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OPTING OUT OF THE GREAT INFLATION: GERMAN MONETARY POLICY AFTER BRETTON WOODS.

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Abstract: The Bundesbank established its reputation, among the most successful central banks in the world, during the turbulent 70s. Germany achieved a high degree of domestic stability and provided a safe haven for investors in the international financial system in times of turmoil. The Bundesbank provided the role model for the European Central Bank. This paper will investigate what features of the monetary policy strategy of the Bundesbank most contributed to their success. It will examine the relation between strategic goals and the actual conduct of monetary policy in real time. It will compare the strategy and conduct of policy, by the Bundesbank, with those followed by other industrialized countries (Canada, France, Italy, Japan, the UK and the US). And, finally, it will try to draw useful lessons for modern central banking.

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1. Introduction.

2. Brief overview of inflation developments in selected industrial countries in the period 1959-1998.

In the second half of the twentieth century, the German Bundesbank and the Swiss National Bank acquired a reputation for their ability to maintain the value of the currency. In other words, they acquired a reputation for maintaining lower inflation than other countries could. In this section, however, we will have a first look at the relevant facts. We will compare inflation in Germany and Switzerland with a number of other industrial countries: Canada, France, Italy, Japan, the UK and the US. The eight countries considered are, therefore, the G-7 plus Switzerland.

The first part of the period covered, from 1959 to 1970, corresponds to the convertible phase of the Bretton Woods International Monetary Regime. The beginning of this stage is marked by the transition to a regime of convertibility, for current account transactions, by most Western European Countries, in December 1958. The Bretton Woods system involved the fixing of a par value for each currency in terms of gold. Hence, it was intended as a kind of gold standard. The idea of the framers of the system was to reconcile positive aspects of the classical gold standard (for example exchange rate stability, intense international trade) with autonomous national macroeconomic policies. The idea was that currency convertibility would be expected only for current account transactions (capital controls were accepted) and that exchange rates would be fixed but adjustable (in the face of fundamental disequilibria). According to Peter Garber (1993): "The collapse of the Bretton Woods system of fixed exchange rates was one of the most accurately and generally predicted of major economic events." The intuition is that there are intrinsic elements of internal tension in any gold exchange standard. Bordo (1993) categorizes the problems under the heading adjustment, liquidity and confidence. One aspect is known as the Triffin (1960) dilemma. The system relied on the convertibility of the US dollar into gold. On the other hand it required the availability of US dollars as liquidity. The latter required US balance of payment deficits thereby undermining (the former) convertibility of the US dollar.

The most symbolic moment was, perhaps, the suspension of the convertibility of the dollar into gold, in August 1971. The system collapses completely into a system of generalized floating in 1973. With the collapse of the last operational link to gold, the age of commodity standard was over.

According to one very well-known folk theorem of international monetary economics there is an impossible trinity. It is not possible to have simultaneously fixed exchange rates, freedom of movement of financial capital and autonomous monetary policy. As mentioned above the Bretton Woods regime allowed for capital controls. Nevertheless, over time, in the context of full convertibility for current account transactions, the effectiveness of capital controls was gradually diminishing. The Bundesbank was vividly aware of the constraint that participation in the Bretton Woods systems imposed on its ability to pursue domestic price stability. During the period 1959-1973 the DM was re-valued three times against the US dollar (1961, 1969 and 1971)[1].

In the period 1960-1998, German inflation, measured in accordance with the Consumer Price Index, was, on average, 3.1 per cent per year (with a standard deviation of 1.8 percentage points). During this period German inflation was the lowest and most stable, as recorded

[1] There were also short episodes of floating.

internationally (see Table 1).Only Switzerland came close with an average inflation rate of 3.3 per cent (and a standard deviation of 2.3 percentage points). Interestingly the correlation between the inflation series in the two countries was high (with a simple correlation coefficient of 0.83). These results compare with the US that recorded an inflation rate of 4.4 per cent, on average per year, with a standard deviation of 2.9 percentage points. In our sample of eight countries inflation was highest and most volatile in Italy with, respectively, 7.4 per cent and 5.4 percentage points for annual inflation and for its standard deviation. After the full period the Deutsche Mark (DM) had retained about 30 per cent of its original value, compared with less than 20 per cent for the US dollar, the Canadian dollar and the Japanese Yen, about 13 per cent for the French Franc, about 8.5 per cent for the Pound Sterling and only about 6 per cent for the Italian Lira (see Table 2.1). The superior performance in terms of price stability is shared, in general, by all nominal variables including short and long interest rates and nominal GDP.

It is interesting (and instructive) to recall that, in the context of the Bretton Woods system, during the 60s, inflation was actually higher in Germany and Switzerland than in the US. Specifically the ten-year average was, respectively, 2.4 and 3.1 per cent, in Germany and Switzerland while it was 2.3 per cent, in the US (Canada was very close with an inflation rate of 2.5 per cent). Nevertheless, in the UK, France, Italy inflation was, on average above 3 per cent and in Japan above 5 per cent. However, using an average for the sixties can be misleading. In the last years of the sixties, prices were accelerating in the US with inflation at 2.8 per cent in 1967, 4.2 per cent in 1968, 5.4 per cent in 1969 and 5.9 per cent in 1970. The corresponding numbers for Germany were 1.6, 1.6, 1.9 and 3.4 per cent.

The differences are most marking in the start of the period of floating exchange rates. In fact, in the period 1974-1982 prices increased 42 per cent in Switzerland and 46 per cent in Germany (with average annual rates of, respectively, 4.5 and 4.8 per cent). In the same period of eight years prices almost doubled in the US (annual average inflation rate of 9 per cent). The differences persisted in the subsequent disinflation. In the longer period 1974-1989 (the year of the fall of the Berlin Wall) prices increased 72 per cent in Germany and 75 per cent in Switzerland (with average annual rates of, respectively, 3.5 and 3.6 per cent). In the same longer period prices increased 181 per cent in the US (corresponding to an annual average rate of 6.7 per cent).

The relative performance of Germany and Switzerland becomes even more impressive when widening the set of comparators. In fact in our sample of eight countries, the US ranks third in terms of average inflation and inflation volatility. It is in the 70s and the 80s that Germany and Switzerland showed their superior nominal stability. Only in Germany and Switzerland did inflation peak at single digit levels. Italy and the UK recorded two-digit ten-year averages in the 70s. Italy did so in the 80s as well. Table 1 shows that the same comparison applies to the volatility of inflation[2]. In contrast, the behavior of real variables did not diverge significantly among countries during the same period.

To avoid the accusation of omitting most relevant facts let us refer the most frequent explanation of the Great Inflation. Our summary follows loosely Bruno and Sachs (1985). According to this explanation the key factor behind the acceleration of prices was the oil price shock[3]. Bruno and Sachs (1985) state (page 7): "A clear and central villain of the piece is the

[2] With some qualification for the case of Canada.

[3] Other related references would be Samuelson (1974), Gordon (1975), Blinder (1979), Darby (1982) and Hamilton (1983).

historically unprecedented rise in commodity prices (mainly food and oil) in 1973-74 and again in 1979-80 that not coincidentally accompanied the two great bursts of stagflation." The traditional explanation emphasizes supply shocks and the subsequent demand response. Supply shocks play the role of the initial exogenous impulse followed by endogenous adjustment of the private sector and policy authorities. Barski and Killian (2002, 2004) offer an alternative reading of the facts. According to their account, oil prices, and other commodity prices, should be seen as responding to global supply and demand factors. Specifically, the authors account for the increase in oil prices in 1973 as a delayed adjustment to consistent demand pressure persisting since the late 60s. The adjustment was delayed because during the 60s oil prices were regulated through long term contracts between oil producers and oil companies. In a situation of clear excess demand at the going price, conditions were ripe for OPEC to renege on its contractual agreements with oil companies leading to much higher oil prices. From such a viewpoint, it seems plausible that broad upward trends in commodity prices, the collapse of Bretton Woods and the collapse of the oil market regime were all driven by excess demand growth in the late 60s and the early 70s. This would be compatible, following Barski and Killian, with a broad monetary account of the Great Inflation. Despite our obvious sympathy for such an account, investigating it is beyond the scope of this paper.

To sum up Chart 2.1 and Table 2.1 suggest that it was the response to the inflation surge in the 70s that made most of the difference. The Bundesbank and the SNB did not manage to avoid price acceleration completely – in both countries CPI inflation averaged 4.8 per cent during the 70s – but performed much better than all other industrialized countries.[4] The remainder of the paper is thus devoted to the question: how did Germany avoid the Great Inflation?

[4] The differences would be even more striking if one would consider a wider sample of industrialized countries (see, for example, Frenkel and Goldstein, 1999, who consider 23 countries).

3. Sound money and price stability in Germany.

3.1. The legacy of the Bundesbank and stability-oriented monetary policy.

On 31 December 1998, together with all national central banks joining European Monetary Union, the Deutsche Bundesbank ended its life as a central bank being responsible for conducting monetary policy for its currency. Combining this period with the term of its predecessor, the Bank deutscher Länder, the overall period coincides with the existence of the D-Mark.[5]

The D-Mark developed − together with the Swiss Franc − into the most stable currency in the world after 1945, and the Bundesbank achieved a reputation as a model of a solid, successful central bank. This left a legacy reaching beyond its existence as a central bank responsible for a national currency. The statute of the European Central Bank, enshrined in the Maastricht Treaty, reflects this fact very well. But it is also fair to say that in addition the Bundesbank's track record influenced the world of central banking on a global scale.

This world wide attention was heavily influenced by the fact that Germany (again together with Switzerland) avoided the "Great Inflation" of the 1970s. What explains such a superior ability to approach price stability? In this section we will examine historical, cultural and institutional evidence. In the next section we will characterize quantitatively the conduct of monetary policy by the Bundesbank.

To explain Germany's post Second World War monetary history one has to go back to 1948 and even beyond. The institutional foundation was laid in 1948 by law of the allies – (West) Germany did not yet exist as a state- which gave the Bank deutscher Länder independence from any political authorities.[6] When a few months later the D-Mark was introduced, this institution was entrusted preserving the stability of the new currency.

The currency reform in cooperation with the simultaneous economic reforms of Ludwig Ehrhard laid the foundations of (West) Germany's economic success, the so-called "Wirtschaftswunder" (economic miracle).

As a consequence most Germans for the first time in their life enjoyed a stable currency. This experience had a deep impact on the mind of the German people. The Mark, initially (1873) created as a currency based on gold had ended its existence in the hyperinflation of 1923 which destroyed Germany's civil society.[7] The successor of the Mark, the Reichsmark, created in 1924 ended its short life with the currency reform of 1948. People had again lost most of their wealth invested in nominal assets. No wonder that a strong aversion against inflation and a desire for monetary stability became deeply entrenched in the mind of the

[5] To be precise: The Bank deutscher Länder was established on 1 March 1948. The D-Mark became the currency of (then) West Germany on 21 June 1948. The Bundesbank replaced its predecessor on 26 July 1957.

[6] De jure the Allied Bank Commission could interfere, but never made any use of this prerogative. See Buchheim (1999).

[7] Stefan Zweig (1970), a writer, claims in his memoirs of that time that the experience of this total loss of the value of the currency more than anything else made Germans „ripe for Hitler".

German people![8] It became so entrenched in Germans' expectations, habits and customs that it deserved the special expression "stability culture". It is interesting to stress the virtuous interaction between Germany's stability culture and the independence of the Bundesbank.

A particular historical episode illustrates it emphatically. The German Constitution of 1949 required the Government to prepare the Deutsche Bundesbank law. The Government was prepared to act on this field. It was no secret that then chancellor Konrad Adenauer was not a friend of an independent central bank. However, his clash with the central bank in May 1956 when he criticised in public the increase of the discount rate (from 4.5 to 5.5 percent) – "…the guillotine will hit ordinary citizens…" had already demonstrated to what extend the media and the public, at large, were behind the independence from political interference of the central bank. As a consequence, he lost the battle against the minister of the economy Ludwig Erhard.In the end, the Bundesbank law of 1957 in section 12 stated explicitly that: "In exercising the powers conferred on it by this Act, [the Bundesbank] is independent of instructions from the Federal Government." Together with the mandate in section 3 of "safeguarding the currency" the Bundesbank Act established the institutional fundament for a stability oriented monetary policy. [9]

Notwithstanding the fact that this law could have been changed at any time by a simple majority of the legislative and insofar seemed to be based on shaky legal ground, the reputation of the Bundesbank became such that there was never any serious initiative to change the law. The status of the Bundesbank and the support for its stability oriented monetary policy was firmly grounded on (and, in turn, reinforced) the "stability culture" (see Issing 1993).

At the time of the ratification of the Bundesbank Act there were not only hardly any independent central banks in the world, it is even difficult to find any serious discussion in the literature on the issue of an appropriate institutional arrangement for a central bank. Interest in this topic was mainly triggered by the experience of the "Great Inflation" in the 1970s and the more and more obvious failures of monetary policy in many countries. First publications discussed credibility issues (Barro, Gordon) and the time inconsistency problem (Kydland, Prescott). The outcome of monetary policy depending on the statute − here the degree of independence of the central bank − caused broader attention not before 1990s with a paper by Alesina and Summers.[10]

Since, the number of publications on central bank independence has exploded, discussing all aspects from defining independence, measuring its degree to designing optimal contracts for central bankers. Is it wrong to say that the good performance of the Bundesbank not least in the 1970s has contributed to, if not triggered, this branch of research?

This interest in the topic and the result by more and more research papers has also supported the claim to give independence to the new central bank which still had to be founded, the

[8] It was interesting to see that in the days before the Berlin Wall fell demonstrators in the streets of Leipzig carried posters saying: "If the D-Mark is not coming to us we will come to the D-Mark". So this desire for stability had also affected the mind of East Germans.

[9] It is interesting to note that „safeguarding the currency" initially referred to the „domestic" as well as the „external" value (i.e. the exchange rate) of the currency. Over time the Bundesbank succeeded in obtaining general acceptance of its interpretation of safeguarding the purchasing power of the currency.

[10] See Alesina and Summers (1990). An early paper by Bade and Parkin (1980) was widely ignored and not even published.

European Central Bank. One should not forget that countries signing the Maastricht Treaty at that time (1992) still had not given independence to their own national central banks. Since then "independence" of the central bank has become a model also on a global scale.

In a nutshell the message stemming from experience and theory is: Institutions matter! The outcome of monetary policy is heavily dependent on the institutional design of the central bank.

Another aspect of great importance pertained, the exchange rate regime (see previous section for a brief reference to the Bretton Woods system and some selected references to the relevant literature). For many years the Bundesbank was in favour of a fixed exchange rate of the D-Mark against the US-Dollar. It even argued against the appreciation of the D-Mark in 1961. But more and more the Bundesbank understood that the fixed exchange rate was a constraint for conducting a monetary policy geared towards a domestic goal, namely price stability. (Richter 1999; von Hagen 1999). In a regime of a fixed exchange rate and free capital flows, money growth becomes endogenous and any attempt to withstand the import of inflation is finally self-defeating.

The law of the "uneasy triangle" had been more or less forgotten (Issing 2006). The Bundesbank experienced a period of excessive money growth driven by interventions buying US-Dollars. In the late 1960s and early 1970s the external component of money creation was sometimes even higher than the growth of the monetary base, implying that the internal contribution of money creation was negative. The consequences of this constellation for the institutional design of monetary policy are far reaching: A central bank notwithstanding its independence from political interference, equipped with all the necessary instruments is powerless with respect to pursuing a domestic goal if the exchange rate is fixed and capital flows freely across borders. This fundamentally changed when in March 1973 Germany let its currency float against the US-Dollar. The Bundesbank being relieved from its obligation to intervene in the exchange market could now consider conducting a monetary policy to safeguard the internal stability of its money, i.e. maintaining price stability.

But, what kind of strategy to follow? As it happened this period coincided with the "monetarist counterrevolution." The leading monetarists Milton Friedman, Karl Brunner and Alan Meltzer claimed that central banks should abstain from any attempt to fine-tune the economy and should instead follow a strategy of monetary targeting. (A floating exchange rate was a necessary condition for controlling the money supply.) These ideas in principle found positive reactions in Germany (Richter 1999; von Hagen 1999). The Bundesbank discussed this approach internally and with leading proponents. Helmut Schlesinger, member of the Executive Board and chief economist, had an intensive exchange of views not least when participating in the intellectually influential Konstanz Seminar founded by Karl Brunner in 1970.[11] The resistance against fine-tuning and turning to medium-term orientation of monetary policy was strongly supported also by the German Sachverständigenrat (1974).

However, in spite of the Bundesbank being the first central bank in the world to adopt a monetary target (for the year 1975) the honeymoon with leading monetarists came soon to an end. This process started already when the Bundesbank declared its move to the new strategy

[11] See Fratianni and von Hagen (2001). The authors give a comprehensive survey on subjects discussed and persons attending. The seminar still continues and was chaired for many years by the leading German monetarist Manfred Neumann.

"an experiment", stressed that it would not (and, in the short run, could not) control the monetary base, and over many years missed its monetary target.

The Bundesbank interpreted its approach as a kind of "pragmatic monetarism" and kept to this strategy until 1998 (Baltenspeger 1999, Issing 2005, see also M. Neumann 1997). Not surprisingly this attitude was heavily criticised especially by Karl Brunner (1983). However, in its monetary policy practice the Bundesbank with its strategy was successful in defending the stability of its currency- if not in absolute terms it did at least (together with the Swiss National Bank) substantially better than most other central banks.

From an institutional point of view the monetarists stood in the tradition of "Rules versus Authorities" – the title of the famous article by Henry Simons – and consequently were strongly opposed to the idea of an independent central bank.

3.2. The conduct of policy under monetary targeting[12].

The choice of a monetary target in 1974 undoubtedly signalled a fundamental regime shift. Not only was it a clear break with the past but also a decision to discard alternative approaches to monetary policy.[13] There were two main arguments in favour of providing a quantified guidepost for the future rate of monetary expansion. First and foremost was the intention of controlling inflation through the control of monetary expansion. Second the Bundesbank tried to provide a guidance of agents' (especially wage bargainers') expectations through the announcement of a quantified objective for monetary growth.[14] Therefore, with its new strategy, the Bundesbank clearly signalled its responsibility for the control of inflation. At the same time, the Bundesbank expressed its view, that while monetary policy by maintaining price stability in the longer run would exert a positive impact on economic growth, the fostering of potential growth in the economy should be considered a task of fiscal and structural policies, while employment was a responsibility of the social partners conducting wage negotiations.

However, the Bundesbank made it clear from the beginning that it could not and would not promise to reach the monetary target with any degree of precision. Accordingly, in this period, the new regime of monetary targeting was in many respects an experiment.

a) Derivation of the money growth target.

From the outset, the Bundesbank recognized the importance of adopting a simple, transparent and at the same time comprehensible method for the derivation of the annual monetary targets.[15] Unlike some academic monetarists, the Bundesbank favoured broad monetary aggregates. The choice of such aggregates was based not least on the perception that in

[12] The text of the following section is taken from Otmar Issing's article "Why did the Great Inflation not happen in Germany?" in the Federal Reserve Bank of St. Louis Review from March/April 2005.

[13] It must be recognized that the start of monetary targeting was characterized by a high degree of uncertainty.
After all, Germany had just come out of the Bretton Woods "adjustable peg" system in which many topics were
seen as irrelevant.

[14] See Schlesinger (1983) on this issue.

[15] See also Issing (1997) for the following considerations.

countries with highly developed financial markets, substantial portfolio shifts between saving, time, and sight deposits might be observed. In essence, the targeted growth rate was derived as the sum of the predicted growth in potential output, the "normative" rate of inflation that was deemed acceptable in the medium-term, and the trend rate of change in the velocity of circulation of money.

This approach reflected the insight that monetary growth consistent with this derivation would create the appropriate conditions for real growth in line with price stability. While these basic relationships were uncontested over medium to longer-term horizons, the Bundesbank was fully aware of the fact that they might not strictly apply over the shorter term. On a month-to-month or quarter-to-quarter basis and even beyond, the basic relationship between the money stock and the overall domestic price level was often obscured by a variety of other factors such as supply and demand shocks. Any attempt to strictly tie money growth to its desired path in the short-term might have led to disturbing volatility in interest and exchange rates, thus imposing unnecessary adjustment costs on the economy. Accordingly, the Bundesbank repeatedly pointed to the medium-term nature of its strategy.

First experiences with monetary targets were not particularly encouraging. Between 1975 and 1978, the quantitative targets were clearly (and in 1978 considerably) overshot (see Table 3.1). Nevertheless, the Bundesbank was able to slow down inflation from the high levels before to 2.7% in 1978. During this period the Bundesbank gained valuable insights into the new regime and introduced a number of technical modifications (see Table 3.1). These experiences helped the Bundesbank to enhance the monetary targeting concept from its experimental stage into a fully-fledged strategy. As a consequence, at the end of 1978, the potential-oriented monetary targeting strategy had been established and had proven its value. Therefore, the Bundesbank was well prepared when Germany entered especially troubled waters.

Table 3.1:

Monetary targets for the central bank money stock or the money stock M3 and their implementation (in percentages)

Year	Aggregate a)	Target form b)	Target value	Actual growth	Target achieved	Inflation Rate
1975	CBM	CY	8%	9.5%	no	5.9%
1976	CBM	AA	8%	9.2%	no	4.3%
1977	CBM	AA	8%	9.0%	no	3.7%
1978	CBM	AA	8%	11.4%	no	2.7%
1979	CBM	CY	6-9%	6.4%	yes	4.1%
1980	CBM	CY	5-8%	4.8%	yes	5.5%
1981	CBM	CY	4-7%	3.5%	yes	6.3%
1982	CBM	CY	4-7%	6.0%	yes	5.2%
1983	CBM	CY	4-7%	7.0%	yes	3.3%
1984	CBM	CY	4-6%	4.7%	yes	2.4%
1985	CBM	CY	3-5%	4.5%	yes	2.0%

Source: Various Annual Reports of the Deutsche Bundesbank, actual figures rounded.
a) CBM = Central Bank Money.
b) AA = annual average; CY= in the course of the year; Between the fourth quarter of the previous year and the fourth quarter of the current year, 1975: December 1974 to December 1975.

b) From 1979 to 1985 – the strategy bears fruit

The economic situation in 1978 was broadly seen as rather comfortable. German real GDP had grown by around 3 per cent, accompanied by high levels of employment growth and falling unemployment. The situation was, however, less positive in terms of monetary growth and inflation. Monetary growth had overshot its target and there were signs of acceleration in the rate of inflation, which in 1978 stood, on average, at 2.7%.[16] Furthermore, the sharp increase in the oil price hit the German economy. The resulting massive increase in import prices, especially energy prices, augmented by a weakening of the exchange rate, brought about a turnaround in Germany's current account position, leading to a current account deficit in 1979 for the first time in many years.

At the same time, government fiscal policy was clearly expansionary. Thus fiscal policy rendered the central bank's task even more difficult. Moreover, the European Monetary System (EMS), an exchange rate regime defining the exchange rates of participating currencies in terms of central rates against the ECU, had begun rather quietly in March 1979,

[16] On the Bundesbank's implementation of monetary targeting, see also Schlesinger (1985).

but subsequently faced tensions and the need to adjust parities from as early as September 1979.

It was obvious from the beginning that the direct effect of the oil price shock on consumer prices could not be prevented by monetary policy. At the same time, the Bundesbank had carefully analysed the lessons of the first oil price shock.

In 1973, the Bundesbank had declared the fight against inflation to be the principal goal of its monetary policy[17] and, in line with this, had already started to slow down inflation (which had peaked at almost 8 per cent in mid-1973) when in October 1973, the first oil crisis broke out. The rise in oil prices thwarted the efforts of the Bundesbank while, at the same time, also real output started to decline. Being confronted with such a situation, the Bundesbank attempted to keep monetary expansion within strict limits in order to avoid possible spill-over effects into the wage and price-setting. In doing so, it did, however, not commit itself to any clear strategy and quantification.[18] Instead, the Bundesbank mainly tried to influence the behaviour of market participants by means of "moral suasion". However, the social partners more or less ignored the signals given by the Bundesbank and agreed on high increases in nominal wages in 1974 trying to compensate for the loss in real disposable income. As a consequence unemployment increased and inflation went up.

Against this experience, in 1979 the Governing Council of the Bundesbank was well aware of the threat that the oil price increase could translate again into sustained increases in inflation brought about by second-round effects in wage and price-setting.[19] In responding to these challenges, the Bundesbank took decisive action. The discount rate was increased in steps from 3 per cent at the start of 1979 to reach 7.5 per cent in May 1980. In parallel, the Lombard rate was increased from its initial level of 3.5 per cent to 9.5 per cent in May 1980, and in February 1981 - as a special Lombard – to as much as 12 per cent, the normal Lombard window being closed.[20] In parallel, by subsequently reducing the monetary targets from 1979 onwards, the Bundesbank sent out a clear signal for restoring price stability.

Not until the second half of 1981 did the growth rates for the monetary base begin to come down. Towards the end of 1981, there were increasingly clear signs of an easing of price and wage pressures. The D-Mark regained confidence in the foreign exchange markets and strengthened again, not only within the EMS but also in relation to the US-Dollar. In parallel, the external adjustment process was promoted through a slowdown in domestic demand and the current account position improved noticeably. Furthermore, through the "monetary warning", the government became aware of the unsustainability of its deficit policy. From then on, budget consolidation was increasingly recognized as being an urgent task.

17 See Deutsche Bundesbank (1974), Annual Report, p. 45.

18 In fact, the Bundesbank tried to ensure that "monetary expansion was not too great but not to small either". See Deutsche Bundesbank (1974), Annual Report, especially p. 17.

19 See Schlesinger (1980) on this point.

20 See Baltensperger (1999) for a more detailed description of this period, the monetary targets and their realisations.

4. The Conduct of Monetary Policy: a Comparison of Monetary Policy Rules.

[In this section our goal will be to provide a systematic comparison of policy rules followed in Germany, the US, the UK and, if feasible, some other industrialized countries. For the current working version of the paper we provide only a preliminary and tentative comparison between Germany and the US only.]

In this section, we try to find out more about the differences between the monetary policy strategies of the Bundesbank and the Fed during the Great Inflation and (possibly) afterwards. In order to provide a more precise characterization of the systematic component of monetary policy, we present estimates of different specifications of the Bundesbank's and the Fed's monetary policy reaction functions.

There is a voluminous literature about the US. According to the established view, there was a regime shift around October 1979 (the start of the Volcker disinflation)[21]. The main difference between the pre-Volcker period and the Volcker-Greenspan period pertains to the interest response to an increase in inflation (or expected inflation). Specifically, the coefficient, measuring the interest rate response to inflation was significantly below unity during the pre-Volcker period and significantly above unity in the later period. An interest rate coefficient below unity corresponds to accommodative monetary policy as real interest rates decline in response to an inflation increase (see, for example, Clarida, Gali and Gertler, CGG, 1998, 2000). In other words, before 1979 US monetary policy does not comply with the Taylor principle. Characterization of monetary policy in the interim period, between 1979 and 1982, is difficult as it seems dominated by transition dynamics induced by the Fed's monetary experiment. Moreover, the Fed's policy response to economic slack also seems difficult to pin down. Orphanides (2003, 2004) goes as far as to argue that the key distinction does not involve the response to expected inflation, but rather the response to policymakers' real-time perceptions of real activity (excess demand). Using real-time data to re-estimate the Fed's policy rule, he finds that, prior to Volcker's appointment, policy was too responsive to perceived output gaps. Specifically, loose monetary policy was a consequence of responding strongly to overestimations of economic slack. More recent papers (Boivin, 2006, Kim and Nelson, 2006, Partouche, 2007), using a time-varying coefficients framework, find important, but gradual changes in the Fed's response to both inflation and real activity, not properly accounted for by the typical split-sample approach.

As a starting point for a comparative analysis of German and US monetary policy during the 1970s, it is useful to take another look at the relative inflation performance of the two countries from the mid-1960s to the early 1980s. As shown in Figure 4.1, Germany did not fully escape the rise in inflation which characterised the US experience of the late 1960s and early 1970s. In fact, from 1971Q2 to 1973Q3, the rate of change of the consumer price index in Germany was even higher than in the US. However, from 1973 onwards, US inflation rose steeply to reach a first peak of 12% in 1974Q4 and then again in 1979 to reach a second (even higher) peak of 14 ½ % in 1980Q2. By contrast, the German rate of inflation peaked in the first quarter of 1974Q1 at a rate of 7 ½ % and remained below that value even in the wake of the second oil price shock. For the US, it took a sharp disinflation of two and a half years to

[21] See Gaspar, Smets and Vestin (2006) for an analytical narrative drawing on the documentary evidence provide in Lindsey, Orphanides and Raasche (2005).

come down from the peak of 14 ½ % in early 1980 to a level once again comparable to the German rate (about 4 ½ % in 1982Q4).

According to Figure 4.1, the upsurge of inflation in Germany in the early 1970s was stopped by quick disinflation which preceded the Volcker disinflation by about six years. Still, the dating of the regime shift is not as straightforward for Germany as it is for the US, where the appointment of Paul Volcker as Chairman provides an obvious date for a structural break. Two potential candidates are the break down of the Bretton Woods System in March 1973 and/or the official start of the monetary targeting regime in 1975Q1.[22] However, most studies on the Bundesbank's reaction function, including Clarida, Gali and Gertler (1998) and our own (Gerberding, Seitz and Worms, 2005, 2007), choose an even later date, namely 1979Q1, as the starting point of their analysis. The reason for doing so can best be understood by comparing the behaviour of real interest rates and inflation during the period in question. As shown in Figure 4.2, pre-1979 the US real rate steadily declines as inflation rises, becoming persistently negative during most of the seventies. In late 1979, the real rate rose sharply, leading to a subsequent decline in inflation. This observation provides the rationale for the analysis in Beyer and Farmer (2007). They argue that the source of the inflation build up in the 1970s was a downward drift in the real interest rate that was translated into a simultaneous increase in unemployment and inflation by passive Fed policy.

For Germany, the picture is different. Real interest rates rose sharply after the break-down of the Bretton Woods System in March 1973. Moreover, real interest rates were (almost) always significantly positive throughout the period. Nevertheless, the early increase in real interest rates was almost completely reversed in 1974/75 and the real rate was kept rather low until the beginning of 1979 (data: inflation measured by CPI inflation against previous quarter, real rates calculated by subtracting period t+1 inflation from three-month money market rates, three-quarter centered moving averages). Clarida and Gertler (1997) interpret this as evidence "that the Bundesbank's commitment to fight inflation waned somewhat during the period between the two major oil shocks" (CGG, 1998). In the Bundesbank's own reading, the loosening was mainly motivated by two considerations which, in hindsight, turned out to be partly based on misjudgments. The first was an overestimation of the negative effect on inflation from currency appreciation, the second was an exaggerated perception of the magnitude of economic slack associated with the 1975 recession (see Gerberding et al., 2004).[23]

In any case, the visual comparison between the conduct of monetary policy in Germany and the US in the 1970s still suggests clearly loose monetary policy in the latter but not in the former. [These remarks should continue to hold when comparing Germany with a broader set of countries e.g. the UK, Canada, Italy, France, etc.] The difficulties associated with modeling the Bundesbank's monetary policy reaction function in the 70s are not surprising. As we emphasized before the period was characterized by regime change. Monetary targeting was being used for the first time. The Bundesbank was still experimenting with the new concept and the reliability of the whole framework was yet to be established. German households and firms were still learning the features of such novel environment [to be elaborated further]

In the remainder of this section, our aim is to characterize more completely monetary policy followed in the two countries. In order to do so, we resort to estimated monetary policy

[22] The Bundesbank had already established an internal monetary target for its own orientation for the year 1974 (see Dudler, 1980, p. 299), so 1974Q1 may be considered another potential breakpoint.
[23] See Bundesbank, AR 1975 and 1976.

reaction functions. We start by estimating the specification proposed by CGG (1998, 2000).. Although the specification proposed by CGG can be criticized on several accounts (see below), it provides a useful starting point for our exercise since it allows us to compare our results with those available from the literature. Moreover, it is feasible to use exactly the same specification for the two countries and to consider versions with both revised data and real-time data. For our purposes the CGG Taylor rule will be written as:

$$i_t = (1-\rho_1-\rho_2)\left(\alpha + \beta E_t((\pi_{t+n} - \pi^*)|\Omega_t) + \gamma E_t(y_t|\Omega_t)\right) + \rho_1 i_{t-1} + \rho_2 i_{t-2} + \varepsilon_t \quad (1),$$

where i_t denotes the interest rate; $E_t((\pi_{t+n} - \pi^*)|\Omega_t)$ is expected inflation for period t+n formed in t on the basis of information available at time t; and $E_t(y_t|\Omega_t)$ is the expected output gap at time t estimated on the basis of information available at the time.

Table 4.1 summarizes our estimates of the CGG specification of the Bundesbank's reaction function, using the real-time data set described in Gerberding et al. (2004). In order to compare the conduct of monetary policy in Germany before and after the collapse of Bretton Woods, we extended the data set backwards to 1965 so that it now covers the sample period 1965 – 1998.[24] As formal tests for structural break do not yield unambiguous results, we present estimates for three different break points, with the Bretton Woods/Pre-Monetary Targeting samples ending in 1973Q1, 1974Q4 and 1978Q4, respectively. (In order to check the robustness of the results to changes in the horizon of the inflation variable, we repeated the exercise for a one-quarter-ahead horizon of the inflation forecast (n=1).)[25]

The analysis yields a number of interesting (albeit tentative) results.

Firstly, we find that the coefficient *β,* which captures the interest rate response to inflation, is significantly below one in the Bretton Woods period (65Q1-73Q1) and in the pre-Monetary Targeting period (65Q1-74Q4), while it is above one for each of the three post-Bretton Woods samples considered here. Note, however, that the standard error of the inflation coefficient and of the equation is lowest for the (arguably more stable) 1979-1998 period. The results hold for both horizons of the inflation forecast considered here, but the point estimate of *β* in the post-Bretton Woods samples is somewhat higher for the one-year-ahead horizon (n=4). Therefore, Bundesbank's policy is found to respect the Taylor principle for all of the post-Bretton Woods period. This contrasts with empirical estimates of standard Taylor rules for the US over the 1970s. Hence we conclude that a crucial difference, between monetary policies followed in the two countries, we found in the response of policy interest rates to inflation.

To repeat: in accordance with our priors, interest rates responded stronger to inflation in Germany than in the US, in the early post-Bretton Woods period, while in the most recent period responses became much more similar, with US behavior approaching Germany's.

[24] The first vintage of Bundesbank estimates of potential output that we were able to reconstruct dates from April 1972 (Bundesbank, AR 1971). In order to go back beyond this date, we proxied the unavailable "true" real-time data by the estimates dating from April 1972. We think this justifiable since there are no indications of major revisions during the time span 1965-1972. For instance, the estimates of the German output gap in the 1960s published by the OECD in April 1970 (see OECD, 1970) are very similar to the estimates that we reconstructed from the April 1972 vintages of Bundesbank data on actual and potential output.

[25] Results available from authors on request.

Secondly, the response to the perceived output gap, γ, is significantly positive with point estimates about 0.5 in the Bretton Woods/pre-Monetary Targeting sub-samples. By contrast, it is close to zero and insignificant in each of the post-Bretton Woods sub-samples, with slightly higher values for the one-quarter-ahead horizon n=1. Again, this result is in line with the evidence presented by Orphanides (2003) who concludes that central banks are well advised to respond mutedly to highly uncertain estimates of the output gap (see also Smets, …, and Gaspar and Vestin, ….).

Thirdly, we find a significant degree of interest rate inertia, captured by ρ, in all sub-sample periods, with point estimates about 0.6 before and about 0.8 after the regime change. This result is in accordance with the Bundesbank´s often professed preference for conducting policy with a steady hand ("Politik der ruhigen Hand").[26]

However, as argued originally by Orphanides (2003), and explored e.g. by Söderström (2005) and Gerberding et al. (2007), a standard Taylor-type policy rule such as Equation (1) may not be fully appropriate to capture the policy rule followed under a monetary targeting strategy. Therefore, we go one step further and present estimates for alternative specifications of the policy rule. Specifically, following the argument in section 3 above we want to take explicitly into account the Bundesbank's monetary targeting strategy. As argued above, at that time, the only blueprint for rule-based behavior in monetary policy was provided by the monetarist school, led by Milton Friedman.[27] (Note that the Friedman's k% rule provided the paradigmatic example to Kydland and Prescott (1977)).

Considering a delegation framework, Söderström (2005) and Kilponen and Leitemo (2007, 2008) have recently analysed the usefulness of assigning a target for money growth to a central bank acting under discretion. While the focus of their analyses is on evaluating the performance of money growth targeting relative to alternative delegation devices, in our context, the delegation approach offers a useful framework for deriving the form of the interest rate rule implied by a strategy of (flexible) money growth targeting. In the annex (to be completed) we show that adding a money growth stabilization target to an otherwise standard central bank loss function implies to an interest rate rule of the form[28]:

$$i_t = (1-\rho_1-\rho_2)\left(\alpha+\beta E_t((\pi_{t+n}-\pi^*)|\Omega_t)+\gamma_1 E_t((x_t-x_t^*)|\Omega_t)+\gamma_2 E_t((\Delta x_t-\Delta x_t^*)|\Omega_t)\right) + \rho_1 i_{t-1}+\rho_2 i_{t-2}+\varepsilon_t \qquad (2)$$

Equation (2) contrasts with a standard Taylor rule because it includes an additional feedback to the change rather than the level of the output gap.

Table 4.2 summarises our estimates for Germany for the extended Taylor rule described by Eq (2). We continue to focus on results using real time data. The horizon of the inflation forecast variable is set to four quarters. Symmetrically, the output growth term is defined as

[26] In Gerberding et al. (2007), we show that this result is robust to the inclusion of an AR(1)-model for the error term.

[27] There may have been some proponents of nominal income growth targeting – have to check this.

[28] This is the specification used by Gerberding et al. (2007). In this earlier work the monetary policy reaction function is heuristically motivated.

the rate of change over the previous four quarters Money growth does not enter the reaction function directly. Instead it is used as an instrument variable.

Several interesting results emerge. For this specification, using the full post-Bretton Woods period starting in 1973Q2 delivers a response to inflation below one (in violation of the Taylor principle). Furthermore, for this sample period both the coefficient on the output gap and on the output gap difference are significantly positive at the 5% level, and there appears to be a high degree of interest rate smoothing. Results are significantly sharpened considering only the periods after monetary targeting was enacted. The response to inflation is now significantly above 1. At the same time, the coefficient on the perceived output gap becomes insignificant and the coefficient on the change in the output gap becomes highly significant (at the 1% level). The interest rate rule continues to be strongly persistent. Overall, these results are robust to changes in the horizon of the inflation variable (e.g. they are qualitatively the same for a forecast horizon of one quarter as well as for inflation over the previous quarter/ the previous four quarters). However, the significantly positive response to the change in the output gap hinges on the use of four-quarter rather than quarterly differences, which is consistent with the formulation of the money growth target in terms of annual rates of growth,[29]

Table 4.3 presents the results for a similar formulation for the US where we use the three months T-Bill rate as a short term interest rate. Regarding the explanatory variables, analogue as for Germany, inflation is measured by year-on-year changes in CPI. Again, we use a standard measure of the output gap $(x_t - x_t^*)$ as described in Gerberding et al (2004). We report results for annual changes in the output gap as well as for its quarterly changes. Notice, that for the US we normalize the inflation target π^* at zero. For the forward looking element we use inflation expectations one period ahead that are formed at period t. For interest rate smoothing we restricted ourselves to the case of one lag only.

For analyzing the US we follow the strategy that is common in the empirical literature and estimate over samples that correspond to the chairmanships of Burns - Miller and Volcker - Greenspan. Using quarterly data we consider the period 1970Q1 – 1979Q22 ("the Burns-Miller period") and the period 1983Q1 - 1998Q4 ("the Volcker-Greenspan period"). The omitted interim period is characterized by transitional dynamics and does not yield useful estimates. We are able to reproduce a number of well known findings. First, the Taylor coefficient on inflation is significantly below unity in the Burns-Miller period and significantly above one in the Volcker-Greenspan period. Second, the coefficient on the lagged interest rate is much larger in the latter period (becoming close to one). Third, and focusing on formulation with the annual measure of the change in the output gap, the coefficient on the output gap is always significant, at the 5% level.
Regarding the history dependence of monetary policy we find significant differences between the US and Germany. For the US the coefficients for both quarterly or annual changes in the output gap is insignificant during the 1970's. Conversely, it is highly significant during the 1980's and 1990's whereas for Germany it is significant throughout the entire post-Bretton Woods sample period.

The comparison of the models for Germany and the US between Table 4.2 and Table 4.3 therefore suggests that the conduct of monetary policy in the US and Germany differed during

[29] Results available from authors on request.

the 1970's but after 1983, US monetary policy approached the practice that the Bundesbank followed since 1975.

5. Conclusion.

REFERENCES

Alesina, A. and Summers, L. (1990), Central bank independence and macroeconomic performance, discussion paper, Harvard University.

Bade, R. and Parkin, M (1980), Central bank laws and monetary policy, discussion paper, University of Ontario.

Baltensperger, E. (1999), Monetary policy under conditions of increasing integration (1979-96), in: Deutsche Bundesbank (ed.), Fifty years of the deutsche Mark − Central Bank and the currency in Germany since 1948, Oxford University Press, pp. 419-523.

Barsky, Robert B. & Lutz Kilian, 2002, Do We Really Know that Oil Caused the Great Stagflation? A Monetary Alternative, *NBER Macroeconomic Annual 2001,* Cambridge: MIT Press pp. 137-183.

Barsky, Robert B. & Lutz Kilian, 2004, "Oil and the Macroeconomy since the 1970s," *Journal of Economic Perspectives*, vol. 18(4), pages 115-134, Fall.

Beyer, Andreas. and Roger Farmer (2007), "Natural Rate Doubts", Journal of Economic Dynamics and Control, 31 (2007) 797–825

Blinder, A., 1979, *Economic Policy and the Great Stagflation,* New York: Academic Press.

Bordo, M, 1993, The Bretton Woods International Monetary System: A Historical Overview, in M. Bordo and B. Eichengreen (eds.), *A Retrospective on the Bretton Woods System,* Chicago: University of Chicago Press.

Boivin, J. (2006): Evidence from Drifting Coefficients and Real-Time Data, *Journal of Money, Credit and Banking*, 38(5), August 2006.

Brunner, K. (1983), Has monetarism failed?, Cato Journal Vol. 3, No. 1, pp. 23-62.

Buchheim, C. (1999), The Establishment of the Bank deutscher Länder and the West German Currency Reform, in: Deutsche Bundesbank (ed.), Fifty Years of the deutsche Mark − Central Bank and the currency in Germany since 1948, Oxford University Press, pp. 55-100.

Clarida, R. and M. Gertler (1997): How the Bundesbank Conducts Monetary Policy, in: C. Romer and D. Romer (eds.), *Reducing Inflation: Motivation and Strategy*, Chicago, 363–412.

Clarida, R., J. Galí, and M. Gertler (1998): Monetary Policy Rules in Practice: Some International Evidence, *European Economic Review* 42, 1033-1067.
Clarida, R., J. Galí and M. Gertler (2000): Monetary Policy Rules and Macroeconomic Stability: Evidence and Some Theory, *Quarterly Journal of Economics* 115, 147-180.

Darby, M.R., 1982, The Price of Oil and World Inflation and Recession, *American Economic Review,* 72(4), September,

Dudler, H.-J. (1980): "Examination of Witnesses: Hermann-Josef Dudler." Testimony, November 10, 1980, in Treasury and Civil Service Committee, Monetary Policy Volume II: Minutes of Evidence, 297–307. London: HMSO, 1981.

Deutsche Bundesbank, Annual Report, Various years.
Fratianni, M. and von Hagen, J. (2001), The Konstanz Seminar on monetary theory and policy, European Journal of Political Economy, Vol. 17, pp. 641-664.

Frenkel, J. and M. Goldstein, 1999, The International Role of the Deutsche Mark, in Deutsche Bundesbank (ed.) *Fifty Years of the Deutsche Mark: Central Bank and Currency in Germany since 1948*, Oxford: Oxford University Press.

Garber, P., 1993, The Collapse of the Bretton Woods Fixed Exchange Rate System, in M. Bordo and B. Eichengreen (eds.), *A Retrospective on the Bretton Woods System,* Chicago: University of Chicago Press.

Gaspar, V., F. Smets and D. Vestin, 2006, Monetary Policy over Time, *Macroeconomic Dynamics,* March.

Gerberding, C., F. Seitz and A. Worms (2005): How the Bundesbank Really Conducted Monetary Policy, *North American Journal of Economics and Finance* 16, 277-292.

Gerberding, C., F. Seitz and A. Worms (2007), Money-Based Interest Rules, Lessons from German Data, Deutsche Bundesbank Discussion Paper Series 1, No. 06/2007.

Gordon, R., 1975, Alternative Responses to External Supply Shocks, *Brookings Papers on Economic Activity,* 1: 183-206.

Giannoni, M. P., and M. Woodford (2003), How Forward-Looking is Optimal Monetary Policy?, *Journal of Money, Credit and Banking* 35 (6, Part 2), 1425–69.

von Hagen, J., 1999, A New Approach to Monetary Policy (1971-78), in Deutsche Bundesbank (ed.) *Fifty Years of the Deutsche Mark: Central Bank and Currency in Germany since 1948*, Oxford: Oxford University Press.

Hamilton, J., 1983, Oil and the Macroeconomy since World War II, *Journal of Political Economy,* 91 (2), 228-248.

Issing, O. (2006), Europe's hard fix: the Euro area, International Economics and Economic Policy, Vol. 3, No 3-4, pp. 181-196.

Issing, O. (2005), Why did the Great Inflation not happen in Germany?, Federal Reserve Bank of St. Louis, Review, March/April.

Issing, O.; Gaspar, V., Tristani, O. and Vestin, O. (2005), Imperfect knowledge and monetary policy, The Stone Lectures in Economics, Cambridge University Press.

Issing, O., Monetary Targeting in Germany: The Stability of Monetary Policy and of the Monetary System, Journal of Monetary Economics, June 1997, 39(1), pp. 67-79.

Issing, O. (1993), Central Bank Independence and Monetary Stability, The Institute of Economic affairs, Occasional Paper 89, London.

Kilponen, J. and K. Leitemo (2008), Model Uncertainty and Delegation: A Case for Friedman's k-percent Money Growth Rule?, *Journal of Money, Credit, and Banking*, forthcoming.

Kilponen, J. and K. Leitemo (2007), Discretion and the transmission lags of monetary policy, Bank of Finland Research Discussion Paper 08/2007.

Kim, C. and C. Nelson, 2006, Estimation of a Forward-Looking Monetary Policy Rule: A Time-Varying Parameter Model using Ex-Post Data," *Journal of Monetary Economics* 53 (Nov.), 1949-66.

Lindsey, D. A. Orphanides and R. Raasche, 2005, The Reform of October 1979: How it Happened and Why, Finance and Economics Discussion Paper, Federal Reserve Board.

Nelson, E. (2005), The Great Inflation of the Seventies: What Really Happened? *Advances in Macroeconomics, 5*(1), Article 3.

Nelson, E. (2007), The Great Inflation and Early Disinflation in Japan and Germany *International Journal of Central Banking*, December 2007, *3*(4), 23-76.

Nelson, Ed, forthcoming a), Ireland and Switzerland: the jagged edges of the Great Inflation, *European Economic Review*.

Nelson, Ed, forthcoming b), The Great Inflation and Early Disinflation in Japan and Germany, *International Journal of Central Banking.*

Neumann, M. J. M. (1997), Monetary Targeting in Germany, in: I. Kuroda (ed.), Towards more effective monetary policy, Hampshire, pp. 176-198.

Neuman, M., 1999, Monetary Policy: Threat and proven Response, in Deutsche Bundesbank (ed.) *Fifty Years of the Deutsche Mark: Central Bank and Currency in Germany since 1948*, Oxford: Oxford University Press.

OECD (1970), Economic Survey of Germany, April 1970.

Orphanides, A. (2001), Monetary Policy Rules Based on Real-Time Data, *American Economic Review,* 91:4, 964-985.

Orphanides, A. (2002), Monetary Policy Rules and the Great Inflation, *American Economic Review*, 92:2; 115-121.

Orphanides, A. (2003): Historical Monetary Policy Analysis and the Taylor Rule, *Journal of Monetary Economics* 50, 983-1022.

Orphanides, A. (2004), Monetary Policy Rules, Macroeconomic Stability and Inflation: A View from the Trenches, *Journal of Money, Credit and Banking*, 36, 151-157.

Partouche, H. (2007): Time-Varying Coefficients in a GMM Framework: Estimation of a Forward Looking Taylor Rule for the Federal Reserve, Banque de France Working Paper No. 177, September 2007.

Richter, R. (1999), German monetary policy as reflected in the academic debate, in: Deutsche Bundesbank (ed.), Fifty years of the deutsche Mark − Central Bank and the currency in Germany since 1948, Oxford University Press, pp. 525-571.

Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung (1974), Vollbeschäftigung für Morgen, Stuttgart.

Samuelson, P., 1974, Worldwide Stagflation, in Nagatani and Crowley (eds.), *Collected Scientific Papers* vol. 4, Cambridge MIT Press, 1977.

Schlesinger, H., Zehn Jahre Geldpolitik mit einem Geldmengenziel, in: W. Gebauer (ed.), Öffentliche Finanzen und monetäre Ökonomie, Festschrift für Karl Hauser zur Vollendung des 65. Lebensjahres, Frankfurt am Main, 1985, pp. 123-47.

Schlesinger, H., The Setting of Monetary Objectives in Germany, in P. Meek (ed.), Central Bank Views of Monetary Targeting. New York: Federal Reserve Bank of New York, 1983, pp. 6-17.

Schlesinger, H., Notenbankpolitik: weiter am kurzen Zügel, Wirtschafts Woche, 1980, Jg. 34, Heft 5, pp. 77-80.

Söderström, U. (2005), Targeting Inflation with a Role for Money, *Economica* 72, 577–596.

Taylor, J. (1996): Policy Rules as a Means to a More Effective Monetary Policy, IMES Discussion Paper 96-E-12.

Triffin, R., 1960, *Gold and the Dollar Crisis*, New Haven: Yale University Press.

Woodford, M. (2003), *Interest and Prices: Foundations of a Theory of Monetary Policy*, Princeton University Press.

Zweig, S. (1970), Die Welt von Gestern- Erinnerungen eines Europäers, Frankfurt, p. 359.

Table 2. 1: Selected Macroeconomic Indicators for G7 & Switzerland.

	CA 60-98		CH 60-98		DE 60-98		FR 60-98		IT 60-98		JP 60-98		UK 60-98		US 60-98	
	me	s.d.	me	s.d	mea	s.d.	mea	s.d	mea	s.d	mea	s.d	mea	s.d	mea	s.d.
CPI %p.a.	4.5	3.1	3.3	2.	3.1	1.8	5.3	3.6	7.4	5.	4.4	4.0	6.5	4.	4.4	2.9
real GDP %p.a.	3.6	2.1	2.3	2.	2.7	2.0	3.3	1.9	*3.4*	*2.*	4.5	4.0	2.4	1.	3.4	2.0
real Cons %p.a.	3.2	2.4	2.6	2.	3.3	2.8	3.0	2.1	3.7	2.	4.4	3.7	2.1	2.	2.9	2.3
Empl %p.a.	2.2	1.6	0.7	1.	0.2	1.2	0.6	0.8	0.1	1.	1.0	0.8	0.3	1.	1.8	1.3
Unemp %p.a	7.7	2.4			5.4	3.6	6.5	3.9	8.2	2.	2.2	0.9	6.3	3.	6.0	1.5
RL	8.5	2.6	4.6	1.	7.1	1.5	8.3	2.9	10.4	4.	6.0	2.3	9.4	2.	7.4	2.5
RS	7.2	3.5			5.3	2.3	7.7	3.4	*11.7*	*4.*	6.0	3.0	8.3	3.	6.0	2.7

INSERT FIGURE 2.1. HERE: Inflation in G7 countries + Switzerland.

Figure 4.1: Inflation in Germany and the US (consumer prices, quarterly data)

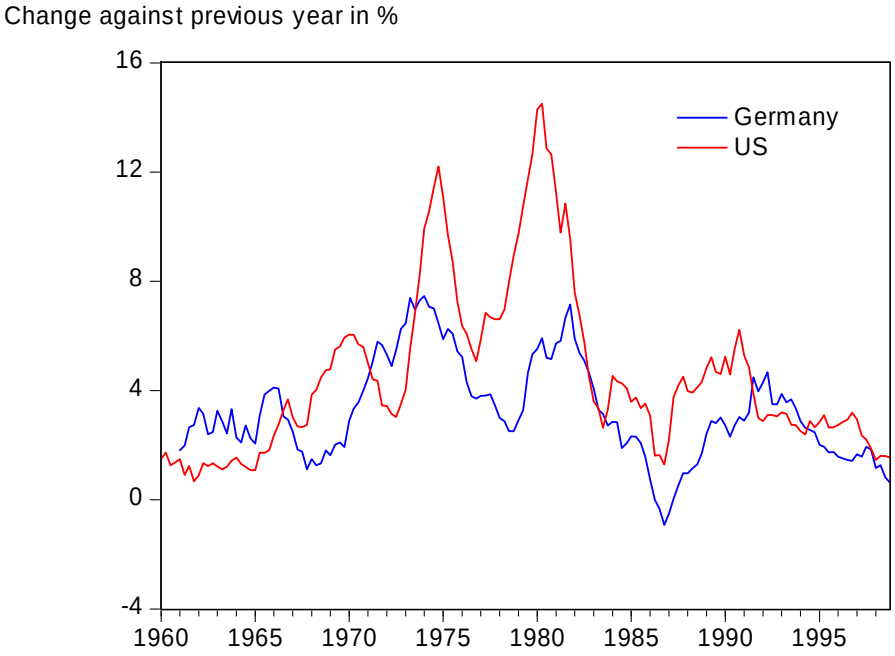

Figure 4.2a: Interest Rates and Inflation in Germany

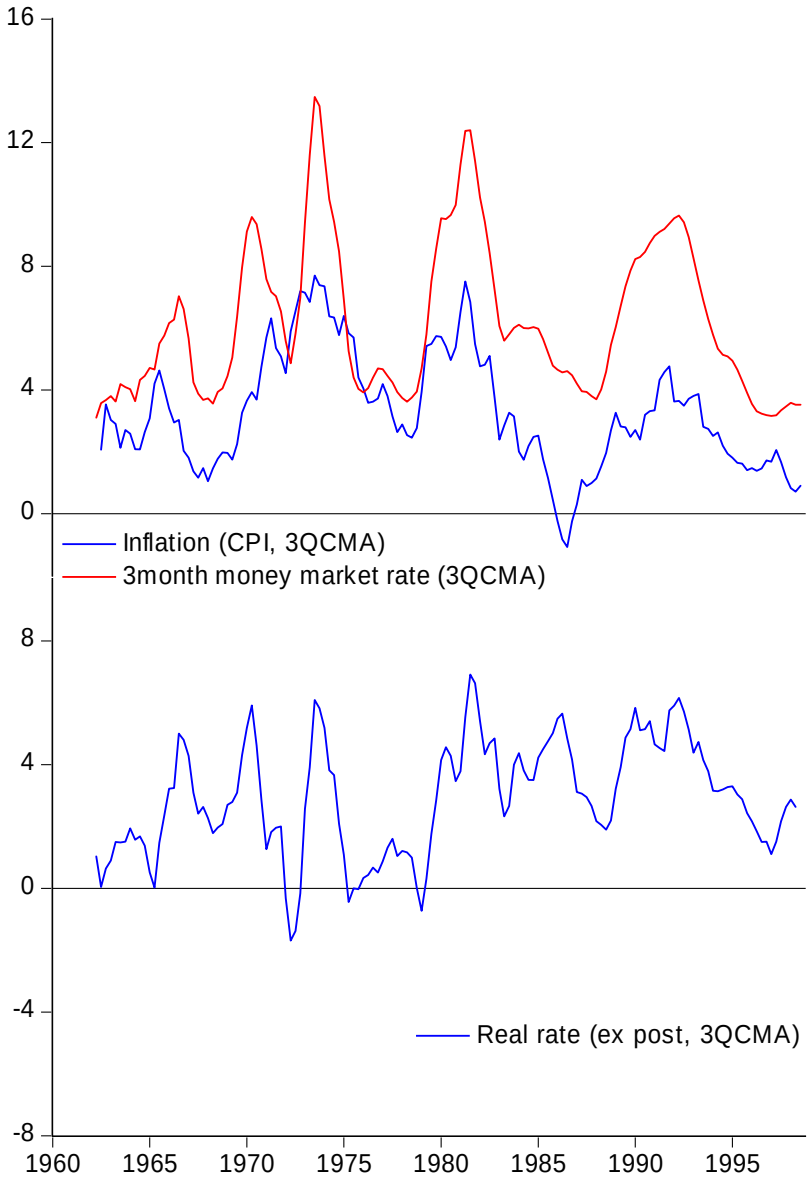

Figure 4.2b: Interest Rates and Inflation in the US

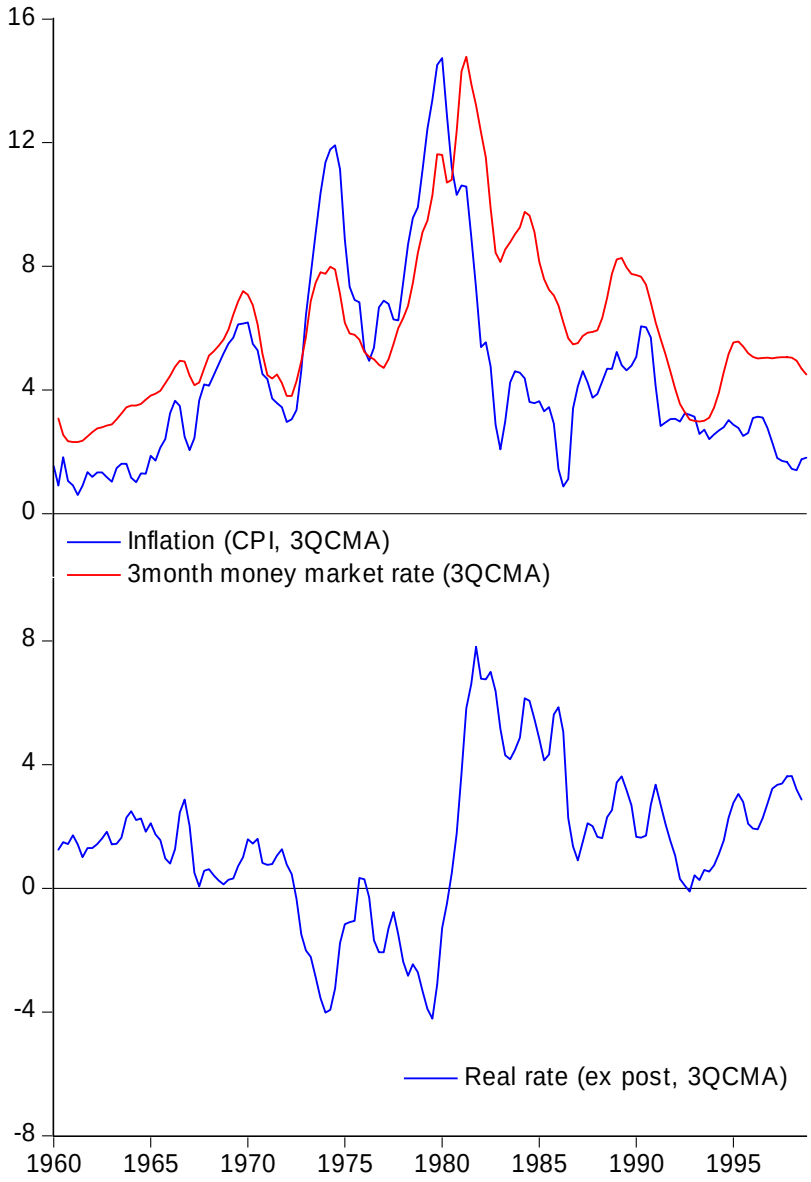

Table 4.1: Estimates of the CGG reaction function, real-time data, n=4

Estimation equation:

$$i_t = (1-\rho_1-\rho_2)\left(\alpha + \beta E_t((\pi_{t+n}-\pi^*)|\Omega_t) + \gamma E_t(y_t|\Omega_t)\right) + \rho_1 i_{t-1} + \rho_2 i_{t-2} + \varepsilon_t$$

	ß	*Γ*	*ρ*	$\overline{R}^2$	*SEE*	*J-stat (p-values)*
Germany's "Great" Inflation (n=4)						
1965Q1-73Q1	0.52*** (0.09)	0.44*** (0.08)	0.60*** (0.07)	0.71	1.09	0.64
1965Q1-74Q4	0.68*** (0.15)	0.51*** (0.13)	0.55*** (0.12)	0.76	1.41	0.55
1965Q1-78Q4	1.04*** (0.24)	0.52*** (0.07)	0.58*** (0.14)	0.81	1.21	0.79
Post-Bretton Woods/Monetary Targeting (n=4)						
19**73Q2**-98Q4	1.89*** (0.30)	-0.14 (0.20)	0.82*** (0.06)	0.90	0.89	0.45
19**75Q1**-98Q4	1.97*** (0.35)	-0.11 (0.19)	0.83*** (0.07)	0.91	0.76	0.55
19**79Q1**-98Q4	1.73*** (0.18)	0.07 (0.12)	0.80*** (0.07)	0.94	0.61	0.64

***(**/*) denotes significance at the 1% (5%/10%) level; estimation method: GMM; HAC-robust standard errors in parentheses. R^2: adjusted coefficient of determination; SEE: standard error of the regression; J-stat: p-value of the J-statistic on the validity of overidentifying restrictions.
Variables: left-hand-side variable: 3-month money market rate (end-of-quarter); right-hand-side variables: inflation gap according to CPI; output gap with Bundesbank's own estimates of production potential. For further details on the data see Gerberding et al (2004).
The instrument set includes contemporary values of qoq rates of change in consumer prices and commodity prices (which were known to policy makers at the end of each quarter) and two/three lags of each explanatory variable and the commodity price variable. Pretesting suggests that this instrument structure is sufficient.

Table 4.2: Estimates of the extended reaction function, inflation forward-looking (from t to t+4), change in output gap from t-4 to t, real-time data

Estimation equation:

$$i_t = (1-\rho_1-\rho_2)\left(\alpha + \beta E_t((\pi^a_{t+4} - \pi^*)|\Omega_t) + \gamma_1 E_t((x_t - x_t^*)|\Omega_t) + \gamma_2 E_t\{\Delta_4(x_t - x_t^*)|\Omega_t\}\right) + \rho_1 i_{t-1} + \rho_2 i_{t-2} + \varepsilon_t$$

Post-Bretton Woods/Monetary Targeting

	β	γ_1	γ_2	ρ_1	ρ_2	$\overline{R}^2$	*SEE*	*J-stat (p-values)*
19**73Q2**-98Q4	0.76** (0.29)	0.56** (0.24)	1.30** (0.61)	1.02*** (0.05)	-0.09 (0.06)	0.92	0.82	0.63
19**75Q1**-98Q4	1.68*** (0.22)	0.06 (0.12)	0.67*** (0.24)	1.03*** (0.06)	-0.20*** (0.05)	0.92	0.69	0.59
19**79Q1**-98Q4	1.89*** (0.19)	0.04 (0.09)	0.75*** (0.24)	0.97*** (0.07)	-0.16*** (0.06)	0.94	0.65	0.89

***(**/*) denotes significance at the 1% (5%/10%) level; estimation method: GMM; HAC-robust standard errors in parentheses. R^2: adjusted coefficient of determination; SEE: standard error of the regression; J-stat: p-value of the J-statistic on the validity of overidentifying restrictions.
Variables: left-hand-side variable: 3-month money market rate (end-of-quarter); right-hand-side variables: inflation gap according to CPI; output gap with Bundesbank's own estimates of production potential. For further details on the data see Gerberding et al (2004).
The instrument set includes contemporary values of the inflation variable (CPI over previous year in %) and a commodity price variable (change of HWWA index of commodity prices in D-Mark over previous quarter in %) as well as three lags of each explanatory variable, the commodity price variable and a money growth variable (change in the Bundesbank's respective monetary target variable over previous year in %). Pretesting suggests that this instrument structure is sufficient.

Table 4.3: The US. Estimates of the extended reaction function, inflation forward-looking y-o-y (from t-3 to t+1)

Estimation equation:

$$i_t = (1-\rho_1)\left(\alpha + \beta E_t((\pi^a_{t+1})\left|\Omega_t\right.) + \gamma_1 E_t((x_t - x_t^*)\left|\Omega_t\right.) + \gamma_2 (E_t\{\Delta_j (x_t - x_t^*)\left|\Omega_t\right.\}\right) + \rho_1 i_{t-1} + \varepsilon_t$$

	β	γ_1	γ_2	ρ_1	*Const*	$\overline{R}^2$	*SEE*	*J-stat* (11dof) *(p-values)*
19**70Q1**-1979Q2 j=1	0.619*** (0.030)	0.195*** (0.040)	***0.095*** ***(0.059)***	0.458*** (0.064)	0.018*** (0.001)	0.87	0.006	0.22*34 (>10%)
19**70Q1**-1979Q2 j=4	0.591*** (0.033)	0.206** (0.084)	***0.014*** ***(0.028)***	0.493*** (0.108)	0.018*** (0.002)	0.86	0.006	0.22*34 (>10%)
1983**Q1**-1998Q4 j=1	2.73* (1.506)	1.406 (1.035)	***0.419**** ***(0.076)***	0.960*** (0.025)	-0.002* (0.001)	0.94	0.004	0.15*60 (>10%)
1983**Q1**-1998Q4 j=4	2.040*** (0.540)	0.475** (0.221)	***0.149**** ***(0.027)***	0.89*** (0.029)	-0.002 (0.002)	0.96	0.003	0.17*60 (>10%)

***(**/*) denotes significance at the 1% (5%/10%) level; estimation method: GMM; HAC-robust standard errors in parentheses. R^2: adjusted coefficient of determination; SEE: standard error of the regression; J-stat: p-value of the J-statistic on the validity of overidentifying restrictions.
Variables: left-hand-side variable: 3-month T-Bill rate; right-hand-side variables: inflation (y-o-y CPI); output gap; and y-o-y changes in the output gap. For further details on the data see Gerberding et al (2004).
The instrument set includes up to 3 lags of i, π, $(x - x^*)$, and changes of commodity prices as well as three lags of nominal money growth M2 (y-o-y).