Chapter 1 – Introduction

Øyvind Eitrheim, Jan T. Klovland and Jan F. Qvigstad [1]

1. Introduction

This book presents historical data on a (small) number of macroeconomic variables relevant to monetary policy analysis for the period 1819-2003. The motivation of the project is to enhance our understanding of the long lines of developments in two areas of utmost importance to central banks - those of fostering price stability and financial stability. Norges Bank aims at stabilizing consumer price inflation at 2.5 per cent within a flexible inflation targeting regime. The promotion of financial stability aims at analyzing and identifying factors that foster sound financial developments through the monitoring of economic developments in the household sector and the corporate sector as well as for banks and other financial intermediaries.

The aim of this study has been to include sufficient macroeconomic variables to sustain the analysis of both price stability and financial stability. Constructing a dataset which covers a long time span enables us to ask questions about the formation of prices in different time epochs and across different economic policy regimes and the evolution of policy institutions, cf. Bordo and Jonung (1987) for a detailed analysis.

The first major prerequisite for a successful empirical research project using historical data is that economic data for the subject matter are available and that the data are of sufficiently high quality. This places some requirements on the accuracy, reliability, coverage and suitability of historical data for the particular application. This fact is often overlooked in practice, maybe because the perceived return on the construction of high-quality data appears to be low. True or not, in this project we hope that the indirect payoff in the form of enthusiastic users of the historical material we present and also the improved quality of the research which is promoted by the availability of these data will greatly outweigh the costs of making the data available to a wider audience. A high quality dataset which covers the period from 1819 to 2003 will provide enhanced understanding of the economic developments across epochs of important changes in Norwegian society.

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2. Why 1819?

This book contains historical monetary statistics widely defined to also include consumer prices, output and asset prices. For many of the macroeconomic variables the time series go back to 1819. The reason that 1819 has been chosen as the main starting year has to do with the fact that a number of main historical developments in Norway took place around the time when the Napoleonic Wars in Europe ended.

In 1814, Norway had been united with Denmark for more than 400 years. The state was strongly centralized, with all important state institutions located in Copenhagen. The Danish King Frederik VI sided with France in the Napoleonic Wars. In 1807 the King had two options, both implying an end to Denmark's strategy of remaining neutral in the conflict: He could either yield to the English demand for control over the Danish/Norwegian fleet to secure their geostrategic interests in Northern Europe, or he could join France and its allies in the sea blockade of England. The English side took by force the Danish/Norwegian fleet in Copenhagen in 1807, undertook the first military terror bombing of civilian targets in Copenhagen and landed close to 30000 troops north of Copenhagen (Feldbæk, 1998, p.314-316). Of the two evils, and having lost the fleet to England, the King decided to join the French side (Feldbæk, 1998, p.318). France offered territorial protection if Denmark took part in the sea blockade of England and supported the French/Russian side in the conflict with Sweden. Sweden, who sided with England in the conflict, had lost Finland to Russia in 1809 and were promised Norway as a compensation and later as a reward for helping Russia during the French invasion in 1812 (Feldbæk, 1998, p.325-329).

France and its allies were finally defeated in 1813 and in January 1814 King Frederik was forced to sign the Treaty of Kiel, ceding Norway to Sweden. This was not immediately accepted by prominent circles in Norway. A Constitutional Assembly was hastily called, and on May 17th a Constitution of an independent Norway was promulgated. Sweden showed some military muscle in order to enforce the Treaty of Kiel, and on November 4th an extraordinary session of the Norwegian Parliament decided to revise the Constitution and accept a union with Sweden, which lasted until 1905. Basic structures of the May 17th Constitution were, however, maintained. Norway was referred to as an independent kingdom united with Sweden under a common king, and it kept all state institutions that characterize an independent state, except the foreign service, which was joint with Sweden. In or shortly after 1814, therefore, Norway established its own Parliament (Stortinget), its own government and central administration, its own Supreme Court (operative from 1815), and its own Central Bank, Norges Bank. In addition, a Norwegian university had been founded by King Frederik in 1811 and was operative from 1813. Concerning monetary policy, the original Constitution of May 1814 listed among the duties of Parliament that it should oversee the monetary system; no reference was made to a Central Bank. The revised Constitution of November 1814, however, explicitly stated that Norway should keep its own Bank and monetary system. Hence the Norwegian Parliament pre-

served its independent legal authority to decide on Norway's monetary system and institutions under the union with Sweden.[2] The Bank was established by the Central Bank Act of 14th June 1816. It took, however, some time before the bank became operational. The first book entries came in 1818. In 1819 the bank was fully operational.

3. A brief overview of the book

Chapter 2 contains an overview of the early work on historical monetary statistics in Norges Bank. Director of the Statistics Department in Norges Bank, Jon P. Holter, started this work in the mid-1990s with a limited aim of improving the rather crude and incomplete consumer price index which had been used since 1978. This index was constructed on the basis of only five goods and used data for every 10th year in the period before 1865. After 1865 the index was spliced with different price indices available from Statistics Norway. Holter's work concentrated on filling in price information for the missing years, based on annual observations of different brands of grain and potatoes. Meat prices were still only observed every 10th year and the intermediate observations were based on (linear) interpolation. The revised index, which covered more items of consumer goods than the previous index, was documented in Holter (1996). After this initial work the scope of the historical project was broadened to cover the main monetary variables which would shed some light on the development in the price index, such as exchange rates (Holter, 1997), monetary aggregates (Holter and Tørum (1999) and the production and circulation of coins (Holter, 2000a). In August 2001 the project was transferred to the Research Department, and in the fall of 2002 the ambitions for the project increased further.[3] The final part of Chapter 2 provides an overview of the development of monetary statistics in Norges Bank, and describes the main principles behind the compilation of monthly tables of monetary statistics which were viewed as necessary for operational purposes.

In Chapter 3 Ola H. Grytten[4] gives an overview of the principles underlying the construction of a new historical *consumer price index* for the period 1516-1871. Grytten has taken up the challenge left by Jon Petter Holter and has constructed a new CPI for Norway, spanning almost five centuries, 1516-2003. The CPI is constructed by splicing existing CPIs from 1871 onwards, with the new CPIs 1516-1819 and 1819-1871. The new indices are, like those they are spliced with, calculated

[2]The increased level of precision in the text of the revised Constitution of November 1814 indicates that the Parliament felt a need to clarify Norway's legal right to an independent monetary system before entering the union with Sweden (NOU 1983:39, p.105-106). The purpose of these clarifications was to avoid a common monetary system and a common central bank with Sweden (Syrstad 2003, p.204), see also Aschehoug (1892, p.384).

[3]Preliminary investigations into the Historical Archive on Prices and Wages at the Norwegian School of Economics and Business Administration, assembled in the 1930s by the School's first rector Professor Ingvar Wedervang, revealed the potential for achieving a significant gain in the quality of the historical consumer price index if we could utilize this material more systematically. See Chapter 3 for a presentation of Professor Wedervang and a more detailed description of these historical archives on prices and wages.

[4]Ola H. Grytten is Professor at the Norwegian School of Economics and Business Administration in Bergen and has been associated with the project since 2002.

according to the Laspeyre formula. This means that annual price movements are weighted by the included item's share of private consumption in the households in the base year. In order to construct this new CPI, most price data are compiled from the Wedervang Archive (see footnote). Information on consumption expenditure weights are taken from research carried out by scholars in economic and social history along with surveys undertaken by the central administration and Statistics Norway. Figures 1 and 2 show the development in consumer prices and annual rates of inflation over the period 1516–2003.

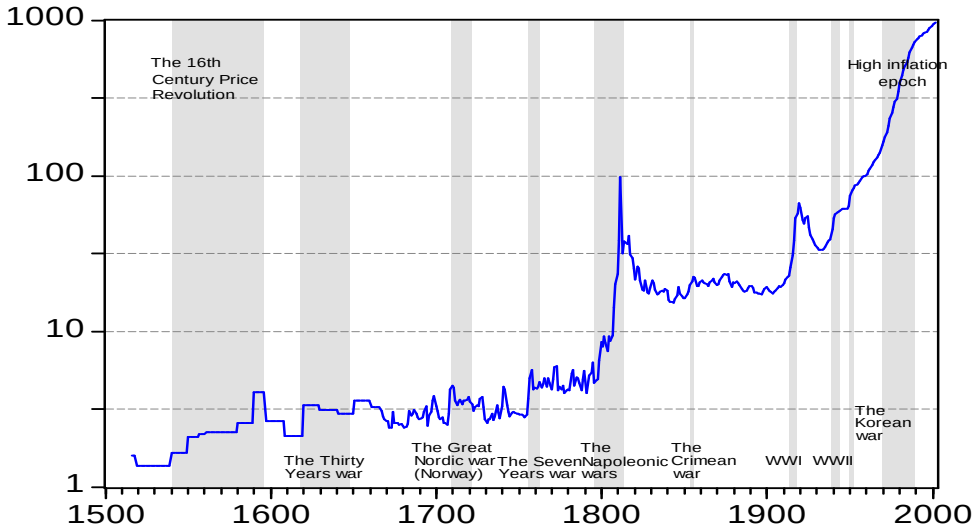

Figure 1: Historical consumer prices 1516–2003. Semi-logarithmic scale. The shaded areas designate periods of war and other periods with high inflation.

In the 16th century prices were increasing but the inflation rate was not so high. Inflation periods are mainly related to wars: The Thirty Years War in Europe (1618-1648), the Great Nordic War (1709-1721), the Seven Years War (1756-1763), the Napoleonic Wars (1796-1814) with hyperinflation, the Crimean War (1854-1856), WWI (1914-18), WWII (1939-45) and The Korean War (1951-1953). A special period is the inflation epoch of the 1970s and the first half of the 1980s. Then we had inflation and no war. We see that for hundreds of years it was normal to have a stable price level with variations around this level and shifts in the price level seem mainly to be associated with periods of war, famine, blockades and/or severe social distress. After WWI there has been a steady rise in the price level.

We had hyperinflation during The Napoleonic Wars, very high inflation after WWI and we observe high inflation in the 1970s and the first half of the 1980s. We observe the highest annual inflation rate in 1812 (152 per cent) and the largest rate of deflation in 1813, when prices fell by 68 per cent.

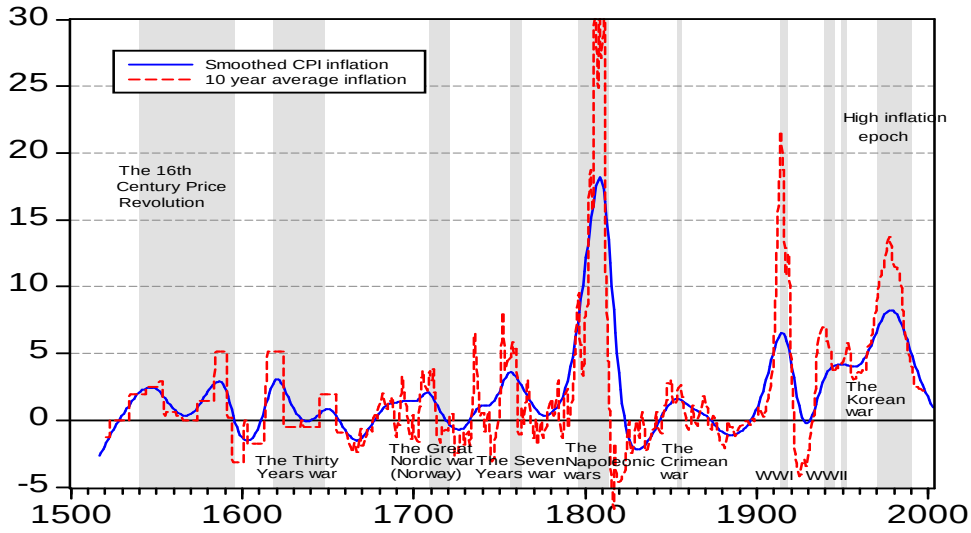

Figure 2: Smoothed rates of annual inflation 1516–2003 (HP-filter with smoothing parameter equal to 1000). The shaded areas designate periods of war and other periods with high inflation.

The longest period of price stability was observed in 1842-1914 when the average inflation rate was 0.6 per cent with a standard deviation of 4.6 percentage points. During this period we had a fixed exchange rate regime with the silver standard (1842-1874) followed by the gold standard (1874-1914). But also the period from 1630 to 1700, when the average inflation rate was 0.3 per cent (with standard deviation 7.5 percentage points), stands out as a period of price stability. However, the last 15 years (1990-2003) have also been a good period for central bankers that like price stability. During this period the average inflation rate has been 2.4 per cent with a standard deviation of 0.9 percentage points.

Is it meaningful to construct such long time series? Let us think of Bach's cello suite (no 1-3) which you can find on a CD from EMI classics. That CD could be purchased for 190 NOK in Oslo in 2003. We can then calculate that this CD would have been priced at 0.75 NOK (75 øre) in 1720 when the music was composed. Is it meaningful to make such calculations? One could perhaps ask the question: What would have been the price of a concert in the Royal Palace (in Copenhagen at that time) with a cellist playing "live"? One would also need to know the weight of live music concerts in the consumption basket of the average consumer in 1720 (not large!) compared to the weight of CDs in the consumer basket of today! When weighting together the different goods in the bundle of consumer goods, we need price data. For meat we had data for cows sold at the market. One would perhaps think it is easy then to find the price of a kilo of meat. But not so. We learned through the

process of making this book that a cow producing milk and meat in 2003 is a very different animal than the cow that produced the same goods 100 years ago. We now know that in the early 19th century the weight of a cow was lower than that of a pig today.

In Chapter 4 Jan T. Klovland presents new empirical evidence on the development in *bond yields* from 1820 to 2003. The first part concentrates on sources and methods for measuring monthly yield data on bonds issued by the Norwegian government (from 1820 onwards), Kongeriket Norges Hypotekbank[5](from 1852 onwards) as well as private bonds in the period after 1921. The bond yield estimates are derived from market quotations for Norwegian bonds traded on the main financial bourses of Northern Europe. Before 1921 the character of the bonds only permits the computation of the average yield on long-term maturities. After 1921, however, the data encompass all maturities along the yield curve, with some gap at the short end in the early years. Figure 3 shows nominal bond yields for the entire period from 1822 to 2003.

Figure 3: Yield (in per cent) on Government bonds March 1822 - December 2003

The average yield in 1819-2003 is 5.1 per cent with a standard deviation of 2.2 per cent. The yield today is 4 1/2 per cent. The highest yield (13.7 per cent) was observed in 1982 and the lowest yield (2.5 per cent) was observed in the late 1940s.

Chapter 5 is also written by Jan T. Klovland and contains a detailed description of data on *monetary aggregates* and key items on the central bank's balance sheet. Historical time series on the stock of

[5]Kongeriket Norges Hypotekbank was established in 1852 as a state bank for mortgage loans.

money and its components for the period extending back to 1819 have not appeared in published form until now, although earlier vintages of the broad money stock estimates have been used in some econometric studies and tabulated in appendices. Most of the time series presented are revised versions of data which first appeared in Klovland (1984a,1984b). Figures 4 and 5 show the levels and growth rates of M0, M2 and notes and coins for the period 1819 - 2003.

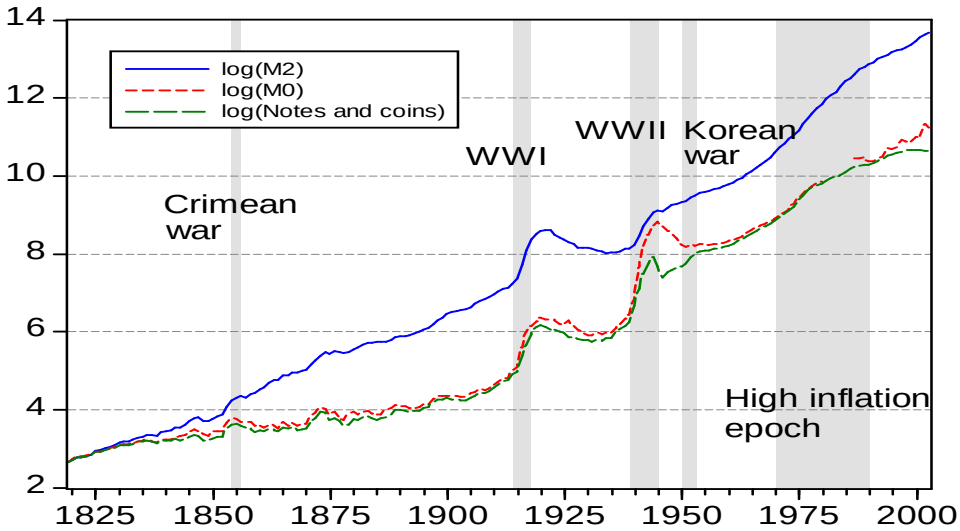

Figure 4: Monetary aggregates 1819–2003. Logarithmic scale.

Chapter 6 is written by Ola H. Grytten and contains a detailed description of sources and data underlying recent calculations of the level of GDP in Norway in the period 1830-1865. These data are combined with Statistics Norway's national accounts data for GDP in Norway from 1865 and revised national accounts 1970 and onwards. Figures 6 and 7 show the development in levels and five-year average annual growth rates of GDP (million NOK in 2000-prices).

The average annual growth of GDP during the entire period 1830-2003 was 2.9 per cent. Growth rates in sub-periods were 2.4 per cent (1830-1870), 2.1 per cent (1870-1914) and 2.5 per cent (1914-1945). Then we had the period of high growth 1945-1970 when the annual average growth rate was 5 per cent. In the most recent period 1970-2003 the growth rate was 3.4 per cent. The highest annual growth rate was 17.1 per cent in 1919; the largest annual decrease was 9.7 per cent in 1921. Note that these episodes cannot be read from Figure 7 which shows five-year average growth rates. The fall in GDP in 1921 is comparable to that of Finland in 1991/92 (-10 per cent), Korea in 1998 (-7 per cent) and Argentina in 2002 (-11 per cent).

In Chapter 7 Jan T. Klovland gives an overview of sources and data for *exchange rates* quoted on

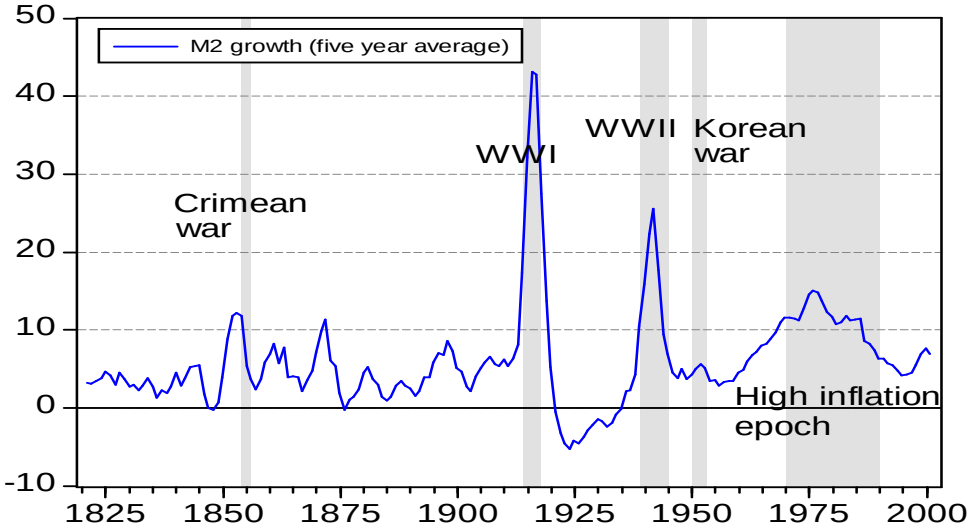

Figure 5: Monetary aggregates 1819–2003. Average annual growth rates over five years.

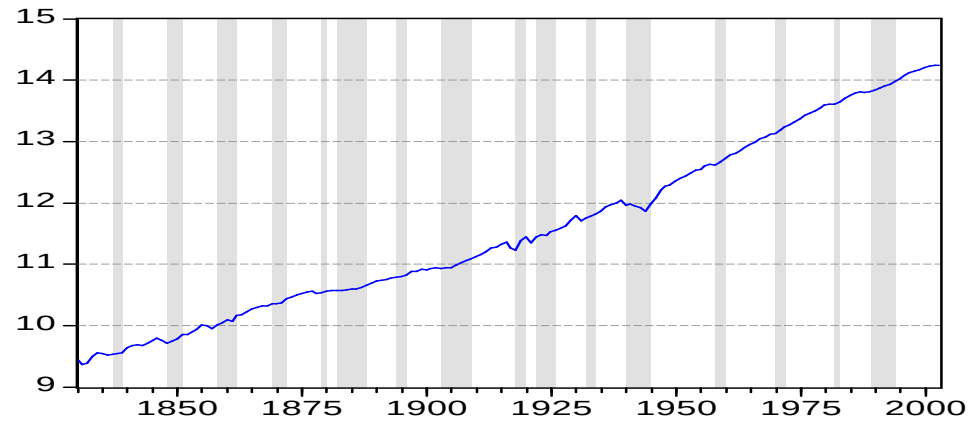

Figure 6: The gross domestic product of Norway 1830–2003 (million NOK in 2000-prices). Logarithmic scale. Shaded areas designate recession periods.

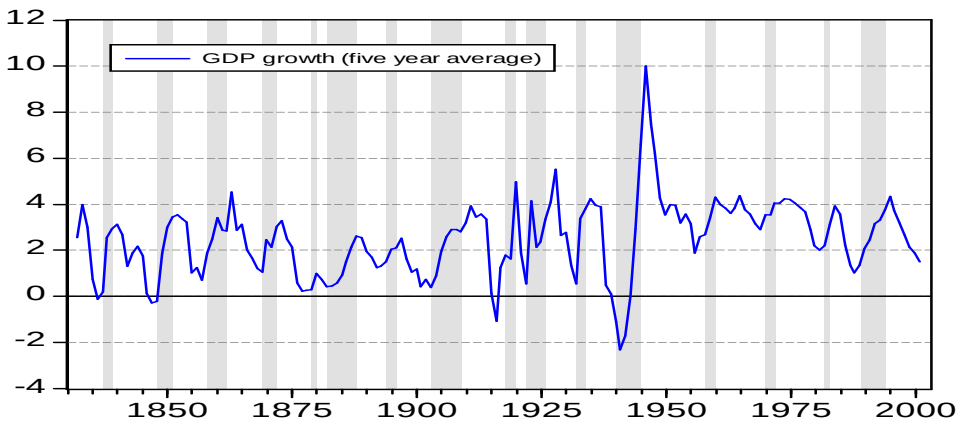

Figure 7: The gross domestic product of Norway 1830–2003. Average annual growth rates of five-year periods. Shaded areas designate recession periods.

the Christiania Stock Exchange since 1819. Monthly quotations are recorded for the most important exchange rates over the 185-year period from 1819 to 2003. In the first decades the most active markets were generally the "long" bill of exchange (time bills). At the end of the 1850s the prices of "short" bills of exchange, which were payable at sight (*a vista*), became the standard market quotation for bills in London and Hamburg. Chapter 7 shows how the recorded prices of time bills must be corrected for the interest component in order to derive a consistent (short) exchange rate series. Figure 8 shows monthly quotations of nominal exchange rates for the British pound and US dollar from 1819 to 2003.

The first years after the establishment of Norges Bank and introduction of our own currency, there were large fluctuations in the exchange rate. In 1823 the Government and Norges Bank decided to re-establish the silver parity. It took 19 years to achieve this target (1842). Norway adopted the gold standard in 1874 and this regime lasted until WWI broke out in 1914. We note from Figure 8 the remarkable stability in the price of the British pound between 1842 and 1914. During the gold standard era from the early 1870s the British pound was the key exchange rate of the international monetary system. After WWII the Bretton Woods System was established with the US dollar as the core medium of exchange.

Chapter 8 is written by Jan T. Klovland and gives an overview of sources and data for *stock exchange indices* quoted on the Oslo Stock Exchange (OSE) since 1914. The material consists of the available stock market indices (with the addition of two months in 1940). The main purpose of this chapter is to present time series without level breaks for the entire period after 1914. It should also be noted that price quotations for shares traded on the Christiania Stock Exchange exist back to 1881. It is thus

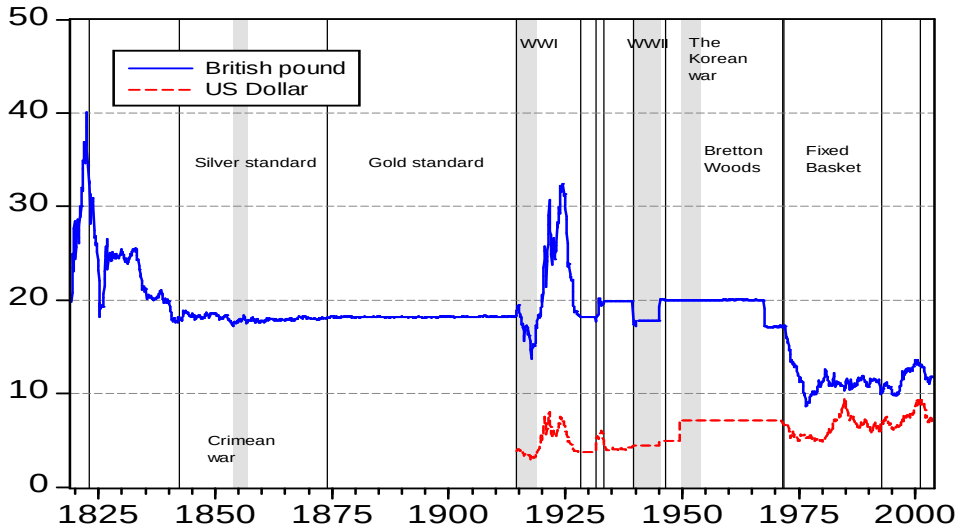

Figure 8: Nominal exchange rates April 1819 - December 2003. Kroner per British pound and kroner per US dollar.

possible to extend the existing indices backward from 1914, but this task is left for future research. Figure 9 shows the monthly development in three stock price indices from September 1914 - July 2001.

In Chapter 9 Øyvind Eitrheim and Solveig Erlandsen[6] present long runs of historical *house price indices* for the four Norwegian cities Oslo, Bergen, Trondheim and Kristiansand, as well as an aggregated house price index from 1819 to 2003. The house price indices for the period 1819 to 1985 are estimated on the basis of nominal transaction prices of real property, compiled from the property registers of the four cities, using the repeat sales method. The new house price indices are spliced with existing house price indices from 1986. Figure 10 shows the development in the aggregate repeat sales house price index. The shaded areas indicate periods with strong growth in nominal house prices. The credit-fuelled boom-to-bust development in house prices in the 1980s and early 1990s is still fresh in mind. However, as Figure 10 shows there were also episodes with strong growth in house prices in the 19th century. For those who visit Oslo and walk around downtown, it is easy to recognize the buildings that were built during the boom period in the 1890s and which ended abruptly in 1899 with the Christiania-crash (see also Chapter 10). Not much new construction of housing was done in Oslo again until WWI.

Chapter 10 is written by Øyvind Eitrheim, Karsten Gerdrup and Jan T. Klovland. This chapter

[6] Solveig Erlandsen is a research officer in the Research Department in Norges Bank.

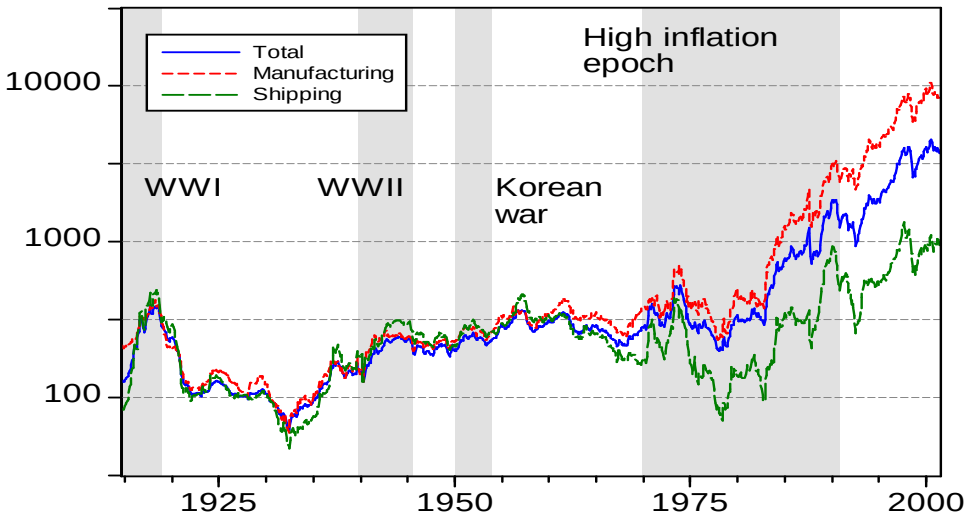

Figure 9: Stock price indices September 1914 - July 2001. Semi-logarithmic scale.

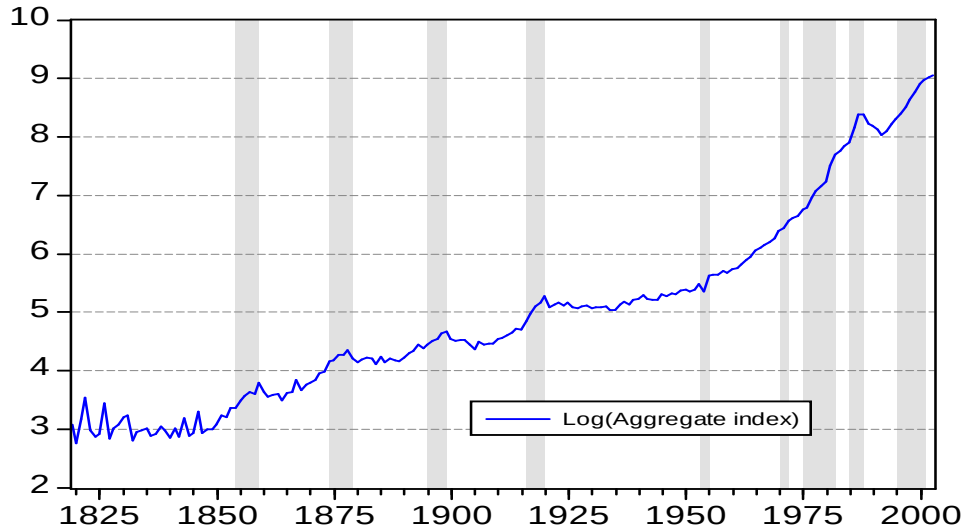

Figure 10: House price indices 1819–2003 (1912=100). Logarithmic scale. The shaded areas designate periods with strong growth in nominal house prices.

gives an overview of sources and data for the credit granted by savings banks and commercial banks from 1840 to 2003. Prior to 1840 the bulk of credit granted to the non-financial private sector came from Norges Bank. The central bank's share of total lending was 82 per cent in 1840. This share fell thereafter as Norges Bank gradually evolved into a more typical central bank in the sense that extension of short-term loans and the use of the discount rate as a monetary policy instrument became more important. Figure 11 shows the development in commercial bank and savings bank lending from 1819 to 2003. We see that bank lending from savings banks and commercial banks tend to show strong growth rates during wars. We also see the credit-financed housing bubble in Oslo in 1899. The large lending in the 1850s is mainly related to the start-up of commercial banking in Norway. Figure 12 shows the annual growth rate of total credit to the general public from 1900 to 2003.

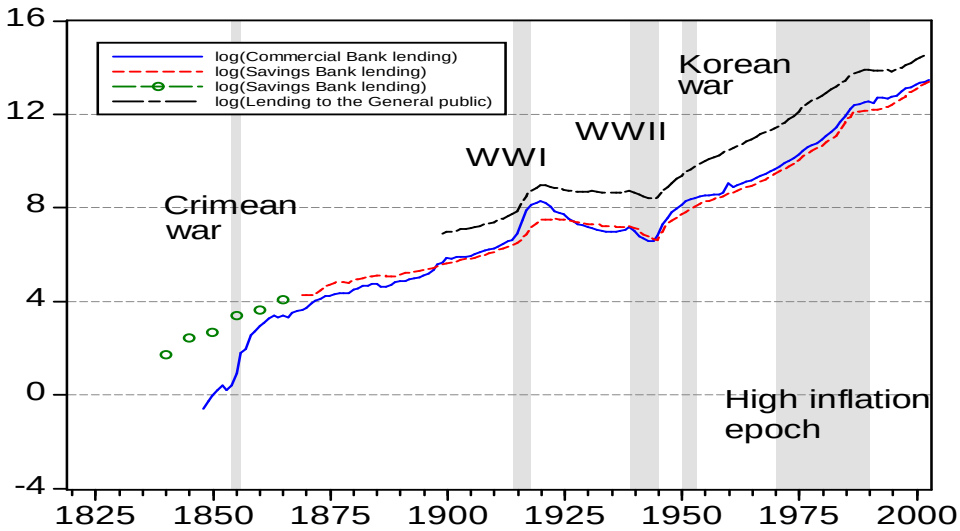

Figure 11: Commercial bank and savings bank lending 1819-2003. Logarithmic scale.

Figure 13 shows the structure of bank lending from 1840 to 1990. We have made extensive use of the material collected by Matre (1992a,1992b) and we also draw on the work reported in Gerdrup (2003). Developments in the banking sector have some interesting implications for developments in the velocity of money. Bordo and Jonung (1987) show that many countries, Norway included, experienced a sharp drop in the velocity of money in the period from 1870 to 1914. Later in the 20th century the fall in velocity was reversed in many countries which led to a U-shaped pattern for the long run trends in velocity. Main monetary developments are summarized in Chapter 10 where we draw heavily on the historical time series described in previous chapters.

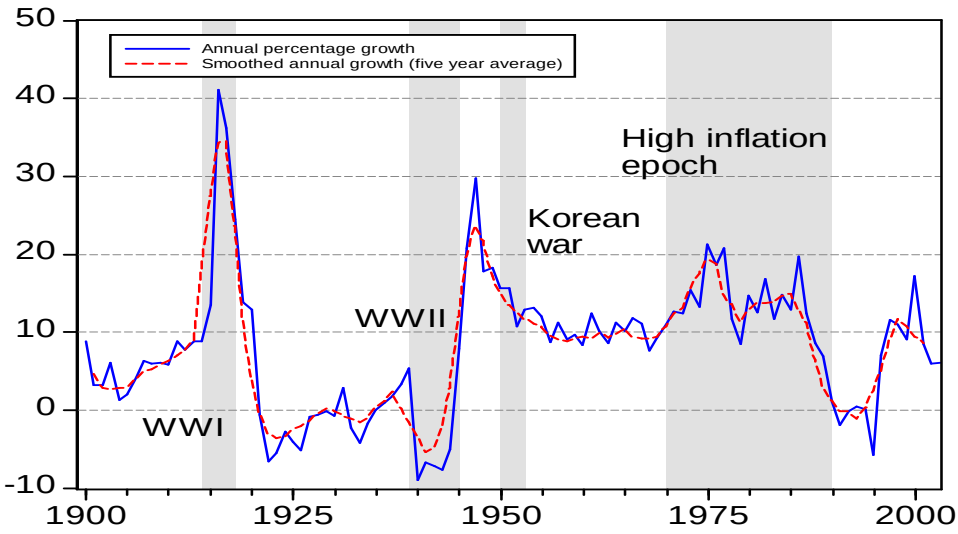

Figure 12: Total credit to the general public 1900-2003. Average annual growth rates.

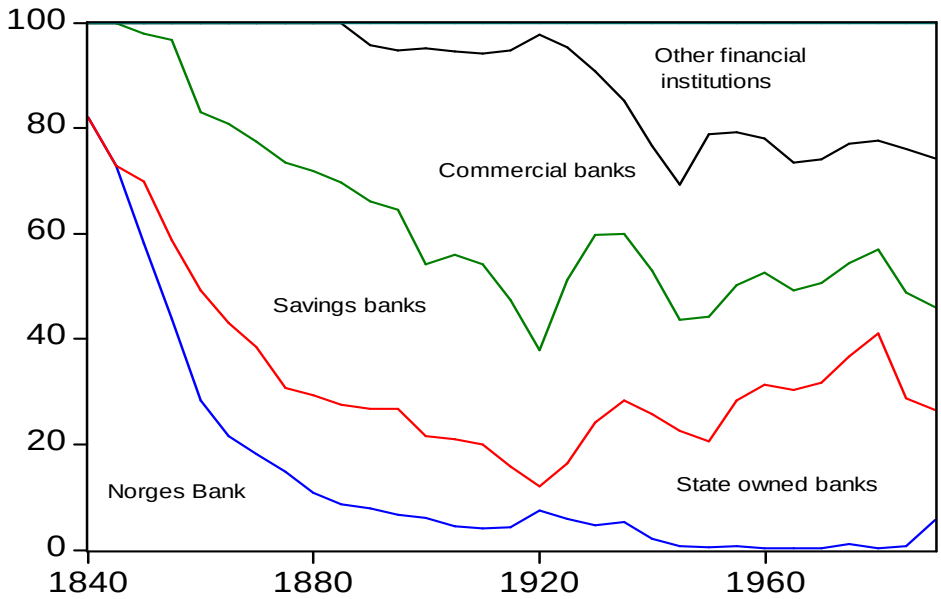

Figure 13: Credit institutions' lending at the end of each decade 1840–1990 (as percentage of total lending).

4. A bird's eye perspective on the data

The aim of this book is to present historical data for monetary variables which can contribute to our understanding of long run economic developments of economic variables such as GDP, and the rate of inflation. To reiterate a point made earlier in this introduction, the focus of the project has been to construct long time series for a limited number of macroeconomic variables. The selected variables are considered to be of central importance in the areas of price stability and financial stability. We hope that increased availability of historical data will stimulate further research and analysis in these areas. In the writing of this book we have deliberately resisted the temptation to start analyzing the data. Instead we have maintained a strong focus on the data themselves and the principles behind their construction. We hope that the readers find that the material is presented in a sufficiently clear manner and in appropriate length to allow a thorough evaluation of the validity and reliability of the data.

As an introduction to further analysis of the data collected in this book, and admittedly, also to fulfill some of our desire to look at some properties of these data in a more analytical context, we will wrap up this introduction with a list of questions and issues which illustrate some potential areas for future work. The list of questions is not complete and the approach we take here relies on simplistic eyeball techniques rather than rigorous analysis, so be aware. Among the indicators we present in the following are the level of real interest rates, measures of cyclical developments in economic activity, i.e., the output gap, as well as real exchange rates, the velocity of money and real house prices. In each case we combine data presented in different chapters of the book, and we start out by focusing on the developments in the real interest rate over a period of more than 180 years.

4.1. What is the historical real interest rate?

Figure 14 shows a smoothed measure of the annual inflation rate based on the consumer price index presented in Chapter 3 and a corresponding *ex post* real rate of interest based on the bond yields in Chapter 4.[7] To help smooth the inflation series we have used a two-sided Hodrick-Prescott filter with smoothing parameter $\lambda = 1000$.

One answer to the question asked in this subsection is that the average real interest rate over the period 1822 to 2003 is 2.2 per cent. If we split into sub-periods, we find the average real interest rate to be 5.4 per cent in 1822-1842, 3.1 per cent in 1842-1914, 0.4 per cent in 1914-1945, -0.5 per cent in 1945-1970, -2.0 per cent in 1970-1985 and 5.1 per cent in 1985-2003. The lowest real rate of interest was observed during WWI. We also had a period of low real rates of interest during and after WWII, and especially in the first half of the 1970s. In the inter-war period and from the late

[7] Note that the interest rate in the early part of the sample refers to bonds with fixed silver value. See Chapter 4 in this book for details.

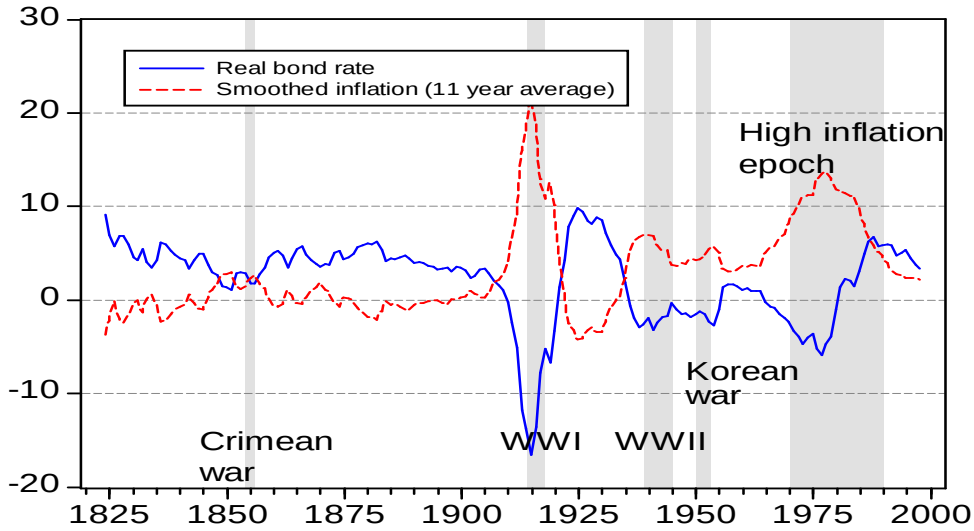

Figure 14: Real bond rates and smoothed inflation 1822–2003

1980s the real rates have been quite high.

4.2. What is the historical output gap?

The output gap is a measure of the deviation between the actual output level and the steady state output level denoted as the GDP potential. Figure 15 shows the difference between the (log of) the GDP potential and the (log of) the actual GDP level. The GDP potential cannot be observed and numerous methods have been proposed in the literature regarding how to measure it. We use a simple detrending method where we apply a two-sided Hodrick-Prescott filter with smoothing parameter $\lambda = 100$. The detrending is based on the (log of) real GDP for the entire period 1830-2003.

The lowest capacity utilization in the economy was observed during WWII. We see that other periods of low capacity utilization ("bad times") were

- 1848-1851 (-5 per cent). This is the period when the Irish emigrated to the USA. An agricultural crisis was followed by a more general commercial crisis.
- 1882-1888 (-2.5 per cent). In the UK at that time this period was called the Great depression. In Norway there was a large emigration flow to America and bank crises.
- 1903-1909 (-3.4 per cent). This period is associated with repercussions from the housing crisis

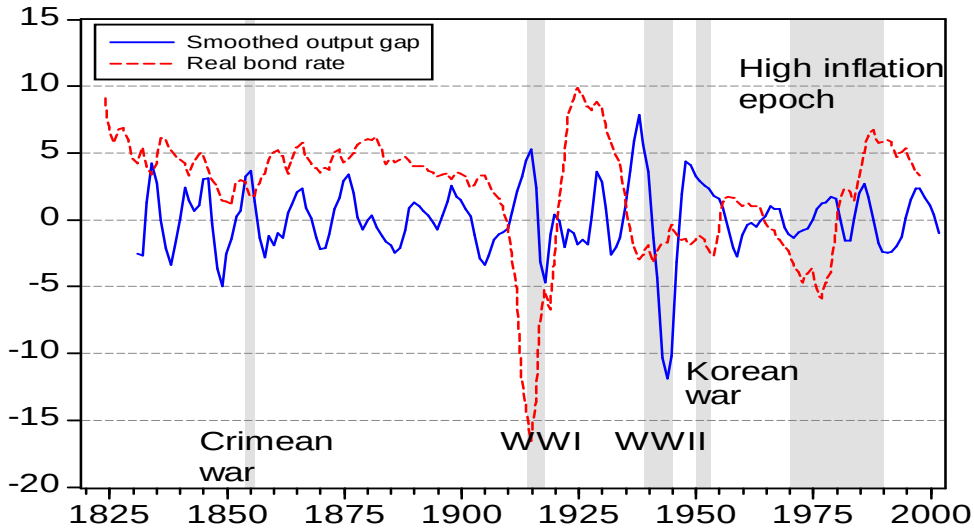

Figure 15: Real interest rates and output gaps 1830–2003

in Christiania, as Oslo was called at that time, in 1899.

- 1958-1959 (-2.8 per cent). International recession was aggravated by an unintentional tax tightening in connection with a tax reform.
- 1989-1994 (-2.4 per cent). Repercussions from the boom-to-bust cycle of the 1980s as well as the overly tight monetary policy following German reunification in 1991.

We note that the "hard 1930s" are not on this "short list" of bad times.

4.3. What is the historical real exchange rate?

Is there a relationship between the development in prices and the nominal exchange rate in the long run? The real exchange rate is computed as

$$R = \frac{S \cdot P_{UK}}{P_{NOR}}$$

where S is the nominal spot exchange rate and P_{NOR} and P_{UK} are price indices for Norway and the United Kingdom, respectively. For Norway we use the consumer price index presented in Chapter 3. For Britain the cost of living indices for the century before WWI have been spliced with the official cost of living or consumer prices index after 1914, see Chapter 7 for details. Figure 16 shows the

nominal and real exchange rates of the Norwegian speciedaler and krone against the British pound over the 185 years from 1819 to 2003.

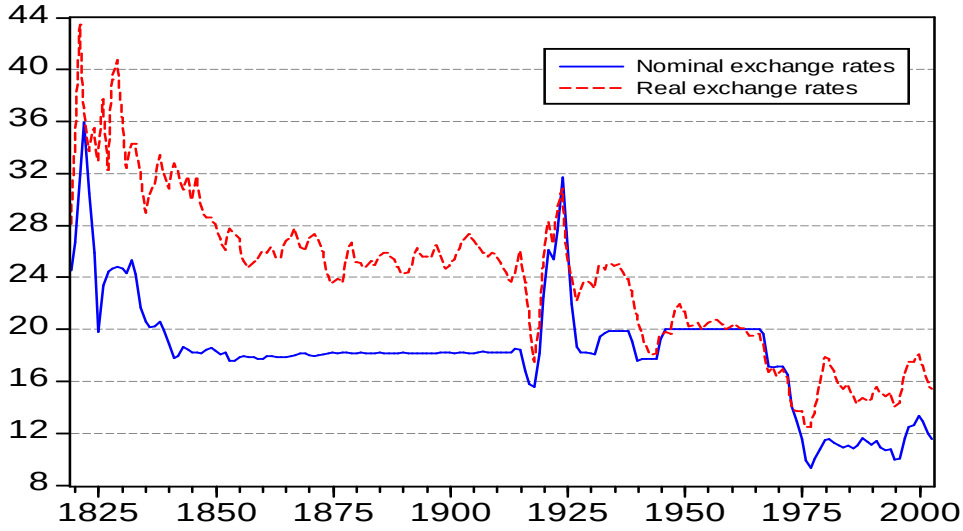

Figure 16: Nominal and real exchange rates against the British pound 1819 - 2003

4.4. What is the historical velocity of money?

Is there a relationship between the price level and the level of the money stock in the long run? This is perhaps most succinctly stated in the monetarist view of inflation — that inflation is always and everywhere a monetary phenomenon (Friedman (1963) p.17).

The velocity of money is derived from the "equation of exchange" identity associated with the quantity theory of money which goes back to Fisher (1911). We can express the velocity of money as

$$V = \frac{CPI \cdot GDP}{M2}$$

When calculating the velocity of money we use as a proxy for the scale variable the historical *GDP* series presented in Chapter 6 multiplied by the consumer price index (*CPI*) presented in Chapter 3. These data are combined with the data on the stock of broad money, *M*2, presented in Chapter 5, into a measure of the velocity of money.

The resulting velocity series is shown in Figure 17. We note that during the period of strong growth in the banking sector the amount of money in the economy grew much faster than nominal output, thus the velocity of money fell substantially over a prolonged period of almost 100 years. The declining

share of currency in *M*2 has been included as a measure of financial sophistication in previous velocity studies, cf. Figure 17. Figure 18 reveals that as the number of banks seems to be almost perfectly negatively correlated with velocity prior to 1920, indicating increased monetization, the stagnation and subsequent decline in the number of banks in the post-WWII period is a less likely explanation of velocity behaviour in this period. We see, however, that the currency-money ratio seems to pick up a similar effect as hypothesized by Bordo and Jonung (1987) and Siklos (1993), giving some support to the view that velocity behaviour depends on the maturity and degree of sophistication of the financial sector.

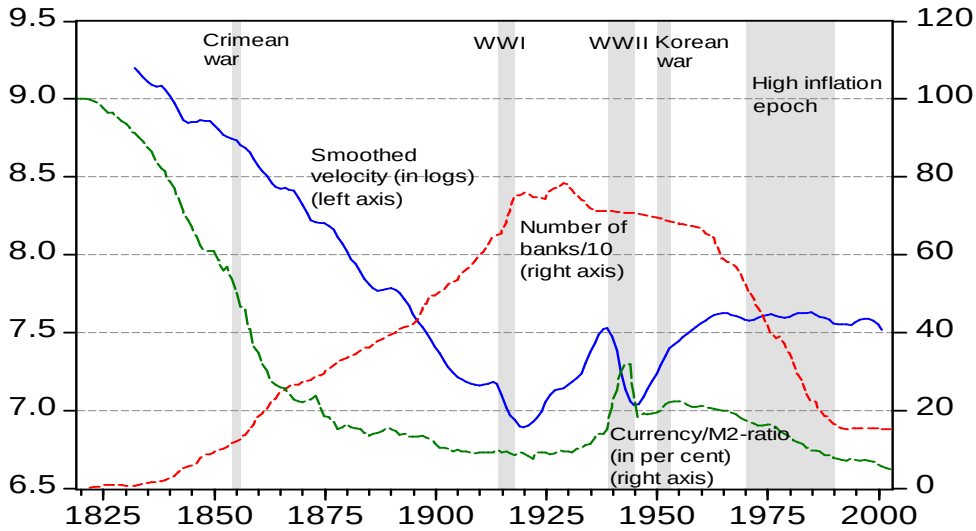

Figure 17: The velocity of money 1830–2003, the number of banks and the share of currency (notes and coins) in M2.

During the first 100 years of this period we see that a farmers' and fishermen's society based on a barter economy is slowly transformed into a modern society with money and banks (the dotted line). We also see that money, which in the beginning meant cash, gradually is transformed into bank deposits (the dashed line). Money today consists only of 7 per cent cash, the rest is bank money. The dotted line shows that the number of banks today is back to the level of 1860.

From the quantity equation we can also see that as long as the velocity of money is relatively constant, the price level is proportional to the stock of money scaled with the level of economic activity, i.e., *CPI* is proportional to $M2/GDP$. In Figure 18 we have plotted *CPI* against $M2/GDP$, setting both indices to 100 in 1960. The constant velocity over the last 50 years is reflected in the close mapping of the two indices over this period. So, if we disregard the first hundred years, when the Norwegian society was introduced to money and finance, we observe a very close link between the

development of the *CPI* and the ratio of the money stock *M*2 to *GDP*. This relationship does not, however, say anything about the causality or third factors that influence both money and prices.

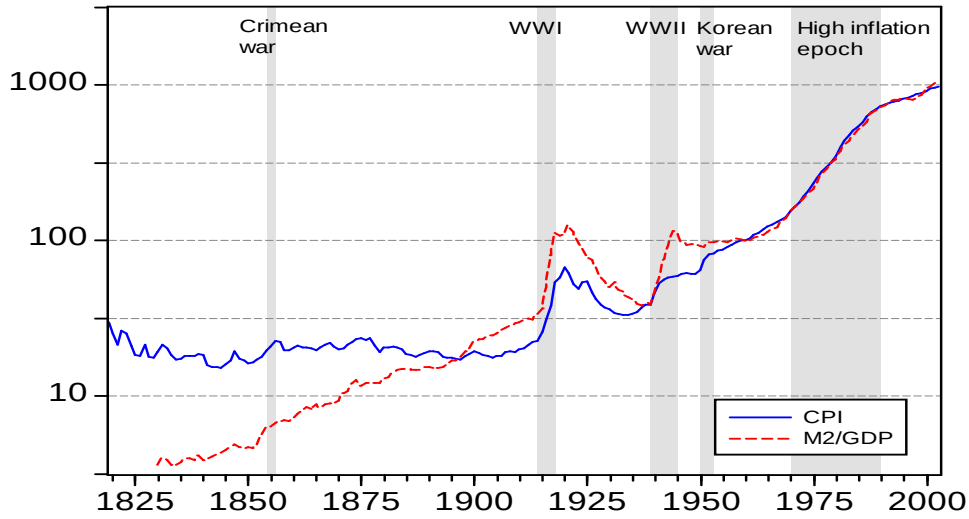

Figure 18: The price level *CPI* and the stock of money scaled with the level of economic activity, $M2/GDP$. 1960=100

4.5. What is the historical equivalent of a Taylor rule?

In Figure 19 below we have done something really courageous. We have calculated what the interest rate would have been according to a simple interest rate rule of the type suggested in Taylor (1993), hereafter dubbed a Taylor-rule. The Taylor rule can be expressed as

$$i_t = r^* + \pi^* + 1.5(\pi - \pi^*) + 0.5(y_t - y_t^*), \tag{1}$$

where r^*, π^*, π_t, y_t and y^* are the equilibrium real interest rate, the inflation target, the current rate of inflation, production (GDP) and trend-GDP respectively. As an approximation we let the equilibrium real rate of interest vary between the different sub-periods for which we presented sample averages above. Hence, we assume that r^* takes the values 5.4 per cent (1830-1842), 3.1 per cent (1842-1914), 0.4 per cent (1914-1945), 0 per cent (1945-1985) and 3.5 per cent (1985-2003).[8] The inflation target, π^*, has been set at 0 per cent in the period 1819-1914, and 2.5 per cent thereafter except during the high inflation period 1970-1985 when we have set the inflation target to 5 per cent.

[8]For the sub-periods 1945-1970 and 1970-1985 where we found negative average real interest rates we have set the equilibrium rate to 0

There are a number of caveats with this type of counterfactual calculations. One is that during the silver standard and gold standard periods, i.e., from 1842 to 1914, the prevailing exchange rate regime would in fact be inconsistent with interest rates following a Taylor-rule, hence the calculations have less relevance for this period. A second caveat is that our use of the bond yield does not take into account movements in the yield curve, thus we make the short-cut of equating short-term and long-term interest rates. This being said, with a Taylor interest rate as a reference one would say that monetary policy was more or less in place during the nineteenth century, except during 1870s when it was somewhat tight. On the other hand monetary policy was not tight enough during WWI, too tight in the 1920s and the beginning of the 1930s, and not tight enough in the 1970s. But this analysis is of course much too crude and rudimentary. John Taylor came up with his analysis of simple representations of the reaction function of the central bank in the early 1990s and, although there are links between modern theory of monetary policy and the work of Wicksell on the natural level of interest rates, this illustration is just meant as an appetizer for further studies.

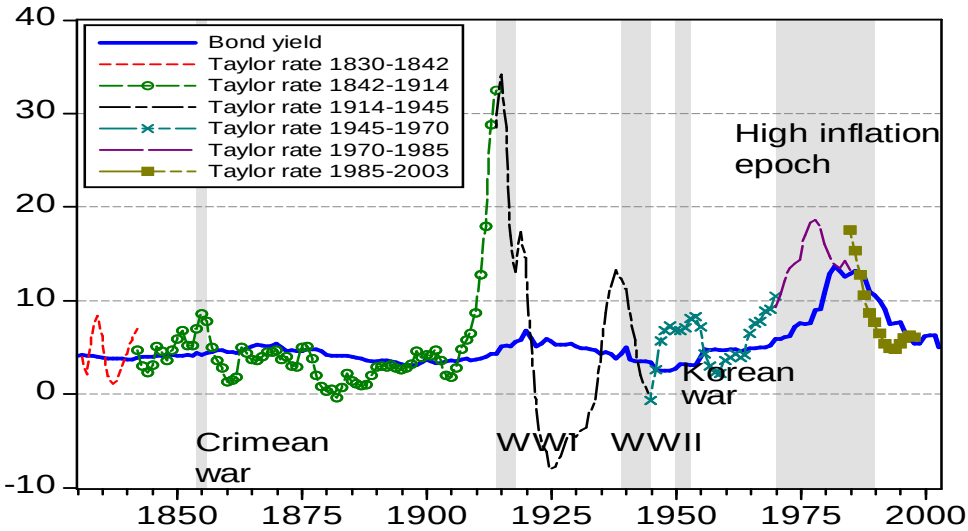

Figure 19: Nominal bond interest rate and calculated Taylor interest rates 1830–2003

4.6. What is the bond premium for an embryonic nation?

We take an emerging market view and compare bond yields for Norwegian government bonds with yields on UK consols from 1819 to 1914 to get an idea about the premium facing the Norwegian government when raising capital in foreign markets in the 19th century and until World War I. Figure 20 shows the spread (in basis points) between the government bond yields and UK consol yields using annual data. The UK consol yield data are from Mitchell (1971). The decline in the spread

in the 1820s and early 1830s may indicate embryonic costs of lending in the early period covered by our data. Such costs may be of a considerable size initially, but are expected to be reduced as time passes. As shown in Chapter 4, however, the Norwegian government issued primarily its debt in Hamburg banco in this period and the increase in the spread against UK consol yields in the mid-19th century also reflects the fact that German interest rates were higher than in the UK.

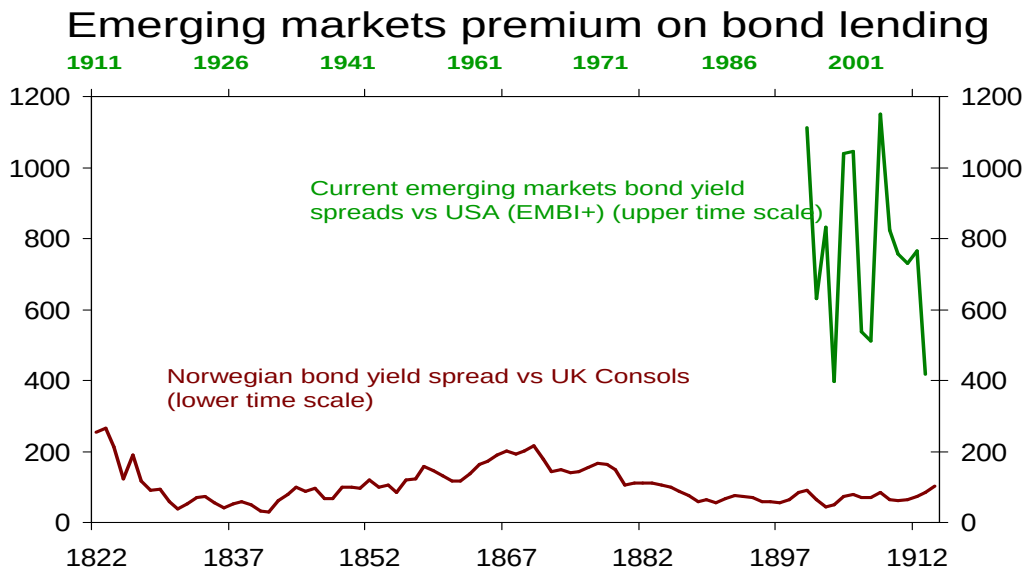

Figure 20: Bond yield spread vs UK Consols (basis points) 1819-1914

Norway borrowed abroad in 1820. The government bonds were traded at a premium of 250 basis points above the best rate obtained by other borrowers in the international capital market. But the Kingdom of Norway very soon became a respected borrower on the international market. The market premium the Kingdom of Norway had to pay is by today's standard surprisingly low. We see that emerging markets have to pay premiums of quite a different magnitude. The fiscal budget of the government in Norway was kept in order. Government expenditure had to be met by government income.

4.7. What is the real house price development?

Figure 21 shows the development in a real house price index for Norway from 1819 to 2003. The repeat sale indices in Chapter 9 are deflated by the consumer price index from Chapter 3 and normalized such that 1912=100.

Figure 21 puts the boom and bust of house price developments in the 1890s in perspective. The

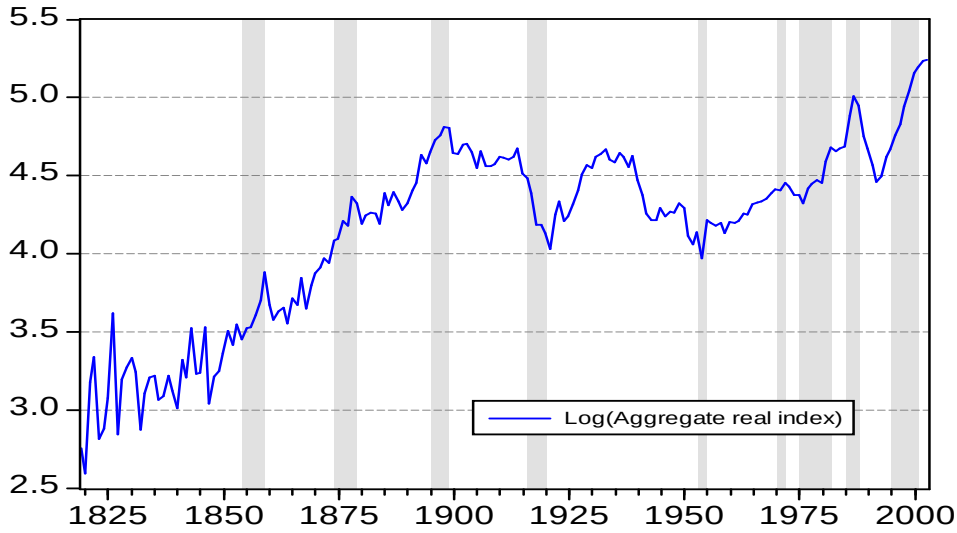

Figure 21: Aggregate real house price index 1819–2003 (1912=100). Logarithmic scale. The shaded areas designate periods with high growth in nominal house prices.

investor who bought a house in 1899 did not get his real money back until the mid-1980s. The figure also indicates that the timing of entering the housing market is important.

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