormous government budget deficit was financed by printing more money. This caused inflation to soar, requiring an extensive currency reform.

As part of this reform, Danmarks Nationalbank was established in 1818 with a monopoly on issuing banknotes in Denmark. It was considered essential to ensure Danmarks Nationalbank's independence of the state, so that it could not be ordered to engage in monetary financing of government budget deficits.

Danmarks Nationalbank spent the first decades of its existence restoring people's trust in the monetary system. It succeeded, but this process illustrates how quickly credibility can be lost and how long it takes to restore it.

War and a chaotic monetary system

Inflation was soaring in Denmark in 1808-13. In 1813 alone, prices rose by more than 300 per cent, cf. Chart 1.1. The background was that Denmark had sided with France in the Napoleonic Wars after the British bombardment of Copenhagen in 1807. This brought Denmark's foreign trade almost to a halt, and government revenue plummeted.

Since the central government was struggling to raise loans, the considerable war expenditure was financed by printing more money. This strongly eroded the purchasing power of Danish banknotes, and Denmark's financial system collapsed de facto. The central government showed that it had also lost confidence in the currency system by requiring payment of certain taxes in kind (grain) rather than banknotes.

Order and stability: The currency reform of 1813

In June 1812, the Minister for Finance presented a proposal to restructure the currency system. On 5 January 1813, this proposal was implemented as "Forordning om Forandring af Pengevæsenet for Kongerigerne Danmark og Norge samt Hertugdømmerne Slesvig og Holsten" (Decree on changing the currency system for the Kingdoms of Denmark and Norway and the Duchies of Schleswig and Holstein). The preface to the Decree said, inter alia:

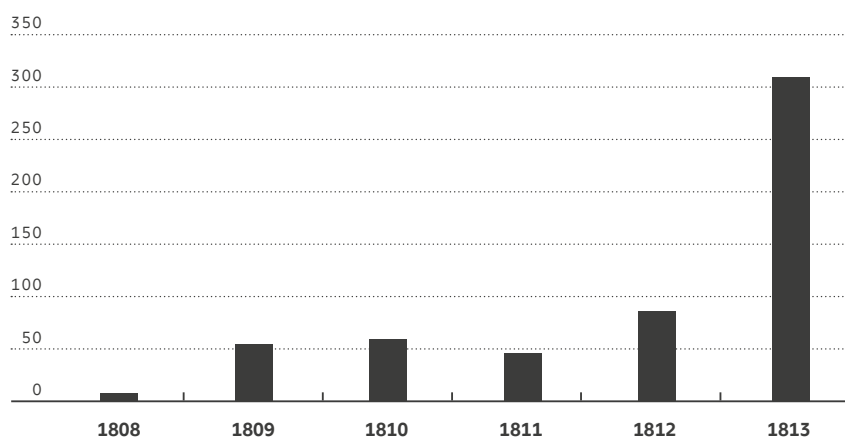
"Since the government's existing currency system is shaken to the core, we have decided to bring order and stability to the system by establishing a permanent and unshakeable foundation for it. ... Any inconvenience which a change as sudden and extensive as this one may cause should just be regarded as being in the interest of our mother country."

The reform included the establishment of a new, state-owned central bank, Rigsbanken. It was granted a monopoly on issuing banknotes in a new currency unit, rigsbankdaler, which the Danes were obliged to accept. The currency reform of 1813 is often called the "state bankruptcy". The reform meant exchange of existing banknotes in the old currency unit (kurantdaler) for new banknotes at an exchange rate of 6 kurantdaler to 1 rigsbankdaler.

CHART 1.1

Consumer price inflation 1808-13

Per cent, year-on-year



Why was a silver or gold standard for banknotes introduced? And why was it abandoned?

In a large part of the 19th century and until the beginning of the 20th century, the currency system in Denmark and many other countries followed first a silver and then a gold standard. Coins had a certain content of precious metal, and banknotes could be exchanged freely for silver or gold coins at the central bank according to the official conversion table.

The rationale was that the government would be able to enhance the credibility of its monetary policy by voluntarily submitting to the straightjacket on banknote issuance which a silver or gold standard represented. Worldwide, the supply of silver and gold was limited, and it was increased only by occasional new discoveries. Accordingly, the government or central bank of a given country could not just print more money, since the volume of banknotes had to be (wholly or partially) covered by the country's silver or gold reserves.

But the rules of the game were not always observed. In many cases, a country chose to abandon the silver or gold standard, not converting the issued banknotes to precious metal. So although the currency system was, in principle, linked to a product (silver or gold), the real value of the banknotes was ultimately only secured by the government's ability to pursue economic policy that would not generate inflation and erode the purchasing power of money.

A fundamental drawback of issuing banknotes linked to precious metal was that the volume of banknotes could not be increased if needed in an economic upturn. Nor was it possible to increase the volume of banknotes if an urgent need for liquidity were to arise in connection with a banking crisis. This seriously restrained the central bank's possibilities of using extraordinary lending to mitigate the crisis. That is why silver and gold standards have now been abandoned.

Precious metals have retained their traditional role as investment assets even though they no longer play a role in banknote issuance. Many central banks have kept gold reserves for historical reasons, and Denmark's Nationalbank's stock of gold still constitutes a (small) part of its foreign exchange reserve.

HIGH INFLATION AND STATE BANKRUPTCY

**Prices
soared by
311 per cent**

in 1813 because the state had financed large budget deficits by the issuing of money.

The main purpose of the currency reform was to combat the rampaging inflation. Rigsbanken's banknote issuance was capped, and the plan was to enable free exchange, after a certain period, of the rigsbankdaler banknotes for silver coins at Rigsbanken in proportion to the official silver value of the banknotes. However, initially the market price of the new banknotes relative to silver was far below their official silver value.

It had not been possible to convert Danish banknotes to silver since 1757, but the silver standard was a key element of the currency reform, aimed at limiting future banknote issuance. In an international perspective it was considered good governance at the time to introduce a silver standard (later a gold standard) for banknote issuance. The idea was that the supply of silver worldwide was limited and increased only by occasional new discoveries. As a result, the government or central bank of a given country could not just print more money, since the amount of banknotes was to be (wholly or partially) covered by the country's silver reserves.

The central government's access to print money

The years up to 1813 illustrate how financing government budget deficits by printing more money can lead to high inflation. There are similar historical examples in other countries. The legendary example is Germany in the early 1920s when inflation skyrocketed to 300,000 per cent p.a.

Danmarks Nationalbank's main buildings in Copenhagen over 200 years

Danmarks Nationalbank's main building 1818-70 was located in the middle of what is now Slotsholmsgade, next to Christian IV's old Stock Exchange in Copenhagen. It was designed by the architect C. F. Harsdorff and had previously housed two of Danmarks Nationalbank's predecessors (Kurantbanken and Rigsbanken).

In the period 1870-1976, the main building was located at Holmens Kanal 17. The building, designed by the architect J. D. Herholdt, was built in 1866-70 and was a true copy of the Italian Palazzo Strozzi in Florence.

Since 1976, Danmarks Nationalbank's main building has been at Havnegade 5. The building was designed by the architect Arne Jacobsen and built in 1965-78. In 2009, the Heritage Agency of Denmark decided to list the building because of its architectural presence in the city, its exquisite materials and its gardens.

KONGENS NYTORV

Main building 1870-1976



CHRISTIANSBORG

Holmens Kanal

HOLMENS KIRKE

Niels Juelsgade

Havnegade

Main building 1818-70



Børsgade

BØRSEN

Slotsholmsgade

Main building since 1976



When Rigsbanken was established in 1813, it was considered very important to ensure its independence of the state in order to boost people's confidence in the new currency unit's purchasing power after the high inflation during the Napoleonic Wars. Today, it is widely agreed that the best foundation for price stability is obtained if the central bank is independent. The central bank thus avoids pressure to finance government expenditure.

The Maastricht Treaty of 1992 therefore contains both a requirement of central bank independence in the EU member states and a prohibition against monetary financing of the public sector.

Establishment of Danmarks Nationalbank in 1818

As mentioned, Rigsbanken was established as a state-owned bank. A royal open letter of 30 July 1813 reassured the Danish people that the bank would be restructured as a private limited liability company. This was done with the establishment of Danmarks Nationalbank in 1818. Private ownership was to cement its independence of the state and enhance confidence that the state would not in future finance its expenditure by the issuing of money.

To support confidence in the new rigsbankdaler, the Rigsbanken was granted mortgage deeds in all real estate in Denmark amounting to 6 per cent of each property's value. This commitment was called the "bank mortgage". The property owners were free to choose whether to redeem these mortgage deeds in pure silver or pay annual interest to Rigsbanken of 6.5 per cent of the debt. However, most of the interest was compensated via reductions of property tax payable to the state. In reality, Rigsbanken – and subsequently Danmarks Nationalbank – had thus been granted a proportion of the central government's future tax revenue as security for the value of banknotes.

Every owner of a property with a bank mortgage above a certain minimum amount was granted the right to shares in Danmarks Nationalbank. Moreover, voluntary subscription of shares was possible, although not many people utilised this option. This meant that Danmarks Nationalbank's shareholders were primarily Danish property owners.

The shareholders had no direct influence on Danmarks Nationalbank's governance – basically their only right was to receive dividend. The purpose was to ensure Danmarks Nationalbank's independence not only of the state, but also of narrow private shareholder interests. Not until 1845 did the shares in Danmarks Nationalbank yield dividend.

**ONLY DANMARKS NATIONALBANK
IS ALLOWED TO ISSUE CASH**

A monopoly on issuing banknotes

**was granted to Danmarks Nationalbank
in 1818 and has applied since then.**

Danmarks Nationalbank's "constitution" – the Charter of 4 July 1818

On 4 July 1818, the King signed Danmarks Nationalbank's "constitution" (Charter), which authorised Danmarks Nationalbank to operate as a central bank and granted it a monopoly on issuing banknotes. Danmarks Nationalbank began to operate in August 1818.

Danmarks Nationalbank's top management consisted of a Board of Directors with 15 members, who were initially appointed by royally designated electors. Subsequently, the Board of Directors was to appoint its own members. The day-to-day management of Danmarks Nationalbank was in the hands of a Board of Governors with 5 members. One was appointed by the King, while the others were appointed by the Board of Directors. As the Royal Bank Commissioner, the Minister for Justice was responsible for overseeing Danmarks Nationalbank's compliance with the Charter.

According to section 3 of the Charter, Danmarks Nationalbank's main objective was:

"... to work towards ensuring a safe and secure currency system in this country."

Moreover, according to section 5, Danmarks Nationalbank must:

"... promote the circulation of money to facilitate production, trade and turnover ..."

Under the Charter, Danmarks Nationalbank was to continue Rigsbankens efforts to reduce the volume of banknotes in circulation to match their price with the official silver value and then to ensure that the banknotes could be converted to silver coins. The cancelled banknotes were burned in public at the Rosenborg Parade Ground at Rosenborg Castle, Copenhagen. The purpose was to support the credibility of the restoration of the currency system.

The currency reform and the cancellation of banknotes succeeded in combating the high inflation, and the price of rigsbankdaler reached the official silver value in 1838. But before that, prices had been falling for many years. Not until 1845 did Danmarks Nationalbank's stock of silver become large enough for conversion of banknotes to silver coins.

The prolonged process of restoring people's confidence in the monetary system in the first half of the 19th century illustrates how easily credibility can be lost and how long it takes to rebuild it.

From rigsbankdaler to kroner

In 1854, the name of the currency unit was changed from rigsbankdaler to rigsdaler (rixdollar). The Coinage Act of 1873 introduced a new currency unit, the krone (100 øre), replacing the rigsdaler. The exchange rate was 1 rigsdaler to 2 kroner. That is why the 2-krone coin was popularly known as a "daler" for many years.

At the same time, the Coinage Act of 1873 introduced a gold standard instead of the silver standard in the currency system. The new krone coins had a fixed gold content, and krone-denominated banknotes could be freely converted to gold coins at Danmarks Nationalbank.



King Frederik VI

Portrait of Frederik VI, who on 4 July 1818 signed Danmarks Nationalbank's "constitution" (Charter), which made it clear that Danmarks Nationalbank was independent of the state and granted it a monopoly on issuing banknotes. The portrait shown was purchased by Danmarks Nationalbank in 1952.

DANMARKS
NATIONALBANK
WAS ESTABLISHED
IN 1818

The krone

was introduced with
the Coinage Act of
1873, replacing the
rigsdaler as Denmark's
currency unit.

In 1818, Denmark was an agricultural society

When Danmarks Nationalbank was established in 1818, Denmark was very much still an agrarian economy, with around 60 per cent of the labour force working in agriculture. A few royal loan funds and predecessors of Danmarks Nationalbank lent money, but credit was mainly granted without financial institutions as intermediaries.



The extensive agricultural reforms in the late 1700s were aimed at improving productivity in the agrarian economy. The reforms focused on abolishing adscription (to ensure the free movement of agricultural labour) and the communal system of agriculture (so that each farmer had a single, larger plot of land – rather than many, scattered strips of land – and was responsible for farming it, whereas previously the village had farmed the land communally) and on the transition from tenant to owner (so that, rather than renting land from the estate owner, the farmer owned his land and benefitted directly from any improvements made).

These extensive reforms, which required considerable financing, took place without the assistance of the institutionalised credit market we know today in the form of credit institutions, etc.

The picture below is by Jens Juel and shows a cultivated landscape in North Zealand after the large-scale agricultural reforms in the late 1700s. The picture above is Peter Hansen's iconic painting of a farmer turning his plough. The "ploughman" was a favourite motif for 500-krone banknotes in the first part of the 20th century. Even today, the Danes still refer to a 500-krone banknote as a "ploughman".



The Danish-West Indian National Bank 1904-35



The Danish-West Indian National Bank was established by an act of 29 March 1904 with a view to creating a stable monetary system in the Danish West Indian Islands (now the US Virgin Islands) and promoting economic development in the Islands.

Danmarks Nationalbank, Privatbanken, Den danske Landmandsbank and Københavns Handelsbank each contributed one fourth of the equity capital. The Danish-West Indian National Bank was granted a monopoly on issuing banknotes on the Islands for a period of 30 years and was also to conduct retail banking operations. 10 per cent of the bank's net proceeds were to be transferred to the Danish government as taxes.

The bank's headquarters were in the city of Charlotte Amalie on St Thomas (see photo) and it had branches in Christiansted and Frederiksted on St Croix. The currency unit of the banknotes issued was franc (divided into 100 bits) and the banknotes could be exchanged for Danish kroner (in Scandinavian gold coins) at a fixed exchange rate via the bank's office in Copenhagen.

Denmark sold the West Indian Islands to the USA for kr. 87 million in 1917. But the Danish-West Indian National Bank continued its operations until the mid-1930s. Its right to issue banknotes expired in 1934, and after that the US dollar was introduced as the currency of the Islands. The Danish-West Indian National Bank ceased its retail banking operations in 1935 and was converted into a winding-up company. By 1937, all activities had been wound up and the company was dissolved.

TIMELINE

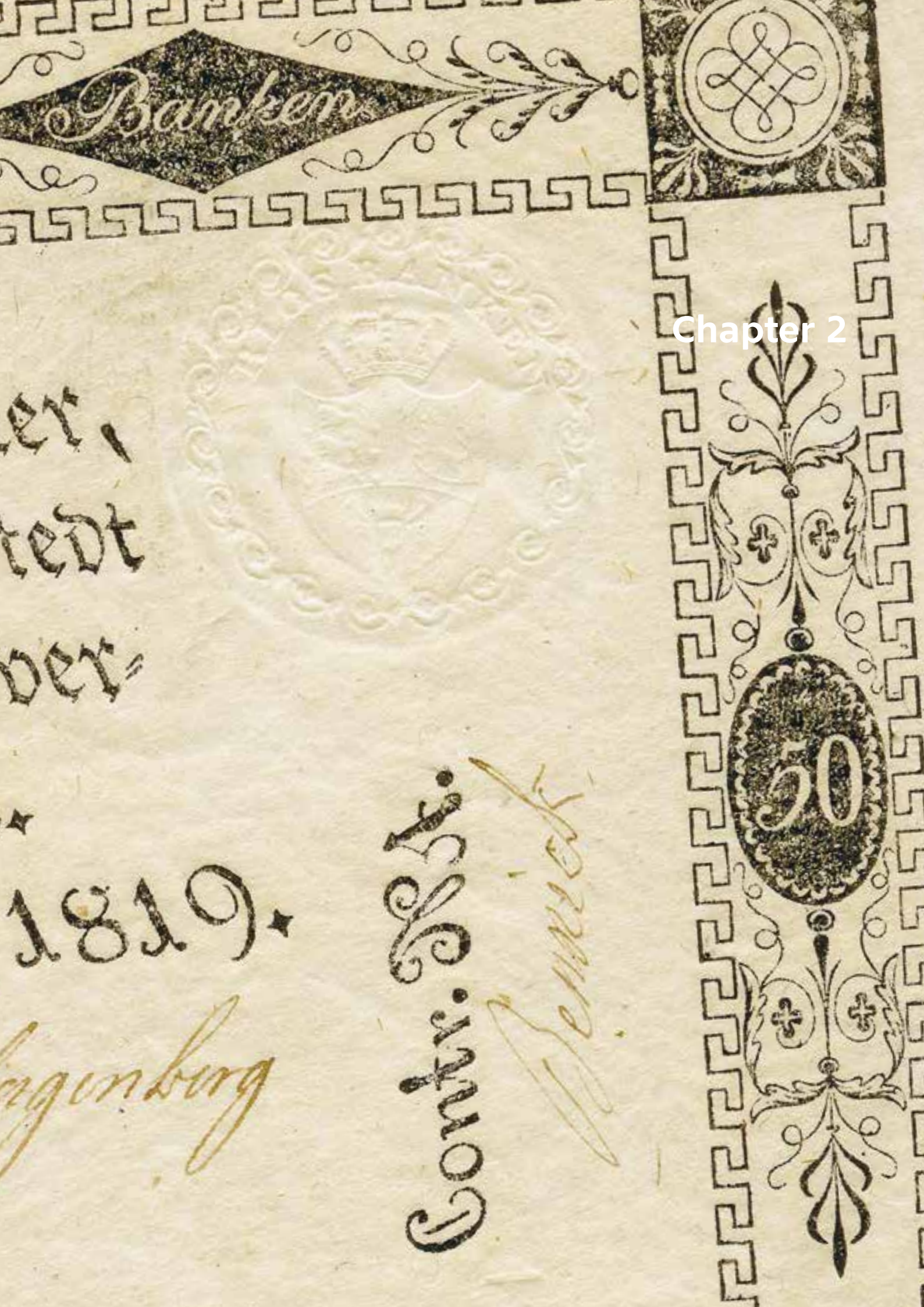
HISTORICAL HIGHLIGHTS FOR DANMARKS NATIONALBANK

1813	Currency reform - a new state-owned central bank, Rigsbanken, is established and a new currency unit, the rigsbankdaler, is introduced.	1813	A royal open letter reassures the Danish people that Rigsbanken will be restructured as a private limited liability company.	1818	Danmarks Nationalbank is established as a private limited liability company by a restructuring of Rigsbanken.	1819	Danmarks Nationalbank issues banknotes for the first time.
1820	Danmarks Nationalbank's coat of arms is laid down by royal resolution.	1838	The market price of Danmarks Nationalbank's banknotes reaches the official silver value.	1845	Danmarks Nationalbank makes it possible to convert banknotes to silver coins.	1854	The name of Denmark's currency unit changes from rigsbankdaler to rigsdaler (rixdollar).
1873	The Coinage Act introduces the krone as Denmark's currency unit, replacing the rigsdaler. Krone-denominated banknotes can be converted to gold coins at Danmarks Nationalbank (gold standard).	1907	Danmarks Nationalbank's Charter of 1818 is extended by another 30 years.	1931	Danmarks Nationalbank's obligation to convert its banknotes to gold is abolished. From then on, the foreign exchange policy is laid down by the government in consultation with Danmarks Nationalbank.	1936	The Danmarks Nationalbank Act of 1936 restructures Danmarks Nationalbank from a private limited liability company to a self-governing institution. This Act is still the legal basis for Danmarks Nationalbank's activities.
1994	The prohibition against monetary financing in the Maastricht Treaty enters into force. For Denmark, this did not prompt any changes to the existing practice.	1998	The predecessor of the European Central Bank - the European Monetary Institute - and the European Commission assess that the Danmarks Nationalbank Act is compatible with the requirement of central bank independence in the Maastricht Treaty.				



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Demmeck

Chapter 2

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Military guards in front of Danmarks Nationalbank

The Charter of 1818 said that guards were to be posted in front of Danmarks Nationalbank. So from 1818 until the Charter was renewed in 1907, there were armed military guards in front of the main building.

The Danmarks Nationalbank Act of 1936

Danmarks Nationalbank's overall objective is to contribute to a robust Danish economy. In this respect, the focus is on three areas: stable prices, safe cash and electronic payments and general monitoring of the stability of the financial system.

The basis for Danmarks Nationalbank is the Danmarks Nationalbank Act of 1936, which – with only very few amendments – is still the legal framework for Danmarks Nationalbank's activities today.

Danmarks Nationalbank carries out its tasks, including monetary policy, independently of the government. According to its by-laws, Danmarks Nationalbank must inform the government prior to any adjustment of interest rates, but it is up to the Board of Governors to make the decision.

A new Danmarks Nationalbank Act in 1936

Danmarks Nationalbank's Charter of 1818 was in force for 90 years and was extended by another 30 years in 1907 with a few minor adjustments. A new legal basis did not come about until the Danmarks Nationalbank Act of 1936.

The legal basis for Danmarks Nationalbank's activities today is still Act no. 116 of 7 April 1936 on Danmarks Nationalbank and the appurtenant by-laws of 1 April 1942, with only a few amendments.

Objectives

Section 1 of the Danmarks Nationalbank Act of 1936 stipulates as follows:

"Danmarks Nationalbank ... shall as the Central Bank of this country have the object ... to maintain a safe and secure currency system in this country, and to facilitate and regulate the traffic in money and the extension of credit."

The Danmarks Nationalbank Act does not lay down in detail which methods and means Danmarks Nationalbank may apply to perform its tasks. The legislators made a deliberate, well-informed choice in this respect. When the Act was presented in 1936, the Minister for Trade, Industry and Shipping made the following statement:

"The best ways and means for Danmarks Nationalbank to safeguard the currency system and facilitate the traffic in money and the extension of credit will depend on the conditions at all times. To seek to establish and bind this in the Act itself would hardly be possible or appropriate at this time."

Danmarks Nationalbank's core areas of responsibility are stable prices and safe payments. At the same time, it must contribute to the smooth and stable functioning of the financial system. This ensures that indi-



From absolute monarchy to democracy

Danmarks Nationalbank's Charter of 1818 was issued in the days of absolute monarchy, which it reflects. For example, the Board of Directors was originally appointed by royally designated electors. With the Constitution of 1849, Denmark became a representative democracy, but with only a few amendments Danmarks Nationalbank's Charter was extended by statutory instrument in 1907. An actual new legal basis for Danmarks Nationalbank was not established until 1936. The picture shows Constantin Hansen's painting of the first meeting of the Constitutional Assembly in 1848.

Danmarks Nationalbank's organisation and management

Under the Danmarks Nationalbank Act of 1936, Danmarks Nationalbank's management is composed of three governing bodies, i.e. a Board of Directors, a Committee of Directors and a Board of Governors.

The Act of 1936 expanded the Board of Directors from 15 to 25 members. 2 members, of whom 1 must be an economist and the other a lawyer, are appointed by the Minister whose field of responsibility comprises Danmarks Nationalbank. In 1936 this meant the Minister for Trade, today it is the Minister for Industry, Business and Financial Affairs. This Minister, as the Royal Bank Commissioner, also oversees Danmarks Nationalbank's compliance with its obligations according to the Danmarks Nationalbank Act and any provisions laid down pursuant to the Act. 8 of the members of the Board of Directors are politicians appointed by the Folketing (Parliament) from among its members. The remaining 15 members are appointed by the Board of Directors itself. They must have thorough knowledge of trade, and due regard is to be paid to ensure comprehensive geographical and sectoral representation as well as representation of workers.

The Committee of Directors has 7 members. The 2 members of the Board of Directors who are appointed by the government are permanent members of the Committee of Directors. The remaining 5 members are elected by the Board of Directors from among its members, for one year at a time.

Danmarks Nationalbank's Board of Governors has 3 members. The Chairman of the Board of Governors is Governor by Royal Appointment, i.e. appointed by the government. The other 2 members are appointed by the Board of Directors on the recommendation of the Committee of Directors. The Board of Governors is charged with the day-to-day management, comprising all tasks that are not directly distributed to the Committee of Directors or the Board of Directors. Consequently, the Board of Governors has full responsibility for the bank's tasks, including monetary policy. The Committee of Directors and the Board of Directors are charged with organisational and administrative tasks. The Committee of Directors is charged with keeping informed of important aspects of the bank's activities, overseeing that auditing is planned satisfactorily, reviewing the bank's major exposures, performing quarterly inspections and recommending/approving recommendations of members of the Board of Directors. The Board of Directors oversees the bank's compliance with the Danmarks Nationalbank Act and the by-laws, performs quarterly inspections and approves the annual accounts, funding of banknote circulation and collective agreements.

viduals' and firms' wishes to save and finance investments can be accommodated safely without any impediments in the system.

From limited liability company to self-governing institution

Danmarks Nationalbank had been established in 1818 as a limited liability company with the entire share capital owned by private shareholders. The Danmarks Nationalbank Act of 1936 restructured Danmarks Nationalbank from a private limited liability company to a self-governing institution. Basically, this was achieved by "buying out" the private shareholders, who were neither better nor worse off than they had been before. The new General Capital Fund was contributed by the central government, and the profit after allocations was to be transferred to the central government. This liberated Danmarks Nationalbank completely from private shareholder interests.

Danmarks Nationalbank's Charter of 1818 was issued at a time when Denmark was an absolute monarchy. The Constitution of 1849 made Denmark a representative democracy, so with the private shareholders gone, the stage was set in 1936 for reorganising Danmarks Nationalbank's management, cf. the Factbox above.

Independent of the central government

Danmarks Nationalbank carries out its tasks, including monetary policy, independently of the government. According to its by-laws, Danmarks Nationalbank must inform the government prior to any adjustment of interest rates, but it is up to the Board of Governors to make the decision.

Danmarks Nationalbank's communication over the years

Danmarks Nationalbank was established in 1818. For many years, the publication of its accounts was not accompanied by a report on its activities. The first report was issued as late as in 1886/87 and was only 3 pages long. By the 1950s, it had grown to around 25 pages.

In 1962, Danmarks Nationalbank began to issue a quarterly publication (Monetary Review) in order to disseminate knowledge of aspects of its activities, i.e. money and credit, interest rate developments, the situation in the capital market, the foreign exchange position, etc. The Monetary Review was originally intended for international readers, so it was initially in English only. The first Monetary Review in Danish was not published until 1972, following a request from a member of the parliamentary Finance Committee.

In 1984, a majority of the parliamentary Economic Policy Committee commissioned the "Wise Men" (the Chairmanship of the Economic Council) to prepare a report on monetary and credit policies in Denmark. In the report, the Chairmanship requested more information from Danmarks Nationalbank. In 1986, the Monetary Review was expanded to include longer reports and analyses. Other series of publications were added later, such as financial stability reports (from 2000) and Working Papers on Danmarks Nationalbank's research and development activities (from 2002). Most recently, the range of publications was restructured at the end of 2016, meaning that reports and analyses are now published individually and continually rather than being gathered in large publications.

In 1998, Danmarks Nationalbank set up a website, which quickly became a key information platform. Since 2013, press conferences have been transmitted live via the website, and in 2014 Danmarks Nationalbank began to use social media for information purposes.

Over the last few decades, Danmarks Nationalbank has also strengthened its effort to collect, prepare and publish statistics about

the financial system. Since the late 1980s, it has participated more actively in the international collaboration on statistics in the Bank for International Settlements (BIS), the International Monetary Fund (IMF), and later on in the European System of Central Banks (ESCB).

In step with the extension of financial statistics, Danmarks Nationalbank had a growing need to strengthen its possibilities of collecting statistics. Under the Executive Order on Foreign Exchange Transactions, Danmarks Nationalbank had the authority to collect any information necessary for the preparation of statistics on cross-border payments and Denmark's net foreign assets. In the financial area, the Danish Financial Supervisory Authority was formally collecting data and could forward relevant information to Danmarks Nationalbank. In 2000, the Statistics Denmark Act was amended. This enabled Statistics Denmark to take over the task of collecting, processing and publishing financial statistics for Danmarks Nationalbank.

The financial crisis in the late 2000s generated a need to improve the statistics used for monitoring financial stability. In 2010, the Danmarks Nationalbank Act was amended to include an actual provision on statistics, authorising Danmarks Nationalbank itself to collect financial statistics. Moreover, since 2010, Danmarks Nationalbank has been able to forward confidential statistical information to the ESCB and the European Systemic Risk Board (ESRB).

As the production of statistics increased, the communication of financial statistics also intensified. In 1998, Danmarks Nationalbank began to publish news about financial statistics continually rather than publishing a statistical summary on a monthly basis. This gave the public faster access to updated statistics.

Danmarks Nationalbank is subject to the requirements of institutional, personal and financial independence, which are stipulated in the Maastricht Treaty and apply to all EU member states. In reports of March 1998, the predecessor of the European Central Bank – the European Monetary Institute – and the European Commission assessed that the Danmarks Nationalbank Act was compatible with these requirements. This means, inter alia, that a Governor cannot be dismissed without just cause.

Issuer of banknotes

Under the law, Danmarks Nationalbank has a monopoly on issuing banknotes in Denmark. Banknotes are legal tender, meaning that anyone is basically entitled to use the banknotes to pay their debt, unless another method of payment has been agreed. Danmarks Nationalbank issues the amount of banknotes deemed necessary for the functioning of the economy.

As mentioned in Chapter 1, the silver standard was replaced by a gold standard in Denmark's currency system with the Coinage Act of 1873. Danmarks Nationalbank's obligation to convert its issued banknotes to gold was suspended in 1931, but when the Act was prepared, it was still expected that the gold standard would be reintroduced. That is why the Act stipulates that Danmarks Nationalbank must have a gold fund to cover at least 25 per cent of banknotes in circulation as security for the banknotes issued. However, since 1939, Danmarks Nationalbank's Board of Directors, with the consent of the Royal Bank Commissioner, has granted exemption from this requirement.



Before the restructuring, Danmarks Nationalbank's share capital had a nominal value of kr. 27 million. The shareholders' dividend equalisation reserve was of more or less the same size, and the market price of Danmarks Nationalbank shares was 185-190. In the previous decade, the shares had yielded dividend of 8-10 per cent. In connection with the restructuring, shareholders were given an amount in Danmarks Nationalbank bonds (see photo) equivalent to double the nominal value of the share capital and with a yield of 4 per cent. The last Danmarks Nationalbank bonds were redeemed in 1963.

All securities – not just Danmarks Nationalbank bonds – were originally physical paper documents. When the yield fell due, the bond owner cut a coupon off the bond and received the amount due when the coupon was handed in. Typically, the bonds were stored in a deposit at a bank or by the issuer. When securities were traded, they had to be physically moved from the seller's to the buyer's deposit.

The volume of bonds issued rose substantially during the 1970s, making it still more cumbersome to manage the paper-based system. So in 1983 physical bonds were registered electronically at the Danish Securities Centre, and in 1988 shares were also registered electronically. Today, trading in securities as well as interest, redemption and dividend payments have become fully electronic.

FACTBOX

Danmarks Nationalbank bonds

The Danmarks Nationalbank Act of 1936 restructured Danmarks Nationalbank from a private limited liability company to a self-governing institution. Private shareholders were basically bought out and it was ensured that they were neither better nor worse off than they had been before.

Foreign exchange policy and the Foreign Exchange Act

In 1931, Denmark suspended the gold standard, and Danmarks Nationalbank's banknotes could no longer be converted to gold. Since the gold standard had entailed fixed exchange rates against other countries with gold-based currency systems, Denmark needed a framework for its exchange rate policy. This resulted in the Foreign Exchange Act, which stipulated that the government determines the foreign exchange policy after negotiation with Danmarks Nationalbank. In the most recent Foreign Exchange Act, from 1988, section 2(3) stipulates that:

"The guidelines for the foreign exchange policy to be pursued in the period that the Act is in force shall be determined on the basis of negotiation between Danmarks Nationalbank and the Royal Bank Commissioner [i.e. the government]."

Open and transparent

When the responsibility for monetary policy is placed with an independent central bank, openness and transparency are of the essence to enable the outside world to hold the central bank accountable for the performance of its tasks. The central bank should issue relevant, accurate information to enable the general public and the financial markets to actually understand monetary policy.

FACTBOX

Danmarks Nationalbank's coats of arms

Over the years, Danmarks Nationalbank has had various coats of arms. The one used today is almost 200 years old.

When the predecessor of Danmarks Nationalbank, Rigsbanken, was established in 1813, Denmark was in a personal union with Norway, so the coat of arms included Denmark's three lions, the Norwegian lion and Holstein's nettle leaf. The personal union with Norway was dissolved by the 1814 Peace Treaty of Kiel, but the Norwegian lion was still included in all official Danish coats of arms as a "memorial coat of arms". When Danmarks Nationalbank was established in 1818, it took over the coat of arms of Rigsbanken.

Danmarks Nationalbank acquired its own coat of arms by royal resolution of 16 February 1820. It included Denmark's three lions surrounded by nine hearts. In addition, it contained the two lions of Schleswig and the nettle leaf of Holstein. This reflected the fact that until 1864 Danmarks Nationalbank was the central bank not only of Denmark, but also of the duchies of Schleswig and Holstein.



Danmarks Nationalbank's "small" coat of arms

Denmark lost the duchies in the war of 1864, and in 1870 it was the small coat of arms without the symbols of Schleswig and Holstein that was placed above the main entrance of the Danmarks Nationalbank building at Holmens Kanal 17.

However, since 1936, Danmarks Nationalbank has used the original, large coat of arms from 1820 in its official publications. A report from 1959 recommended repealing the royal resolution from 1820, but this was never enacted. So Danmarks Nationalbank is still entitled to use the "large" coat of arms from 1820 that includes the symbols of Schleswig and Holstein.



SNAPSHOT FROM THE HISTORY OF DANMARKS NATIONALBANK

Danmarks Nationalbank's coat of arms on the cap and button from a uniform previously worn by Danmarks Nationalbank staff.

THE OBJECTIVE OF DANMARKS NATIONALBANK IS STIPULATED IN ACT NO. 116 OF 7 APRIL 1936

“ ... to maintain a safe and secure currency system in this country, and to facilitate and regulate the traffic in money and the extension of credit...”

is the objective of Danmarks Nationalbank according to section 1 of the Act. This contributes to a robust Danish economy.



Rigsbanken's coat of arms



Danmarks Nationalbank's "large" coat of arms

Denmark has a long tradition of pursuing a fixed exchange rate policy. In a fixed exchange rate regime, monetary policy is basically very transparent, because the public can easily keep informed via the daily news media about whether the fixed exchange rate is maintained.

According to the Danmarks Nationalbank Act of 1936, Danmarks Nationalbank is obliged each year to publish a report on its work in the year expired. In accordance with developments in other parts of society, there is a clear tendency for central banks to publish more information about their tasks, objectives and decisions than previously. Like other central banks, Danmarks Nationalbank has gradually strengthened its communication effort in recent decades.

Overseer of payment systems

Danmarks Nationalbank contributes to safe and efficient payment systems and securities settlement systems by overseeing the systems.

Since the late 1980s, international organisations have issued standards to promote safe and efficient payment and settlement systems. They have also developed principles for central bank oversight of the systems' compliance with the international standards. In 2006, Danmarks Nationalbank's existing powers to oversee payment systems were included in the Securities Trading Act. These powers are now enshrined in section 212(3) of the Capital Markets Act 2017:

“Danmarks Nationalbank shall oversee designated payment systems which Danmarks Nationalbank finds to be of material importance to the settlement of payments or the execution of Danmarks Nationalbank's monetary policy transactions.”

If those responsible for a payment system do not comply with an order issued by Danmarks Nationalbank as part of its oversight, Danmarks Nationalbank may impose penalty payment on them.



Item

Lina Valuta, som
bestect for 5 Rigsb
Nati

Leder



Chapter 3

Ringsbankens

Banken ier, og denne Rigsbank
bank i Overensstemmelse med
om banken i Kiøbenhavn 1831

1831





Inflation as an election theme

The rate of inflation was 5-7 per cent p.a. in 1955-56, and the battle against inflation became a theme in the 1957 election campaign. In the 1970s and early 1980s, inflation was even higher.

Low inflation for 200 years – with a few exceptions

In most countries, the main objective of monetary policy is price stability, meaning low, stable inflation.

High, fluctuating inflation makes it difficult for families and firms to make the right consumption and investment decisions. Inflation also means redistribution of purchasing power between borrowers and creditors, which is often perceived as random and unfair.

Annual inflation has averaged 1.7 per cent over the last 200 years. Low inflation has been the order of the day, except in periods of war. The notable exception was in the 1970s and early 1980s, when inflation had reached double-digit rates and government budget deficits were massive.

Inflation erodes the purchasing power of money

In 1860, 1 kg of rye bread cost kr. 0.13, cf. Chart 3.1. By 2015, the price had risen to almost kr. 20. Inflation is when prices of most goods and services rise every year. Inflation erodes the purchasing power of money, meaning that a given amount of money can buy fewer goods and services year by year.

Inflation is not to be confused with shifts in relative prices. If demand for a given product rises or the supply becomes smaller, its price may increase relative to those of other goods. But the term inflation refers to a general year-on-year increase in the prices of most goods and services.

Low inflation has been the order of the day for 200 years

The consumer price index is often used as a measure of general price developments in the economy. The index is obtained by weighting

CHART 3.1

Prices of selected groceries 1860-2015

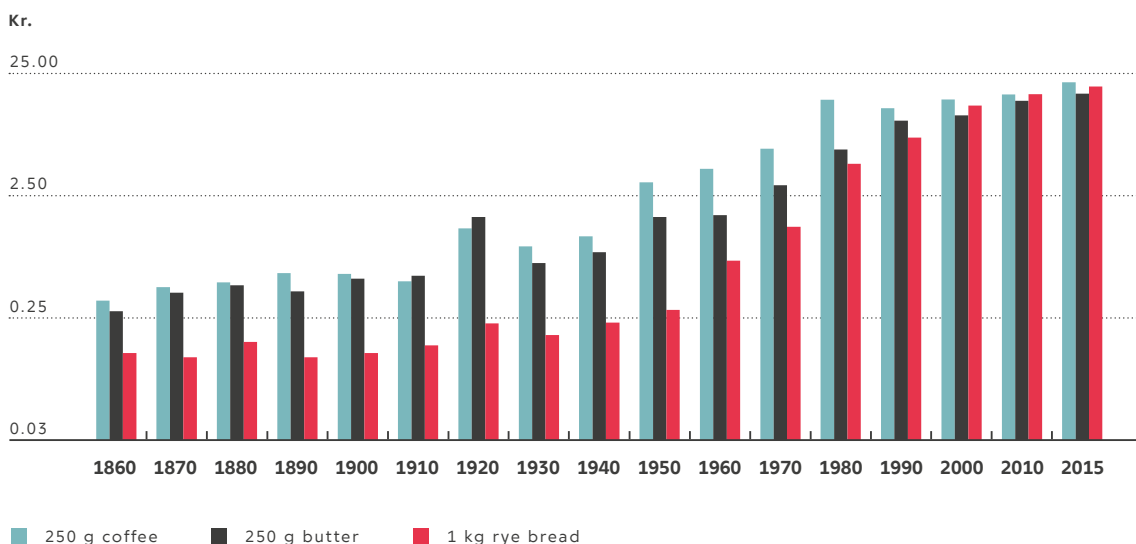
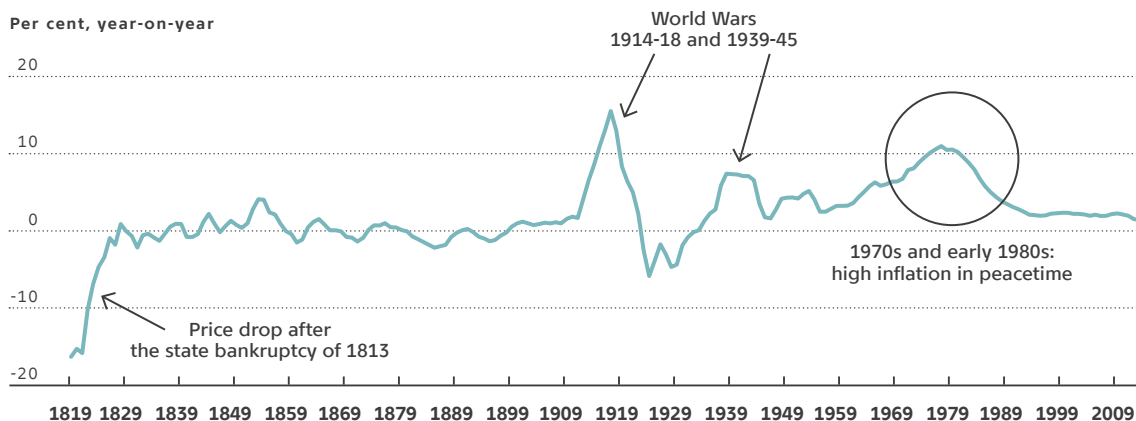


CHART 3.2

Consumer price inflation 1819-2016



When inflation erodes the value of money

In the 1970s and early 1980s, wage increases were to a large extent swallowed up by inflation. This period is a good example of how high wage growth does not always result in increased purchasing power.



LOW INFLATION IS
THE ORDER OF THE DAY

**1.7 per cent
a year**

has been the average inflation
rate for the last 200 years.

prices for the goods and services that make up an average household's consumption.

Chart 3.2 shows the annual increase in the consumer price index over the last 200 years. Annual inflation has averaged 1.7 per cent. Low inflation has generally been the order of the day, except in the period of falling prices right after the state bankruptcy in 1813 and the periods of high inflation around World Wars I and II. The notable exception was the period in the 1970s and the early 1980s when price stability was disrupted. This culminated in massive government budget deficits and double-digit inflation rates.

Persistent inflation can trigger wage and price spirals

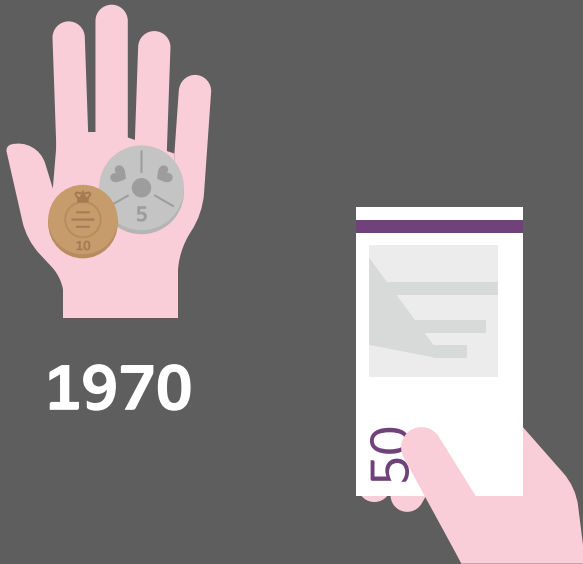
High inflation tends to be persistent and self-reinforcing. Wage earners will demand higher wages as compensation for price increases. Higher wages prompt firms to raise prices to be able to cover the higher payroll costs, followed by further demands from wage earners to compensate for the new price increases. A wage/price spiral will then be running.

The development in the 1970s and early 1980s is a good example of how high nominal wage increases do not guarantee higher real wages. A case in point is 1982, when wages increased by 10 per cent, but real wages did not rise, because the wage increase was swallowed up by price increases of the same magnitude. 20 years later, in 2002, wages rose by 4 per cent, but real wages increased, given that price rises were only 2.4 per cent.

If wage increases are underpinned by productivity growth, the firms' unit labour costs will not rise even though wages are rising. It will then be possible to keep prices stable, while real wages will grow.

Wages soared in the 1970s, but so did prices, resulting in lower growth in purchasing power

Hourly wages



1970

1980

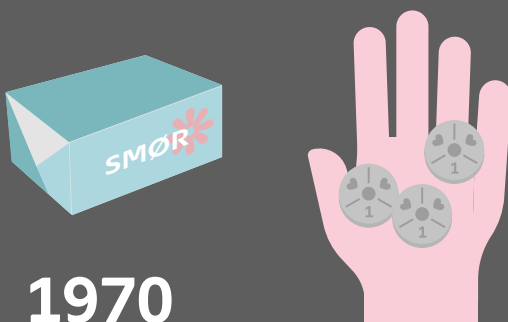
Hourly wages could buy this many packs of butter (250 g, smør)



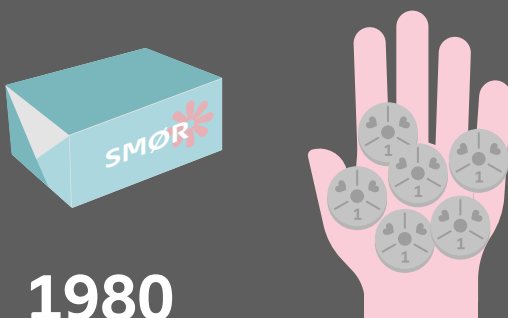
1970

1980

Price of a pack of butter (250 g, smør)



1970



1980

Kr. 100 could buy this many packs of butter (250 g, smør)



1970

1980

Why do central banks not have a zero inflation objective?

There are several reasons why most central banks interpret price stability as stable inflation around a couple of per cent annually, rather than zero inflation:

Firstly, a little inflation can make it easier for individual firms and industries to make the necessary adjustments of real wages. The reason is that actual wages can seldom be reduced, as collective agreements or custom prevents it. Similarly, a little inflation can make it easier to adjust the relationship between the prices of different goods and services.

Secondly, an inflation objective of a couple of per cent gives central banks more scope to ease monetary policy in periods of low or negative interest rates. This is because households and firms might choose cash over e.g. deposits or bonds if interest rates fall too far below zero for a prolonged period. Inflation-adjusted interest rates (real interest rates) are a key driver of the economy, and if interest rates are as low as they can go, central banks cannot use interest rates as a tool to stimulate the economy. A very low inflation objective would increase the risk of such a situation arising.

Thirdly, central banks' inflation objectives are often set on the basis of consumer price indices, which tend to overestimate inflation. The consumer price index weighs prices using weights reflecting the significance of the individual goods and services in the budget of an average household. These weights are only updated at regular intervals. As a result, the index tends to overestimate inflation, as consumers will normally buy more of the goods with relatively low price increases and fewer of the goods with relatively high price increases. Experience shows that technological advances also can complicate the use of the consumer price index as an expression of inflationary developments. For example, failure to capture quality improvements in the form of new computers may lead to overestimation of inflation.

**SKYROCKETING INFLATION CAN DRIVE THE ECONOMY TO
THE BRINK OF COLLAPSE**

89,700,000,000,000,000,000,000

per cent was the annual rate of inflation in Zimbabwe in November 2008,
meaning that prices doubled in less than 25 hours.

High, fluctuating inflation is bad for the economy

Experience shows that high inflation and strong fluctuations in inflation tend to go hand in hand. Even if wages are able to keep up with prices, high and fluctuating inflation has many drawbacks for households and firms. For example, households may find it difficult to keep track of the relative changes in prices. This makes it hard to make the right consumer choices. Firms may find it difficult to assess future production costs and sales prices, making it hard for them to find out e.g. whether it will be profitable to invest in new jobs. Moreover, the real return on investment after tax will depend on the inflation rate.

Unforeseen inflation also means redistribution of purchasing power between borrowers and creditors because inflation is eroding the real value of debt. Such redistribution does not reflect changes in working effort or investment volume, so it is often perceived as random and unfair.

Soaring inflation can drive the economy to the brink of collapse. That happened in Denmark in connection with the state bankruptcy in 1813, as described in Chapter 1. In the 20th century, Argentina, Brazil, Chile, Germany, Israel and Russia, among others, have experienced periods of social unrest, economic collapse and strong economic remedies to combat soaring inflation. For people in those countries, money could scarcely be used for savings purposes and ultimately lost its value as a means of payment and unit of account. Zimbabwe is the most prominent example in the 21st century. During 2008, annual inflation in Zimbabwe reached 89.7 sextillion per cent (89,700,000,000,000,000,000,000 per cent), meaning that prices doubled in less than 25 hours.

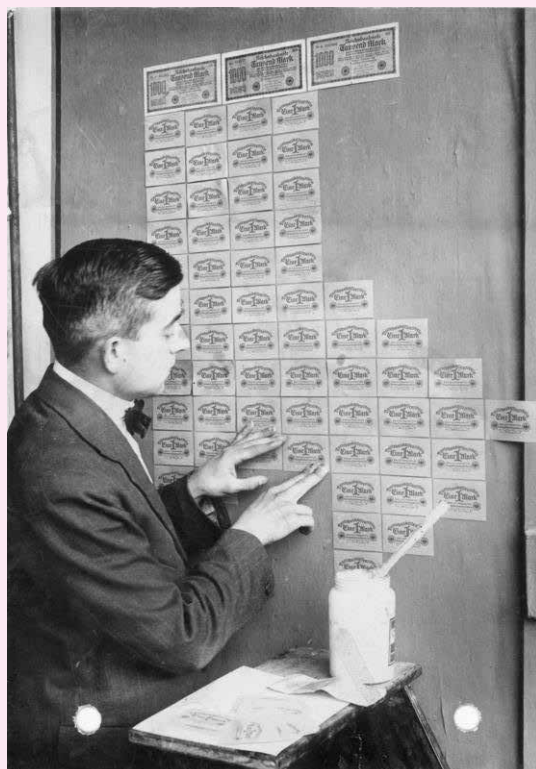
Deflation also causes problems

All in all, high inflation is detrimental to everyone – households, firms and the economy in general. But it is also a problem if prices keep falling year after year, which was the case in many countries during the Great Depression in the early 1930s. That is called deflation. In that case, borrowers find that the real value of their debt is rising even though they are not raising new loans. This may reinforce an economic recession.

Central banks have price stability as their objective

Given the detrimental effects of high inflation, most countries have price stability as the main objective of their monetary policies. Most central banks interpret price stability as stable inflation around a couple of per cent annually, rather than zero inflation. This reduces the risk of deflation.

Hyperinflation in Germany in the 1920s



Bundesarchiv, Bild 102-00104
Foto: 6. Aug. 1923

History has seen many examples of how funding government budget deficits by printing more money has led to high inflation. One of the best known examples is the hyperinflation in Germany in the early 1920s.

When inflation peaked, the money stock increased by 1,300 per cent a month and inflation reached 300,000 per cent p.a.

Prices rose so fast that cash was de facto useless as a means of payment. A stamp cost 90 billion (90,000,000,000) marks and a newspaper as much as 200 billion marks.

Around 30 paper mills were constantly working overtime to provide the German central bank (Deutsche Reichsbank) with sufficient paper for banknote production.

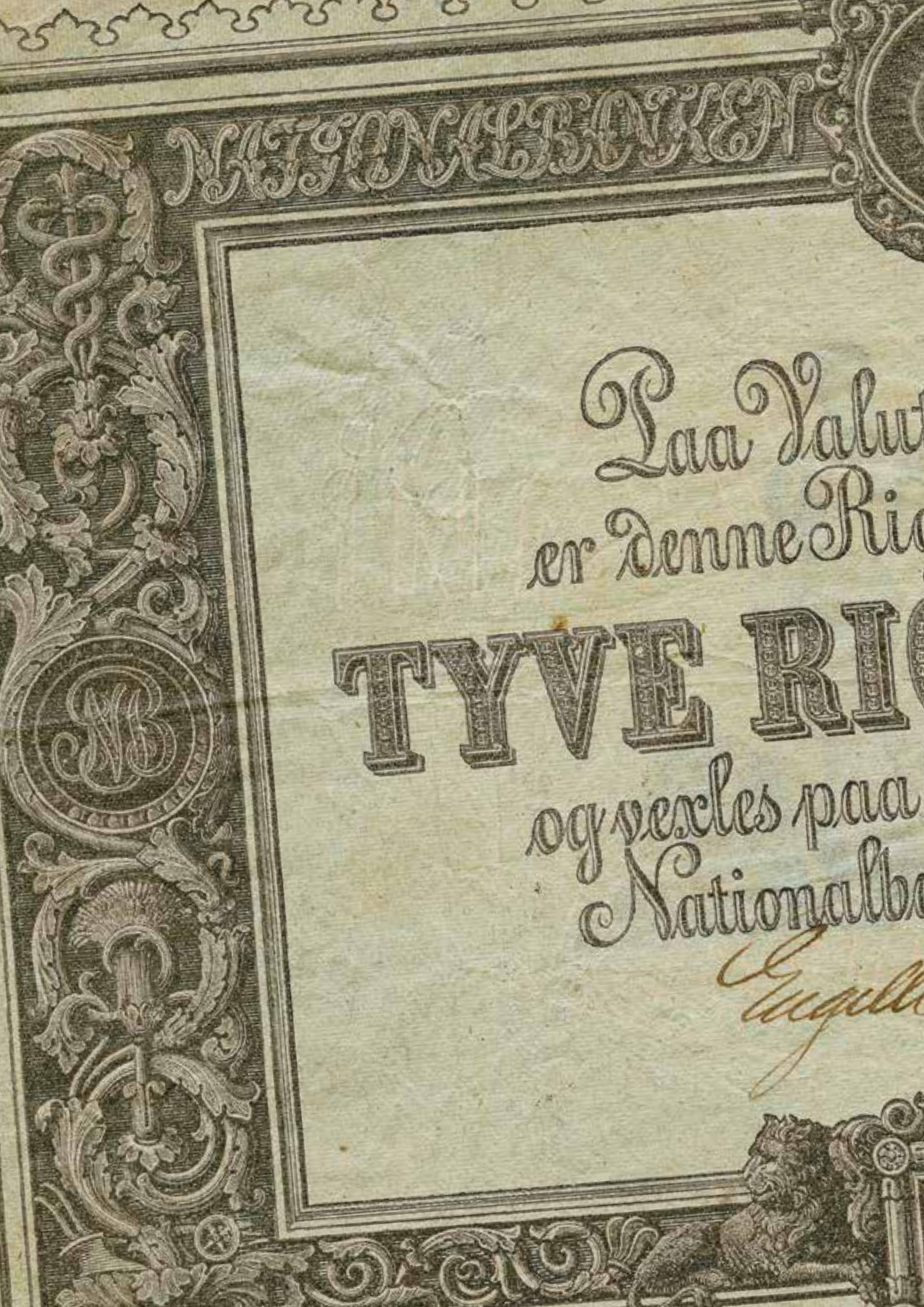
In the end the banknotes were of so little value that it was cheaper to use them as wallpaper than to buy wallpaper. In late 1923, Germany removed 12 zeros from its banknotes.

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Chapter 4

ta, som Banken eier,
ysbank-Seddel udstedt for

G S B A N K D A L E R

Enfordring med Sølvmunt.
Banken i Kiöbenhavn 1851.

Amur



N^o 29958



Run on Danmarks Nationalbank just before the convertibility of banknotes to gold was suspended in 1914

In late July 1914, there was panic in the money and capital markets in many countries because war was expected to break out. In Denmark, too, many people tried to withdraw their savings in securities and bank deposits and exchange banknotes for gold coins. Danmarks Nationalbank was released from its obligation to convert banknotes to gold coins by an Act of 2 August 1914. The picture shows the run on Danmarks Nationalbank just before the gold standard was suspended.

A fixed exchange rate has provided for stable prices

Denmark's fixed exchange rate policy tradition goes back a long way. In the 19th century, Denmark followed first the silver standard and then the gold standard. This meant fixed exchange rates against other countries adhering to the same standards. Later, the fixed exchange rate was maintained against the pound sterling, the dollar and the D-mark.

Since 1999, Denmark's fixed exchange rate policy has been against the euro, meaning that the krone exchange rate against the euro determines Denmark's Nationalbank's interest rate policy. As a result, Denmark's Nationalbank's interest rates tend to follow the interest rates determined by the European Central Bank for the euro area. The fixed exchange rate policy means that price developments in Denmark mirror those of the euro area.

The 1970s and early 1980s represented a notable and not very successful deviation from the fixed exchange rate policy tradition. This period ended in high inflation, and the yield on government bonds reached more than 20 per cent p.a. in the early 1980s.

DENMARK HAS PURSUED A FIXED EXCHANGE RATE POLICY AGAINST THE EURO SINCE 1999

Kr. 7.46038 per euro

has been the central rate since the introduction of the euro on 1 January 1999.

Different roads can lead to price stability

Many countries have had a medium-term inflation objective as the cornerstone of monetary policy in recent decades. If the outlook is for higher inflation than the objective, the central bank will raise interest rates. Higher interest rates make it more advantageous for households to save rather than spend. Higher interest rates also push down house prices, causing household wealth and consumption to shrink. Moreover, an increase in interest rates leads to a decline in residential construction as well as business investment in plant and equipment and buildings and facilities. The overall effect is a dampening of demand in the economy, resulting in more moderate wage growth and downward pressure on inflation. Conversely, the central bank will reduce interest rates to stimulate demand if the outlook is for lower medium-term inflation than the objective.

Denmark has a long tradition for anchoring its monetary policy strategy on a fixed exchange rate policy. Since 1999, we have pursued a fixed exchange rate policy against the euro. Danmarks Nationalbank is responsible for keeping the krone stable against the euro, and the path of the krone rate is key to Danmarks Nationalbank's interest rate policy. As a result, Danmarks Nationalbank's interest rates tend to follow the interest rates determined by the European Central Bank (ECB) for the euro area. Should the krone tend to weaken, Danmarks Nationalbank raises interest rates unilaterally, making it more attractive to buy kroner and place investments in Denmark. If the krone becomes too strong, interest rates are lowered unilaterally.

As regards the euro area, the ECB's objective is to maintain inflation below, but close to 2 per cent p.a. in the medium term. Keeping the krone rate stable against the euro will, over time, align inflation in Denmark with that of the euro area, cf. Chart 4.1. Denmark's fixed exchange rate policy de facto means that we adopt the ECB's inflation objective for the euro area. The fixed exchange rate policy implies a clear division of responsibilities in economic policy: When Danmarks Nationalbank's interest rates are reserved for exchange

Proposals for national side of Danish euro coins

In the euro area, coins have a common side and a national side that is designed by the individual member states. The illustration shows the proposed designs for Danish euro coins prepared by Danmarks Nationalbank – at the instigation of the government – prior to the referendum on Danish participation in the euro on 28 September 2000.

1, 2 and 5 cent

10, 20 and 50 cent

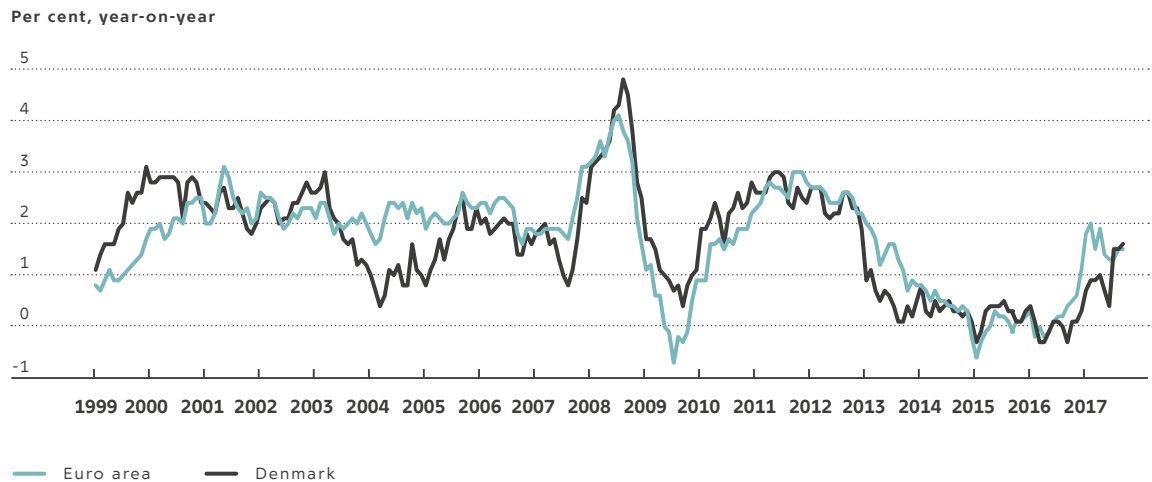
1 euro

2 euro



CHART 4.1

Consumer price inflation in Denmark and the euro area 1999-2017



rate management purposes, they cannot at the same time be used for management of the domestic cyclical situation. This requires that fiscal and structural policies are designed to ensure stable economic development. With a fixed exchange rate policy vis-a-vis the euro, fiscal policy must be planned so that Danish inflation is in line with inflation in euro area countries.

Keeping the krone rate stable against a large trading partner such as the euro area with low, stable inflation ensures low and stable inflation in Denmark in the medium term. If inflation is higher in Denmark than in the euro area, Denmark's competitiveness will, all else equal, deteriorate relative to the euro area. This entails fewer jobs in export firms and in the import-competing sectors. As a result, wage and price increases in Denmark are dampened, so that they gradually approach the euro area level again. In contrast, lower inflation in Denmark than in the euro area will, all else equal, improve employment in the internationally competing parts of the business sector. This will exert upward pressure on inflation in Denmark until it reaches the euro area level.

In the 1970s and 1980s, several countries, e.g. USA and Germany, used monetary targets to control inflation. There are several different monetary aggregates, but they often include bank deposits from households and firms as well as their cash holdings. But these countries learned the lesson that the relationship between inflation and the money stock is neither particularly stable in the short nor the medium term. So money has not played any key role in monetary policy planning in e.g. the USA since the early 1980s. Germany did not formally abandon its monetary target until the end of 1998, but in practice Deutsche Bundesbank relied more on inflation than money when laying down interest rate policy in the 1990s.

The euro area and the European Exchange Rate Mechanism

The euro was introduced at the beginning of 1999 as the single currency in 11 EU member states under the Maastricht Treaty. Today, the euro is the currency of 19 EU member states with a total population of more than 300 million people.

The Danes voted no to the Maastricht Treaty in a referendum on 2 June 1992. Following political negotiations, a "national

compromise" was reached and endorsed by most parties in the Danish Parliament (Folketinget). The compromise set conditions for Denmark's acceptance of the Treaty; one condition was that we would not introduce the single currency. This was accepted at European level at the Edinburgh summit on 11-12 December 1992, and the Maastricht Treaty and the Edinburgh decision were adopted in a referendum in Denmark on 18 May 1993. A new proposal for Denmark to join the euro area was rejected in a referendum on 28 September 2000.

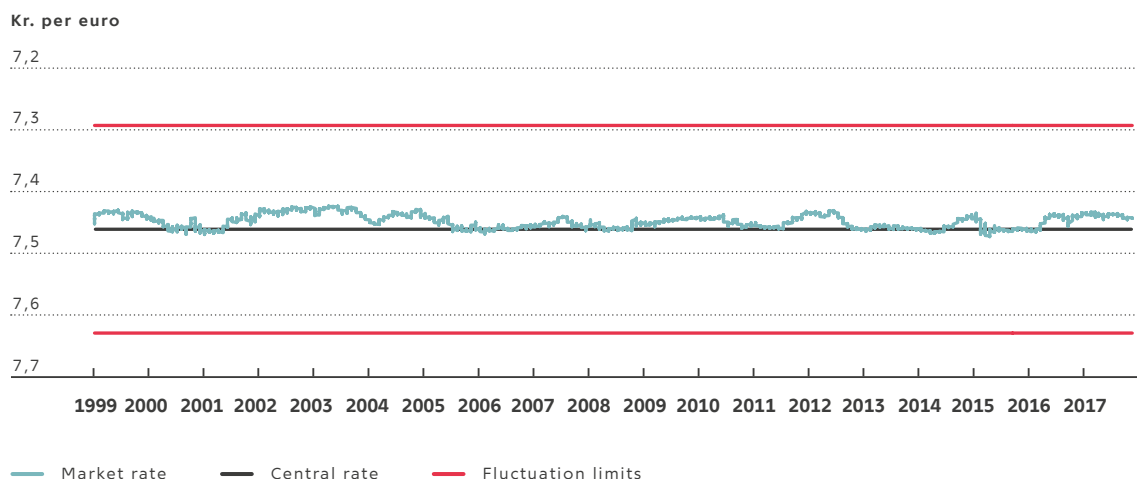
As a result, Denmark is outside the euro area. Instead, we have opted for a fixed exchange rate policy against the euro within the ERM 2 (European Exchange Rate Mechanism 2), the exchange rate mechanism between the euro area and EU member states outside it. The agreement on Denmark's participation in ERM 2 was concluded between the EU Ministers for Economic Affairs and Finance and central bank governors at a meeting in Vienna on 25-27 September 1998. Denmark succeeded in obtaining a narrow fluctuation band for the krone against the euro of +/- 2.25 per cent around the central rate – on the condition that Denmark would continue the stability-oriented economic policy pursued since the 1980s.

The exchange rate of the krone has been close to the central rate throughout the lifetime of the euro, cf. Chart 4.2. The central rate of kr. 7.46038 per euro corresponds to conversion of the krone's central rate against the D-mark in the previous ERM from 12 January 1987 to the end of 1998. This means, in reality, that 2017 marked the 30th anniversary of the krone's central rate against the euro.

Since the second half of the 1990s, experience has been that the krone is most stable when Danmarks Nationalbank keeps it close to the central rate rather than utilising the full fluctuation band. The central rate is a natural focal point for transactions by actors in the foreign exchange market. This mechanism, known as "stabilising speculation", in itself contributes to a stable krone exchange rate: When the krone is inexpensive compared to the central rate, the banks buy kroner, and when it is expensive, they sell kroner. This helps to keep the krone stable without Danmarks Nationalbank having to intervene.

CHART 4.2

Exchange rate of krone against euro 1999-2017



The International Monetary Fund and the Bretton Woods system

The International Monetary Fund (IMF) was established at a conference in Bretton Woods in 1944 to promote international monetary cooperation.

One of the tasks of the IMF was to manage an international fixed exchange rate system, the Bretton Woods system, under which each currency was pegged to the dollar, which was in turn linked to the value of gold. This system collapsed in the early 1970s.

The picture shows senior US Treasury department official Harry Dexter White (left) and the economist John Maynard Keynes (right) at the inaugural meeting of the IMF's Board of Governors in March 1946. Mr Keynes headed the UK delegation in connection with the negotiations on establishment of the IMF. Denmark joined the IMF in March 1946.



SNAPSHOT FROM THE HISTORY OF DANMARKS NATIONALBANK

During the gold standard, the main coins had a fixed gold content. The photo shows a scale used to check the weight of gold coins in the early 20th century.



A long fixed exchange rate policy tradition

Denmark has a long tradition of having a fixed exchange rate objective as the anchor for monetary policy. In connection with the first reading of the bill that in 1936 became the Danmarks Nationalbank Act, the then Minister for Trade stated as follows:

"A safe and secure currency system should be taken to mean that exchange rates will be kept stable in so far as this is at all within the powers of the Bank and society."

After the collapse of the international gold standard system in the early 1930s, Denmark pursued a fixed exchange rate policy against the pound at a time when the UK was Denmark's largest trading partner. Later, Denmark and many other countries participated in the dollar-based Bretton Woods system that was established after World War II under the auspices of the International Monetary Fund (IMF). This system collapsed in the early 1970s. Since then, the krone has participated in the European exchange rate cooperation.

Silver and gold led to fixed exchange rates in the 1800s too

In the 19th century, the main Danish coins had a fixed silver content until the Coinage Act of 1873, and then a fixed gold content. At the same time, Danmarks Nationalbank was willing to exchange its banknotes for silver coins from 1845 to 1873 and then for gold coins. This entailed fixed exchange rates against countries with similar silver and gold standards.

How the gold standard led to fixed exchange rates

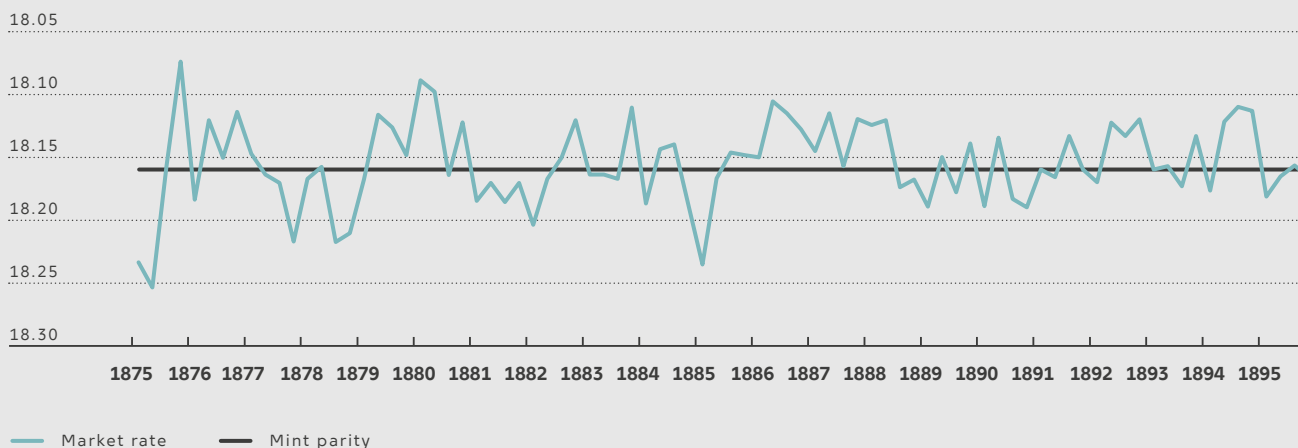
The gold standard entailed fixed exchange rates among the participating countries. In 1875, Danish krone coins contained 0.4032 g fine gold, while a pound coin contained 7.3224 g fine gold. This resulted in a relationship between the two countries' coins of $7.3224/0.4032 = \text{kr. } 18.16$ per pound. The exchange rate between kroner and pounds fluctuated closely around this "mint parity", cf. Chart 4.3. If the exchange rate deviated too much from the mint parity, it would be

profitable to buy the cheaper of the two currencies, have it melted down and minted as the more expensive of the two currencies. Any deviation from the mint parity was due to the inherent costs of minting, insurance and transport of gold. As a result, the exchange rate fluctuated within a rather narrow band determined by the costs of minting, insurance and transport of gold.

CHART 4.3

Exchange rate of the pound 1875-95

Kr. per pound



"No" poster from the 1992 referendum on the Maastricht Treaty

In the Danish referendum on 2 June 1992, the Maastricht Treaty was rejected by a narrow majority of 50.7 per cent "no" votes. The debate focused on issues such as the environment, social protection, defence policy, police cooperation, union citizenship and the single currency. However, the single currency issue played only a limited role in the political debate, presumably because a protocol to the Treaty already allowed Denmark to opt out. The picture shows a poster from the Socialist People's Party that became almost iconic.

Kroner or euro?

The euro was introduced as “account money” in 1999 and as physical banknotes and coins in 2002. This marked the end of a long process towards a single currency that actually went back more than 30 years. The concept of a single European currency was first formulated in earnest in the Werner Report of 1970. The 11 member states that originally introduced the euro as their currency in 1999 were: Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain. The fact that the euro was now a reality made Danish politicians reconsider whether Denmark should replace the krone by the euro. This is symbolised in the cartoon to the right from 1999, in which Anders Fogh flips a coin.



In the late 1800s and early 1900s, many countries followed the gold standard. This was not a system coordinated by an international organisation or similar. A country would normally join the international gold standard system by committing itself to issue banknotes that were freely convertible to gold and by also allowing the free movement of gold and capital across national borders.

The Scandinavian Currency Union

The Scandinavian countries did not follow the pattern of unilaterally joining the gold standard. In the first half of the 1870s, Norway, Sweden and Denmark concluded agreements on a Scandinavian Currency Union, setting common standards for the gold content in their main coins. As described in Chapter 1, Denmark introduced the gold standard with the Coinage Act of 1873, and from the mid-1870s the krone coins of Denmark, Sweden and Norway had the same gold content.

The gold standard collapsed, was re-established and collapsed again

The international gold standard system was suspended at the outbreak of World War I in 1914, but re-established during the 1920s. The Danish krone returned to the gold standard in 1927 with the same gold content as in 1913 (the “honest krone”). But Denmark's Nationalbank was only obliged to convert banknotes to whole gold bars (the gold exchange standard).

The UK abandoned the gold standard again in September 1931. Denmark did the same shortly after, and regulation of cross-border payments was introduced. In the first half of the 1930s, international trade was a web of bilateral trade and payment agreements. The trade agreements contained requirements on imports of foreign goods in return for exports of Danish products. This meant that firms could no longer import whatever they wanted, and from 1932 they had to obtain an import permit from the Exchange Control Office (Valutacentralen) at Danmarks Nationalbank.

Bringing foreign trade and cross-border payments back to normal took a long time after the worldwide restrictions introduced in the 1930s and during World War II. The 1950s saw liberalisation of trade in goods between Western countries. This re-established the free international competition which is an important precondition for ongoing rationalisation of the business community, good employment conditions and improvement of the standard of living. This liberalisation was supported by the establishment of several international cooperation organisations, including the Organisation for European Economic Cooperation (OEEC, the predecessor of the OECD), the European Payment Union (EPU) and the IMF. It took a considerably longer time to return to completely free capital movements across national borders. In Denmark, this was not achieved until 1988.

Deviation from the fixed exchange rate in the 1970s

The period from the mid-1970s to early 1980s represents a notable and not very successful deviation from Denmark's long fixed exchange rate policy tradition. From 1976 to 1982, the central rate of the krone against the German D-mark was reduced by more than 30 per cent, cf. Chart 4.4.

The background was massive imbalances in the Danish economy. In the early 1980s, unemployment had risen to around 10 per cent of the labour force, annual inflation was more than 10 per cent, and the government budget deficit was approaching 10 per cent of the gross domestic product, GDP. Moreover, Denmark had been running a current account deficit every year since 1964, bringing the foreign debt to more than 40 per cent of GDP. Expressions like "the edge of the abyss" and "state bankruptcy" were used in public debate. The krone was devalued on several occasions to restore Denmark's competitiveness, but that contributed to increasing inflation and generating expectations of further devaluation of the krone. This resulted in massive upward pressure on long-term interest rates, which reached more than 20 per cent p.a. in the early 1980s, cf. Chart 4.5.

It was gradually realised that devaluations were not the solution to basic structural problems in the economy. This led to a decisive change of direction in recent economic policy history in Denmark. In September 1982, the incoming government stated that it would refrain from using exchange rate adjustment as an economic policy instrument. The government's stabilisation policy also comprised fiscal tightening and discontinuation of the cost-of-living adjustment, which had entailed automatic upward adjustment of wages in step with price developments.

The promise of a fixed exchange rate policy was quickly put to the test when Sweden devalued its currency by 16 per cent in October 1982. Denmark did not follow suit, which, combined with other tightening measures, boosted confidence in Denmark's economic policy. The central rate of the Danish krone against the D-mark was reduced on several occasions until 1987, but not at Denmark's initiative. The return to a credible fixed exchange rate policy gradually and markedly narrowed the long-term yield spread between Denmark and Germany. The yield spread narrowed from more than 13



Denmark's international credit rating

In 1990, Denmark had a balance of payments surplus for the first time in more than 25 years. This was a milestone on the long and strenuous road towards restoring the Danish economy that characterised economic policy in the 1980s. Restoration of the economy was needed after the highly dissatisfactory developments in the late 1970s and early 1980s. In 1991, the credit rating of the Danish government for loans in foreign currency was raised to AA+ by Standard & Poor's, with reference to the improvement of the Danish economy and the balance of payments surplus. In 2001, Denmark was further upgraded from AA+ to AAA, which is the highest possible rating.

CHART 4.4

Bilateral exchange rate and relative developments in consumer prices between Denmark and Germany 1970-98

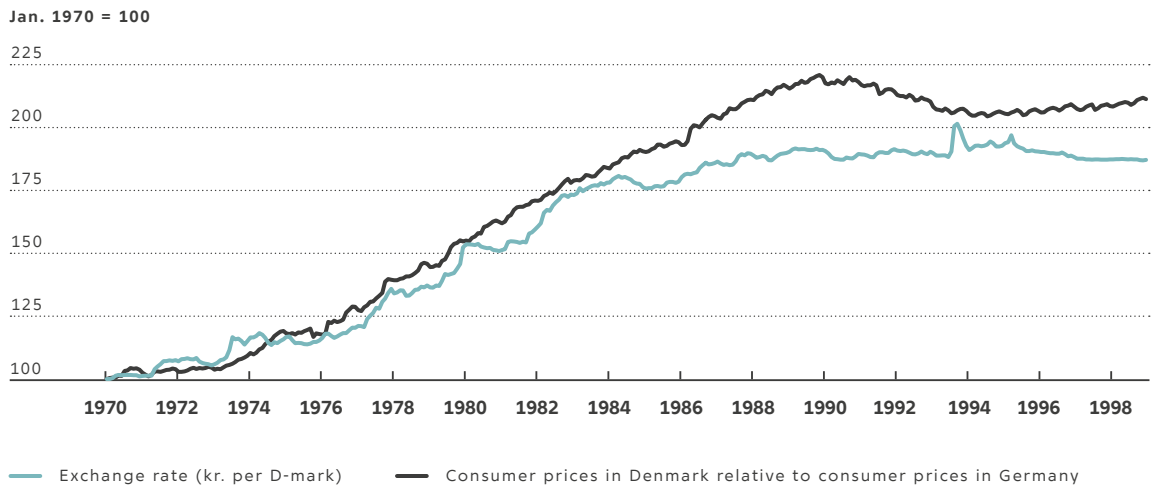
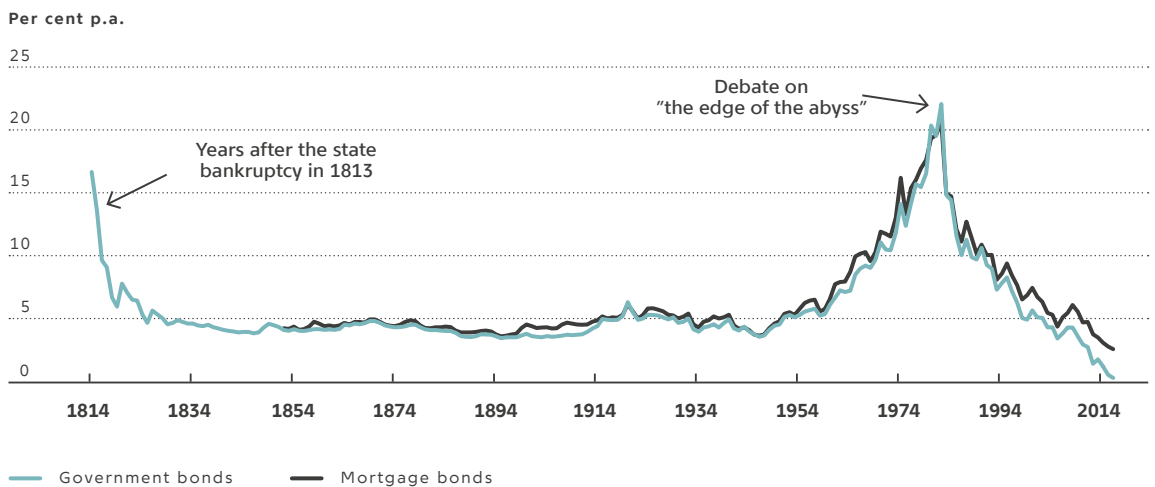


CHART 4.5

Yields to maturity on long-term bonds 1814-2016



percentage points in 1982 to less than 1 percentage point in 1991. In addition, annual inflation declined to a couple of per cent in the early 1990s, implying a return to price stability in Denmark.

Ground rules for a fixed exchange rate policy

The change of direction in the 1980s marked the beginning of the stability-oriented economic policy which various governments and a broad majority in the Folketing have since endorsed.

A fixed exchange rate policy as a monetary policy strategy is a cornerstone of this policy, although the role of monetary policy in economic policy cannot be regarded in isolation. In a fixed exchange rate regime, Denmark's Nationalbank's interest rates are reserved for managing the exchange rate. This means that they cannot also be used for management of the domestic cyclical situation. For instance, if Denmark's Nationalbank were to lower interest rates to support economic growth, the krone would weaken, and Denmark's National-

bank would have to raise its interest rates again. Conversely, if Danmarks Nationalbank were to raise interest rates to dampen overheating of the economy and strong growth in house prices, the krone rate would strengthen, and Danmarks Nationalbank would have to lower its interest rates again.

When it is not possible to use monetary policy for managing the business cycle, it is important that both fiscal policy and other economic policies are aimed at keeping the economy stable to prevent overheating as well as high unemployment.

It is important that fiscal policy is designed with enough room in government budgets to let the automatic stabilisers work. This means that fiscal policy automatically stimulates the economy during a cyclical downturn because e.g. unemployment benefit expenditure increases when unemployment rises. Moreover, taxes fall when the earnings of households and firms decline. Conversely, fiscal policy automatically puts a damper on the economy during a cyclical upturn via increased tax revenue and lower expenditure for transfer income. Stability-oriented fiscal policy is characterised by a budget surplus in good years, providing room for easing in bad times.

Another decisive factor for stability in the economy is that the economy is flexible and adaptable. This applies especially to the labour market, where flexible wage formation and a high degree of job mobility are important to avoid high unemployment or capacity pressures in the economy.

The fixed exchange rate policy in the last 30 years has served Denmark well

Over the last three decades and under various governments, Denmark's fixed exchange rate policy has been a cornerstone of economic policy. It is widely accepted throughout the business community and among organisations and media.

In her speech at Danmarks Nationalbank's 175th anniversary in 1993, Royal Bank Commissioner Marianne Jelved, then Minister for Economic Affairs, said:

THE FIXED EXCHANGE RATE POLICY OVER THE LAST 25 YEARS HAS SERVED DENMARK WELL IN THE FORM OF PRICE STABILITY

“My hope is that the governors and Royal Bank Commissioner who celebrate the Nationalbank's 200th anniversary in 25 years' time will be able to look back on more than three decades of low inflation”

said Marianne Jelved, Minister for Economic Affairs, at Danmarks Nationalbank's 175th anniversary in 1993. That has been achieved.

TIMELINE

DENMARK'S EXCHANGE RATE REGIMES OVER TIME

1845	Danmarks Nationalbank introduces conversion of its banknotes to silver coins, and Denmark joins the silver standard.	1872	Norway, Sweden and Denmark conclude an agreement on the Scandinavian Currency Union based on the gold standard.	1914	At the outbreak of World War I, the gold standard collapses, and Danmarks Nationalbank is no longer obliged to convert its banknotes to gold coins.	1927	The Danish krone returns to the gold standard with the same gold content as in 1913. Danmarks Nationalbank is only obliged to exchange amounts in banknotes for whole gold bars (the gold exchange standard).
1931	The UK abandons the gold standard. Denmark follows suit shortly after, and restrictions on cross-border capital flows are introduced.	1946	Denmark joins the dollar-based fixed exchange rate cooperation (the Bretton Woods System).	1971	The Bretton Woods System collapses.	1972	Denmark joins the European currency cooperation (the "Currency Snake").
1979	Denmark joins the European Exchange Rate Mechanism (ERM).	1982	The incoming government announces its intention of refraining from using exchange rate adjustment as an economic policy instrument.	1988	Denmark lifts the last restrictions on cross-border capital flows.	1998	Denmark concludes an agreement on the European Exchange Rate Mechanism 2 (ERM 2), which has been the framework for Denmark's fixed exchange rate policy against the euro since 1 January 1999.

"My hope is that the governors and Royal Bank Commissioner who celebrate the Nationalbank's 200th anniversary in 25 years' time will be able to look back on more than three decades of low inflation."

This has been achieved, and the fixed exchange rate policy has been an important part of the stability-oriented stance of general economic policy that began in 1982.

The effective exchange rate of the krone is a trade-weighted average of developments in the bilateral krone rates against Denmark's most important trading partners' currencies. Given that the euro area is Denmark's largest trading partner, the fixed exchange rate policy has also contributed to a stable course of the effective krone rate. As a result, the competitiveness of Danish firms has been affected by fewer sudden exchange rate fluctuations than would have been the case with floating exchange rates. Less uncertainty about exchange rates benefits exporters and firms in import-competing sectors, as they will find it easier to plan for the future and save exchange rate hedging costs. This improves the basis for trade and the resultant welfare gains.

The experience of which monetary strategy works best varies across countries. In the case of Denmark a credible fixed exchange rate policy – supported by stability-oriented fiscal and structural policies – has proved to be a sound framework for stable macroeconomic development over the last 30 years.

FEM RIGSDA

Paa Valuta, som Banken
er denne Seddel udstedt for 5 R.
og vexles paa Ansfordring med
Nationalbanken i Sjöbenhavn

4898516

ALLE

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Rigsdaler
Sölvmynt
1863

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Chapter 5





The exchange rate crises in the first half of the 1990s

In 1992-93, the challenge in relation to Denmark's monetary and foreign exchange policies was to keep the fixed exchange rate policy on track in spite of turmoil in the European foreign exchange markets and strong devaluation by some of Denmark's major trading partners. This period was also characterised by low economic growth in Denmark and crises in the banking sector. But the krone was steered successfully through the choppy waters and stabilised at a rate close to its central rate against the D-mark. The sea serpent is a reference to the European exchange rate cooperation in the 1970s, which was known as "the Snake".

Danmarks Nationalbank's toolbox: Interest rates and foreign exchange reserves

Interest rate adjustments and purchase and sale of foreign exchange are Danmarks Nationalbank's most important monetary and foreign exchange policy instruments. That has been the case under the fixed exchange rate policy against the euro since 1999, but also in previous periods of fixed exchange rate policy.

Danmarks Nationalbank's toolbox has stood the test all through the foreign exchange crises of the 1990s and the financial and sovereign debt crises in recent years. This has strengthened the credibility of the fixed exchange rate policy.

The extensive exchange control introduced during the crisis in the 1930s took more than 50 years to roll back. In the 1960s and 1970s, the exchange control was supplemented with credit restrictions and reserve requirements on the deposit banks. This regulatory monetary policy approach was not very efficient. During the 1980s, it was replaced by a more market-oriented approach.

The toolbox in a fixed exchange rate regime

Denmark has pursued a fixed exchange rate policy against the euro since 1999. This means that Danmarks Nationalbank's interest rates normally mirror those fixed by the ECB for the euro area. In the second half of the 1980s and in the 1990s, Denmark pursued a fixed exchange rate policy against the core ERM currencies, i.e. especially the D-mark. In this period, Danmarks Nationalbank's interest rates normally followed the rates fixed by Deutsche Bundesbank for Germany.

If the krone fluctuates a little against the euro, Danmarks Nationalbank may sell or buy kroner against euro in the foreign exchange market to stabilise the krone. The krone will strengthen if Danmarks Nationalbank buys kroner (and sells euro) and weaken if Danmarks Nationalbank sells kroner (and buys euro).

Besides the direct impact on the supply and demand for Danish kroner, Danmarks Nationalbank's intervention in the foreign exchange market signals a will to defend a stable krone rate.

Intervention in the foreign exchange market makes it expensive to speculate against the krone. Danmarks Nationalbank buys euro when the euro is cheap measured in Danish kroner and sells euro when the euro is expensive. This entails a profit for Danmarks Nationalbank in the event of speculation against the stable krone rate.

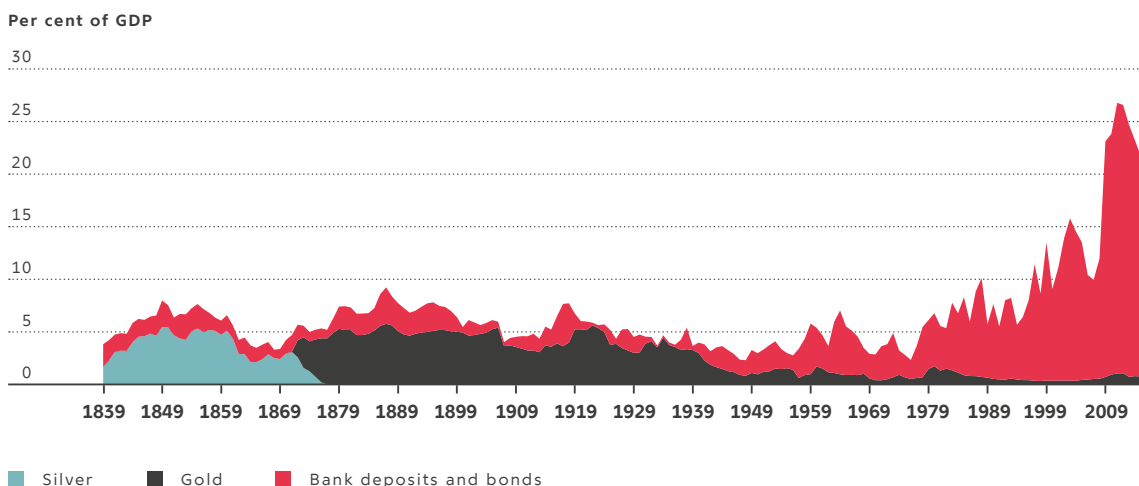
Danmarks Nationalbank's foreign exchange reserve consists primarily of deposits at foreign banks as well as euro-denominated bonds, which can quickly be sold or pledged as collateral for a loan if foreign exchange is needed to defend the krone. During the silver and gold standard periods, silver or gold, respectively, accounted for the largest share of the foreign exchange reserve, cf. Chart 5.1. Gold has not played any role in the banknote system since the gold standard was suspended in the early 1930s, but gold remained a considerable reserve asset until the early 1980s. Today, Danmarks Nationalbank's gold stock makes up only a small share of the foreign exchange reserve.

DANMARKS NATIONAL-BANK DOES NOT KEEP GOLD IN ITS VAULTS

66,550 kg gold

was what Danmarks Nationalbank had in its foreign exchange reserve at the end of 2016 – most of it is stored securely at the Bank of England.

CHART 5.1
Danmarks Nationalbank's foreign exchange reserve 1839-2016



Danmarks Nationalbank's gold stock

In a historical context, gold has played a key role in relation to the banknote system, also in Denmark. When the gold standard applied, it was important for Danmarks Nationalbank to have a stock of gold, given that Danish banknotes were freely convertible to gold. As described in Chapter 4, the gold standard more or less automatically resulted in fixed exchange rates between the krone and other gold standard currencies. But Danmarks Nationalbank was able to support the fixed exchange rates by adjusting interest rates in accordance with the fixed exchange rate policy. For example, if the krone tended to weaken, interest rates could be raised, which would make it more attractive to invest in Denmark, thereby strengthening the krone.

Today, Danmarks Nationalbank's gold stock simply constitutes a share of the foreign exchange reserve. Danmarks Nationalbank held 66,550 kg gold at the end of 2016, at a

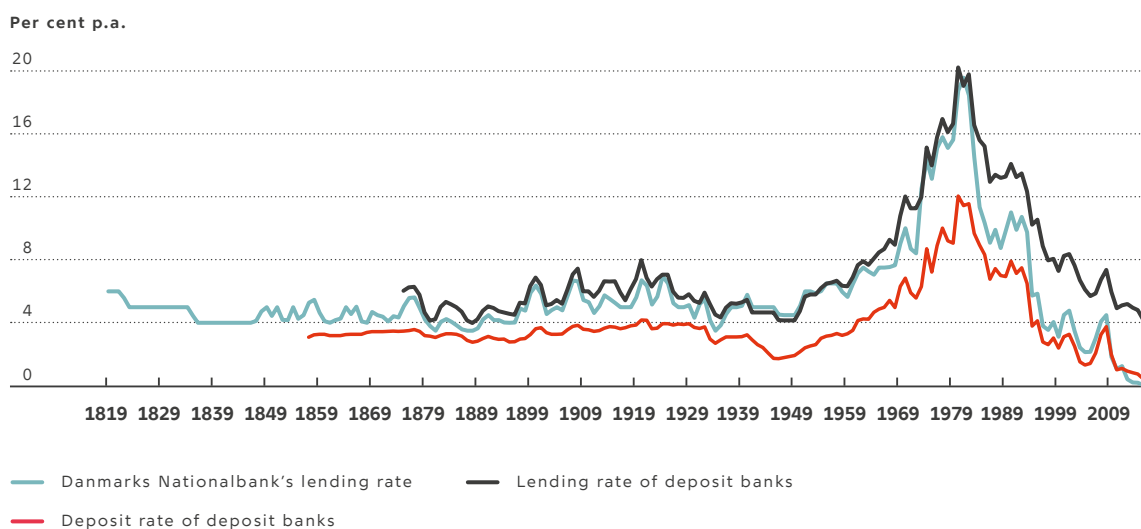
market value of kr. 17.5 billion. The gain on the gold stock is attributable to increases in value over time as a result of gold price developments.

Moreover, since 1987 Danmarks Nationalbank has lent some of its gold at times to gain current interest income on the gold stock. In the international market for lending in gold, central banks lend gold to commercial banks for e.g. 3 or 6 months. The commercial banks in turn lend the gold to e.g. mining companies wishing to hedge against future price falls for gold. If, in May, a mining company wants to hedge against lower prices of gold from its mining operations in August, the company can choose, in May, to borrow gold from a commercial bank for 3 months subject to interest payments. The mining company sells the borrowed gold in the spot market in May and returns gold (from its mining operations in August) to the commercial bank in August. This means that the mining company has in reality sold the gold from its mining operations in August at the gold price applying in May.

Gold is heavy, but not very bulky. Danmarks Nationalbank's entire gold stock would fit into a small box measuring around 1.5 by 1.5 by 1.5 metres.

CHART 5.2

Interest rates of Danmarks Nationalbank and the deposit banks 1819-2016





Persistent pressure on the krone will induce Danmarks Nationalbank to adjust its interest rates. This makes it expensive to speculate against the fixed exchange rate policy. Downward pressure on the krone will prompt Danmarks Nationalbank to raise interest rates. This makes it more expensive to borrow kroner to buy and invest in euro. Upward pressure on the krone will prompt Danmarks Nationalbank to lower interest rates. This makes it less attractive to borrow euro and buy and invest in Danish kroner.

Danmarks Nationalbank's instruments are really called into action when the krone comes under pressure. They have proved to be robust and have stood the test through the foreign exchange crises of the 1990s, with downward pressure on the krone, as well as in recent years with upward pressure on the krone, cf. the Factbox on page 66-67. This has contributed to strengthening the credibility of the fixed exchange rate policy.

Danmarks Nationalbank is banker to the banks

In practice, Danmarks Nationalbank conducts monetary policy in its role as "banker to the banks". Deposit banks and mortgage banks may raise loans from and hold deposit accounts at Danmarks Nationalbank. So when interest rates are adjusted, this refers to the interest rates on Danmarks Nationalbank's loans to and deposits from deposit banks and mortgage banks. That is why deposit banks and mortgage banks are also known as Danmarks Nationalbank's monetary policy counterparties. Normally, Danmarks Nationalbank's interest rate adjustments quickly lead to adjustment of interbank interest rates and the deposit banks' retail rates, cf. Chart 5.2.

When the toolbox included lending caps

As described in Chapter 4, extensive exchange control was introduced during the crisis in the 1930s, and it took more than 50 years to roll it back again.

The exchange control enabled Danmarks Nationalbank to contribute to managing domestic demand or meeting other economic

The krone crisis in 2015

In early 2015, large volumes of foreign exchange flowed into Denmark. The background was market expectations that the ECB would announce an extensive programme to purchase European government bonds in order to push down long-term interest rates. In mid-January, the Swiss National Bank abandoned the cap on how strong the Swiss franc could be against the euro, and just a few hours later there was also strong upward pressure on the krone against the euro. The magnitude of Danmarks Nationalbank's intervention in the foreign exchange market set a new record, and the key interest rate had to be reduced to -0.75 per cent. However, Danmarks Nationalbank managed to stem the tide of upward pressure, and the exchange rate of the krone was stabilised at a level close to its central rate against the euro.

INTEREST RATES MAY BECOME NEGATIVE

-0.20 per cent

was the rate of interest on certificates of deposit after the reduction on 5 July 2012. This was the first time ever that one of Danmarks Nationalbank's interest rates became negative.

policy objectives if the foreign exchange reserve permitted it. For instance, Danmarks Nationalbank made considerable bond purchases in the 1960s to curb the increase in yields on long-term bonds, which attracted much political attention. Moreover, the exchange control provided for experiments with various alternative monetary policy instruments, including credit restrictions and reserve requirements on the deposit banks.

In 1965-71, a quota system (bond rationing) applied to the mortgage banks' loan offers, according to an agreement between Danmarks Nationalbank and the mortgage credit sector. In 1965, Danmarks Nationalbank also concluded deposit agreements with the deposit banks' organisations. Under the agreements, commercial banks and savings banks had to deposit a certain percentage of their deposit growth at Danmarks Nationalbank or invest the funds in bonds (or foreign assets as regards the commercial banks). The reserve requirements on deposit banks under the deposit agreements were replaced in 1970 by an outright cap on the deposit banks' loan commitments. In 1975, Danmarks Nationalbank and the Association of Danish Mortgage Banks concluded an agreement to cap mortgage banks' loan commitments, and in 1979 the insurance and pension organisations concluded an agreement with Danmarks Nationalbank to regulate their lending.

The cap on lending by deposit banks and mortgage banks was lifted in 1980, and the regulation of lending by the insurance and pension sector was lifted in 1982. In 1985, Danmarks Nationalbank introduced a deposit monitoring system under which the deposit banks should deposit certain reserves at Danmarks Nationalbank if deposit growth exceeded an agreed rate. But in reality this was abolished again already in 1988. From then on, Danmarks Nationalbank's monetary policy was entirely on market terms, with interest rate adjustments and intervention in the foreign exchange market as the most important instruments in normal times.

TIMELINE

FOREIGN EXCHANGE CRISES AND KRONE PRESSURES SINCE 1990



The engine room gets busy when the krone comes under pressure

The foreign exchange crises in 1992-93

In the early 1990s, the European foreign exchange market came under strong speculative pressure, one currency after the other falling under attack. The background was a combination of the unification of East and West Germany and imbalances in a number of economies. The unification in 1990 was followed by several years of strong economic growth, government budget deficits and increased inflation in Germany, which led to high German interest rates. This was undesirable in the ERM countries with large macroeconomic imbalances, and foreign exchange market participants began to perceive the existing ERM exchange rates as unsustainable.

The rejection of the Maastricht Treaty in the Danish referendum in June 1992 may also have added to the pressure on the currencies. The confidence in a fast, smooth move towards a single European currency was weakened further by the narrow yes majority at the referendum in France in September 1992.

In September 1992, the UK decided to leave the ERM and let the pound float, and later that year, Sweden and Norway had to abandon their fixed exchange rate policies. The speculative pressure spread to the core currencies in the ERM, and in the autumn of 1992, Danmarks Nationalbank had to intervene in the foreign exchange market for considerable amounts to support the krone. Moreover, Danmarks Nationalbank raised its interest rates considerably, resulting in the interest rate spread to Deutsche Bundesbank reaching more than 6 percentage points in November 1992. The pressure on the Danish krone ceased with the agreement on the Danish EU opt-outs in Edinburgh on 11-12 December 1992.

The Irish pound remained under pressure and was devalued by 10 per cent on 1 February 1993. Speculation then immediately targeted the Danish krone again. The new Danish government made a firm statement about its will to continue the fixed exchange rate policy, but the pressure on the krone persisted. On 3 February, Danmarks Nationalbank intervened in support of the krone, buying kroner for around kr. 24 billion, or half of the foreign exchange reserve at that time. On 4 February 1993, Danmarks Nationalbank raised its interest rate by 2 percentage points to 11.5 per cent and, by agreement with the central banks of Belgium, France, Germany, the Netherlands and Spain, coordinated intervention in support of the krone was made. The joint action surprised the foreign exchange market participants. The krone was stabilised and strengthened further when, on the same day, Deutsche Bundesbank announced an interest rate reduction. Danmarks Nationalbank charged an interest rate of 40 per cent p.a. on the 17-day loans it granted to certain banks. Towards the end of the month, the krone had strengthened, and considerable amounts of foreign exchange flowed back into Denmark. In the latter part of February, Danmarks Nationalbank again began to lower its interest rates.

The European foreign exchange markets stabilised somewhat from February 1993, but turmoil arose again in May and peaked in July. Danmarks Nationalbank again had to intervene in support of the krone for considerable amounts and to raise interest rates. During July, Danmarks Nationalbank sold foreign exchange for around kr. 50 billion. This large-scale intervention was possible because the foreign exchange reserve had been strengthened since February 1993, and because Danmarks Nationalbank could draw on ERM intervention credits.

On Friday 30 July, the financial markets were convinced that the ERM would collapse. A meeting was convened and resulted in a widening of the ERM fluctuation band to +/- 15 per cent on 2 August 1993. In a statement of 2 August in the morning, the Danish government confirmed its will to continue the fixed exchange rate policy, and the krone gradually strengthened again, while Danmarks Nationalbank was able to normalise interest rates and begin to repurchase foreign exchange.

The LTCM crisis of 1998

In September 1998, the Danish krone came under pressure in connection with general turmoil in the international financial markets. The background was mainly that Russia ceased to service its debt in August and gave up stabilising the rouble against the dollar. The turmoil resulted, inter alia, in problems for a large US hedge fund, Long-Term Capital Management (LTCM). This fund and other investors had taken substantial positions in Danish mortgage bonds.

Danmarks Nationalbank intervened in support of the krone for just under kr. 13 billion from 10 to 18 September to keep the krone stable. In addition, interest rates were raised with effect from 21 September. The pressure on the krone continued immediately after the raising of interest rates, as the outlook for the Scandinavian currencies became uncertain after an election in Sweden. On 21 September, Danmarks Nationalbank had to sell foreign exchange for just under kr. 11 billion.

But the pressure quickly subsided and Danmarks Nationalbank could buy back foreign exchange while the krone strengthened. The announcement of 26 September 1998 on Denmark's participation in ERM 2 contributed significantly to this. Danmarks Nationalbank was able to reduce interest rates gradually during October and November.

The euro referendum in 2000

In the period just before the Danish referendum on 28 September 2000 on euro area participation, the krone weakened, although there was no actual turmoil. Danmarks Nationalbank raised interest rates a little on several occasions and in September sold foreign exchange for around kr. 11 billion.

In the referendum, the proposal for Denmark to join the euro area was rejected by a majority of 53 per cent. Immediately after the referendum, the government and Danmarks Nationalbank issued a joint press release emphasising that Denmark would continue its fixed exchange rate policy within ERM 2. In addition, Danmarks Nationalbank raised its interest rates to avoid uncertainty about the krone after the referendum. This brought the spread to the ECB's interest rate to 1.1 percentage points. The krone then strengthened against the euro, and the foreign exchange outflow made way for an

inflow. In October, Danmarks Nationalbank bought foreign exchange for around kr. 17 billion and could gradually begin to normalise interest rates.

The financial crisis in 2008

The most recent international financial crisis began in the summer of 2007, but worsened considerably in mid-September 2008, when the US authorities allowed the Lehman Brothers investment bank to fail. Equity prices dropped, banks were unwilling to lend to each other via the money markets, and several small currencies came under pressure – including the Danish krone.

To stabilise the krone, Danmarks Nationalbank intervened in the foreign exchange market, buying kroner for a considerable amount from late September to early October. This was not enough to counter the pressure on the krone, and on 7 October Danmarks Nationalbank announced that it would raise its interest rates with effect from 8 October. Around mid-day on 8 October, the ECB announced an interest rate reduction of 0.5 percentage point. Since Danmarks Nationalbank maintained its interest rates, the spread between monetary policy interest rates in Denmark and the euro area widened to 1.25 percentage points.

At the end of October, Danmarks Nationalbank again bought kroner in the foreign exchange market to stabilise the krone, which was under pressure as a result of a continued outflow of foreign exchange because the financial crisis prompted investors to withdraw from the small currencies. On 24 October, Danmarks Nationalbank raised interest rates by a further 0.5 percentage point to 5.5 per cent in response to the sustained pressure against the krone. This caused the interest rate spread between Danmarks Nationalbank and the ECB to widen to 1.75 percentage points. Danmarks Nationalbank sold foreign exchange for around kr. 64 billion in total during September and October 2008.

From the end of October the krone strengthened and Danmarks Nationalbank was able to buy back foreign exchange. On 6 November, Danmarks Nationalbank, mirroring the ECB, cut its interest rates by 0.5 percentage point effective from 7 November. In December and in the 1st half of 2009, Danmarks Nationalbank continued to buy back foreign exchange and normalise interest rates.

The sovereign debt crisis in some euro area member states 2011-12

For some euro area member states with macroeconomic imbalances, the most recent financial crisis developed into a full-blown sovereign debt crisis. Most countries eased fiscal policy to a significant extent to mitigate the negative effects on output and employment of the global economic and financial crisis which broke out in earnest in 2008. But several countries quickly realised that their government budgets did not allow fiscal policy accommodation of that magnitude. In addition, several euro area member states, notably Greece, Portugal and Spain, had built up very large and unsustainable current account deficits before the crisis. The reason was a strong increase in domestic demand, partially driven by far too expansionary fiscal policies. This led to wage increases that were too high to be warranted by productivity

developments. This eroded competitiveness, which – viewed in isolation – increased the current account deficit even more. Ultimately, the deficit member states' ability to honour future public and private debt obligations was questioned.

The Danish krone strengthened against the euro in the period from July 2011 to July 2012, when the sovereign debt crisis peaked and a key issue was the risk that the euro area would be split up. To counter the strengthening of the krone, Danmarks Nationalbank intervened and bought foreign exchange for considerable amounts and lowered its interest rates. In that period, Danmarks Nationalbank bought foreign exchange for around kr. 91 billion, and on 5 July 2012 the rate of interest on certificates of deposit was lowered to -0.20 pct. For the first time in Danmarks Nationalbank's 200-year history, one of its interest rates became negative. Viewed in a larger global context, it was presumably also the first time a central bank brought its key interest rate into negative territory.

The upward pressure on the krone subsided after the transition to a negative interest rate. However, another background factor was stronger confidence in the ability to manage the sovereign debt crisis in some euro area member states, given the statement by the President of the ECB in a speech on 26 July 2012 that within its mandate, the ECB would do "whatever it takes" to preserve the euro.

The krone crisis in 2015

January 2015 saw a substantial inflow of foreign exchange to Denmark and upward pressure on the krone against the euro. The background was market expectations that the ECB would announce extensive purchases of government bonds to press down interest rates in the euro area. On 15 January, the Swiss National Bank decided to abandon the cap on how strong the Swiss franc could be against the euro. This prompted some foreign investors to buy kroner, expecting Denmark to follow suit and abandon its fixed exchange rate policy so the value of the krone would appreciate. Danish insurance companies and pension funds were also buying kroner to reduce their foreign exchange exposures. This reinforced the upward pressure on the Danish krone.

To prevent the substantial foreign exchange inflow from strengthening the krone, Danmarks Nationalbank bought foreign exchange against kroner for a record-high amount of kr. 275 billion during January and February. Moreover, Danmarks Nationalbank lowered its interest rates on several occasions. With effect from 6 February, the rate of interest on certificates of deposit was lowered to -0.75 per cent. The interest rate reductions caused especially short-term Danish interest rates to fall. In order to further halt the inflow of foreign exchange, the Ministry of Finance decided to suspend issuance of Danish government bonds on 30 January. This was done at the recommendation of Danmarks Nationalbank. As a result, yields on Danish government bonds became even lower, making them less attractive.

The inflow of foreign exchange ceased towards the end of February, and in April Danmarks Nationalbank could begin to sell foreign exchange again. From April to August, it sold foreign exchange for kr. 191 billion, and on 26 August, it announced that the extraordinary measures were no longer needed. This prompted the Ministry of Finance to resume issuance of Danish government bonds in October 2015.

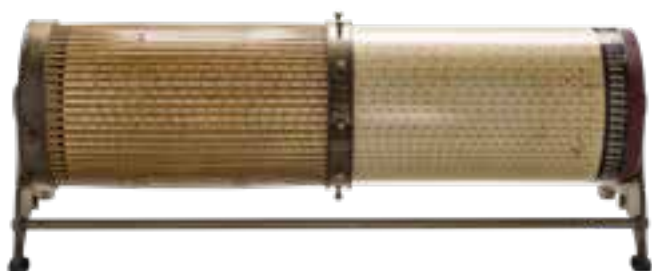
The lesson from the 1970s was that quotas and caps were far less precise instruments than expected. The problem of regulating lending by deposit banks and mortgage banks was highlighted by the occurrence of new credit channels. That was why it was also necessary to regulate lending by insurance companies and pension funds. Moreover, there were no restrictions on the deposit banks' bond purchases, the private market for mortgage deeds (the grey loan market) and lending by financing companies. In addition, Danish firms were increasingly raising loans abroad during the 1980s as foreign exchange restrictions were phased out.

The post-World War II decades were also a time when Danmarks Nationalbank was involved in several selective credit schemes that were not linked to its core tasks:

- In 1958, Danmarks Nationalbank was involved in the establishment of Finansieringsinstituttet for Industri og Håndværk (Finance for Danish Industry) with the purpose of strengthening the industrialisation process by granting medium-term loans to industrial firms and craftsman's businesses.
- In 1959, Danmarks Nationalbank was involved in the establishment of Byggeriets Realkreditfond (the Mortgage Fund of the Building Trades), which could grant third priority mortgage loans.
- In 1960, Danmarks Nationalbank was involved in the establishment of Dansk Landbrugs Realkreditfond (the Agricultural Mortgage Bank) with the purpose of granting second priority loans secured by agricultural properties, etc.
- In 1961, Danmarks Nationalbank was involved in the establishment of Danmarks Skibskreditfond (Danish Ship Finance) with the purpose of granting loans secured by ships.
- In 1967, Danmarks Nationalbank was involved in the establishment of Grønlandsbanken with a view to setting up a bank in Greenland which could be an authorised currency dealer, among other things.
- In 1975, Danmarks Nationalbank was involved in the establishment of Dansk Eksportfinansieringsfond (the Danish Export Finance Corporation) with the purpose of granting long-term export credit.

SNAPSHOT FROM THE HISTORY OF DANMARKS NATIONALBANK

Logarithmic calculator from Danmarks Nationalbank's main building in Holmens Kanal. Used for converting amounts in one currency into another.



TIMELINE

LENDING CAPS AND RESERVE REQUIREMENTS 1965-88

1965-71	Loan offers from mortgage banks were subject to a quota system (bond rationing).
1965-70	The deposit banks had to deposit a certain percentage of their deposit growth at Danmarks Nationalbank.
1970-80	Cap on the deposit banks' loan commitments (lending ceiling).
1975-80	Cap on the mortgage banks' loan commitments.
1979-82	Regulation of lending by insurance companies and pension funds.
1985-88	The deposit banks had to deposit certain reserves at Danmarks Nationalbank if deposit growth exceeded an agreed rate.

Fixing of exchange rates

In its 200-year history, Danmarks Nationalbank has played a key role in the fixing and publication of exchange rates.

Official fixing of exchange rates was introduced in Denmark as far back as 1787. It was linked to the Copenhagen Stock Exchange, and after Danmarks Nationalbank's establishment in 1818, one of the bank's governors participated in the process.

In connection with the extensive foreign exchange regulation in the 1930s, Danmarks Nationalbank took over the task of fixing the exchange rates to be used by the banks when buying or selling foreign exchange.

1953 saw a return to the system of basing fixing on market-determined exchange rates. To this end, most of the major foreign exchange dealers participated in a daily procedure at Danmarks Nationalbank where the official exchange rates were fixed according to an auction-like principle.

By the early 1990s, this type of official fixing of exchange rates had become outdated. Currencies are now traded throughout the day in foreign



exchange markets worldwide at fluctuating exchange rates that can be monitored via modern information systems and news media. The official fixing of exchange rates ceased in 1991.

Danmarks Nationalbank still publishes daily the exchange rate of the krone against a number of other currencies on the basis of information from various central banks. But the banks are no longer under an obligation to use Danmarks Nationalbank's exchange rates in their transactions. The picture shows one of Danmarks Nationalbank's foreign exchange trading desks in 2015 – with a wealth of electronic information systems.

When Danmarks Nationalbank's gold reserves were sent abroad for secure storage during World War II



In the period just before the German occupation of Denmark on 9 April 1940, Danmarks Nationalbank's gold stock in Copenhagen was secretly transported to the Federal Reserve in New York.

This was due to fears that Germany would occupy Denmark and rumours that the central banks of countries occupied by Germany had been robbed of their gold reserves. Since some of Danmarks Nationalbank's gold was already deposited in England, there was practically no gold at Danmarks Nationalbank in Copenhagen on 9 April.

The gold was transported in boxes holding four gold ingots weighing 12.5 kg each. Transport of the gold took place in a top secret operation involving a series of shipments via Sweden and Norway. It was the official policy of the Danish government not to take measures to indicate that a German occupation was expected. The transports were initiated at a measured pace in December 1939 and accelerated strongly in early 1940.

In June 1941, the German legation in Copenhagen requested a meeting with Danmarks Nationalbank to learn more about Denmark's gold reserves. Danmarks Nationalbank was able to confirm that practically all the gold had been freighted to the USA. The reason given by the bank was that there was a need to hold international means of payment in New York for use in connection with ongoing financial transactions.

After the War, the gold was repatriated. Following the outbreak of the Korean War in 1950, the international situation became tense again, and in 1951 the gold was moved abroad once more, mainly to the Bank of England in London, which still stores most of Danmarks Nationalbank's gold.

At the end of 2016 Danmarks Nationalbank owned 66,550 kg gold. One of the ingots is displayed in a partly open glass showcase in the lobby of Danmarks Nationalbank, where visitors can touch and lift it.



Transport box
for four gold ingots



Bank of England's
gold vault

Gold ingot
in Danmarks
Nationalbank's
lobby

It took many years to dismantle Danmarks Nationalbank's involvement in these activities, but over time they were all replaced by more market-oriented solutions.

The credit restrictions in the 1960s and 1970s preserved credit market structures by limiting competition in the financial sector and reducing incentives to make the products cheaper and better. The deregulation of the financial sector during the 1980s generated considerable welfare gains. These gains were reflected in lower prices (narrowing of the spread between lending and deposit rates) and a wider range of financial products (such as new payment solutions, more money market products and financial risk hedging products like options and futures) in response to increased competition and higher labour productivity in the financial sector.

**ONLY DEPOSIT BANKS AND MORTGAGE BANKS
MAY BORROW FROM DANMARKS NATIONALBANK**

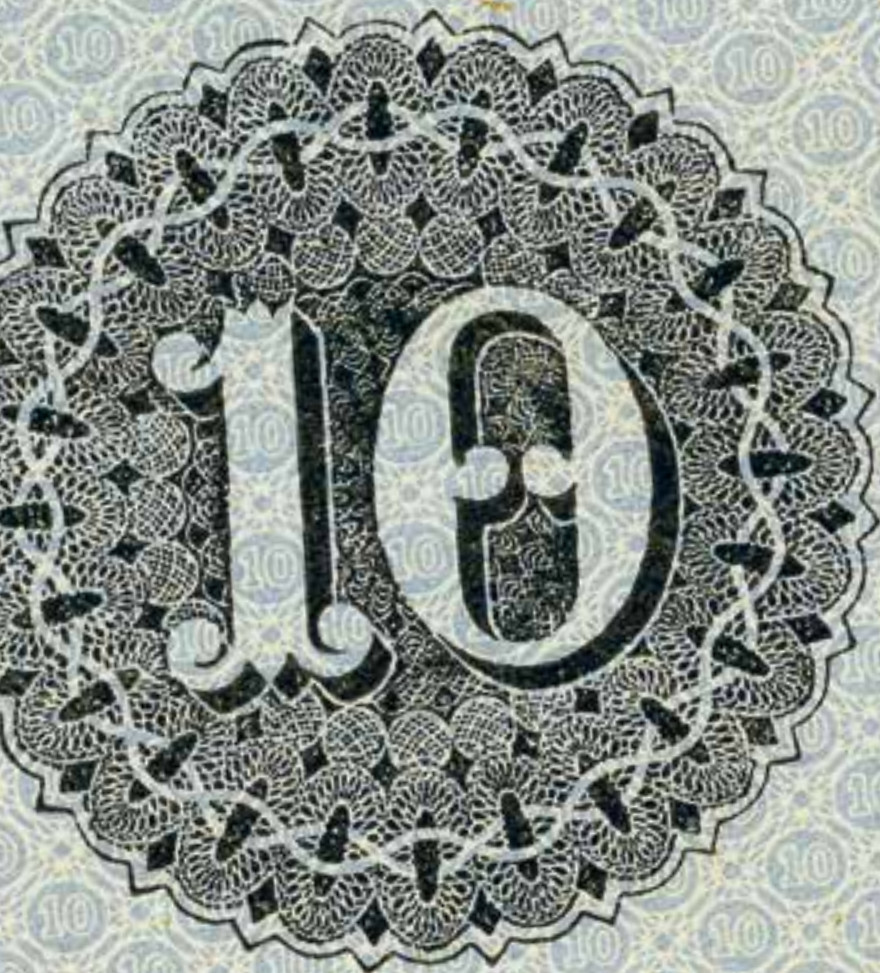
"Banker to the banks"

is a term often used about Danmarks Nationalbank. When interest rates are adjusted, this refers to the interest rates on Danmarks Nationalbank's loans to and deposits from deposit banks and mortgage banks. The changes soon ripple through to other short-term interest rates in the economy.

The stability of the financial system

Since 1818, a private sector financial system has gradually developed which smoothly and efficiently meets the need for financial products. However, there have been crises along the way, and Danmarks Nationalbank – as “banker to the banks” – and the central government have had to step in with liquidity, guarantees and capital in order to support stability.

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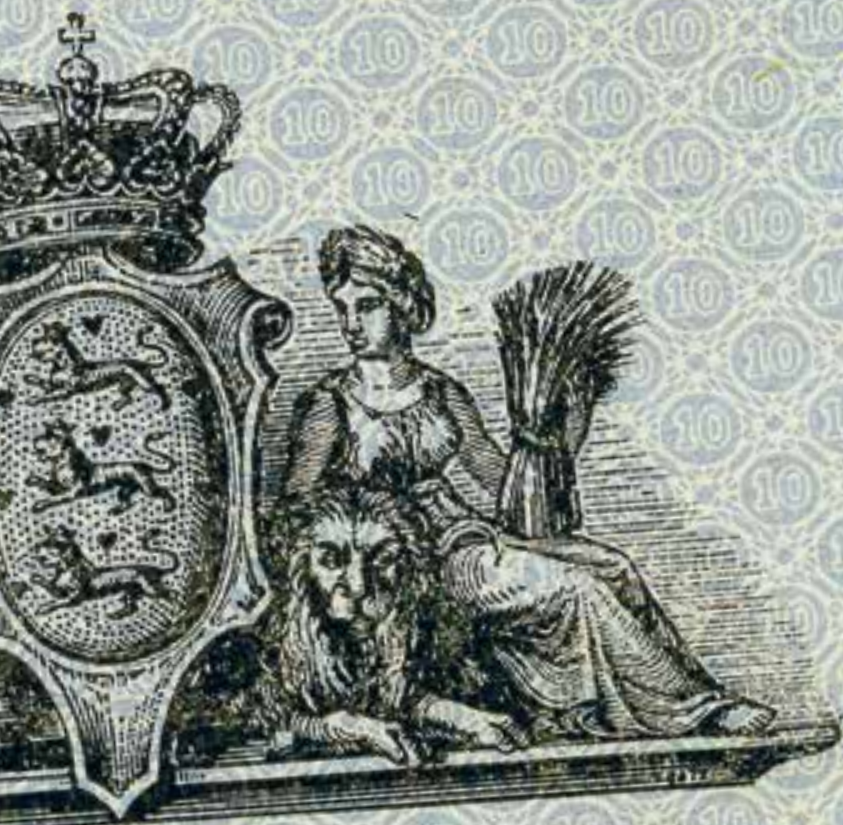


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Chapter 6

Kroner.

ordring med Guldmonnt.

i Kjøbenhavn 1891.





The fire of Copenhagen on 5 June 1795

There was a massive need for home financing after the fire of Copenhagen in 1795, which consumed around one third of the city's buildings. This led to the establishment of the first Danish mortgage bank, Kreditkassen for Husejere i Kjøbenhavn, in 1797. It merged with BRFKredit in 1975.

From savings banks to financial supermarkets

In the 18th century, credit was mainly granted without financial institutions as intermediaries.

The first Danish mortgage bank was established in 1797, the first savings bank in 1810 and the first commercial bank in 1846. In the second half of the 19th century, the basic features of the extensive private sector financial system we know today emerged.

In recent decades, the banking sector has been characterised by many mergers with a view to streamlining operations and achieving economies of scale.

Liberalisation of cross-border securities trading during the 1970s and 1980s has allowed pension companies and investment funds to diversify investment of members' savings internationally.

Credit existed before credit institutions were invented

Throughout most of the 18th century, no deposit banks or mortgage banks existed in Denmark. Credit was mainly granted on a bilateral basis between individuals. For example, the owner of an estate could raise a loan against a registered mortgage on the property, a firm could obtain credit by issuing a debt instrument (bill of exchange) or a private individual could pawn possessions such as furniture. There were a few royal loan funds and predecessors of Danmarks Nationalbank that lent money, but credit was mainly granted without financial institutions as intermediaries.

As the economy developed, the need for credit intermediation and access to savings products increased. That paved the way for the various private sector financial institutions we know today.

For many years after its establishment, Danmarks Nationalbank conducted retail banking operations alongside its role as central bank. This meant that it counted private individuals and especially traders and merchants among its customers. As a private sector banking system developed in the course of the 19th century, Danmarks Nationalbank could shift its focus from retail banking operations to its role as “banker to the banks”.

Savings banks emerge in the first half of the 19th century

Savings banks were originally self-governing institutions, and Denmark’s first savings bank was established in 1810. Its name was Sparrekassen for Grevskabet Holsteinborg og Omegn and its aim was to

FACTBOX

When Danmarks Nationalbank conducted retail banking operations

For many years after its establishment, Danmarks Nationalbank – or Nationalbanken i København as it was called until 1936 – conducted retail banking operations alongside its role as central bank. This meant that it counted private individuals and especially traders and merchants among its customers. That was in an age when the private banking sector had not yet evolved.

All private individuals, traders and merchants – or “subjects of the King” as they were referred to in section 25 of Danmarks Nationalbank’s Charter of 1818 – were entitled to open an account for the deposit of cash. Fees were charged for such accounts while no interest was paid on deposits. It was mainly large traders and merchants that held such deposit accounts. Danmarks

Nationalbank also lent money to traders and merchants.

As a private sector banking system developed in the course of the 19th century, Danmarks Nationalbank could shift its focus from retail banking operations to its role as banker to the banks and the central government. However, many years passed before the last business had been transacted with non-banks. As late as in the early 1960s a group of non-banks held accounts and had access to credit at Danmarks Nationalbank. The last of these customer relationships were discontinued in 1967.

UNTIL 1846, DANMARKS NATIONALBANK WAS THE ONLY ACTUAL BANK IN DENMARK

From bank to “banker to the banks”

As a well-functioning private sector banking system developed in the course of the 19th century, Danmarks Nationalbank could shift its focus from retail banking operations to its role as banker to the banks and the central government.

promote thrift among the less well-to-do people in the area. Interest was paid only on deposits below a certain size. The savings bank accepted larger deposits but saw no reason to pay interest on them.

The second savings bank was established in 1816, and during the 1820s and 1830s some 20 new savings banks were set up. Around the year 1900, there were more than 500 savings banks in Denmark, and the number of savings bank accounts more or less matched the number of families, cf. Chart 6.1.

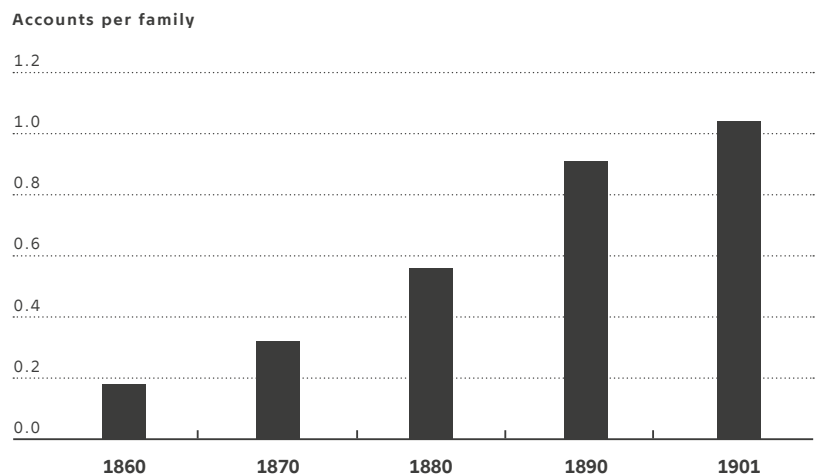
Originally, the savings banks deposited a large share of the funds received with the central government or Danmarks Nationalbank. During the 1840s and 1850s they came to play a key role in the Danish economy as lenders.

The commercial banking system emerges around 1850

Being self-governing institutions, the savings banks did not have any capital base that allowed them to meet the constantly growing demand for credit. That provided a basis for the emergence of commercial banks established as limited liability companies.

CHART 6.1

Number of savings bank accounts 1860-1901



Denmark's first commercial bank was Fyens Diskonto Kasse. It was established in Odense in 1846, and over the next few decades more banks opened. By 1873, there were around 30 commercial banks, including the three main commercial banks that were to dominate the banking structure for the next 100 years. They were Privatbanken (established in 1857), Den Danske Landmandsbank (established in 1871) and Handelsbanken (established in 1873).

A certain division of tasks developed between savings banks and commercial banks. The strongholds of the savings banks were agriculture and the rural population, while the commercial banks concentrated on the non-farming business sectors and the credit needs of the urban population.

Not until 1913 did total deposits in commercial banks exceed total deposits in savings banks.

The distinction between commercial banks and savings banks becomes blurred

The savings banks gradually lost market shares to the commercial banks as the business structure shifted from agriculture towards industry and services in the decades after World War II. But the commercial banks also increasingly targeted wage earners as customers, especially from the 1960s onwards. Until then, this had been one of the savings banks' core segments.

The 1960s also saw the introduction of electronic data processing in the Danish banking sector. Some institutions invested in their own data processing systems, while others joined forces and set up shared data centres.

In 1975, new, common regulation of commercial banks and savings banks made it possible for saving banks to carry out the same business as commercial banks. In other words, they were now able to purchase debt instruments issued by firms (to "discount bills of exchange"), issue guarantees, trade in equities and bonds for their own account, participate in share issues and trade in foreign exchange. Until then, these activities had been the prerogative of the commercial banks.

In 1989, the savings banks were allowed to transform their businesses from independent institutions to limited liability companies so that they could raise capital in the equity market. So now the Danish commercial banks and savings banks were on an equal legislative footing. The following year, a single Danish Bankers Association was created when the existing Danish Bankers' Association and the Danish Savings Banks' Association merged. 1990 also saw the

THE DANISH DEPOSIT BANKING SECTOR HAS BEEN CHARACTERISED BY LARGE STRUCTURAL SHIFTS OVER TIME

From 700 to 80

That is, in round numbers, the decrease in the number of deposit banks from 1930 to 2016.



Søren Kierkegaard held an account at Danmarks Nationalbank

For many years after its establishment, Danmarks Nationalbank – or Nationalbanken i Kjøbenhavn as it was called until 1936 – conducted retail banking operations alongside its role as central bank.

Søren Aabye Kierkegaard (picture above) was among those who held an account at Danmarks Nationalbank in the 1830s (picture below). The Danish philosopher was born in 1813, " ... the year when so many worthless notes were put into circulation ...", as he wrote in his diary with a reference to the state bankruptcy.





Denmark's first commercial bank

Denmark's first commercial bank was Fyens Diskonto Kasse. It was established in Odense in 1846 after the city of Odense had, in vain, asked Danmarks Nationalbank to set up a branch in the city. This photo from 1860 shows Fyens Diskonto Kasse on the far left. Danmarks Nationalbank did not set up a branch in Odense until 1901. In 1967, Fyens Diskonto Kasse merged with Aarhus Privatbank and continued under the name of Den Danske Provinsbank. In 1990, Den Danske Bank, Handelsbanken and Den Danske Provinsbank merged, with Den Danske Bank as the continuing company.

merger of the savings bank Sparekassen SDS and the two commercial banks Privatbanken and Andelsbanken, which became Unibank. This meant that the former division of tasks between commercial banks and savings banks was rapidly disappearing, also in practice. Commercial banks and savings banks were now referred to as "deposit banks".

The mortgage credit sector

The first Danish mortgage bank, Kreditkassen for Husejere i København, was established in 1797 in response to the fire of Copenhagen in 1795. Around one third of the city's buildings were consumed by the fire, and there was a massive and immediate need for home financing.

The first mortgage credit act was passed in 1850 and created the basis for the large market for Danish mortgage bonds that still exists. The act allowed mortgage banks to provide fixed rate loans against a first-ranking mortgage on real property up to 60 per cent of the property value. The loans were interminable by the lender and were financed by issuing bonds. The bonds were to reflect the rates of interest on and amortisation terms of the loans granted (the balance principle).

In the 1890s, the first second-mortgage banks were established. They granted loans against a second-ranking mortgage on real property up to 75 per cent of the property value. In the late 1950s, they were followed by mortgage banks that offered third-ranking mortgages on real property.

The 1970 Mortgage Credit Act entailed a shift from a three-tier to a two-tier system. All mortgage banks were allowed to offer both first mortgages (general credit) and second mortgages (special credit) so that borrowers no longer had to raise loans from several types of institutions. This soon led to numerous mergers within the sector.

The Danish mortgage credit system has undergone major changes since 1970. The two-tier system for private owner-occupied dwellings was replaced by a single mortgaging system in 1980, and

in 1989 the mortgage banks were allowed to transform their legal status from associations to limited liability companies.

Since the mid-1990s, the mortgage credit sector has seen intensive product development, which has given borrowers more choice. Until the mid-1990s, long-term fixed rate loans dominated the home financing market in Denmark. In 1996, adjustable rate mortgages were introduced, and especially loans with annual refinancing rapidly became popular. After the millennium rollover, capped variable rate loans and deferred amortisation loans (interest-only loans) were introduced. However, the basic idea in the Danish mortgage credit system – to offer loans against mortgages on real property by issuing negotiable bonds – remains the same.

Sector overlap, internationalisation and consolidation

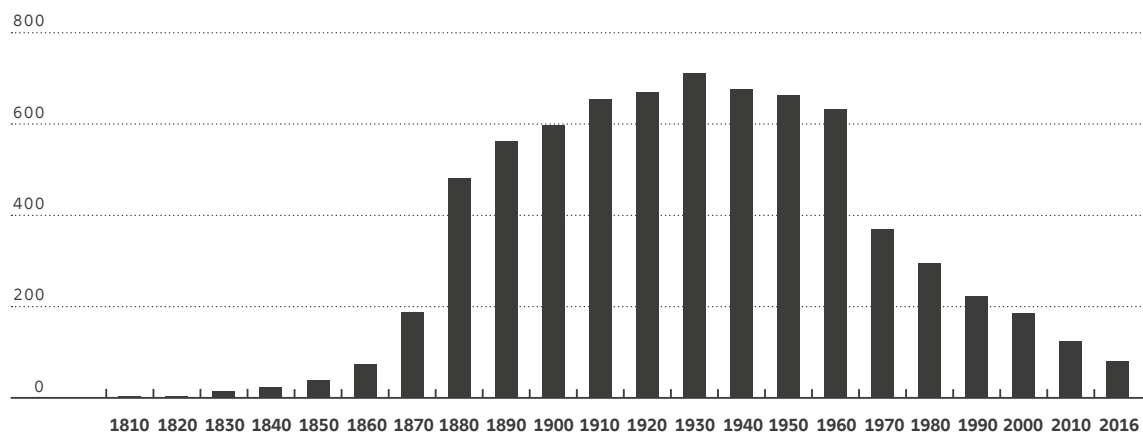
The Danish banking sector has also seen large structural shifts since 1980. Many commercial banks and savings banks have ceased to exist and there have been several waves of mergers and acquisitions as part of the sector's general attempts to rationalise and achieve economies of scale. The number of deposit banks has decreased from just under 300 in 1980 to just below 80 in 2016, cf. Chart 6.2. Mergers have led to the closure of branches due to overlapping branch networks. The number of branches has also decreased as a result of technological advances – such as ATMs and access to telephone and online banking.

The structure of the deposit banking sector changed dramatically in 1990, when six of the largest institutions merged into two major banks. Den Danske Bank, Handelsbanken and Provinsbanken merged and continued as Den Danske Bank, and, as previously mentioned, Sparekassen SDS, Privatbanken and Andelsbanken became Unibank. This led to a marked concentration within the sector. Jointly, the two new banks accounted for 55-60 per cent of total lending by Danish deposit banks after the mergers.

Until the mid-1980s, financial institutions in Denmark were split into sectors with clear divides between banking, mortgage credit and insurance activities. From the mid-1980s, the first financial

CHART 6.2

Number of deposit banks 1810-2016



groups began to emerge, i.e. financial “supermarkets” that operated within several financial subsectors such as banking, mortgage credit, insurance, etc.

The trend towards concentration and sector overlap within the financial area continued after 1990 and was also reflected in many and changing cooperation agreements across subsectors. In 1993, two new deposit bank-owned mortgage banks were established, and in 1994, the two largest mortgage banks became more closely linked to banking operations via cooperation agreements and capital injections so that they could offer loans and sell bonds via a network of deposit bank branches that were in close contact with potential customers. After the millennium rollover, several deposit banks began to offer variable rate loans against the home as collateral (“mortgage-like bank loans”) on terms and conditions that could compete directly with the mortgage banks’ products. Another sign of the sector overlap is that the Danish Bankers Association, the Association of Danish Mortgage Banks and the Danish Mortgage Banks’ Federation in 2016 merged into a single industry association (Finance Denmark) for deposit banks and mortgage banks in Denmark. In 2017, the Danish Investment Association (IFB) also became integrated into Finance Denmark.

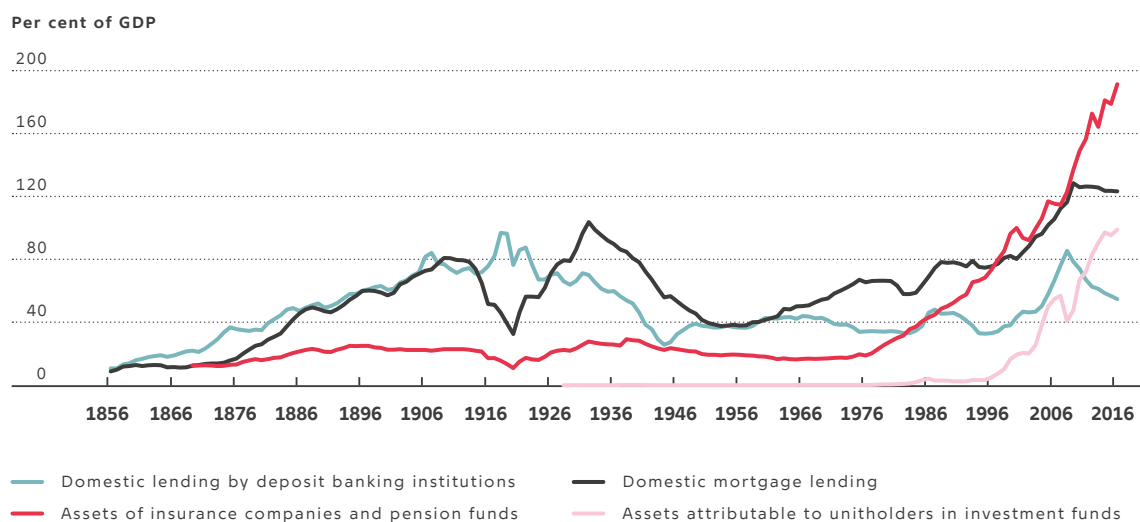
Many of the mergers that took place in the Danish financial sector in the early 1990s were characterised by the formation of financial groups within Denmark. In the late 1990s and after 2000, the sector was increasingly also affected by globalisation, with mergers and acquisitions across borders. A notable example is the establishment of Nordea in 1999-2000, when Unibank, the insurance company Tryg-Baltica, the Norwegian non-life insurance company Vesta, Finnish/Swedish MeritaNordbanken and Norwegian Christiania Bank og Kreditkasse merged. This resulted in the largest financial group in the Nordic region so far.

Size and development of the financial sector

In a long-term historical perspective, there has been considerable growth in the financial institutions’ balance sheets relative to GDP, cf. Chart 6.3. The same trend has been evidenced in other countries.

CHART 6.3

Size of the financial sector 1856-2016





The Copenhagen Stock Exchange

The Copenhagen Stock Exchange was established in 1624. Originally, physical goods were exchanged. Trading in shares on the stock exchange can be traced back to the 1780s, and from the early 1800s government bonds were also traded. The illustration shows Danmarks Nationalbank's first building, designed by the architect C. F. Harsdorff, next to the Stock Exchange. On the right-hand side is "the chancellery" at the corner of Christiansborg Slotsplads and Slotsholmsgade. The chancellery was built in 1715-20 and has been used by various government offices since 1721. It is often referred to as "the red building". Today it houses the Ministry of Finance.

This is because a higher income level generates increased demand for financial services. But it should be noted that Chart 6.3 comprises the institutionalised part of the financial system only. Before the emergence of credit institutions and other financial institutions, lending and saving took place without such institutions as intermediaries, as previously described.

It could be argued that developments within the financial sector – at least until a certain point – have a positive impact on the economy. A well-functioning financial sector brings savers and investors together, reduce transaction costs and ensure that more investments obtain funding. It also facilitates risk diversification, which reduces financing costs and promotes investment. At a more general level, the financial sector's payment solutions help to support a large volume of transactions in a dynamic market economy.

As far back as the late 19th century, commercial banks, savings banks and mortgage banks played a key role in the Danish economy as financial intermediaries. Before World War I, domestic lending by deposit banking institutions accounted for 70-80 per cent of GDP, and lending by mortgage banks was of a similar magnitude. The interwar period seems to have been a turning point, and by the mid-1950s lending by both sectors had declined to about 40 per cent of GDP. Subsequently the tide turned again, but it was not until the period of financial liberalisation and rising property prices in recent decades that the balance sheets of the financial sector once again reached the pre-World War I level.

The early introduction of a tax-funded old age pension scheme in Denmark (in 1891) originally reduced the potential size of the private pension sector. But recent decades have seen the build-up of contribution-based labour market pensions, reflected in strong growth in the assets managed by life insurance companies and pension funds. This development has also been boosted by tax allowances for contributions to private pension saving schemes.

The lifting of restrictions on cross-border securities trading in the 1970s and 1980s produced an increase in the volume of assets managed by investment funds. But the balance sheets of investment funds did not begin to grow in earnest until the second half of the 1990s. This growth reflected, in part, a global trend towards international diversification of investor portfolios. Moreover, institutional investors increasingly found it more convenient to use investment funds as investment vehicles rather than purchasing the individual securities directly.



The first wave of industrialisation in Denmark

The “industrial revolution” was not a revolution, but rather a long process with the economy undergoing a gradual transition from an agricultural to an industrial society. The last quarter of the 19th century and the first decade of the 20th are normally regarded as the period when the first wave of industrialisation hit Denmark.

In this period, the major commercial banks participated actively in the establishment of companies within industry and transport and helped to raise investment capital (via share issues) and working capital (via lending). In 1898, a mortgage bank (Kreditforeningen for industrielle Ejendomme) was set up that was specifically aimed at supplying the industrial sector with mortgage finance.

Krøyer’s painting of the foundry at Burmeister & Wain in 1885 depicts life at one of the major industrial workplaces of the age.

TIMELINE

DEVELOPMENT OF THE FINANCIAL SYSTEM IN DENMARK

1797	First mortgage bank is established.	1810	First savings bank is established.	1846	First commercial bank is established.	1850	First mortgage credit act.
1880	First savings bank act.	1919	First commercial banking act.	1975	New, common regulation of commercial banks and savings banks makes it possible for saving banks to carry out the same business as commercial banks.	1989	Mortgage banks are allowed to transform their legal status from associations to limited liability companies.
1989	Savings banks are allowed to transform their legal status from self-governing institutions to limited liability companies.	1990	A single Danish Bankers Association is created when the existing Danish Bankers' Association and the Danish Savings Banks' Association merge.	1993	Two deposit bank-owned companies enter the mortgage credit market.	1996	The mortgage bank sector introduces adjustable rate mortgages.
2003	The mortgage bank sector introduces deferred amortisation mortgages (interest-only loans).	2016	The Danish Bankers Association, the Association of Danish Mortgage Banks and the Danish Mortgage Banks' Federation merge into a single industry association (Finance Denmark) for deposit banks and mortgage banks in Denmark.	2017	The Danish Investment Association (IFB) becomes integrated into Finance Denmark.		

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Chapter 7

REDE KRONER

Ansfordring med Guldmönt.
Banken i Kjøbenhavn 1875.

Carl

Argentin

00790



**Cash for Landmandsbanken
in the beginning of the 1920s**

Landmandsbanken was restructured several times during the 1920s with help from the Danish government and Danmarks Nationalbank. The picture shows staff from Danmarks Nationalbank's main building in Holmens Kanal carrying cash across the street to Landmandsbanken.

When history repeats itself: banking and financial crises

The last 150 years have witnessed several banking and financial crises. The monetary crisis of 1857-58 was the first one – and was followed by banking and financial crises in 1876-78, 1885, 1907-09, 1920-33, 1984-85, 1987-93 and 2007/08-13.

These crises have often made it necessary to reconsider the frameworks conditions of the financial system in order to make it more resilient. The savings bank crisis of 1876-78 led to the first Danish savings bank act in 1880, and the construction and banking crisis in 1907-09 resulted in the first commercial banking act in 1919.

After the most recent financial crisis, requirements for bank capital and liquidity have been tightened, and a bank resolution framework has been set up.

The monetary crisis of 1857-58

The monetary crisis of 1857 was the first serious crisis to hit the Danish banking sector. During the Crimean War, international trade and lending increased strongly. The war had kept Russia out of the international grain trade, but when the war ended in 1856, Russia was back in the grain market. Combined with a bumper harvest in Europe in 1857, this contributed to price falls. The result was an international liquidity crisis, which towards the end of the year spread from the USA over the UK to Germany and Denmark.

The size of Danmarks Nationalbank's stock of silver limited the amount of loans that the bank could grant with a view to mitigating the liquidity crisis (i.e. act as "lender of last resort"). So the central government had to step in and set up a "temporary loan fund for the Kingdom", which granted loans to mainly deposit banks, local government and merchants.

One mortgage bank also experienced difficulties and had to suspend lending in the wake of the crisis. It was wound up over a number of years without losses for bond holders.

This crisis did not result in any legislative initiatives in relation to the unregulated private Danish banking sector, which was still in its infancy. The first commercial bank in Denmark had existed for only a decade or so, and in 1857 there were just 12 commercial banks in Denmark.

The savings bank crisis of 1876-78

The early 1870s were characterised by a boom in the economy. But in 1873 the international economy was hit by a lengthy downturn, and a few years later the crisis hit Denmark and the Danish banking institutions.

In the boom years, several savings banks had entered into more risky activities. Now the savings banks came under pressure, and many of them had to finance a decline in deposits by borrowing from Danmarks Nationalbank. Several savings banks were in distress in the second half of the 1870s. Also a few commercial banks had to close, while others suffered large losses.

As a result of the crisis, the first Danish savings bank act was passed in 1880. The act placed savings banks under supervision, and certain requirements were introduced as regards solvency, accounts and audit, as well as valuation of securities. In contrast, the commercial banks were not placed under supervision and were not governed by special legislation. Many of the commercial banks' customers were traders and merchants, and the rationale was that they were able to assess the quality of their bankers themselves without the legislative interfering.

TIMELINE

BANKING AND FINANCIAL CRISES IN THE ECONOMIC HISTORY OF DENMARK



The Great Depression in the 1930s

In Denmark, the large interwar banking crisis came in the 1920s, while the banking systems of many other countries experienced more serious problems in the 1930s.



In the USA, GDP fell by around 30 per cent in the period 1929-33. During the Depression, doubt arose about the solvency of the banks, and this led to runs on the banks from customers wishing to withdraw their deposits (see photo). Many banks had to close. The number of banks shrank from around 24,000 in January 1929 to 14,000 in March 1933.

Denmark was among the countries with the smallest fall in output during the Depression in the 1930s. Only one year, 1932, saw a decline, and it was considerably smaller (2.6 per cent) than in many other countries. This should be seen in the light of Denmark's still relatively large agricultural sector, which tried to "produce its way out of the crisis". At the same time, the crisis in the UK – which was Denmark's largest export market – was relatively mild and brief.

This may seem surprising since we often hear about the very high rate of unemployment in Denmark in the 1930s, more than 30 per cent in 1932. At the time, the rate of unemployment was calculated as the number of unemployed people

who were covered by unemployment insurance as a percentage of all members of unemployment funds. This exaggerated the actual unemployment rate, as mainly people within the manufacturing and building and construction sectors, where the risk of unemployment was high, were insured. The official unemployment statistics in the 1930s did not include the rate of unemployment among those who were not insured. Subsequent studies have shown that unemployment in the 1930s did not exceed 10 per cent of the labour force according to the modern definition.

Nevertheless, an unemployment rate of around 10 per cent of the labour force was serious for those affected. Social security in Denmark in the 1930s was not as extensive as it is today. Unemployment benefits constituted only around 20 per cent of the average wage level, and a mere 15-25 per cent of the labour force was insured against unemployment. At the same time, the level of income in the 1930s was only around one fifth of what it is today.

1920-33

The interwar banking crisis.

1984-85

The Kronebanken crisis.

1987-93

The seven-year slump.

2007/08-13

The financial crisis.

THE INTERWAR PERIOD SAW AN EXTENSIVE BANKING CRISIS

Landmandsbanken – Scandinavia’s largest bank – had to be rescued by the central government and Danmarks Nationalbank

Overall, more than 20 per cent of the deposit banks’ loans and guarantees were written down in the period 1920-33.

The liquidity crisis of 1885

Following a prolonged period of falling prices, a number of firms went bankrupt in the autumn of 1885, and especially the liquidity position of commercial banks came under pressure. To counter the liquidity crisis, Danmarks Nationalbank pursued an accommodative lending policy.

The construction and banking crisis of 1907-09

At the start of the 20th century, the banking system expanded fiercely in a period of economic growth and a construction boom, especially in Copenhagen, but 1907 brought a downturn in the construction sector. In the 2nd half of 1907, Danmarks Nationalbank was involved in a support action to prevent lack of confidence in a single bank from developing into a run on the whole banking system. Furthermore, most of the commercial banks in Copenhagen set up a consortium to make support purchases of mortgage bonds.

However, the crisis escalated in early 1908 because a banking crisis had erupted in the USA in late 1907. This gave Danish commercial banks and firms problems in relation to extending the considerable external short-term debt built up in the preceding years. In February 1908, Danmarks Nationalbank, the central government and the four largest commercial banks had to set up a banking committee that issued guarantees to depositors and other creditors of the two commercial banks most severely affected by the crisis, i.e. Detailhandlerbanken and Grundejerbanken.

One of Denmark’s largest savings banks, Den Sjællandske Bondestands Sparekasse, also experienced problems in these years, following an episode of fraud. It was restructured with assistance from the government.

The government’s costs for rescuing deposit banks in 1907-08 meant that in 1910 a commission was set up, which presented its report in 1912. As a result, the first Danish commercial banking act was passed in 1919 and entered into force in 1920. From then on, the commercial banks were subject to supervision, capital and liquidity requirements and provisions regarding accounts and audit. At the same time, the Savings Bank Act was amended, inter alia with enhanced capital requirements and investment rules.

The interwar banking crisis of 1920-33

In the 1920s and early 1930s, many Danish deposit banks experienced major problems.

The crisis began in 1920 after the end of World War I. The commercial banks suffered large losses because of falling equity prices, and Danish exporters had difficulty selling their goods. This crisis came after a number of years with high credit growth, and the 1919 Commercial Banking Act came too late to curb this expansion. In the 1920s, the Danish economy was generally characterised by falling prices and large fluctuations in output, which made life difficult for the commercial banks. Later on, sluggish international growth was seen in the years after the Wall Street Crash in 1929 and the abandonment of the gold standard by many countries in 1931.

Overall, the deposit banks had to write down more than 20 per cent of their loans and guarantees in the period 1920-33, cf. Chart 7.1. Several of the large deposit banks, including Scandinavia's largest (Landmandsbanken) received capital injections and/or liquidity support from the central government and Danmarks Nationalbank.

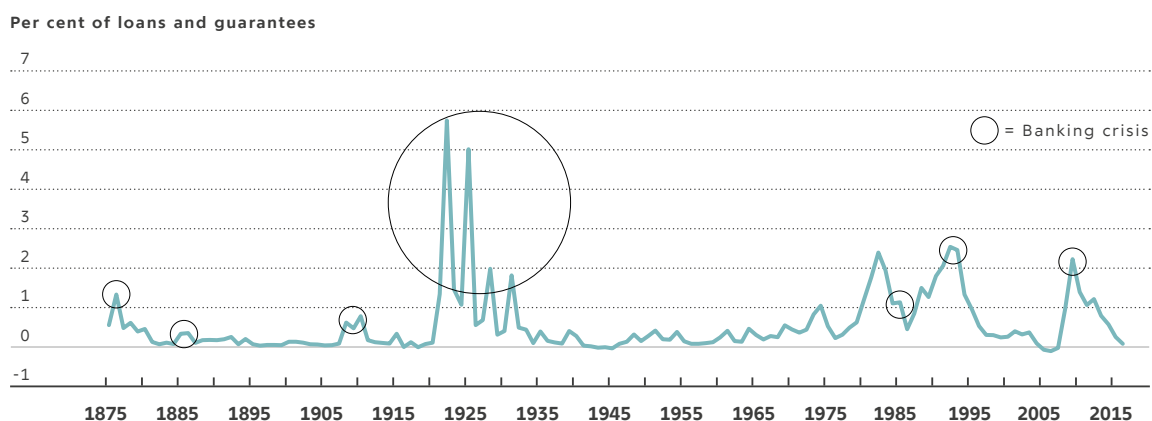
In connection with many of the interwar bank failures, not only shareholders but also depositors suffered losses. A large share of the commercial banks that defaulted had granted disproportionately large loans to individual borrowers. As a result, the Commercial Banking Act's provisions on large exposures were tightened in this respect in 1930. Requirements for commercial banks' capital and liquidity were also tightened.

The Kronebanken crisis of 1984-85

In 1984, Denmark's seventh largest deposit bank, Kronebanken, became distressed even though the Danish economy was in a solid upswing. The crisis occurred after losses on mainly one large exposure to a single customer in the construction sector. Danmarks Nationalbank and some large deposit banks provided a guarantee to depositors and other Kronebanken creditors. In addition, Danmarks Nationalbank entered into a commitment to make liquidity available to Kronebanken. In 1985, Kronebanken merged with Den Danske Provinsbank, with virtually no losses for Kronebanken shareholders.

CHART 7.1

Deposit banks' loan impairment charges 1875-2016





The failure of Roskilde Bank in 2008

Roskilde Bank was the first medium-sized deposit bank in Denmark to experience difficulties during the most recent financial crisis. It received liquidity support from Danmarks Nationalbank in July 2008, but later it had to discontinue its operations and was wound up.

The seven-year slump 1987-93

The years 1987-93 saw an unusually long period of low growth and rising unemployment in Denmark. This period came after five years of fairly strong growth and overheating of the economy.

49 deposit banks experienced problems and were discontinued in the period 1987-95. The vast majority of them were acquired by other deposit banks – often with the Danish Financial Supervisory Authority as intermediary. These deposit banks were primarily small or medium-sized.

Danmarks Nationalbank and the central government were directly involved in finding solutions for a few deposit banks, including the action to rescue Varde Bank, Denmark's ninth largest deposit bank, in 1992/93. Danmarks Nationalbank also provided temporary financing in connection with the Faroese banking crisis in the early 1990s.

Some of the banking crises in the 1980s gave rise to specific measures on the part of the authorities. Firstly, the suspension of payments by 6. Juli Banken in 1987 led to the introduction of a general deposit guarantee scheme in 1988. Secondly, Danmarks Nationalbank's losses in connection with the C&G Banken crisis in 1987 led to the introduction in the late 1980s of a collateral requirement for deposit banks' overnight loans via overdrafts on their accounts at Danmarks Nationalbank. However, the deposit banks' access to uncollateralised overdraft of their accounts during the day ("intraday overdraft") was not fully abolished until 1998.

The banking crises in the early 1990s also led to a few amendments of financial legislation. For example, the deposit guarantee scheme's coverage of ordinary deposits in connection with suspension of payments or default was increased from kr. 250,000 to kr. 300,000 in 1995. Later, it was increased further – to approximately kr. 375,000 (50,000 euro) in 2009 and to approximately kr. 750,000 (100,000 euro) in 2010.

The financial crisis of 2007/08-13

The most recent international financial crisis was triggered by turmoil in the US financial markets in the summer of 2007 following the downturn in the US housing market. In the 2nd half of 2007, the crisis spread to the financial markets in Europe. During the crisis, a

number of Danish deposit banks became distressed and were unable to continue as independent institutions, including 4 of the 15 largest deposit banks.

Initially it was a liquidity crisis for the banking system, but during 2008 it became clear that the losses of some of the world's major financial enterprises were so severe that their solvency and financial stability were at risk. In September 2008, the federal authorities had to take control of the two large US mortgage institutions, Fannie Mae and Freddie Mac. The same applied to the large insurance company AIG, while the investment bank Lehman Brothers was allowed to default. That shook global confidence in the financial system.

The severity of the financial crisis was emphasised by the fact that governments and central banks in many countries had to launch extensive rescue packages. That was also the case in Denmark.

The loan impairment charges of Danish deposit banks soared in 2008, and from the beginning of 2008 until August 2013, 62 deposit banks ceased to exist. Roskilde Bank was the first medium-sized deposit bank in Denmark to experience difficulties. The bank had seen dramatic growth in lending in the years leading up to the financial crisis and was heavily exposed to the property market. It had to have liquidity support from Danmarks Nationalbank in July 2008 (with a government guarantee covering any losses) and later it had to close down its operations and was wound up. Before the financial crisis, there was no framework for controlled resolution of banks, so Roskilde Bank was initially taken over by the private banking sector (via the Danish Bankers Association's Danish Contingency Association) and Danmarks Nationalbank. Subsequently Roskilde Bank was taken over by the government company established for winding up distressed deposit banks, cf. below.

The central government had to introduce a number of bank rescue packages during the crisis. Bank Rescue Package 1, introduced in October 2008, ensured that for a 2-year period the claims of all depositors and other unsecured creditors on deposit banks were covered by a full guarantee. The government guarantee was very extensive (kr. 4,200 billion, corresponding to around 250 per cent of GDP). The financial sector was to contribute up to kr. 35 billion to the scheme. At the same time, the government set up a winding-up company, the Financial Stability Company, to take care of

Bank rescue packages

During the most recent financial crisis, the government had to introduce several "bank rescue packages" to ensure the stability of the financial system and prevent the crisis from developing into a credit crunch so that creditworthy households and firms could not borrow. Bank Rescue Package 1, introduced in October 2008, included an extensive guarantee scheme ensuring that the claims of all depositors and other unsecured creditors on deposit banks were fully covered for a 2-year period. With Bank Rescue Package 2 from February 2009, credit institutions were able to obtain government capital injections and purchase individual government guarantees for a period.





After a banking crisis comes a report

Banking and financial crises are often followed up by investigations to shed light on the reasons for the crisis. The aim is to map the course of events so that measures can be taken to reduce the risk of similar crises in the future.

In the second half of the 1980s and the first half of the 1990s, 52 Danish deposit banks ceased to exist because they became distressed, including the ninth largest deposit bank, Varde Bank. After the banking crises, Det Tværministerielle Kontaktudvalg vedrørende det Finansielle Marked (the inter-ministerial liaison committee on the financial market) prepared a report that, inter alia, included a proposal to authorise the Danish Financial Supervisory Authority to impose extraordinary requirements regarding provisions for parts of the loan portfolio on deposit banks with particularly high risk profiles. The proposal was implemented via an amendment to the Commercial Bank and Savings Bank Act in 1996. However, in practice it never played any major role and it was abolished again in 2003.

In 2012, the Minister for Business and Growth set up an expert committee to investigate the reasons for the financial crisis and the tightening measures already implemented in response to the crisis. Denmark's National-

bank was represented on this committee and was also part of the secretariat. In its report, the committee mentioned that the financial crisis had had large costs for output in the economy. The committee recommended a number of steps that the government could take to prevent future financial crises. Given the popularity of deferred amortisation loans, the committee proposed that the Danish Financial Supervisory Authority should introduce a supervisory diamond for mortgage banks with limit values indicating mortgage banking activities with heightened risk. The Danish Financial Supervisory Authority did so in 2014.

The drawing refers to the fact that the private sector think tank Kraka also set up a financial crisis commission after the most recent financial crisis. The drawing by Roald Als was shown on the front page of the Kraka report "Den danske finanskrise – kan det ske igen?" (the Danish financial crisis – can it happen again?), November 2014.

distressed deposit banks. With Bank Rescue Package 2, credit institutions were for a while able to benefit from government capital injections and to buy individual government guarantees, while Bank Rescue Package 3 from October 2010 introduced a model for controlled resolution of (small and medium-sized) distressed deposit banks.

Like central banks in other countries, Danmarks Nationalbank introduced many unconventional measures during the crisis in order to improve the stability of the financial system. Extra loan facilities were set up and the range of assets accepted by Danmarks Nationalbank as collateral for loans to deposit banks and mortgage banks was increased. Danmarks Nationalbank was not able to start phasing out the last of these measures until the end of 2013.

After the financial crisis, extensive initiatives were launched, in Denmark and internationally, to make the financial system more resilient and to seek to prevent similar serious crises from arising and developing in the future. For example, the requirements for deposit banks' capital and liquidity were tightened. Mechanisms were also introduced for controlled resolution of large deposit banks. Their purpose is to ensure that the key functions of a distressed bank can be continued so that customers are not required to find new bankers at short notice. Another objective is to ensure that the owners of and investors in a distressed deposit bank bear the losses in connection with resolution – not the taxpayers.

Furthermore, institutions have been set up to monitor economic developments and warn against threats to financial stability – in Denmark the Systemic Risk Council was set up by the Minister for Business and Growth in February 2013. The aim is to prevent risks from evolving and reaching a level where they may have large, negative implications for the financial system and the economy as a whole. The Council comprises one representative from each of the Ministries of Industry, Business and Financial Affairs, Finance, and Economic Affairs and the Interior, two from the Danish Financial Supervisory Authority, two from Danmarks Nationalbank and three independent experts. Danmarks Nationalbank chairs the Council.

DURING THE MOST RECENT FINANCIAL CRISIS, THE CENTRAL GOVERNMENT HAD TO PROVIDE EXTENSIVE GUARANTEES TO ENSURE FINANCIAL STABILITY

Kr. 4,200,000,000,000

was the size of the 2-year guarantee issued by the central government to bank depositors and other unsecured creditors in the autumn of 2008. The guarantee corresponded to around 250 per cent of GDP.





Chapter 8



The house price bubble in the mid-2000s

The years prior to the most recent financial crisis were characterised by soaring house prices. There were many underlying factors: solid growth in household income, low interest rates, a freeze on property value taxes and deferred amortisation loans. From the mid-2000s, an actual house price bubble could be said to exist, i.e. prices were to some extent driven by expectations of further price increases and resultant capital gains.

Credit and house price bubbles

The two most recent banking crises, in 1987-93 and 2007/08-13, both followed a period of overheating of the Danish economy and soaring property prices.

Unlike the crisis in 1987-93, the most recent financial crisis was to a large extent triggered by the international economy. But pre-crisis developments in Denmark also had an impact. Fiscal policy was too accommodative and contributed to the overheating of the economy.

The freeze on property value taxes in 2001 and the introduction of deferred amortisation mortgage loans in 2003 were part of the reason why house prices soared until the mid-2000s. But there were also signs of an actual house price bubble.

Banking crises are costly for the economy

Banking crises are costly for the economy in the form of loss of output. Consequently, many analyses have been performed to try to understand why banking and financial crises occur from time to time. They indicate that there are many different reasons, given the complex interaction between the real economy and the financial system. But many of the analyses stress that the most serious crises often follow in the wake of credit-financed property price bubbles. This diagnosis broadly fits the two periods of banking crises seen in Denmark since the early 1980s. In both cases, the pre-crisis years were characterised by an overheated economy and soaring property prices.

The banking crises of 1987-93

The mid-1980s saw a solid upswing, overheating of the economy and strong growth in credit and property prices, cf. Chart 8.1. The upswing was followed by an unusually long period of low economic growth and rising unemployment.

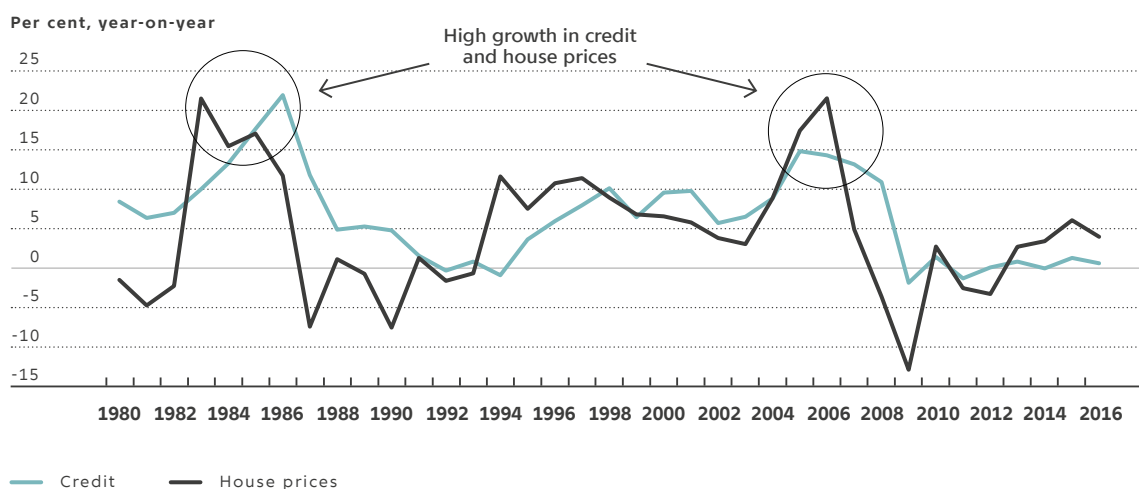
The economy reversed already at the beginning of 1986, i.e. before the government's austerity measures in October 1986, which, inter alia, tightened the rules for home financing in order to counter a rapidly growing current account deficit.

Devaluation and inflation expectations were reduced during the 1980s, following the transition to a consistent fixed exchange rate policy in 1982 and abolition of the automatic cost-of-living adjustment. But the resultant fall in interest rates also fuelled a strong upswing with overheating of the economy. As the point of departure was an economy with massive foreign debt, large current account deficits and an inflexible labour market, there was a need for a substantial improvement of public finances and incentives to boost private sector savings. The necessary period of adjustment was long but it created also the foundation for the subsequent strength of the Danish economy and confidence in the fixed exchange rate policy.

Real interest after tax had been negative from the early 1970s until the mid-1980s. With effect from 1987, an extensive tax reform

CHART 8.1

Growth in credit and house prices 1980-2016





Adviser or salesman?

Experience shows that the most serious crises, with major implications for financial stability, frequently follow in the wake of loan-financed property price bubbles. In many cases, financing and buying a home is one of the largest financial decisions made by a household. Advice is needed in this connection, and the dual role of many financial institutions as both sellers of financial products and advisers has often been in focus. This was one of the issues addressed by the then governor of Denmark's Nationalbank Bodil Nyboe Andersen at the annual meeting of the Association of Danish Mortgage Banks on 29 April 2004: "So the coming years will show who among you have been good at advising customers on the consequences of interest rate changes or changes in their ability to pay - and who have merely been salesmen".

was introduced. The reform reduced the tax value of interest rate deductibility, which could be as high as 73 per cent before the reform. After the reform, the real interest rate after tax became positive. This provided an incentive to save, but in the short term it also dampened consumption and residential investment.

Finally, the overheating of the economy in the mid-1980s meant that very high wage increases (close to 10 per cent in 1987) were agreed in the 1987 collective bargaining. This reduced the competitiveness of the business sector so much that the government had to step in and restructure employer taxes at the end of the year.

However, the low economic growth in the second half of the 1980s was not attributable to external cyclical factors. In those years, Denmark's export markets were booming, and in the early 1990s Danish exports benefited further from high growth in Germany immediately after the unification of East and West Germany. It was not until 1992/93 that the cyclical reversal in the European economy seriously dampened growth in Danish exports.

The downturn in the Danish economy in the second half of the 1980s led to low or negative growth in lending by deposit banks and mortgage banks. The weak cyclical development hit a few sectors - notably the construction and property sectors - particularly severely and led to large loan impairment charges for a number of years. This applied particularly to deposit banking institutions that were heavily exposed to these sectors. But in general impairment charges on bank loans to the corporate sector and households were relatively high. This reflected the general cyclical position, falling property prices and an excess of commercial properties. The number of enforced sales and the unemployment rate were also high.



High credit growth in the mid-1980s

The mid-1980s saw very high growth in lending by deposit banks and mortgage banks, and experience shows that the deposit banks lend more to bad customers in periods of high lending growth. There was also political focus on the lending activities of financing companies (including subsidiaries owned by deposit banks). In 1986, a "disciplinary committee" was set up, chaired by governor Richard Mikkelsen from Danmarks Nationalbank and with representatives of banking organisations. The committee was to ensure that the deposit banks refrained from actively marketing consumer loans, as recommended by Danmarks Nationalbank in late 1985. The committee contacted a number of deposit banks and deposit bank-owned financing companies that did not comply with the recommendation.

The mortgage bank sector also had to make large loan impairment charges in the late 1980s, primarily due to the general economic situation. Furthermore, some mortgage banks tried to expand internationally in the 1980s and suffered large losses as a result.

Some of the largest Danish insurance groups also experienced large losses in the early 1990s and ceased to exist as independent business enterprises. These losses were not attributable to their core activities (insurance) but to loan-financed investments in properties, etc.

In the late 1980s and especially in the early 1990s, Norway, Sweden and Finland experienced outright systemic crises and large parts of the banking sector, including several major nationwide banks, became distressed. Despite the deposit banks' large loan impairment charges, the Danish financial system was not as severely affected in the crisis years 1987-93 as those of the other Nordic countries. One of the reasons was that the crisis in Denmark was triggered by real economic factors rather than problems within the financial sector.

All the same, there is no doubt that the crisis in the Danish financial sector in the second half of the 1980s and especially in the early 1990s was serious. In June 1992, Danmarks Nationalbank had to make a standby liquidity arrangement available for Denmark's second largest deposit bank, Unibank, in response to rumours that the Danish Financial Supervisory Authority had taken special initiatives against the bank. The situation soon calmed down, but if it had developed in an unfortunate direction, this could have had serious implications for the stability of the Danish financial sector and for the economy in general.

The financial crisis of 2007/08-13

Unlike the crisis of 1987-93, the most recent financial crisis was to a large extent triggered by the downturn in the international economy. In Denmark, real GDP fell by approximately 5 per cent in 2009, which was around 6 percentage points lower than forecast by Danmarks Nationalbank in the 1st quarter of 2008. Around two thirds of the

BANKING CRISES OFTEN ARISE IN THE WAKE OF LOAN-FINANCED PROPERTY PRICE BUBBLES

15-20 per cent p.a.

was the rate of increase in both house prices and credit prior to the two most recent banking and financial crises. That was not sustainable.

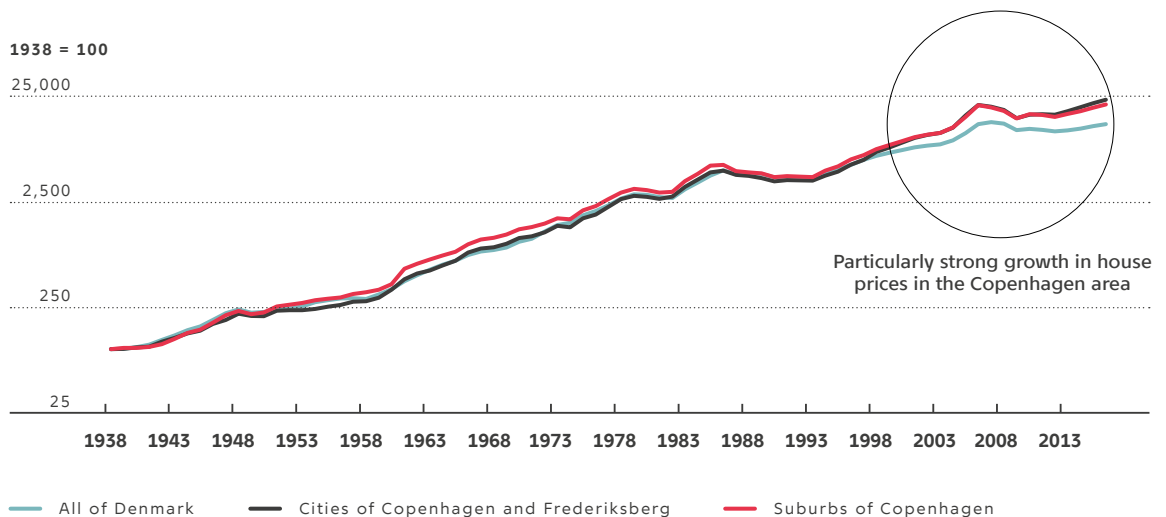
unexpectedly large drop in output was attributable to lower growth in the export markets.

However, the Danish economy was already slowing down before the global financial crisis really erupted in 2008. Both house prices and real GDP fell in the 4th quarter of 2007. The slowdown followed several years of a strong boom and overexploitation of production resources. Too accommodative fiscal policy added to the overheating of the economy and pressure on the labour market in those years. By comparison, the tight fiscal policy in the mid-1980s helped to mitigate the overheating of the economy.

The years leading up to the financial crisis were also characterised by surging property prices, especially in the Copenhagen area, cf. Chart 8.2. There were several reasons for this. First and foremost, household disposable income grew substantially and interest rates were relatively low. Furthermore, the freeze on property value taxes in 2001 amplified price rises, as opposed to the previous situation where the taxes payable reflected the property values so that they had a dampening effect on house price fluctuations. The introduction of deferred amortisation loans in 2003 also pushed up house prices. Finally, from the mid-2000s there were elements of an actual house price bubble, i.e. prices were to some extent driven by expectations of further price increases and resultant capital gains.

CHART 8.2

Price index for single-family houses 1938-2016





Interest-only mortgage loans

In October 2003, it became possible for the mortgage banks to offer mortgage loans for financing homes and summer cottages with up to 10 years' deferred amortisation. The new type of mortgage loans ("interest-only loans") entailed lower first-year payments and contributed to strong growth in house prices in the period leading up to the most recent financial crisis. Furthermore, with deferred amortisation the owner does not "automatically" build up a certain distance to the LTV limit over time, as is the case with loans with amortisation. This makes the mortgage credit system more vulnerable to falling house prices and has led to a debate on whether deferred amortisation should be restricted.

The financial crisis primarily affected the Danish business sector, which saw the highest default rates since the late 1970s. Households were not as severely hit, which was reflected in a considerably lower number of enforced sales and fewer loan impairment charges in the mortgage credit sector compared with the early 1990s. Household finances benefited from the low level of both short-term and long-term after-tax interest rates on home loans, as well as a relatively low unemployment rate despite the rise.

Compared with the situation in 1987-93, more of the medium-sized deposit banks encountered difficulties during the financial crisis in 2007/08-13. Several of the deposit banks that ceased to exist as independent institutions had differed from the sector overall in a number of key areas. They had had particularly strong lending growth, many large exposures, substantial customer funding gaps and considerable exposure to the property sector.

A notable difference between the two most recent banking crises relates to the deposit banks' buffers against losses. In the second half of the 1980s, the banks had sizeable buffers that allowed them to absorb losses. That was not the case at the onset of the most recent crisis. One of the reasons was the transition to new international accounting standards in 2005, which abolished the prudent accounting principle so that it was no longer possible to build up "hidden" reserves. This reduced the buffers and provided scope for increased credit expansion. Another reason was that capital requirements had been eased in connection with the introduction of new capital adequacy rules in 2007. Some deposit banks chose to take this opportunity to increase lending, and experience shows that high lending growth entails increased lending to less creditworthy persons and firms.

One of the main focus areas of the regulatory measures taken after the most recent financial crisis has been to increase the capitalisation of the financial system to make it more resilient to losses. Furthermore, a framework has been established for controlled resolution of banks, cf. Chapter 7.



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KRONER

Safe and secure payments

In 1818, there were no private banks, and coins and banknotes were the prevailing means of payment. Since then, other and more convenient payment solutions have emerged. Today, payments are most often made using electronic payment cards or via online banking or mobile telephones. As a result, providing secure IT systems for interbank payments has become a cornerstone of Danmarks Nationalbank's work.

100

100

NATION

HUNDREDE
VEXLES PAA ANFØRDRING

1891.

J. G. Johnson



ALBANKEN I KJØBENHAVN.

Hundrede

Fronnet

Chapter 9

KRONE
MED GULDINDE

1891.

Handwritten signature





**Paper cheques from Danmarks Nationalbank issued
by German occupation forces during World War II**

Denmark was occupied by the Germans during World War II, and many of the occupation forces' expenses were financed by drawing on accounts at Danmarks Nationalbank, with a guarantee from the government as collateral. The picture shows some of the cheques drawn on Danmarks Nationalbank by the German occupation forces to cover their expenses.

From coins to mobile apps – means of payment over 200 years

Danmarks Nationalbank issued its first banknotes in 1819, and cash, in the form of coins and banknotes, remained the most important means of payment for consumers' daily purchases well into the 20th century.

Today, households prefer electronic payment solutions based on bank deposits, and only around one tenth of private consumption is paid for in cash.

Like other financial assets, money is based on trust. This applies to cash and bank deposits alike. The last 100 years have seen the introduction of capital requirements for deposit banks and limits on the risks they are allowed to assume. Moreover, a deposit guarantee scheme was introduced in 1988, safeguarding deposits below a certain limit if a deposit bank fails.

Means of payment through the ages

Money is a human invention that facilitates trade and division of tasks. Today, we pay for purchases of goods and services by using cash, i.e. banknotes and coins, by transferring money deposited at a private bank via online banking on a computer or by using a card or an app on a mobile telephone. This was not always the case.

Back in time, primitive societies were based on direct barter of goods and services. A farmer could perhaps barter a barrel of grain for a wild boar from a hunter, or two barrels of grain for clothing from a tailor. This barter economy depended on people finding someone with exactly the opposite need.

Direct barter would not work in today's society with its division of tasks. For instance, a maths teacher wanting a caffè latte would probably find it hard to locate a café owner who would be willing to serve the coffee against payment in the form of a lesson in quadratic equations or extra tuition. In the barter economy, it was also necessary to juggle a very large number of relative prices in your head. There was not just one price for chickens, but one price for chickens relative to pigs, another relative to clothing, etc.

Later in history, indirect barter was used. A standard good was found, which everybody accepted in exchange for their own goods. The result was far fewer relative prices to keep track of as it was only necessary to know the prices of various goods in relation to the standard good. Cattle was an example of a standard good, and the word "pecuniary" comes from Latin "pecus" meaning cattle. Grain is another example of a standard good used as a means of payment. Characteristics of the standard good were that most people could relate to it and easily assess its value.

Over time, other goods gained ground as means of payment, e.g. silver and gold in nuggets and pieces. The advantages of precious metals were that, unlike grain, they would neither rot nor be eaten by mice, and they could easily be divided into small pieces, unlike cattle. So they were more convenient means of payment than cattle or grain. Later, coins were minted, for which the King or another public authority guaranteed the content of precious metal. As a result, you did not have to take out your scales to find out how many grams of gold you had to spend in a transaction. But you did have to use the scales if the coin showed signs of gold having been filed off the edge.

But precious metal coins were heavy to carry when travelling and not suitable for large financial transactions. This could be remedied by banknotes made of paper. Today, many electronic means of

**DANMARKS NATIONALBANK ISSUED ITS FIRST
BANKNOTES IN 1819 - WITH HIGH DENOMINATIONS!**

Between a half and a full year's pay

was the equivalent value of the 100-rigsbankdaler banknote
issued in 1819.

Printing banknotes

Since its establishment in 1818, Danmarks Nationalbank has had a monopoly on issuing Danish banknotes. Originally the banknotes were printed by private printing works. In 1918, Danmarks Nationalbank took over the task of printing, but in 2014 it was decided to outsource banknote printing again. The left-hand picture is from around 1900 and shows workers producing plates for banknote printing at H. H. Thieles Bogtrykkeri. The right-hand picture shows the last 50-krone banknotes printed in-house at Danmarks Nationalbank in 2016. Danmarks Nationalbank still issues the banknotes although the actual printing process in 2018 was outsourced to Oberthur Fiduciaire SAS.



payment have emerged that are more convenient than cash in many situations.

What makes a good means of payment?

A good means of payment has some important qualities:

- It is widely used and generally accepted so that it can be used for everyday purchases of many different goods and services.
- Its value is stable relative to goods and services, meaning that there is not too much uncertainty about the amount of goods and services a given amount of means of payment will buy if you look just a little into the future. This means that it can be used as store of value.
- It is measured in the same units as prices of goods and services, i.e. kroner in Denmark.

The term "money stock" is often used to describe households' and firms' total holdings of means of payment or other liquid financial assets that can easily be converted to means of payment. But in practice, the money stock can be difficult to define and delimit. Cash can be used instantly as a means of payment, but the money stock is a much wider concept than just the cash held by households and firms. Deposits in most bank accounts can easily be withdrawn in cash or used directly as means of payment by card or an app on a mobile telephone. Such liquid bank deposits can be called "account money".



**Bathtub with rotation and knives
for destruction of banknotes**

Destruction of worn banknotes

It is key to upholding the trust in the currency system that good counterfeit banknotes are difficult to make. So it is important that banknotes in circulation are of a high quality and that well-used and worn banknotes are taken out of circulation and disposed of.

For many years, unfit banknotes were burnt at Rosenborg Parade Ground with armed guards on duty. Later on, the machine shown in the picture above was used to destroy banknotes. The machine was a sort of bathtub with rotation and knives at the bottom. Banknotes were put in the machine together with hot water and it was all transformed into a kind of fine banknote pulp. The pulp was then poured into the sewers.



This method was discontinued for environmental reasons. Instead, Danmarks Nationalbank introduced the method still used, i.e. to shred the banknotes and then send them for incineration. The left-hand picture is from 2008 and shows pellets of compressed, shredded banknotes that are ready to be sent for incineration. One pellet contains around 200 shredded banknotes, so if they were 1000-krone banknotes, the pre-destruction value would be kr. 200,000.

**Pellets of
shredded banknotes**

So the money stock is often taken to mean the cash holdings of households and firms and liquid deposits in accounts at banks.

But it could be argued to define the money stock in other ways, for instance by taking into account unutilised overdraft facilities or securities that are easy to sell. The liquidity of the individual financial assets may also change over time. Before cheques saw the light of day, the only way to convert a bank deposit to means of payment was to withdraw it. Payment methods can evolve over time, and the money stock at a given time basically consists of the assets which households and firms choose to use as means of payment or which can easily be converted to such.

A matter of trust

Like other financial assets, cash or bank deposits are based on trust. For instance, households and firms need to be able to trust that excessive issuance of banknotes will not take place, which would erode the purchasing power of money as seen during the state bankruptcy in 1813, cf. Chapter 1. That is why the government budget deficit cannot be financed by just printing more money.

Similarly, households and firms need to trust that their bank deposits are safe. This is ensured through regulation of deposit banks, imposing capital requirements on them to enable them to withstand losses, and limiting the risks which the banks are allowed to assume. Moreover, a deposit guarantee scheme has been in place since 1988, protecting deposits below a certain limit if a bank should fail.

From cash to bank deposits

When Danmarks Nationalbank was established in 1818, there were no private banks and only a few savings banks in Denmark. Cash was the prevailing means of payment, and Danmarks Nationalbank issued its first banknotes in 1819. All the banknote series since 1819 are shown in the Appendix.

According to section 17 of Danmarks Nationalbank's Charter of 1818, banknotes were legal tender alongside coins. That meant that anyone had the right to use Danmarks Nationalbank's banknotes to buy goods and services or get out of a debt, unless another payment method had been agreed. The fact that Danmarks Nationalbank's banknotes are legal tender is also stipulated in section 8 of the Danmarks Nationalbank Act of 1936:

"The notes issued by the Bank shall be legal tender between man and man and for payments and disbursements which take place in public pay-offices."

Danmarks Nationalbank's first banknotes had very high denominations. The highest denomination in the 1819 banknote series was 100 rigsbankdaler. That was equivalent to around half the annual salary of a banknote counter at Danmarks Nationalbank or an entire year's pay for a manual labourer in Odense. In other words, a 100-rigsbankdaler note had a very high face value. The background was that since very few banks existed in 1819, and cheques had not yet come about, banknotes were used by households and firms alike for large financial transactions, for settlement of credit purchases and as saving instruments in line with large silver and later gold coins.

Even the value of the smallest banknote in the 1819 series – 1 rigsbankdaler – was equivalent to a few days' pay. That is why households used coins for most of their daily purchases. In other banknote series later in the 19th century, the smallest denomination was even higher, corresponding to even more days' pay, cf. Chart 9.1. Not until

Development in bank-based payment solutions

Cheques

The cheque was introduced in Denmark by Privatbanken in 1857. It was a written order via which the cheque issuer by his signature instructed his bank to allow another person to withdraw the value of the cheque from his account. Cheques made it easier to use bank deposits as payment for purchases of goods, services and financial assets. The use of cheques really gained ground from the mid-1890s. This resulted in the Cheque Act of 1897, which laid down the framework for use and acceptance of cheques.

By 1927, cheques had become so widely used that Danmarks Nationalbank and the three principal commercial banks concluded an agreement on centralised settlement and netting of cheques at Danmarks Nationalbank's premises (cheque clearing). It was also agreed that other deposit banks could join the scheme.

In the 1970s, cheques were the most widely used means of payment in Denmark measured in terms of amount, and the costs of handling the vast number of paper cheques had become rather high. As a result, electronic cheque clearing was introduced in the late 1970s. Physical cheques were stored at the acquiring bank, which would electronically send the information on the cheque to the clearing system.

Paper cheques were still used in retail stores, but over time other, electronic payment solutions emerged which were easier to manage for deposit banks, retailers and consumers alike. In 2004, cheques accounted for only around 2 per cent of payments in the retail sector, and paper cheques were de facto completely phased out in 2016.

Giro

Sending money by letter has always been associated with certain risks. In 1851, the state-owned postal service introduced a safer alternative, the money order. With a money order, the payer paid a cash amount at the post office to execute the payment. The payee could then withdraw the

amount at another post office upon presentation of personal identification and the money order received by letter.

The post office giro was introduced in 1920. It was now possible to open a post office giro account and use the deposit in this account to pay bills to payees who also had post office giro accounts. Those without a giro account could pay their bills ("giro inpayment forms") by paying cash at the post office. In this way, the postal service had established an alternative to bank-based cheque payments. The postal service had a wide-ranging network of post giro offices all over Denmark, and the spread of giro payments was strengthened by the central and local governments' decisions to use post office giro accounts extensively for both inpayments and disbursements. In the early 1980s, giro transactions were on a par with cheque turnover in terms of amount.

In order to avoid distortion of competition to the detriment of the banks, the postal service was not allowed to grant loans. As a result, customers were not allowed to overdraw their post office giro accounts in connection with payments. Not until 1991, when the post office giro system was separated from the postal service and privatised, were credit facilities introduced.

Credit transfers

In the late 1960s and early 1970s, automation of credit transfers really took off.

A corporate payroll system (Multiløn) was introduced in 1969, and Betalingservice (direct debit) was introduced in 1974. This offered households an easy way of paying regular bills. By registering a bill for payment via Betalingservice, the debtor authorises the creditor to draw an outstanding amount directly from the debtor's account. Once a month the debtor receives a payment summary from Betalingservice, specifying the amounts to be paid to various creditors during the next month.

In 1981, LeverandørService (supplier service) was launched as the equivalent of Betalingservice, but for private and public sector firms.

The Dankort – a success

The Dankort was introduced in 1983 as a payment card (debit card) linked to a bank account. When payment is made using the card, the payee is granted the right to withdraw the amount directly from the payer's account.

At first, Dankort payments in retail trade were based on paper vouchers and mechanical imprinters. In 1984, the banks introduced street ATMs, enabling withdrawal of cash 24/7. The electronic Dankort system, enabling use of the Dankort for "online" payments in stores via card terminals, was tested in 1984 and launched nationwide in 1985.

Until 1986, Dankort payments were still dominated by paper vouchers, but then electronic card payments quickly gained ground and became predominant. From 1998, it became possible to use the Dankort for internet-based payments, and the paper-based mechanical imprinters were abolished at the end of 2007.

In 2015, the “contactless” Dankort was launched, meaning that all you have to do is to touch the card on the reader rather than reading the card in a terminal, and for small amounts it is no longer necessary to enter a PIN

The Danmønt card – not a success

In 1993, the Danmønt card was introduced nationwide after a trial period in Næstved from September 1992. It was a prepaid electronic card intended as an electronic alternative to cash for small payments. These card payments took place at special terminals and did not require a PIN. It was not necessary for the cardholder to have a bank account, and the card could not be overdrawn.

The first generation of Danmønt cards could not be topped up, but in 1996, top-up became possible.

But the Danmønt card was never really a success and was phased out in 2005. The reason why it did not catch on with consumers was probably the Dankort’s popularity as a means of payment in retail trade without fees. Moreover, Danmønt card terminals had only been installed at relatively few locations.

Telephone banking, online banking and mobile apps

In the second half of the 1980s, auto-dial telephone banking systems gained ground, while internet-based home banking systems were introduced in the second half of the 1990s. This enabled consumers to make online payments in the comfort of their own homes.

Later, mobile telephone-based payment solutions were added, such as MobilePay (2013) and the mobile Dankort (2017). For both solutions, the payer opens an app on a mobile telephone, enters or receives a wireless amount and verifies the payment by entering a PIN.



The Dankort

The Dankort was introduced in 1983 and has become a very popular means of payment. At first, Dankort payments were based on paper vouchers placed in mechanical imprinters as shown in the top image above. In 1984, the banks introduced street ATMs, enabling withdrawal of cash 24/7. The electronic Dankort system was tested in 1984 and launched nationwide in 1985. It enabled use of the Dankort for “online” payments in stores via card terminals (bottom image above).

**PRIVATE CONSUMPTION IS NOW
PAID FOR USING ELECTRONIC
PAYMENT SOLUTIONS BASED ON
BANK ACCOUNTS**

**Only 1/10
of private
consumption**

is paid for in cash.

1952 did the smallest banknote denomination approach the value of one hour's pay.

During the 1960s, employers, employees and deposit banks concluded agreements on the use of salary accounts, and households' use of cheques rose markedly during the 1970s. This meant a simultaneous decrease in their use of cash. Since then, the use of cash has declined further, while electronic payment solutions (automatic credit transfers and electronic payment cards, etc.) offered by banks have gained ground. In 2015, only around one tenth of private consumption was paid for in cash, cf. Chart 9.2.

Nowadays, the large majority of households prefer bank account-based electronic payment solutions over physical cash. This means that one of Danmarks Nationalbank's most important

CHART 9.1

The value of the smallest banknote in Danmarks Nationalbank's banknote series relative to hourly wages

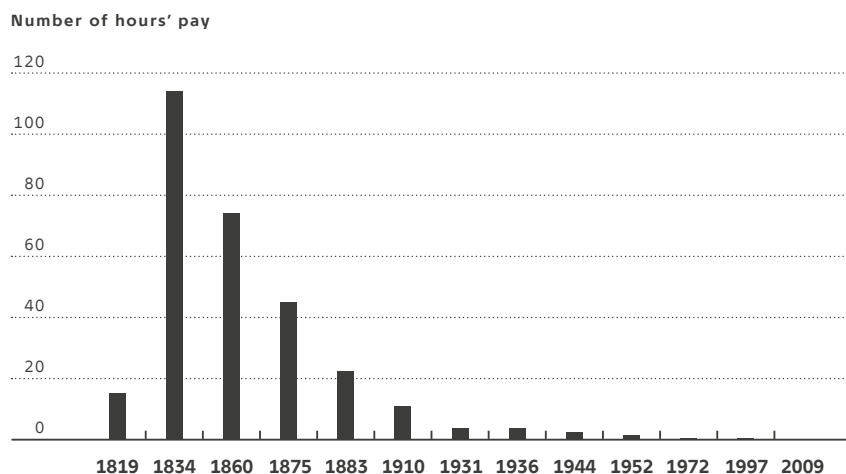
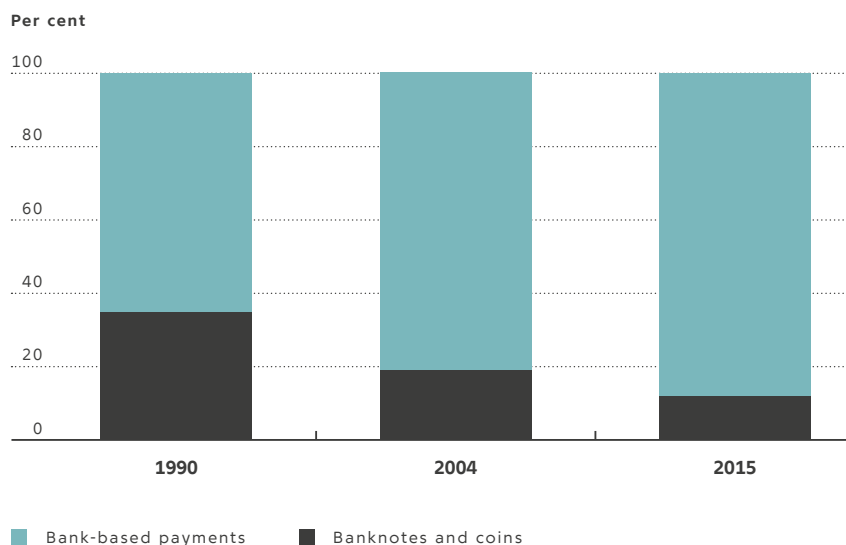


CHART 9.2

Means of payment used for private consumption 1990-2015



Outsourcing coin production

Far back in the history of Denmark, the King (and later the government) has had a monopoly on issuing coins. The oldest Danish coin bearing the name of the king and the country is Sweyn Forkbeard's silver coin from around 995, and according to section 26 of the Danish Constitution, the King "is entitled to have money minted as provided by statute". According to the Coinage Act, the government is still responsible for minting coins. In 1975, the Royal Danish Mint was transferred from the government to Danmarks Nationalbank. Since then, production and administration tasks related to minting of coins have been delegated to Danmarks Nationalbank, including the obligation to redeem coins. Danmarks Nationalbank produced coins "in-house" from 1975 to 2016, after which production was outsourced to the Mint of Finland. Danmarks Nationalbank still issues the coins although the actual production has been outsourced.



SNAPSHOT FROM THE HISTORY OF DANMARKS NATIONALBANK

Drum from around 1960 for transport of bags of coins between Danmarks Nationalbank and the savings bank Balling Sparekasse.

roles regarding retail payments is to make payment systems available to the deposit banks to enable safe transfer of money between the various deposit banks used by households and firms. Moreover, Danmarks Nationalbank monitors the most important payment solutions, which are currently the Dankort, Betalingsservice (direct debit) and credit transfers. The historical development in bank-based payment solutions is described in more detail in the Factbox on page 120-121.

Faroe Islands and Greenland

All parts of the Danish Commonwealth – Denmark, the Faroe Islands and Greenland – share the same currency, the Danish krone, and Danmarks Nationalbank supplies the Faroe Islands and Greenland with banknotes.

According to Act no. 248 of 12 April 1949 on banknotes, etc. in the Faroe Islands, Danmarks Nationalbank must produce special Faroese banknotes with the same denominations as the banknotes issued in Denmark. The currency unit is 1 króna, on a 1:1 basis relative to Danish banknotes. Coins in the Faroe Islands are the same as in Denmark.

On 1 June 2007, Act no. 436 of 14 May 2007 on banknotes in Greenland entered into force. This Act made it possible to introduce special Greenlandic banknotes, in line with the Faroese banknotes, and preparatory work was initiated. In January 2010, the government informed Danmarks Nationalbank that Landstinget (Greenlandic parliament) wanted to reconsider the introduction of special Greenlandic banknotes. Consequently, the work on the Greenlandic banknotes was suspended. In the autumn of 2010, the Greenlandic government announced that they did not want to introduce special Greenlandic banknotes. This prompted Danmarks Nationalbank to stop the work on a Greenlandic banknote series.

TIMELINE

MEANS OF PAYMENT OVER TIME

1819	Danmarks Nationalbank issues its first banknotes.	1851	Money orders are introduced.	1857	Cheques are introduced.	1920	The post office giro system is introduced.
1969	Automation of firms' payroll transactions (Multiløn)	1974	Betalingservice (direct debit) is introduced.	1981	LeverandørService (supplier service) is introduced.	1983	The Dankort is introduced, based on paper vouchers and mechanical imprinters.
1984	The banks introduce street ATMs, enabling withdrawal of cash 24/7 using the Dankort.	1984	The electronic Dankort system is introduced, enabling consumers to use the Dankort for "online" payments in stores via card terminals.	SECOND HALF OF THE 1980s	Telephone banking systems are introduced.	1992	The Danmønt card is introduced.
SECOND HALF OF THE 1990s	The deposit banks introduce web-based home banking systems.	1998	It becomes possible to use the Dankort for internet-based payments.	2005	The phasing-out of the Danmønt card is completed.	2007	Paper-based mechanical imprinters for Dankort payments are abolished.
2013	Mobile telephone-based payment solutions (MobilePay) are introduced.	2015	The Dankort becomes contactless.	2016	Paper-based cheques are de facto completely phased out.	2017	Dankort payment via a mobile telephone app is enabled.

**SNAPSHOT FROM THE HISTORY
OF DANMARKS NATIONALBANK**

Machine used by Danmarks Nationalbank to count coins received from commercial banks and savings banks. The operator of the machine had in the same work process to check whether there were coins that should be discarded and not returned in circulation again.





BALNEUM PRESIA

50



UNIVERSITY OF CAMBRIDGE

Chapter 10

50



Champagneskrædderen.
Interieur fra „Vaaren“.

Counterfeiting

Counterfeiting goes back a long way. One of the more spectacular cases took place in 1903, when a man who was out on the town tried to pay kr. 80 for a bottle of champagne using eight counterfeit 10-krone banknotes with the same serial number. They turned out to come from a batch of more than 2,000 counterfeit banknotes.

From counterfeiting to cybercrime

Ever since it came into being in 1818, Danmarks Nationalbank has been responsible for issuing banknotes and from 1975 also coins. Danmarks Nationalbank is still responsible for issuing cash in Denmark, although the production of banknotes and coins has been outsourced.

Counterfeiting undermines trust in the currency system and has always been severely punished. Provisions on counterfeiting go right back to Medieval times, to the Jutland Act of 1241.

Only a few decades ago, physical bank robberies were at the top of the agenda in any debate on security in the financial sector. Today, the financial sector is heavily dependent on complex IT systems, and both physical acts of terrorism and cybercrime are more serious threats against the modern financial system.

Cash supply

Households and firms now have access to cash via many different channels. You can obtain cash from your deposit bank, from ATMs or when shopping. In all cases, the cash is issued by Danmarks Nationalbank, which has been responsible for issuing banknotes in Denmark ever since it was established in 1818 and from 1975 also for issuing coins.

Danmarks Nationalbank puts cash into circulation via the deposit banks. Until the late 1980s, the cash supply to deposit banks on Funen and in Jutland came from Danmarks Nationalbank's provincial branches, while Danmarks Nationalbank's head office in Copenhagen supplied cash to deposit banks east of the Great Belt.

The branches were originally established at a time when Danmarks Nationalbank also performed retail-banking activities to a certain degree, in addition to its central bank tasks. As these tasks were discontinued, cash supply was the only remaining business area for the branches, so eventually they became too expensive to maintain.

After the closure of Danmarks Nationalbank's last branches in 1989, cash depots were set up at certain deposit banks west of the Great Belt to undertake the supply of cash to the local areas. This reduced the number and distance of cash transports, enhancing cash supply security. From 1998, cash depots were also established on Zealand.

In 2009, after a series of violent robberies, work was initiated to design a new cash supply model to further enhance security. As a result, the number of cash depots was gradually reduced. Today, there are two cash depots (one in Copenhagen, owned by Nordea, and one in Aarhus, owned by Danske Bank) with very high security standards. Danmarks Nationalbank supplies cash to the two depots. A private cash-in-transit firm then supplies the deposit banks and the retail sector with cash.

Counterfeiting

It is key to upholding the trust in the currency system that the number of counterfeit banknotes in circulation is low. So it is important

SEVERE PUNISHMENT FOR COUNTERFEITING

Death

was the penalty for counterfeiting according to the Danish Code of 1683. The maximum penalty today is 12 years' imprisonment.



Banknote security

It is important that banknotes are difficult to counterfeit. On Danmarks Nationalbank's first banknotes, the signature was one of the most important proofs that they were genuine. Since then, many more elements have been added to the banknotes to enhance their security, such as security threads and holograms.

**SNAPSHOT FROM THE HISTORY
OF DANMARKS NATIONALBANK**

Stamp with the word "falsk"
(counterfeit) for use on
counterfeit banknotes handed
in to Danmarks Nationalbank.



that banknotes are difficult to reproduce and that citizens and firms are familiar with the appearance and security features of genuine banknotes. The more people who know how to distinguish a genuine banknote from a counterfeit, the more difficult it becomes to use counterfeits.

On Danmarks Nationalbank's first banknotes, the signature was the most important proof that they were genuine. Since then, many more elements have been added to the banknotes to enhance their security, and banknotes are undoubtedly better protected against reproduction today than ever before.

Banknote counterfeiting has become easier and cheaper in step with the development of modern reproduction technologies. This has led to an increase in the volume of counterfeit banknotes over the last decades. In the early 1990s, photocopying was the most important technology for producing counterfeits. They were not particularly good, and access to colour photocopiers was limited for most people. In the mid-1990s, counterfeiters began to use colour printers, and after the millennium rollover, genuine-looking counterfeits made in an actual printing press have been found.

The annual number of counterfeit banknotes found in circulation rose from less than 100 in the first half of the 1990s to around 700-800 after the millennium rollover. These figures should be seen relative to the total number of banknotes in circulation, which was more than 172 million in 2016. So the probability of encountering a counterfeit banknote is very low, and the problem of counterfeit banknotes in Denmark is still very limited.

Counterfeiting undermines trust in the currency system and has always been severely punished. Provisions on counterfeiting go right back to Medieval times, to the Jutland Act of 1241, and the Danish Code of 1683 prescribed the death penalty for counterfeiting, equal to the punishment for lese-majesty. This level of punishment still applied in 1818 when Danmarks Nationalbank was established, but was abolished in 1840. At that time, it had not been used in living memory. Today, counterfeiting of banknotes and coins is punishable by up to 12 years' imprisonment. This is one of the harshest maximum penalties under the Danish Criminal Code. Typically, anyone convicted of manufacturing and distributing counterfeits or being an accessory to counterfeiting will receive an unsuspended prison sentence.

Payment and settlement systems

From the general public's point of view, Danmarks Nationalbank's most visible payment system task is to issue Danish banknotes and coins. But Danmarks Nationalbank also plays a key role in the payment system as banker to the banks.

As described in Chapter 6, the banking sector already had a decent size in the early 1870s. The small deposit banks normally co-operated with a larger deposit bank – a correspondent bank – which would assist them with execution of payments, including payments related to securities and foreign exchange trading. When small deposit banks held accounts with large deposit banks, payments could be swiftly and efficiently executed between customers of two different deposit banks. Many deposit banks also held accounts with Danmarks Nationalbank, which they could use for interbank transfers. All transactions were carried out manually on paper with pen and ink.

Today, interbank payments take place electronically via accounts at Danmarks Nationalbank, which makes a payment system (Kronos) available to the deposit banks. In popular terms, Kronos is the "home banking system" of the deposit banks. It gives them online access to their accounts at Danmarks Nationalbank and allows them to transfer payments from their own accounts to the accounts of other deposit banks or to systems for settlement of securities or foreign exchange transactions.

It is important to the deposit banks that large, time-critical payments in Kronos are processed securely and in a timely manner. This means that payments via Kronos are instant payments executed immediately after the payment request. Danmarks Nationalbank was one of the first central banks in the world to make an electronic instant payment system available to the deposit banks. That was in 1981.

Physical acts of terrorism, breakdown and cybercrime

Only a few decades ago, physical bank robberies were at the top of the agenda in any debate on security in the financial sector. Today, the financial sector is heavily dependent on complex IT systems, and it is important in relation to upholding trust in the financial system that they always work and are secure. Citizens and firms must be able to trust that the risk of someone breaking into their online bank is low, that their holdings of electronic securities are properly registered, that no data is lost in the event of power outages and that confidential data does not fall into unauthorised hands in the event of a hacker attack, etc.

Over the last decades, several serious incidents have occurred which have pinpointed the risks in a modern financial system. In the USA, the financial sector was severely hit by the terrorist attacks on 11 September 2001, in which one of the locations hit was the World Trade Center in New York that housed several of the largest financial enterprises in the country. The US payment systems were not directly affected by the attack, but employees of several banks were reported missing, and documents and computers were lost. Immediately after the disaster, the Federal Reserve announced that its payment system (Fedwire) was fully operational, but the number and volume of payments executed fell to far below the normal level due to problems for the participants. The cheque clearing system in the USA was affected by several banks being unable to honour cheques drawn on them. Federal Reserve provided large amounts of liquidity to mitigate the impact of the terrorist attack on the US payment system.

Despite the extensive damage, it could be ascertained afterwards that the events on 11 September 2001 did not as such threaten financial stability. However, the terrorist attack clearly illustrated the vulnerability of the financial system at the time. Since 2001, there has

THE NUMBER OF COUNTERFEIT DANISH BANKNOTES IS VERY LIMITED

172,500,000

banknotes were in circulation in 2016. Only 859 counterfeits were found among them.

The money changeover in 1945



Denmark was occupied by the Germans during World War II, and many of the occupation forces' expenses were financed by drawing on accounts at Danmarks Nationalbank against a guarantee from the government. This led to a strong increase in banknotes in circulation and it was necessary to substitute them after the war.

The changeover began on 23 July 1945. At the same time, stocktaking of assets took place so that an extraordinary tax could be imposed on large increases in wealth during the war. In that way, the profits of collaborators could be seized, black marketeers could be revealed and any banknotes taken out of Denmark by Germans could be cancelled.

been stronger focus on oversight of systemically important payment and settlement systems and on analysing the risk of extreme events that may cause a breakdown in the settlement of payments, securities transactions, etc. In the last few years, cybersecurity has been given particular attention, as computers and networks are increasingly being attacked by cybercriminals.

Serious incidents such as physical acts of terrorism and cyber-crime are not the only threats to the modern financial system. Smaller incidents, such as severed cables, power outages, a defective IT component or errors in software updates, may also cause substantial inconvenience to customers. A case in point is that in March 2003, Denmark's largest bank, Danske Bank, was hit by major IT problems preventing the bank from fully participating in the payment system for several days. Later that year, large parts of Eastern Denmark were affected by a power outage lasting several hours. That has highlighted the need to ensure that the financial sector has the necessary emergency procedures and backup facilities in place, enabling it to get quickly back to normal after a breakdown or similar. The deposit banks and Danmarks Nationalbank commit very large resources to protecting the security of payment systems.

Danmarks Nationalbank's branches

When Danmarks Nationalbank conducted retail banking operations, the branches played an important role in connection with loans to private sector customers, especially firms. The branches also played a key role in terms of supplying deposit banks in different parts of Denmark with banknotes until the supply of cash became more centralised.

Kolding



Jernbanegade 29 1902-24



Jernbanegade 27 1924-68

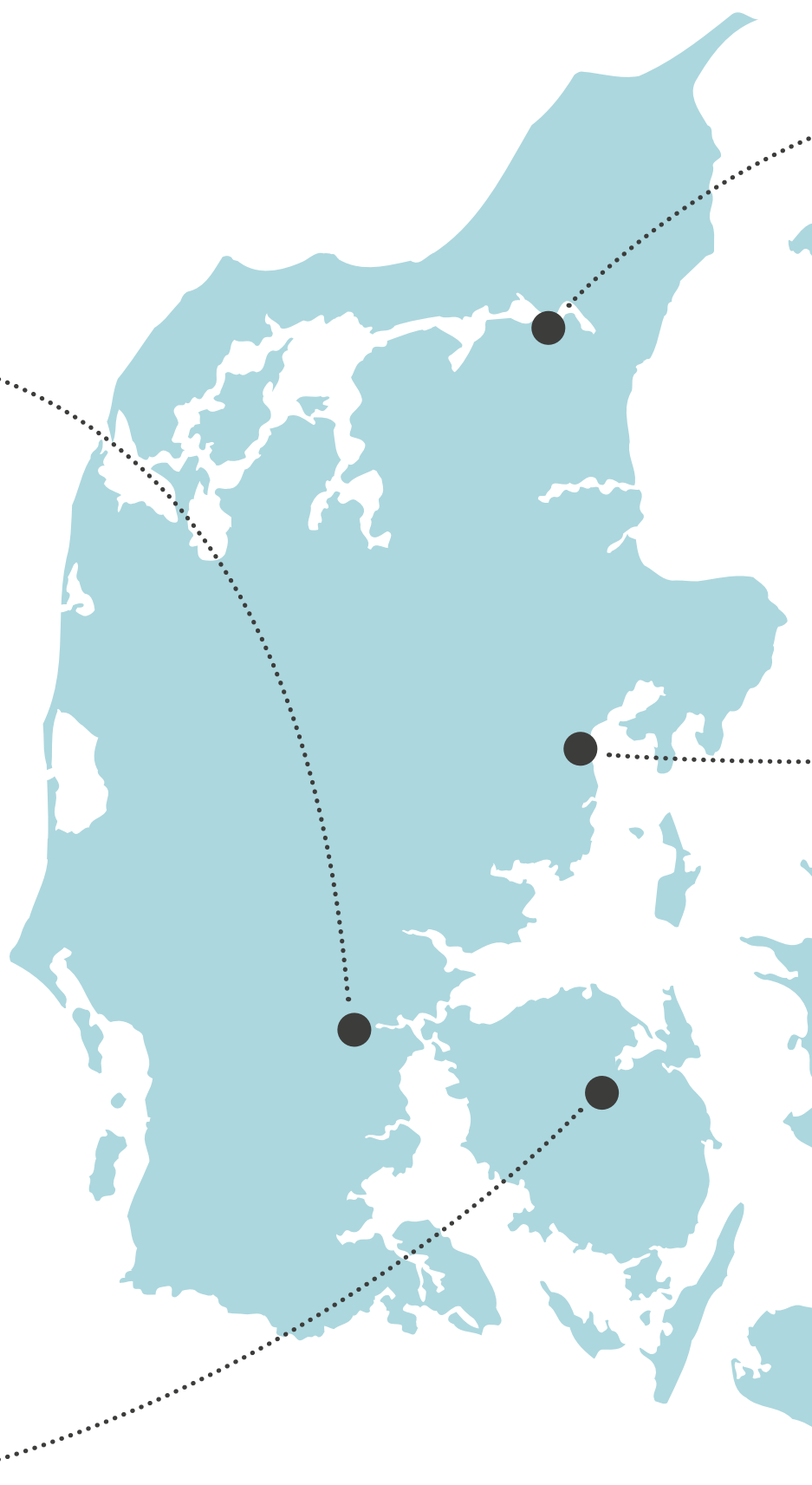
Odense



Overgade 1901-67



Munkersvej 1967-89





Ålborg



Jernbanegade 1881-1943



Gl. Torv 1943-72

Aarhus



Store Torv 1837-1927



Rosensgade 1927-89



Nykøbing Falster



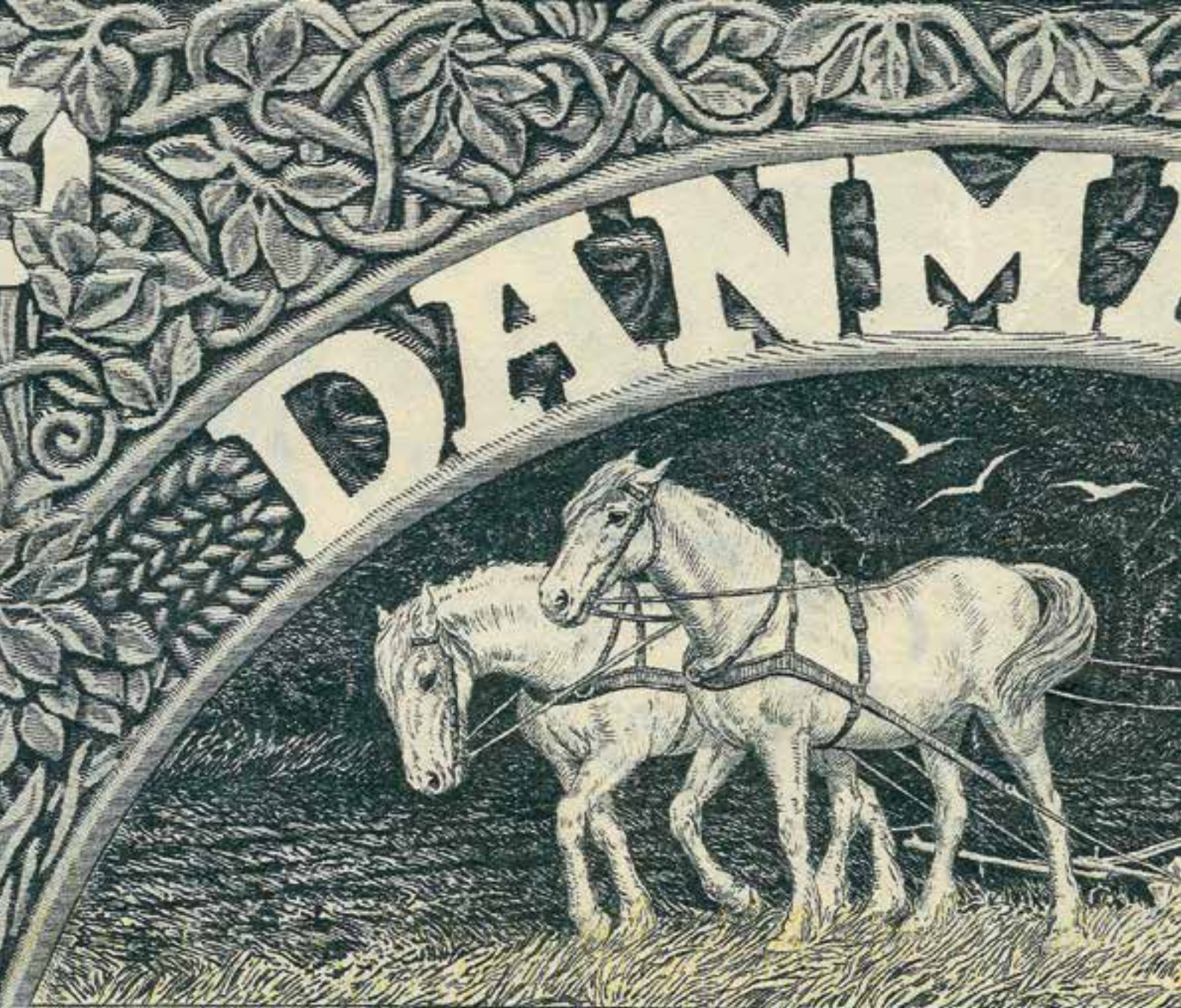
Langgade 1882-84



Slotsgade 1884-1908



Dronningensgade 1908-64



FEM HUNDREDE

NATIONALBANKENS SEDLER INDLØSES MED

DANMARKS NATIONAL

Leibson

0614964 A

500



5000

ARPT

Chapter 11

KRONER

GULD EFTER GULDENDE LOV
BANK 1941

Kaumba

A 0614964



Providing for the aged

Growing old could be tough in an age when the modern welfare state had not yet been established – as illustrated in Hans Andersen Brendekilde's painting "Udslidt" (worn out) from 1889. The first actual tax-funded provision for the aged was introduced in 1891. On application, it was granted to the deserving poor aged 60 years or more, and the size of the benefit was based on an individual assessment.

200 years with a rising standard of living – despite fluctuations

The standard of living has improved notably over the last 200 years. Real wages have multiplied by a factor 17, working hours have been reduced and life expectancy has increased from around 40 to 80 years.

In the longer term, the trend in real income does not depend on monetary policy but on how efficiently the economy can produce goods and services. The increase in prosperity reflects a rise in productivity.

However, it has not been a smooth ride without any bumps on the road. The economy has fluctuated over the years and there has been a clear tendency for downturns with banking crises to be deeper or longer than downturns without banking crises.

Substantial rise in the standard of living over the last 200 years

The standard of living has improved substantially over the last 200 years. On average, real annual wages have risen by 1.4 per cent p.a. since 1818, cf. Chart 11.1. This means that real wages have increased by a factor 17.

Growth in real annual wages has gone hand in hand with shorter working hours. In 1875, people worked Saturday and part of Sunday, bringing the total number of hours per week close to 70. Today a full-time job in Denmark is usually 37 hours a week. In the same period, holidays have been extended from virtually none in 1875 to six weeks today.

The improved standard of living is clearly reflected in life expectancy. In the 1860s, life expectancy was 44 years for a newborn boy and 46 years for a newborn girl. By 2015-16, it had risen to 79 years for men and 83 years for women. This does not mean that there were no old people in the 1860s. The main reason for the low life expectancy was the high child mortality, especially among infants. Around 12-15 per cent of all newborn babies did not live to celebrate their 1st birthdays. But those who survived their 50th birthdays could expect to enjoy another 20 years or so of life.

The rise in prosperity is also reflected in other key figures. In 1844, food accounted for more than half of household consumption. By 2015, this share had fallen to 10 per cent, and there was plenty of room in the budget for consuming a variety of other goods and services.

The improvement over the last 200 years is in stark contrast to developments before 1800. Back then, good years made way for bad years, and basically real annual wages did not improve from 1500 to 1800.

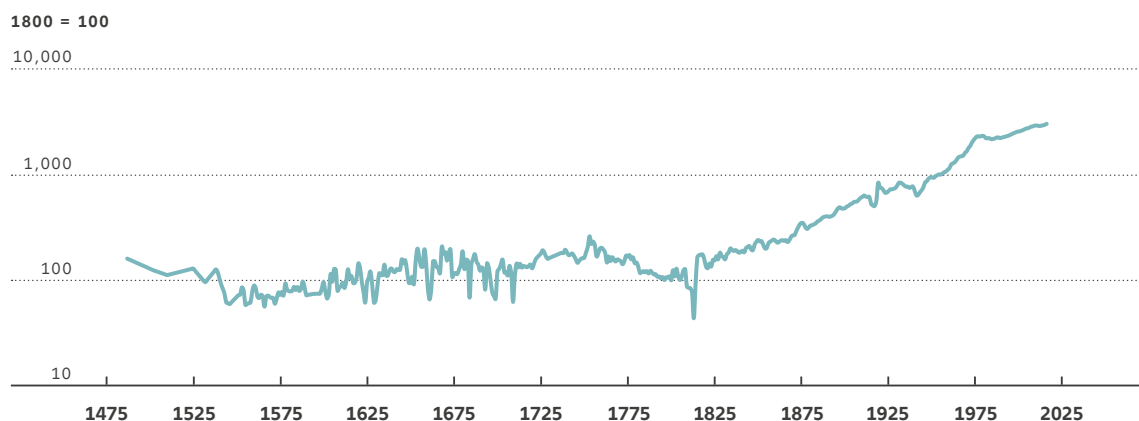
Prosperity is a result of higher productivity

In the longer term, the trend in real income does not depend on monetary policy but on how efficiently the economy can produce goods and services. The economic growth seen over the last 200 years is attributable to production of still more goods and services with the same labour. In other words, productivity has risen significantly.

There are many reasons for this, including a larger and still more efficient capital stock, a higher level of education and generally smarter ways of organising production, including increased division of tasks.

CHART 11.1

Development in real annual wages 1489-2016



A strong fall in infant mortality and a rise in life expectancy

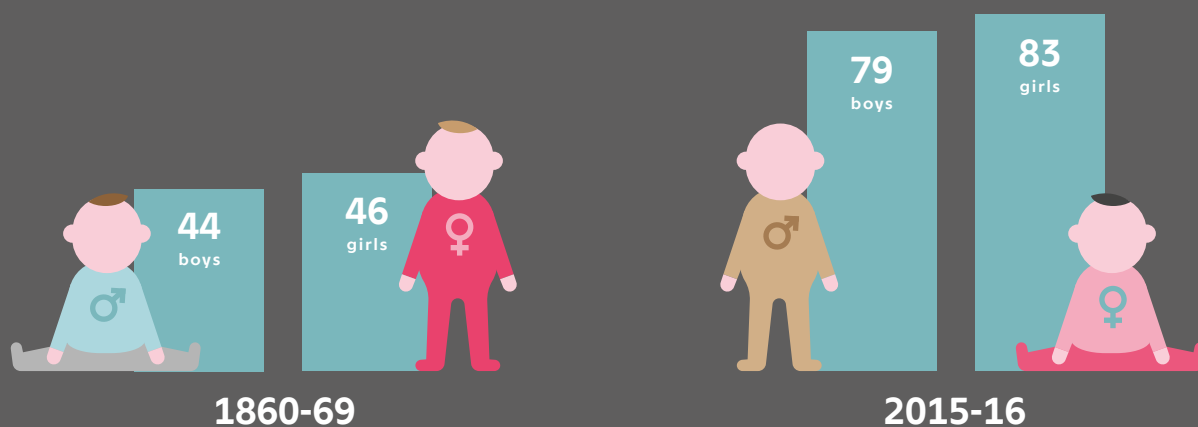
Infant mortality

Number of deaths of children under one year of age per 1,000 live births



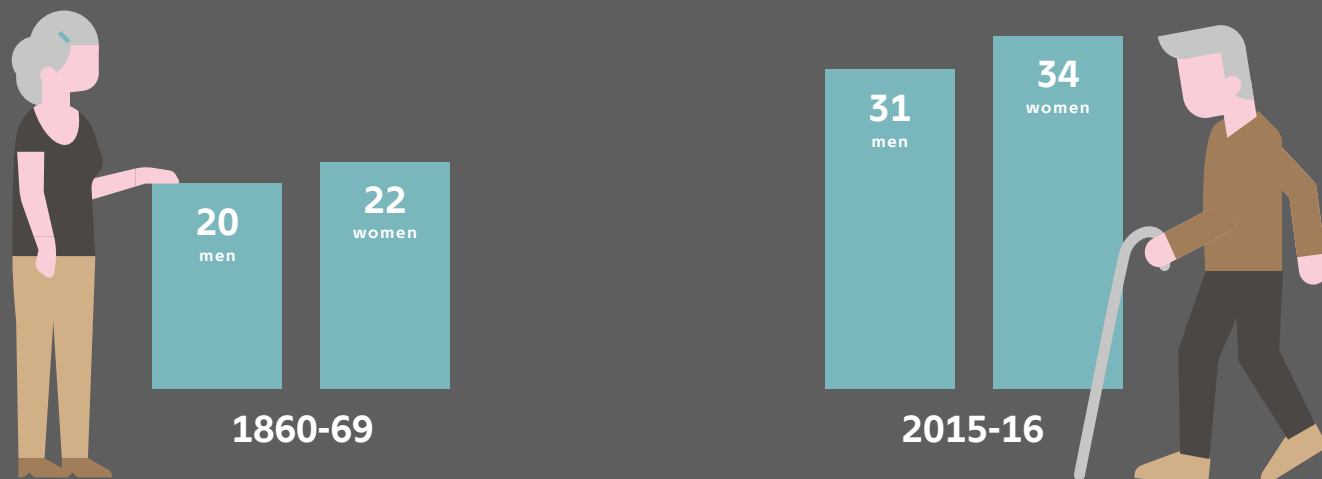
Life expectancy for a new born

Years



Expected survival time for a 50-year-old

Years



Holidays and the Danish labour market model

A characteristic of the Danish labour market is that issues relating to wages and working conditions are to a very large extent regulated through agreements between the social partners. First and foremost wages, but also working hours, are laid down by collective agreement. This is why Denmark, unlike certain other EU member states, has no statutory minimum wage.

The agreements-based Danish labour market system goes back to the "September agreement" in 1899, concluded between the principal organisations of wage earners and employers following a long and extensive industrial dispute.

In a few areas, the labour market agreements are followed up by general legislation. This applies to holidays, for example. In 1875, virtually no wage earners were entitled to any holidays. In the first couple of decades of the 20th century, the right to holidays was included in several collective agreements, and the first holiday act, from 1938, entitled all wage earners to two weeks' holiday a year. Today, the Holiday Act entitles wage earners to five weeks' holiday and most have six weeks if the non-statutory special days off are included.



Higher productivity in coin production

Labour productivity increases when output per employee rises. In 1975, the Royal Danish Mint was transferred to Danmarks Nationalbank. The Mint had 101 employees, who produced 162 million coins that year, i.e. 1.6 million coins per employee. 10 years later, 48 employees produced 127 million coins, i.e. 2.6 million coins per employee. This picture from 2014 shows a machine producing coins at Danmarks Nationalbank.



A fluctuating upward trend

However, it has not been a smooth ride without any bumps on the road. The economy has fluctuated over the years, cf. the Factbox on page 146-147. The interwar period and the two world wars were characterised by particularly strong fluctuations in output.

There has been a clear tendency for downturns with banking crises to be deeper or longer than downturns without banking crises:

- The cyclical downturn in 2007-09, in which the most recent financial crisis played a role, was the deepest one so far since World War II.
- The cyclical downturn in 1855-58, which included the monetary crisis in 1857-58, was the deepest one before World War I.
- The cyclical downturn in 1876-77, in which the savings bank crisis played a role, was the deepest one during the gold standard period prior to World War I.

**THANKS TO THE HIGHER STANDARD OF LIVING,
WE CAN AFFORD TO WORK LESS**

70 hours a week

that was how much people normally worked in 1875.
Today full time is 37 hours.

Business cycles through 200 years

The Danish economy has grown considerably over the last 200 years, but growth has not followed a straight line. There have been years with high growth, years with growth well below average and years with shrinking output. In other words, the economy has fluctuated, reflecting the business cycles.

Chart 11.2 illustrates the concept of a business cycle in a time series, e.g. real GDP.

- An upswing starts at a trough in the time series and ends at a peak.
- A downturn starts at a peak in the time series and ends at a trough.
- A business cycle comprises an upswing followed by a downturn.

Table 11.1 provides an overview of all business cycles in Denmark during the last 200 years.

CHART 11.2
A business cycle

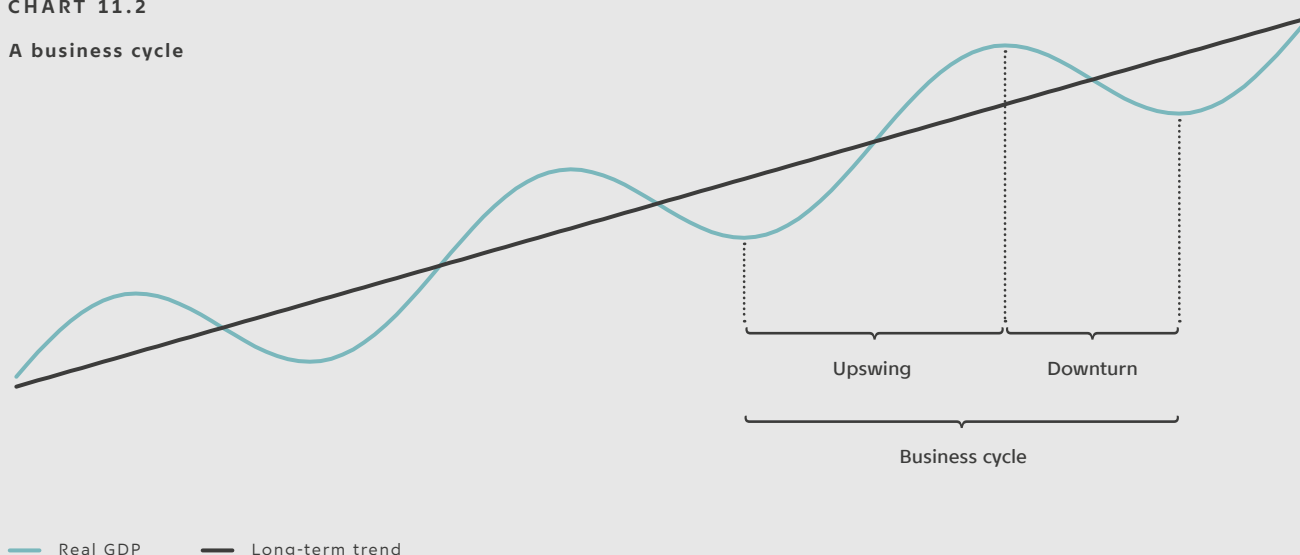


TABLE 11.1

Chronology of Danish business cycles 1821-2009

Turning points			Duration (years)			Amplitude (per cent of GDP)	
Trough	Peak	Trough	Upswing	Downturn	Cycle	Strength of upswing	Depth of downturn
...	1821	1823	...	2	2.4
1823	1824	1825	1	1	2	1.7	1.3
1825	1828	1833	3	5	8	2.7	3.7
1833	1834	1836	1	2	3	3.7	3.3
1836	1840	1842	4	2	6	2.1	3.5
1842	1845	1847	3	2	5	4.0	4.3
1847	1850	1854	3	4	7	7.3	7.2
1854	1855	1858	1	3	4	8.8	8.8
1858	1859	1861	1	2	3	4.9	3.5
1861	1863	1864	2	1	3	4.1	3.3
1864	1865	1868	1	3	4	1.9	3.6
1868	1870	1871	2	1	3	3.6	2.1
1871	1872	1873	1	1	2	2.5	2.4
1873	1876	1877	3	1	4	2.0	4.3
1877	1879	1881	2	2	4	3.3	1.6
1881	1883	1885	2	2	4	2.6	3.1
1885	1887	1889	2	2	4	2.6	2.8
1889	1890	1894	1	4	5	3.0	2.9
1894	1896	1898	2	2	4	2.7	2.2
1898	1903	1906	5	3	8	2.6	2.1
1906	1911	1912	5	1	6	2.3	2.4
1912	1914	1915	2	1	3	6.0	7.0
1915	1916	1918	1	2	3	4.8	10.5
1918	1920	1921	2	1	3	10.3	8.0
1921	1923	1925	2	2	4	10.9	8.7
1925	1930	1932	5	2	7	6.5	5.8
1932	1939	1941	7	2	9	12.4	20.1
1941	1944	1945	3	1	4	15.4	12.8
1945	1950	1952	5	2	7	10.2	4.5
1952	1954	1958	2	4	6	2.9	3.1
1958	1961	1963	3	2	5	2.9	2.9
1963	1965	1966	2	1	3	3.0	2.3
1966	1973	1975	7	2	9	3.8	5.8
1975	1979	1981	4	2	6	5.3	4.5
1981	1986	1993	5	7	12	5.0	5.1
1993	2000	2003	7	3	10	3.9	2.8
2003	2007	2009	4	2	6	3.9	6.1

TECHNOLOGICAL ADVANCES HAVE
INCREASED PRODUCTIVITY AND THE SPEED
AT WHICH INFORMATION TRAVELS

3 weeks

was the time it took to send information about US Treasury bonds by ship from New York to London before a permanent transatlantic telegraph cable was laid in 1866.

- The cyclical downturn in 1986-93, during which many deposit banks were distressed, was the longest one (7 years) since 1821.
- The banking crisis in the 1920s and early 1930s extended over a very long period, and this period was characterised by very deep cyclical downturns.

The causal link between cyclical fluctuations and banking crises goes both ways, but there can be no doubt that banking crises are bad for the economy. Historical events clearly emphasise the importance of having a stable financial system if we want a robust economy.



“The Box”

More recently, technological advances have also contributed to making sea transport still cheaper, e.g. the introduction of standardised containers (“boxes”) in the Danish merchant fleet in the early 1970s. They have made it easier to load, stack and unload various types of goods in a uniform manner, thereby contributing to reducing transport costs.



Technological advances

The increase in the standard of living over the last 200 years is attributable to increased productivity, to a large extent reflecting technological advances.

In the 19th century, steam engines and steamships were clear examples of technological advances. The first railway in the Danish monarchy, between Kiel and Altona in the Duchy of Holstein, opened in 1844, and the first railway in the Kingdom of Denmark ran between Copenhagen and Roskilde and opened in 1847. The following year, a steamship company opened a direct line between Jutland and England. Expansion of the railway network and the establishment of more steamer connections in the latter half of the 19th century were of major significance to the business sector.

Technological advances also had a huge impact on how fast information could travel. In 1866, a permanent telegraph cable was laid under the Atlantic Ocean and this played an important role in linking the financial markets in the USA and Europe. Before the cable connection opened, it took around three weeks to send information about US Treasury bonds by ship from New York to London where they also were traded. With the telegraph cable, the time lag could be reduced to one day, and by 1914 transmission time was down to less than one minute.

Appendix

Danmarks Nationalbank's banknotes since 1818

Since its establishment in 1818, Danmarks Nationalbank has had a monopoly on issuing Danish banknotes. This appendix shows all Danish banknote series (face/reverse). Emergency banknotes have not been included.

Rigsbankdaler

Danmarks Nationalbank's first banknotes were printed on one side only – the other side was blank. The security features on the banknotes were two handwritten signatures by Danmarks Nationalbank employees and a watermark with the king's monogram.

1 rigsbankdaler
Identical cartouches ("framed figures") on each side.

5 rigsbankdaler
Identical arabesques on each side.

10 rigsbankdaler
Arabesque with cartouche on the left-hand side.

50 rigsbankdaler
Cartouche frame around the whole banknote.

100 rigsbankdaler
Left-hand side of the banknote decorated with floral borders and an oval with Denmark's three lions, Norway's lion with a halberd and Holstein's nettle leaf.



Rigsbankdaler

The banknotes were designed by the architect and artistic craftsman G. F. Hetsch. The new 5-rigsbankdaler banknote was issued in 1834, followed by the rest of the series over a number of years. Except for the 5-rigsbankdaler banknote, the series had print on both sides and in different techniques in order to enhance security. The 1- and 10-rigsbankdaler banknotes from the 1819 series were not replaced, but in 1851 a new 20-rigsbankdaler banknote was introduced.

5 rigsbankdaler

Tessellated frame around the whole banknote. Decorative elements along all four sides. / Blank.

20 rigsbankdaler

Thick borders around the banknote make it look like a framed picture. / The large coat of arms with two savages holding the shield.

50 rigsbankdaler

The large coat of arms. / Leaf mosaic.

100 rigsbankdaler

The first Danish banknote to be printed on both sides. In the two side fields Mercury (symbol of trade) and Neptune (the sea) and in the middle of the lower part of the banknote Minerva (crafts) and Ceres (fertility) flanking the large coat of arms / Tessellated frame.



Rigsdaler

In 1854, the name of the currency unit changed from rigsbankdaler to rigsdaler and a new banknote series was issued. The painter and sculptor Henrik Olrik designed a new 5-rigsdaler banknote, while the other banknotes were updates of G. F. Hetsch's series from 1834 with a different text but the same motifs.

5 rigsdaler

Black print on a blue base. Rich decorations on the whole banknote. Neptune in a medallion on the left-hand side and Ceres on the right-hand side. / Blank.

10 rigsdaler

See the description of the 20-rigsbankdaler banknote in the 1834 series.

50 rigsdaler

See the description of the 50-rigsbankdaler banknote in the 1834 series.

100 rigsdaler

See the description of the 100-rigsbankdaler banknote in the 1834 series.



Kroner

With the Coinage Act of 1873, rigsdaler was replaced by kroner as the currency unit and a new banknote series was issued. The banknotes were designed by a number of illustrators working together (Henrik Olrik, Magnus Petersen, Nilas Frstrup – after certain originals by G. F. Hetsch). From this series, one of the signatures was printed on the banknotes while the other one remained handwritten until 1912, after which both signatures were printed. On the 500-krone banknote, for the first time portraits of well-known Danes are used on banknotes (the sculptor Bertel Thorvaldsen and the physicist Hans Christian Ørsted).

10 kroner

The small coat of arms with Minerva and Ceres holding the shield. / Blank.

50 kroner

Blue letterpress printing with decorative frame. / In the middle a garland of leaves surrounded by rows of bees.

100 kroner

On an oval arabesque lie chubby children (putti), lions and dolphins. Medallions with Mercury and Vulcan on the left- and right-hand sides, respectively. / Dolphins.

500 kroner

Face as on the 100-rigsbankdaler banknote in the 1834 series, but redrawn with a few changes. / Frame with leaf and fruit pattern. Three medallions (portraits and coat of arms) surrounded by garlands of leaves.



Kroner

The banknotes were designed by various illustrators working together (Hans Tegner, Nilas Fristrup, Henrik Olrik and an unknown illustrator working for printers H. H. Thiele). All four banknotes were issued with a different watermark in 1904.

5 kroner

Mosaic of figures of five. /
Interwoven figures of five.

10 kroner

The large coat of arms with two savages holding the shield on the left-hand side. / Three empty fields. String of ten 1-krone coins at the bottom.

50 kroner

Female figure with a shield (Mother Denmark) in the left-hand field. / Decorative elements.

100 kroner

Female figure standing on a head of Medusa. / Sea nymph and Ceres flanking the small coat of arms.



Heilmann

The 1910, 1931 and 1936 series were designed by the painter and illustrator Gerhard Heilmann. These series are also known as Heilmann (1), Heilmann (2) and Heilmann (3). The series differed only in respect of the specific wording on the banknotes regarding gold convertibility. It became necessary to change this when the obligation to convert banknotes to gold was suspended in 1931 and the name of the bank was changed to Danmarks Nationalbank in 1936. At the time when the 1936 Act was prepared, it was still expected that the gold standard would be reintroduced. So the banknotes in the 1936 series still bear a text saying that they can be converted to gold in accordance with legislation in force. A lot of work had been put into making a uniform banknote series with advanced security features.

5 kroner

Landscape with dolmen. / The small coat of arms surrounded by birch leaves.

10 kroner

Seaweed decoration. / Lions around a head of Hermes (or Mercury).

50 kroner

Boat with fishermen drawing in their nets. / The small coat of arms surrounded by oak and beech branches.

100 kroner

Seaweed decoration surrounded by dolphins. / Mermen flanking the small coat of arms.

500 kroner

Farmer behind horse-drawn plough ("a ploughman"). / Small coat of arms surrounded by oak and beech branches.



The changeover series

In the autumn of 1943, Danmarks Nationalbank secretly began to produce a new banknote series in cooperation with printers Egmont H. Petersen so that it would be ready for the money changeover on 23 July 1945. The faces of most of the banknotes were designed by the painter and illustrator Gerhard Heilmann. In connection with the changeover, stocktaking of assets also took place so that an extraordinary tax could be imposed on large increases in wealth during the war. In that way, the profits of collaborators could be seized, black marketeers could be revealed and any banknotes taken out of Denmark by Germans could be cancelled. The 10-krone banknote was changed in 1945 and 1947. The latter version is shown.

5 kroner

Interwoven figures of five. / Rosettes with the small coat of arms in the middle.

10 kroner

Seaweed decoration. / Rosettes with the small coat of arms in the middle.

50 kroner

Boat with fishermen. / Rosettes with the small coat of arms in the middle.

100 kroner

Seaweed decoration surrounded by dolphins. / Rosettes with the small coat of arms in the middle.

500 kroner

Farmer behind horse-drawn plough. / Rosettes with the small coat of arms in the middle.



Portraits and landscapes

After the war, Danmarks Nationalbank wished to replace the changeover series and held an open competition for proposals for new banknotes in 1947. Six proposals were rewarded, but none of them formed the basis for the new series. Instead, it was designed in cooperation between the architect and graphic artist Gunnar Biilmann Petersen, Danmarks Nationalbank's illustrator Gunnar Andersen and the illustrator and architect Ib Andersen, who had participated in the competition. The faces of banknotes showed portraits of well-known Danes. Ib Andersen drew the originals for the stork's nest (10 kroner) and the Round Tower (50 kroner) on the faces of the banknotes, and the landscapes on the reverse of the banknotes were also based on drawings by Ib Andersen. In 1954, the 10-krone banknote was issued in a revised edition with a new format and colour. The revised version is shown.

5 kroner

Portrait of the sculptor Bertel Thorvaldsen and his marble sculpture "The Graces" on the right-hand side. / Town of Kalundborg.

10 kroner

Portrait of the writer Hans Christian Andersen and stork's nest from Asminderød. / Egeskov Windmill in Kværndrup Parish.

50 kroner

Astronomer and physicist Ole Rømer and Round Tower in Copenhagen. / Stenvad long barrow in Djursland.

100 kroner

Portrait of the scientist Hans Christian Ørsted and a compass with an electrical wire. / Kronborg Castle.

500 kroner

Agricultural reformer Christian Ditlev Frederik Reventlow and a farmer with a horse/plough. / City of Roskilde.



Portraits and animals

“The Ib Andersen series”

The portraits on the faces of the banknotes had all been engraved on the basis of paintings by the Danish artist Jens Juel (1745-1802). The animals on the reverse were based on water-colours and drawings by the illustrator and architect Ib Andersen, the painter and graphic artist Johannes Larsen and Danmarks Nationalbank's illustrator Gunnar Andersen. In 1995, the 100-krone banknote was issued in a revised edition (with microprint, a partly visible metallic security thread and strong colours) to enhance protection against counterfeiting. The revised 100-krone banknote is shown.

10 kroner
Cathrine Sophie Kirchoff. / Queen eider.

20 kroner
Pauline Tutein. / Sparrows.

50 kroner
Engelke Charlotte Ryberg. / Crucian carp.

100 kroner
Self-portrait of Jens Juel. / “Red underwing” moth.

500 kroner
Portrait of unknown woman, presumably Franziska Genoveva von Qualen. / Lizard.

1000 kroner
Thomasine Heiberg. / Squirrel.



Science, culture and church art

The banknotes were designed by Danmarks Nationalbank's illustrator Johan Alkjær. In the period from 2002 to 2005, the series was upgraded and new security features were added in the form of holograms and fluorescent colours. The upgraded banknotes are shown.

50 kroner
The writer Karen Blixen. / Centaur from Landet Church on the island of Tåsinge.

100 kroner
The composer Carl Nielsen. / Basilisk from Tømmerby Church in Vester Hanherred.

200 kroner
Actress Johanne Luise Heiberg. / Lion from apse of Viborg Cathedral.

500 kroner
The nuclear scientist Niels Bohr. / Knight in armour and a dragon from the font at Lihme Church.

1000 kroner
The artists Anna and Michael Ancher. / Tournament scene from Bislev Church in northern Jutland.



Danish bridges and prehistoric finds

In the period 2009-11, Danmarks Nationalbank issued new banknotes. The banknotes were designed by the artist Karin Birgitte Lund and as a new element the 100-krone and 200-krone banknotes had special embossed print for blind and visually impaired people.

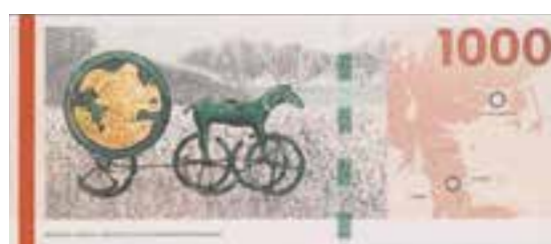
50 kroner
The Sallingsund Bridge. /
The Skarpsalling Vessel, Himmerland.

100 kroner
The Old Little Belt Bridge. /
The Hindsgavl dagger from
the island of Fænø.

200 kroner
Knippelsbro bridge in Copenhagen. /
Belt plate from Langstrup.

500 kroner
The bridge Dronning Alexandrines
Bro. / Bronze pail from Keldby.

1000 kroner
The Great Belt Bridge. / The Sun
Chariot from Trundholm Bog.





SNAPSHOT FROM THE HISTORY OF DANMARKS NATIONALBANK

Watermark have always been an important part of the security features in Danmarks Nationalbank's banknotes. The photo shows a metal die used by Silkeborg paper mill for manufacturing watermarked paper for banknotes in the 1930s.

Sources, notes and image credits

Charts

Chart 1.1 Source: Abildgren, Kim (2010), Consumer Prices in Denmark 1502-2007, *Scandinavian Economic History Review*, Vol. 58(1), pp. 2-24.

Chart 3.1 Note: Semilogarithmic scale.
Source: Pedersen, Jørgen (1930), *Arbejdslønnen i Danmark under skiftende konjunkturer i perioden ca. 1850-1913* (Wages in Denmark during various business cycles in approximately 1850-1913 – in Danish only), Nordisk Forlag; and Statistics Denmark.

Chart 3.2 Note: 7-year centred moving average of inflation rates.
Source: Abildgren, Kim (2010), Consumer Prices in Denmark 1502-2007, *Scandinavian Economic History Review*, Vol. 58(1), pp. 2-24; and Statistics Denmark.

Chart 4.1 Note: EU Harmonised Index of Consumer Prices (HICP).
Source: Eurostat.

Chart 4.2 Source: Danmarks Nationalbank.

Chart 4.3 Source: Abildgren, Kim (2014), Tail events in the FX markets since 1740, *Journal of Risk Finance*, Vol. 15(3), pp. 294-311.

Chart 4.4 Note: West Germany before 1991.
Source: Danmarks Nationalbank (2003), *Monetary Policy in Denmark*, 2nd edition, Danmarks Nationalbank.

Chart 4.5 Source: Abildgren, Kim (2014), Far out in the tails – The historical distributions of macro-financial risk factors in Denmark, *Danish Journal of Economics (Nationaløkonomisk Tidsskrift)*, Vol. 152(1), pp. 1-31; Hansen, Svend Aage (1969), Kreditmarkedsstatistik (Credit market statistics – in Danish only), *Statistics Denmark Statistical Inquiries*, No. 24; Statistics Denmark; and Association of Danish Mortgage Banks.

Chart 5.1 Note: Foreign exchange reserve assets (not excluding liabilities).
Source: Abildgren, Kim (2017), 175 years of financial risks and returns in central banking: Danmarks Nationalbank, 1839–2014, *Financial History Review*, vol. 24(3), pp. 307-329; Danmarks Nationalbank; and Statistics Denmark.

Chart 5.2 Note: The deposit rate of deposit banks comprises savings banks only before 1875.
Source: Hoffmeyer, Erik (1960), *Strukturændringer på penge- og kapitalmarkedet. En studie i anledning af sparekassernes 150*

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Chart 6.1 Note: The number of families has been calculated as the number of breadwinners and the number of servants.
Source: Statistics Denmark.

Chart 6.2 Source: Abildgren, Kim, Bodil Nyboe Andersen and Jens Thomsen (2010), *Monetary History of Denmark 1990-2005*, Danmarks Nationalbank; Hansen, Svend Aage (1969), Kreditmarkedsstatistik (Credit market statistics – in Danish only), *Statistics Denmark Statistical Inquiries*, No. 24; Statistics Denmark; and Danish Financial Supervisory Authority.

Chart 6.3 Note: Domestic lending by deposit banks comprises domestic lending to non-MFIs. Domestic lending by mortgage banks comprises lending to non-financial corporations and households.
Source: Abildgren, Kim (2008), A 'First Go' on Financial Accounts for Denmark 1875-2005, *Scandinavian Economic History Review*, Vol. 56(2), pp. 103-121; Abildgren, Kim (2014), Far out in the tails – The historical distributions of macro-financial risk factors in Denmark, *Danish Journal of Economics (Nationaløkonomisk Tidsskrift)*, Vol. 152(1), pp. 1-31; Hansen, Svend Aage and Knud Erik Svendsen (1968), *Dansk pengehistorie 1700-1914* (Monetary History of Denmark 1700-1914 – in Danish only), Danmarks Nationalbank; Statistics Denmark; and Danmarks Nationalbank.

Chart 7.1 Source: Abildgren, Kim and Andreas Kuchler (2013), Banks, credit and business cycles, *Danmarks Nationalbank Monetary Review*, Vol. 52(2,2), pp. 1-49; and Danish Financial Supervisory Authority.

Tables

Chart 8.1 Note: Nominal values. Lending by deposit banks and mortgage banks to the domestic non-MFI sector.
Source: Abildgren, Kim (2014), Far out in the tails – The historical distributions of macro-financial risk factors in Denmark, *Danish Journal of Economics (Nationaløkonomisk Tidsskrift)*, Vol. 152(1), pp. 1-31; Statistics Denmark; and Danmarks Nationalbank.

Chart 8.2 Note: Semilogarithmic scale. Nominal prices. Suburbs of Copenhagen comprise the County of Copenhagen before 2007.
Source: Abildgren, Kim (2014), Far out in the tails – The historical distributions of macro-financial risk factors in Denmark, *Danish Journal of Economics (Nationaløkonomisk Tidsskrift)*, Vol. 152(1), pp. 1-31; Ministry of Economic Affairs (1966), *Inflationens årsager. Betænkning afgivet af det af økonomiministeren den 2. juli 1965 nedsatte udvalg* (The reasons for inflation. Report by the committee set up by the Minister for Economic Affairs on 2 July 1965 – in Danish only), Statens Trykningskontor; Told&Skat, *Ejendomssalg* (Property sales – in Danish only), various volumes; and Statistics Denmark.

Chart 9.1 Note: The years refer to the banknote series shown in the Appendix. The chart comprises only Danmarks Nationalbank's ordinary banknote series, not the emergency banknotes with a face value of kr. 1 that Danmarks Nationalbank issued in 1914-21 when small coins were scarce.
Source: Confederation of Danish Employers (2007), *Lønstatistik 1907-2007* (Wage statistics 1907-2007 – in Danish only), DA-Forlag; and Abildgren, Kim (2017), Trends in real wages in Denmark since the Late Middle Ages, *Historical Methods*, Vol. 50(2), pp. 67-78.

Chart 9.2 Note: Bank-based payments comprise cheques, direct debit, giro, inpayment forms, payment cards, etc.
Source: Carlsen, Maria and Johanne Dinesen Riishøj (2006), Brug af kontanter i Danmark (The use of cash in Denmark – in Danish only), *Danmarks Nationalbank Working Papers*, No. 41; Danish Payments Council (2016), *Report on the role of cash in society*, Danmarks Nationalbank; and Statistics Denmark.

Chart 11.1 Note: Nominal annual income deflated using the consumer price index. Semilogarithmic scale.
Source: Abildgren, Kim (2017), Trends in real wages in Denmark since the Late Middle Ages, *Historical Methods*, Vol. 50(2), pp. 67-78; and Statistics Denmark.

Chart 11.2 Source: Abildgren, Kim, Birgitte Vølund Buchholst, Atef Qureshi and Jonas Staghøj (2011), Real economic consequences of financial crises, *Danmarks Nationalbank Monetary Review*, Vol. 50(3,2), pp. 1-50.

Table 11.1 Note: The depth of a downturn is measured from the peak to the trough. The strength of an upswing is measured from the trough to the peak.
Source: Abildgren, Kim, Birgitte Vølund Buchholst, Atef Qureshi and Jonas Staghøj (2011), Real economic consequences of financial crises, *Danmarks Nationalbank Monetary Review*, Vol. 50(3,2), pp. 1-50.

Image credits

Cover	<i>Section of the 50-krone banknote from the 1910-36 series (Heilmann), Danmarks Nationalbank.</i>		
Page 4	<i>Section of the 10-krone banknote from the 1910-36 series (Heilmann), Danmarks Nationalbank.</i>		
Page 6	<i>Door for vaults from the firm Lips in Danmarks Nationalbank's main building in Holmens Kanal, Danmarks Nationalbank / Ida Lund Nellemann.</i>		
Page 10-11	<i>Section of the 1-rigsbankdaler banknote from the 1819 series (Rigsbankdaler), Danmarks Nationalbank.</i>		
Page 12	<i>C.A. Lorentzen, The Most Terrible Night: View of Kongens Nytorv in Copenhagen During the English Bombardment of Copenhagen at Night between 4 and 5 September 1807, 1807-08, National Gallery of Denmark (http://collection.smk.dk/#/detail/KMS3468), Public Domain (CC0 1.0, https://creativecommons.org/publicdomain/zero/1.0/).</i>		
Page 16	<i>Main building 1818-70: Bag Børsen, c. 1860, Museum of Copenhagen / unknown photographer (http://kbhbilleder.dk/kbh-museum/85351), Public Domain (http://kbhbilleder.dk/rettigheder-og-brug). Main building 1870-1976: Holmens Kanal, Danmarks Nationalbank, 1877, Museum of Copenhagen / Oluf W. Jørgensen (Chr. Neuhaus' Eftf.) (http://kbhbilleder.dk/kbh-museum/84212), Public Domain (http://kbhbilleder.dk/rettigheder-og-brug). Main building since 1976: Danmarks Nationalbank Havnegade 5, Danmarks Nationalbank / Jens Lindhe.</i>		
Page 18	<i>Niels Moe, 1792-1854, Portrait of Frederik VI, Danmarks Nationalbank / Jon Norddahl.</i>		
Page 19	<i>Top: Peter Hansen, The Ploughman Turns, c. 1902, National Gallery of Denmark (http://collection.smk.dk/#/en/detail/KMS3939), Public Domain (CC0 1.0, https://creativecommons.org/publicdomain/zero/1.0/). Bottom: Jens Juel, Landscape by the Sound, c. 1800, Nivaagaards Malerisamling (http://www.nivaagaard.dk/en/samling-en/jens-juel-1/), Public Domain (http://www.nivaagaard.dk/public-domain/).</i>		
Page 20	<i>The Danish West-Indian National Bank in Charlotte Amalie, c. 1900-1910, Maritime Museum of Denmark (http://billedarkiv.mfs.dk/</i>		<i>fotoweb/archives/5001-Billedarkiv/archive/Arkiv-10/000032923.jpg.info</i>), CC-BY-NC-SA.
		Page 22-23	<i>Section of the 50-rigsbankdaler banknote from the 1819 series (Rigsbankdaler), Danmarks Nationalbank.</i>
		Page 24	<i>Military guards in front of Danmarks Nationalbank, c. 1900, unknown photographer. Rephotographed by Danmarks Nationalbank / Jon Norddahl.</i>
		Page 26	<i>Constantin Hansen, The National Constitutional Assembly, 1860-64, Wikimedia Commons / Villy Fink Isaksen (https://commons.wikimedia.org/wiki/File:Grundlovgivende_rigsforsamling_-_Constantin_Hansen.jpg), Public Domain Mark 1.0 (https://creativecommons.org/publicdomain/mark/1.0/deed.en).</i>
		Page 29	<i>Bond issued by Danmarks Nationalbank, 1936, Danmarks Nationalbank / Jon Norddahl.</i>
		Page 30-31	<i>In factbox: Logo of Rigsbanken, 1813, Danish National Archives (https://www.flickr.com/photos/statensarkiver/8283104063/in/album-72157632276326266/), CC BY-NC-SA 2.0 (https://creativecommons.org/licenses/by-nc-sa/2.0/). Danmarks Nationalbank's "large" coat of arms on one of the police-like access badges in silver or silver-plated copper that employees had to present for many years until 1952 in order to gain access to the main building, Danmarks Nationalbank / Jon Norddahl. Danmarks Nationalbank's "small" coat of arms that was placed over the main entrance of the Danmarks Nationalbank building at Holmens Kanal 17, Danmarks Nationalbank / Jon Norddahl.</i>
		Page 31	<i>Top: Cap previously worn by Danmarks Nationalbank staff, Danmarks Nationalbank / Jon Norddahl. Button from uniform previously worn by Danmarks Nationalbank staff, Danmarks Nationalbank / Jon Norddahl.</i>
		Page 34-35	<i>Section of the 5-rigsbankdaler banknote from the 1834 series (Rigsbankdaler), Danmarks Nationalbank.</i>
		Page 36	<i>John Lee and Arnold Mikkelsen, Election poster for the Danish Liberal Party, 1957, National Museum of Denmark (http://samlinger.natmus.dk/DNT/asset/27750), CC BY-SA 2.5 (https://creativecommons.org/licenses/by-sa/2.5/dk/).</i>
		Page 39	<i>Cartoon by Bo Bojesen in the newspaper Politiken, 13 April 1973. Title: Hans Christian Andersen's swan song. Accompanying text: Wage gains are being swallowed up by price rises: – Once upon a time, there was a tenner that thought it was of value... © Bo Bojesen/VISDA.dk. Cartoon reproduced by permission of Niels Bo Bojesen and VISDA.</i>
		Page 43	<i>Inflation, Using Banknotes as Wallpaper, 1923, German Federal Archives, Picture</i>

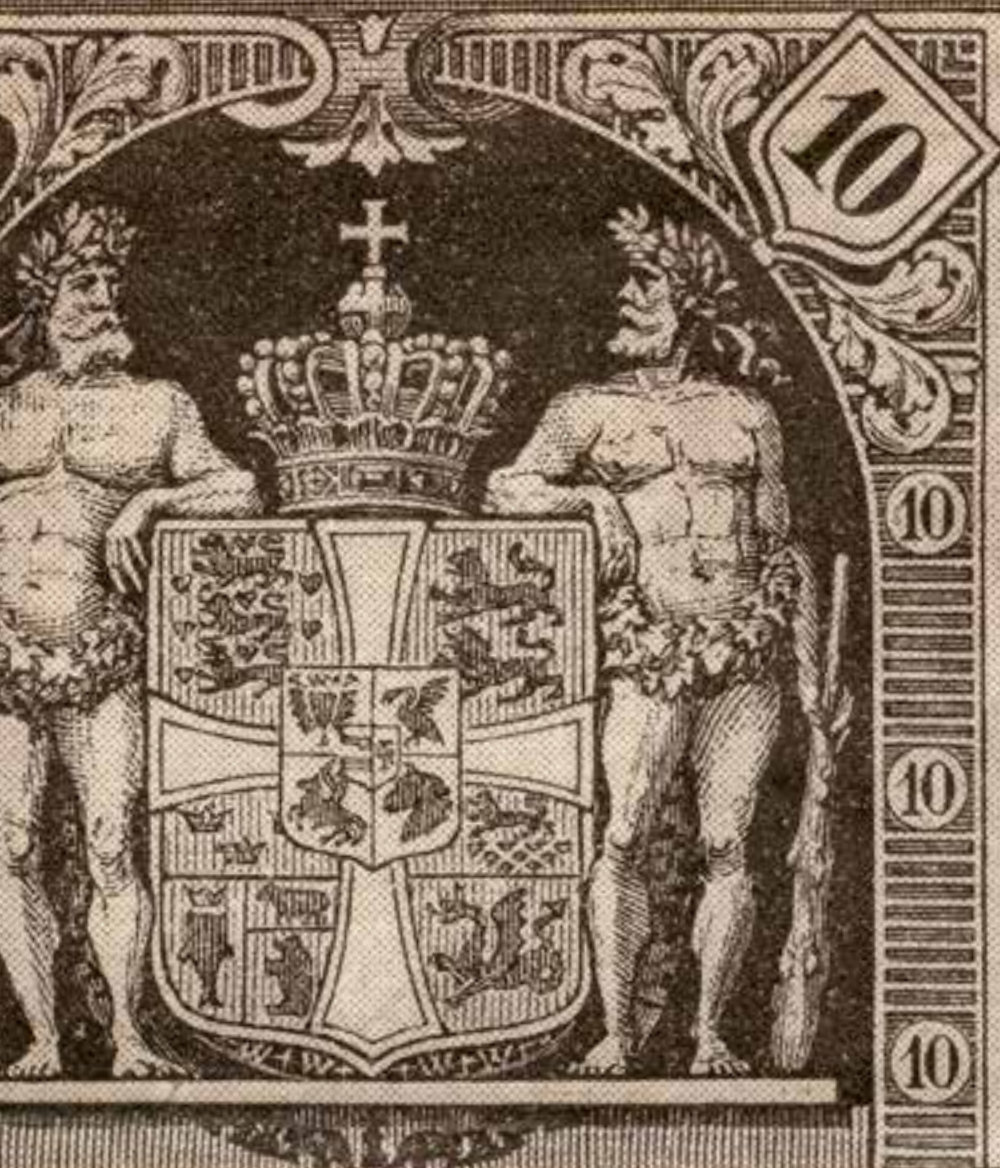
- 102-00104 / Georg Pahl (https://commons.wikimedia.org/wiki/File:Bundesarchiv_Bild_102-00104,_Inflation,_Tapezieren_mit_Geldscheinen.jpg), CC BY-SA 3.0 (<https://creativecommons.org/licenses/by-sa/3.0/de/deed.en>).
- Page 44-45** *Section of the 20-rigsbankdaler banknote from the 1834 series (Rigsbankdaler), Danmarks Nationalbank.*
- Page 46** *Danmarks Nationalbank 2 August 1914, Royal Danish Library (<http://www.kb.dk/images/billed/2010/okt/billeder/object143500/da/>), CC BY-NC-ND 3.0 (<https://creativecommons.org/licenses/by-nc-nd/3.0/>).*
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- Page 51** *In factbox: Assistant Secretary, U.S. Treasury, Harry Dexter White (left) and John Maynard Keynes, honorary advisor to the U.K. Treasury at the inaugural meeting of the International Monetary Fund's Board of Governors in Savannah, Georgia, U.S., March 8, 1946, IMF / unknown photographer (<http://www.imf.org/external/np/adm/pictures/images/hwmkm.jpg>), Public Domain (<http://www.imf.org/external/np/adm/pictures/captions.htm>).*
Bottom: Scales used to check the weight of gold coins in the early 20th century, Danmarks Nationalbank / Jon Norddahl.
- Page 52** *Holger and his wife say no to the union, Referendum poster from the Socialist People's Party, 1992. Poster reproduced by permission of the Socialist People's Party. Picture file supplied by Arbejderbevægelsens Bibliotek og Arkiv (ABA). The poster text plays on the similarity of names between the party leader of the Socialist People's Party and the legendary figure Holger the Dane, who is supposed to come to the rescue if Denmark is in peril.*
- Page 53** *Cartoon by Tom Wikborg in the newspaper Berlingske Tidende in 1999. Title: Anders Fogh with a coin. Dialogue: – Euro or turmoil? Cartoon reproduced by permission of Tom Wikborg. There is a pun on the Danish word "uro", meaning turmoil.*
- Page 54** *Cartoon by Bo Bojesen in the newspaper Politiken, 27 June 1974. Title: The borrower. Accompanying text: Denmark is losing its remaining external creditworthiness. © Bo Bojesen/VISDA.dk. Cartoon reproduced by permission of Niels Bo Bojesen og VISDA.*
- Page 58-59** *Section of the 5-rigsdaler banknote from the 1860 series (Rigsdaler), Danmarks Nationalbank.*
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- Page 64** *Cartoon by Roald Als in the newspaper Politiken, 8 February 2015. Title: When bankers go to war. Dialogue: If only we had joined the euro – then we would only have been on the rocks. Cartoon reproduced by permission of Politiken.*
- Page 68** *Logarithmic calculator from Danmarks Nationalbank's main building in Holmens Kanal. Used for converting amounts in one currency into another, Danmarks Nationalbank / Jon Norddahl.*
- Page 69** *Foreign exchange trading desk at Danmarks Nationalbank in 2015, Danmarks Nationalbank / Jon Norddahl.*
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Bottom, left: Section of gold ingot in Danmarks Nationalbank's lobby, Danmarks Nationalbank / Jon Norddahl. Bottom, right: Gold ingot in Danmarks Nationalbank's lobby, Danmarks Nationalbank / Jon Norddahl.
- Page 74-75** *Section of the 10-krone banknote from the 1875 series (Kroner), Danmarks Nationalbank.*
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- Page 81** *Top: Hans Peter Hansen, Søren Kierkegaard, 1853-55, Danish Royal Library (<https://www.flickr.com/photos/departmentofmapsprintsandphotographs/theroyallibrarydenmark/9642115871/>), No known copyright restrictions (<https://www.flickr.com/commons/usage/> ; <http://www.kb.dk/en/kb/copyright/index.html>).*
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- Page 93** *Depression: 'Runs on Banks'. People milling about outside of a bank*, 1933, Franklin D. Roosevelt Presidential Library & Museum / unknown photographer (<http://www.fdrlibrary.marist.edu/archives/collections/franklin/?p=digitalibrary/digitalcontent&id=3485>), Public Domain (to the best of knowledge).
- Page 96** *Roskilde Bank, Roskilde*, 25 August 2008, Wikimedia Commons / Mogens Englund (https://commons.m.wikimedia.org/wiki/File:Roskilde_Bank_new_owner.jpg), CC BY-SA 3.0 (<https://creativecommons.org/licenses/by-sa/3.0/deed.en>).
- Page 97** Cartoon by Claus Bigum in the newspaper Berlingske Tidende, 14 December 2008. Title: Bank Rescue Package 2 – how? Dialogue: – The bottom line is that the patient is both healthy and well-run. Cartoon reproduced by permission of Claus Bigum.
- Page 98** Cartoon by Roald Als in the newspaper Politiken, 15 December 2012. Title: Blind faith. Accompanying text: The think tank Kraka has asked two of the members of the Chairmanship of the Economic Council, who did not see the last crisis coming, to detect the next one. Dialogue: And now take a good look at the economic landscape. Cartoon reproduced by permission of Politiken.
- Page 100-101** *Section of the 5-krone banknote from the 1883 series (Kroner)*, Danmarks Nationalbank.
- Page 102** Cartoon by Roald Als in the newspaper Politiken, 2 July 2005. Title: The house stands on a solid foundation. Dialogue: – The house stands on a solid foundation. Cartoon reproduced by permission of Politiken.
- Page 105** Cartoon by Arne Sørensen in the newspaper Vejle Amts Folkeblad, in 1993. Title: Multi-functional. Dialogue: Just sign here – and the house is yours! Cartoon reproduced by permission of Arne Sørensen.
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- Page 118** Top: *Machine used for banknote destruction at Danmarks Nationalbank*, 7 February 1950, the weekly magazine BILLED-BLADET / A.E. Andersen. Rephotographed by Danmarks Nationalbank / Jon Norddahl. Bottom: *Pellets of shredded banknotes*, 2008, Danmarks Nationalbank / Peter Bugge.
- Page 121** Top: *Imprinter for Dankort vouchers*, Europeana / Danish Agency for Culture / Historical Museum of Vendsyssel (http://www.europeana.eu/portal/da/record/2058618/object_KUAS_7769348.html) CC BY 4.0 (<https://creativecommons.org/licenses/by/4.0/>). Bottom: *Dankort terminal for use by retailer staff*, Europeana / Danish Agency for Culture / Danish Museum of Science & Technology (http://www.europeana.eu/portal/da/record/2058618/object_KUAS_22118332.html) CC BY 4.0 (<https://creativecommons.org/licenses/by/4.0/>).

- Page 123** Top: Cartoon by Niels Bo Bojesen in the newspaper Jyllands-Posten, 12 December 2016. Title: Danmarks Nationalbank puts its coin and banknote production equipment up for sale. Dialogue: – This one asks if he can postpone payment until he has got them up and running. Cartoon reproduced by permission of Niels Bo Bojesen. Bottom: *Drum from around 1960 for transport of coins to and from the savings bank Balling Sparekasse*, Danmarks Nationalbank / Jon Norddahl.
- Page 125** *Automated coin counter from Danmarks Nationalbank's main building in Holmens Kanal*, Danmarks Nationalbank / Jon Norddahl.
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- Page 131** *Stamp with the word "falsk" (counterfeit) for use on counterfeit banknotes handed in to Danmarks Nationalbank*, Danmarks Nationalbank / Jon Norddahl.
- Page 133** *Queue outside Kolding Folkebank in Jernbanegade in Kolding on 23 July 1945 in connection with the money changeover*, National Museum of Denmark / Museum of Danish Resistance / unknown photographer (<https://www.flickr.com/photos/national-museet/7393292068>), CC BY-SA 2.0 (<https://creativecommons.org/licenses/by-sa/2.0/>).
- Page 134-135** Odense/Munkerisvej: Skott Reklame-Fotografi. Rephotographed by Danmarks Nationalbank / Jon Norddahl. Converted to black/white by Danmarks Nationalbank. Reproduced by permission of Peter Skott. Other photos: Unknown photographers. Rephotographed by Danmarks Nationalbank / Jon Norddahl.
- Page 138-139** *Section of the 500-krone banknote from the 1910-36 series (Heilmann)*, Danmarks Nationalbank.
- Page 140** Hans Andersen Brendekilde, *Worn out*, 1889, Wikimedia Commons / Villy Fink Isaksen ([https://da.wikipedia.org/wiki/Fil:H._A._Brendekilde_-_Udslidt_\(1889\).jpg](https://da.wikipedia.org/wiki/Fil:H._A._Brendekilde_-_Udslidt_(1889).jpg)), Public Domain Mark 1.0 (<https://creativecommons.org/publicdomain/mark/1.0/deed.en>).
- Page 144** Erik Henningsen, *An agitator*, 1899, Wikimedia Commons / Villy Fink Isaksen ([https://commons.wikimedia.org/wiki/File:En_agita-tor_\(Henningsen\).jpg](https://commons.wikimedia.org/wiki/File:En_agita-tor_(Henningsen).jpg)), Public Domain Mark 1.0 (<https://creativecommons.org/publicdomain/mark/1.0/deed.en>).
- Page 145** *Machine producing coins at Danmarks Nationalbank*, 2014, Danmarks Nationalbank / Jon Norddahl.
- Page 148** *Containers*, 2014, Maritime Museum of Denmark (<http://billedarkiv.mfs.dk/foto-web/archives/5001-Billedarkiv/archive/Arkiv-11/000035937.JPG.info>), CC-BY-NC-SA.
- Page 149** C.W. Eckersberg, *A railway engine and a steamship*, 1838, National Gallery of Denmark (<http://collection.smk.dk/#/detail/KKSgb5836>), Public Domain (CC0 1.0, <https://creativecommons.org/publicdomain/zero/1.0/>).
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Text and infographics

- Chapter 1** The quotation from the "Forordning om Forandring af Pengevæsenet for Kongerigerne Danmark og Norge samt Hertugdømmerne Slesvig og Holsten" (Decree on changing the currency system for the Kingdoms of Denmark and Norway and the Duchies of Schleswig and Holstein) of 5 January 1813 is based on the reproduction in Aarhus University's danmarkshistorien.dk (<http://danmarkshistorien.dk/leksikon-og-kilder/vis/materiale/statsbankerotten-af-1813/>). The quotations from "Octroy for Nationalbanken i Kjøbenhavn paa 90 aar" (Charter for Nationalbanken i Kjøbenhavn for 90 years) of 4 July 1818 are from the reproduction in Rubow, Axel (1918), *Nationalbankens historie 1818-1878*, (History of Nationalbanken i Kjøbenhavn 1818-1878 – in Danish only), Nationalbanken i Kjøbenhavn, 67 ff.
- Chapter 2** The quoted statement from the Minister for Trade, Industry and Shipping, Johannes Kjærbøl, in 1936 is from Rigsdagstidende (Rigsdag Hansard), Forhandlinger i Folketinget 1935-36, column 2556.
- Chapter 3** The information on nominal wage increases in the main text is based on: Abildgren, Kim (2009), Monetary Regimes and the Endogeneity of Labour Market Structures – Empirical Evidence from Denmark 1875-2007, *European Review of Economic History*, Vol. 13(2), pp. 199-218. The information on price and wage levels in 1970 and 1980 in the infographics is from Statistics Denmark and Confederation of Danish Employers (2007), *Lønstatistik 1907-2007* (Wage statistics 1907-2007 – in Danish only), DA-Forlag (the wage statistics refer to blue-collar workers).
- Chapter 4** The quoted statement from Trade Minister Christen Hauge during the first reading of the bill which became the Danmarks Nationalbank Act in 1936 is from Rigsdagstidende (Rigsdag Hansard), Forhandlinger i Folketinget, 1933-34, column 4472. The quotation from Royal Bank Commissioner Marianne Jelved's speech on the occasion of Danmarks Nationalbank's 175th anniversary in 1993 is from page 28 of Danmarks Nationalbank, *Monetary Review*, Vol. 32(2), 1993.
- Chapter 11** The information on working hours and holidays is based on: Abildgren, Kim (2009), Monetary Regimes and the Endogeneity of Labour Market Structures – Empirical Evidence from Denmark 1875-2007, *European Review of Economic History*, Vol. 13(2), pp. 199-218. The information on the share of food in private consumption comes from Hansen, Svend Aage (1983), *Økonomisk vækst i Danmark. Bind II: 1914-1983* (Economic growth in Denmark. Volume II: 1914-1983 – in Danish only), Akademisk Forlag; and Statistics Denmark. The information about infant mortality and life expectancy in the infographics is from Statistics Denmark.



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