# Measuring the Monetary Policy Stance in Europe

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**Summary**

This paper analyses the overall monetary policy stance in the EU-11 area from 1980 – 1999. A SVAR is estimated which yields a decomposition of the short term interest rate into an endogenous and exogenous component. The deviation of the short rate from a neutral rate is interpreted as a measure of the course of overall monetary policy. A historical decomposition yields information on the importance of the response of the interest rate to the structural shocks identified in the SVAR. Finally, accumulation of the structural interest rate residuals produces a measure of the stance of monetary policy in Europe.

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## 1. Measuring Monetary Policy

This paper deals with the issue of measuring the monetary policy stance in an economy. It first briefly surveys some issues concerning the identification of monetary policy in general and then looks at an aggregate European dataset to shed some light on the course of monetary policy in the EU-11 area for the period 1980 – 1999.

The literature on measuring monetary policy poses the question of how one can get information on the stance of monetary policy from the general data and information available. The central question therefore is to isolate from the overall movement of a relevant variable the part that can be attributed to monetary policy. More broadly interpreted the aim is to identify monetary policy as one out of many sources of the cyclical and long run behaviour of key macroeconomic variables.

Following the literature on empirical macroeconomics one can distinguish between monetary policy *actions* and monetary policy *shocks*, monetary policy action standing for the component of monetary policy that is responding to current movements in the economy and that can be captured by an empirical policy rule given by a policy reaction function. Policy action is thus the forecasteable or anticipated component of monetary policy, assuming that the agents have a knowledge of the rule while forming their expectations about future policy. In contrast, monetary policy shocks are all deviations of the policy makers from this rule, thus representing the unforecasteable or unanticipated component of monetary policy, which could be, but is not necessarily the result of discretionary policy action.

In addition an endogeneity problem arises: a variable that is assumed to contain information on monetary policy may in fact change due to policy movements, but may also move due to changing economic conditions that may not be connected to policy. Thus a variable potentially contains information along two dimensions: exogenous movements of the variable may indicate policy movements by the monetary authorities (be it actions or shocks in the above defined way), whereas endogenous movements may be an indicator of changing monetary or more generally economic conditions. The aim of measuring monetary policy is to find methods that isolate the first aspect, namely isolate policy movements by the authorities.[1]

[1] A closely related aspect is analysing the effects of monetary policy on macroeconomic variables and constructing an indicator for these policy effects. As the focus of this paper is a different, this aspect is not further looked at here. Ehrmann (2000) compares the effects of monetary policy across European countries, Gottschalk and Höppner (2000) construct an indicator for an European aggregate dataset, distinguishing between the effects of anticipated and unanticipated monetary policy. For an excellent general survey of VAR based studies on the transmission mechanism see Christiano et al. (1999).

Several approaches to the measurement of monetary policy have been proposed in the literature.[2] The narrative approach put forward by Romer and Romer (1989) tries to extract information on key policy actions taken by looking at publications of the central bank, e.g. the minutes of the policy committee or other statements of the decision making bodies.

More commonly used alternatives are measures that are based directly on the information content of an indicator variable. In a seminal paper, Bernanke and Blinder (1992) argue that the federal funds rate has been the primary policy target of the Fed in the US, movements of this overnight interest rate therefore above all reflect monetary policy actions by the Fed. They argue that for this reason the federal funds rate may be used as an indicator of monetary policy. Changes in the funds rate hence reflect all components of monetary policy, namely systematic rule based policy as well as unpredictable deviations from the policy rule. Alternatively, Christiano and Eichenbaum (1992) propose to use nonborrowed reserves as the indicator variable, Strongin (1995) proposes to use the part of nonborrowed reserves growth that is orthogonal to total reserve growth. Extending the work of Bernanke and Blinder (1992), Bernanke and Mihov (1998) use a linear combination of several policy variables as the indicator of monetary policy. All proposed indicators share the property that they are assumed to be directly affected by monetary policy, whereas the influence of other economic variables appears negligible, thereby addressing the endogeneity problem discussed above.

A straightforward extension of the indicator variable approach can be given in the context of a VAR model. Bernanke and Blinder (1992) argue that the structural residuals of the federal funds equation of a VAR can be interpreted as innovations to the monetary policy of the Fed. While the federal funds rate itself is an indicator of overall policy including rule based systematic policy, innovations to this rule are interpreted as unforecasteable policy shifts or policy *shocks*.

Following the notion in the literature, in this paper measurement of overall monetary policy is interpreted in a broad way, including the systematic rule based component of policy, whereas the more narrowly defined measurement of the policy stance is based on the policy shocks. The idea of this distinction is that endogenous reactions of the central bank to output or inflation are not necessarily in itself changes in the stance, meaning the underlying monetary policy orientation. Changes in this more general orientation of monetary policy are rather indicated by policy shocks that point towards deviations from the policy rule.[3]

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[2] See Bernanke and Mihov (1998) for a more detailed survey.

[3] See also Cochrane (1998) or Bernanke, Gertler and Watson (1997) for an important empirical discussion of the distinction between anticipated and unanticipated monetary policy in the VAR literature.

To get some insights into overall monetary policy directions as well as the policy stance in EU-11 for the period 1980 – 1999, this paper takes up the indicator variable concept and applies it to an European aggregate dataset. It uses the short-term interest rate as an indicator of monetary policy and decomposes it into endogenous and exogenous components via the estimation of a structural VAR model. A historical decomposition of the interest rate gives some information on the importance of the response of the interest rate to several structural shocks identified in the SVAR model. In addition, the accumulation of the structural interest rate residuals is used as a measure of the policy stance in Europe.[4]

The construction of historical measures for the EU-11 area is certainly somewhat artificial, as there was no clear single monetary policy for Europe between 1983 and 1999. Nevertheless this analysis can be of interest as certainly there was at least some common structure in the conduction of national monetary policies in the EMS and it thus may be of interest to analyse the movement of an aggregate measure of the policy stance during the period preceding the actual monetary union in 1999.

## 2. A VAR Model of the European Economy

In the following section a simple VAR model of the European economy is introduced and data, estimation and identification issues are discussed in turn. The statistical model that is used in this paper is a VAR in error-correction representation (VECM) of the following form:

$$\Gamma(L)\Delta x_t = m + ab' x_{t-k} + u_t \qquad (1)$$

$$\Gamma(L) = (I - \Gamma_1 L - \Gamma_2 L^2 ... - \Gamma_{k-1} L^{k-1}) \qquad (2)$$

where $x_t$ is the column vector of $n$ variables included in the VAR, $a$ is the matrix of loading coefficients, $b$ are the cointegrating vectors, $m$ is an intercept term, and $u_t$ are the reduced form residuals which are normally distributed vector white noise (VWN): $u_t \sim VWN(0,\Sigma)$. The reduced form of the VAR is given by equation (1). In this VECM set-up the polynomial

[4] Undoubtedly interpreting the structural shocks of a VAR model as monetary policy shocks has to be done with some caution, a discussion of possible interpretations of monetary policy shocks identified from VAR models can be found in Christiano et al. (1999), section 2. See also the critical discussion of the results in section three of this paper.

$\Gamma(L)$ captures the short run dynamics of the VAR, whereas $b' x_{t-k}$ represent the stationary long-run cointegrating relationships.

In order to obtain orthogonal innovations for each variable included in $x_t$, one has to factorise the variance-covariance matrix $\Sigma = E(u_t u_t')$. Define structural innovations $e_t$ by:

$$e_t = B u_t \qquad (3)$$

where $e_t$ is normally distributed vector white noise with variance $I_n$. Then $\Sigma = PP'$ is the factorisation of the variance-covariance matrix and furthermore $B = P^{-1}$. Matrix $B$ in equation (3) defines the structural residuals as contemporaneous linear combinations of the reduced form residuals. The factorisation leaves *n(n-1)/2* degrees of freedom so that some contemporaneous restrictions on $B$ must be introduced in order to identify the structural innovations from the estimated residuals. Section 2.2 discusses the structural identification in more detail.

## 2.1 The Data

The five variables included in the VAR are the following:

*y*: log of real GDP

*inf*: log of quarterly CPI inflation

*m3*: log of the real broad money aggregate M3

*st*: three month interest rate

*rer*: log of the real Euro/US $ exchange rate.

The dataset used is based on quarterly EMU-wide aggregate data from 1983:1 until 1999:4.[5] To correctly model the trend characteristics of the data, Augmented Dickey-Fuller and Phillips-Perron unit root tests are performed on all variables. The result of this analysis is reported in table 1 on the following page. It is apparent from the table that for all variables in levels the hypothesis of a unit root can not be rejected. Furthermore the results indicate that all variables are first difference stationary. It has to be noted that due to the limited sample length

[5] The data has been taken from the Area-Wide Model (AWM) data set, published by Fagan et al. (2001). From 1996 onwards, the time series have been updated from the ECB Monthly Bulletin. In addition the dataset includes the “synthetic” real exchange rate index of the Euro against the Dollar constructed by Clostermann and Schatz (2000).

**Table 1: Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests[(1)]**

| Variable | ADF test | PP test | Variable | ADF test | PP test |
|---|---|---|---|---|---|
| *y* | -2.009 | -2.342 | $\Delta y$ | -7.727 (**) | -7.746 (**) |
| *inf* | -2.709 | -2.111 | $\Delta inf$ | -10.393 (**) | -12.929 (**) |
| *m3* | -2.357 | -2.449 | $\Delta m3$ | -2.996 (*) | -4.857 (**) |
| *st* | -1.271 | -0.693 | $\Delta sr$ | -4.878 (**) | -5.494 (**) |
| *rer* | -2.086 | -2.075 | $\Delta rer$ | -4.011 (**) | -6.556 (**) |

(1): $\Delta$ is the first difference operator. The null hypothesis is the existence of a unit root. (*) indicates the rejection of the null hypothesis at the 5%, (**) at the 1% significance level, where critical values are taken from MacKinnon (1991). All tests are specified using an intercept, the analysis of y and m3 in levels additionally include a trend. Only significant lags are included in the ADF regressions.

the results of the unit root tests are only tentative, nevertheless they strongly indicate that all variables exhibit a stochastic trend, so that they can be modelled in the vector error correction framework presented in the proceeding section. For the variables in levels an intercept and a linear trend are allowed for in the VAR, the cointegrating vector includes an intercept. As the data is seasonally adjusted, no further dummies are included in the model.

## 2.2 Cointegration and Structural Identification

Applying the Johansen trace-test to test for the cointegration rank *r* of the VAR process leads to the acceptance of *r=1* cointegrating vector at a 5% significance level.[6]

Concerning the identification of this equilibrium relationship economic reasoning and previous studies on European wide data[7] suggest the existence of a long run money demand relationship. Imposing adequate restrictions leads to the acceptance of the following I(0) cointegrating vector (p-value 0.13):

$$CV_1 = m3 - y + \underset{(0.515)}{3.1145} * st$$

The number in the parentheses is the standard error. One can see that the homogeneity constraint between money and income is accepted resulting in a unitary income elasticity. In addition the interest rate elasticity is estimated very precisely and has the expected sign. Particularly the magnitude is quite close to the ones found in previous studies on a European money demand relationship.

6 All estimations and testing have been performed using the RATS procedure MALCOLM 2.2 by R. Mosconi.
7 See for example Coenen and Vega (1999), Hajo (1998) and Clausen and Kim (1997).

In addition to the cointegrating vector, an appropriate structural identification scheme that models contemporaneous relationships among the residuals through a proper specification of the matrix *B* needs to be found.

The core of the identification scheme used in the following is the assumption of a European wide structural relationship during the period 1983 until 1999. There are certainly some indications to the adequacy of this assumption. First the already mentioned empirical studies that looked at European wide data found a stable European money demand relationship over the whole sample period. Furthermore monetary policy in practice clearly was centred around the Bundesbank policy, implicitly imposing some common structure of monetary policy in Europe. These factors support the view that there has been at least some implicit economic structure among the European economies that can be captured in the identification scheme.

The structural identification scheme used in this paper is inspired by Clarida and Gertler (1996). Clarida and Gertler distinguish between policy and non-policy variables, i.e. variables that the monetary authorities are able to influence within the current period and others that are only affected with a certain time lag. Here money balances, the interest rate and the exchange rate are defined as policy variables, whereas GDP and inflation are assumed to be a non-policy variable, not contemporaneously responding to policy shocks. For this reason, a Cholesky recursive causal relationship is assumed among the non-policy variables (rows 1 and 2 in matrix *B*). The money balance and the interest rate reduced-form residuals are related to the other residuals through a money demand and a money supply specification (rows 3 and 4 in matrix *B*), and the exchange rate innovations respond contemporaneously to any other innovations in the system (last row in matrix *B*). Accordingly Equation (3) can be written in the following form, where a star stands for a structural coefficient to be estimated:

$$\begin{pmatrix} e_y \\ e_{inf} \\ e_{m3} \\ e_{st} \\ e_{rer} \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ * & 1 & 0 & 0 & 0 \\ * & 0 & 1 & * & 0 \\ 0 & * & * & 1 & 0 \\ * & * & * & * & 1 \end{pmatrix} * \begin{pmatrix} u_y \\ u_{inf} \\ u_{m3} \\ u_{st} \\ u_{rer} \end{pmatrix} \tag{4}$$

This identification scheme imposes overidentifying restrictions on the data. These restrictions are with a p-value of 0.24 significantly accepted when estimating the model. Alternatively

**Table 2: Misspecification tests[(1)]**

| (a) Jarque-Bera test on each equation: | | | |
|---|---|---|---|
| Equation | Skewness | Kurtosis | Skew.&Kurtosis |
| *y* | 0.415 | 1.209 | 1.624 |
| *inf* | 0.200 | 1.747 | 1.947 |
| *m3* | 0.010 | 5.048 (**) | 5.059 (*) |
| *st* | 0.164 | 0.187 | 0.350 |
| *rer* | 0.001 | 2.384 | 2.385 |
| (b) multivariate normality test: | | | |
| | Skewness | Kurtosis | Skew.&Kurtosis |
| *system* | 1.499 | 8.576 | 10.075 |

(1): the separate test statistic for skewness and kurtosis in columns 2 and 3 both have a $\chi^2(1)$ distribution, whereas the joint test (Jarque-Bera normality test) in column 4 has a $\chi^2(2)$ distribution. (**) indicates rejection of normality at the 5%, (*) at the 10% significance level. For the system the distributions are $\chi^2(5)$ and $\chi^2(10)$ respectively.

using a Cholesky decomposition with the above given ordering of the variables does not change the final results in a significant way.

## 2.3 Estimation and Stability Tests

Applying the Akaike and the Hannan-Quinn information criteria for the choice of the lag length indicates an optimal lag length of two. The model is then estimated using the Full Information Maximum Likelihood (FIML) estimation method. Standard impulse response analysis as a specification check is then performed. Though not being presented here, the impulse response functions exhibit the usual expected shape and none of the well known 'puzzles' appeared. As further specification tests, a visual inspection of the univariate correlation functions for each variable indicates no sign of autocorrelation. Univariate and multivariate normality tests are performed on the residuals of each equation. Results of this analysis are presented in table 2. The univariate analysis indicates some problems with the kurtosis of the residuals of the money equation (*m3*), however in the joint Jarque-Bera test for the money residuals normality is not rejected at the 5% level. Moreover, the multivariate test shows that for the system as a whole normality is significantly accepted as well. Overall this is rather good evidence of a proper specification of the model in terms of the residuals.

The analysis of the proceeding section has indicated the existence of one equilibrium relationship in the system, namely the long run money demand equation. It has still to be analysed if this cointegrating relationship is structurally stable over the whole sample period.

Two questions are of particular interest. One is the analysis of the stability of the cointegrating rank, the other the stability of the estimated coefficients in the long run equation. The tests are performed using recursive estimation of the whole system beginning in 1992. The results indicate clear stability of the cointegrating rank of $r=1$ as well as of the estimated coefficients of the money demand equation.[8]

## 3. Measuring Monetary Policy in Europe

This section uses the VAR model described in the preceding section to shed some light on the monetary policy stance in EU-11 for the period 1980 – 1999. The short-term interest rate is used as the relevant indicator of monetary policy and the deviation of the short rate from an approximate neutral rate is taken as an indicator of the direction of overall monetary policy including the systematic component. The VAR based decomposition of the interest rate into an endogenous and exogenous component sheds some light of the relative importance of these components. Furthermore a historical decomposition of the interest rate is performed to analyse the response of the interest rate to different shocks identified in the VAR model. The accumulation of the structural policy shocks is then used as a measure of the policy stance.

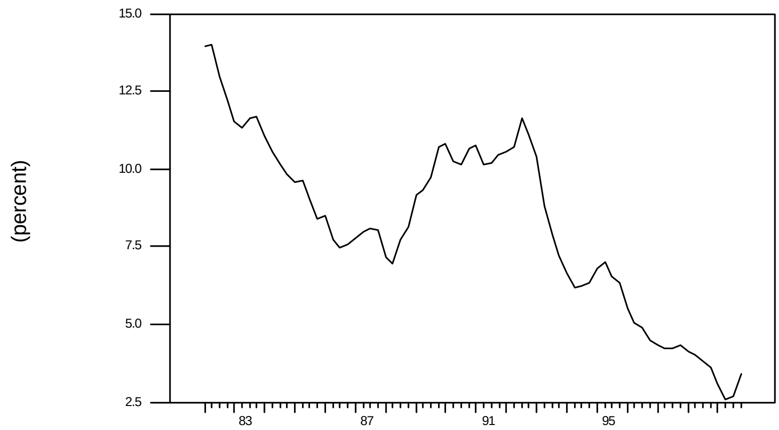
### 3.1 The Short Rate as an Indicator of Monetary Policy

In this paper the short-term three month interest rate is used as the indicator of overall monetary policy. There is an extensive discussion in the literature whether monetary aggregates or short-term interest rates are a better indicator of monetary policy, see Gottschalk and Höppner (2000) for a more detailed discussion of this issue in the European context. In the end the choice of the policy variable for an empirical investigation is mainly an empirical question itself and several recent studies[9] indicate that money is a relatively bad indicator concerning the information content concerning future inflation or output movements in Europe. Therefore the three month short-term interest rate is chosen as the relevant indicator of monetary policy in this paper.

Figure 1 presents the aggregate three month interest rate for the EU-11 area. One can see the decline in the level of the rate from 12 per cent in 1983 down to 7 per cent in 1988 and again

[8] The result of this test as well as the impulse response analysis is available from the author upon request.
[9] See for example Gerlach and Svensson (1999) and Trecroci and Vega (2000) among others.

**Figure 1: Short-Term Interest Rate**

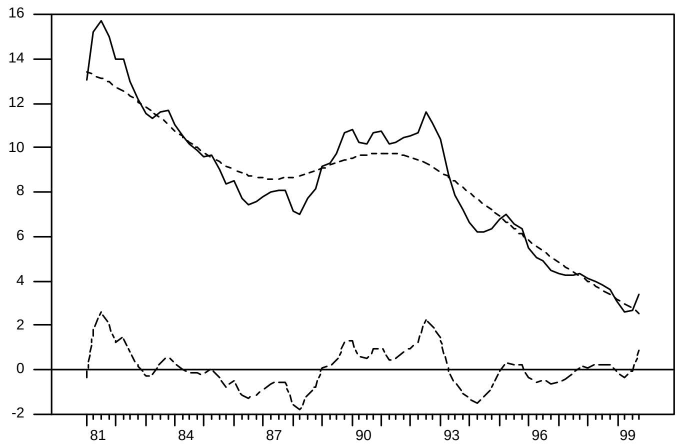



an increase with the final peak in 1992 triggered by the German unification and the alignment problems in the EMS leading to the crisis in late 1992. After the breakdown of the narrow bands the rate exhibits a continuous decline to the low levels of around 3 per cent we can observe nowadays, interrupted 1994-95 by the interest rate effects of the then reoccurring speculative problems in the EMS.

A first approach to get a picture of the overall course of monetary policy is to compare the development of the actual interest rate to some benchmark neutral rate. The concept of the neutral rate chosen in this paper is based on a Taylor rule type reaction function. A neutral policy stance thus is achieved when there is no output gap and the actual inflation rate equals the target. The neutral interest rate is then given by the equilibrium real interest rate and the inflation target. Neutrality is interpreted here as the absence of real output effects of monetary policy. As there are no clear defined ways to measure these concepts in the context of this paper, the simplifying assumption that the trend in the interest rate roughly captures changes in the real rate and the inflation target is made. The deviation of the interest rate from a simple Hodrick-Prescott trend accordingly can be seen as an approximate measure of the directions of overall monetary policy.

The measure together with the actual interest rate and the HP-trend is shown in figure 2 and some fundamental developments of the orientation of monetary policy in Europe can be read from the graph. In the early eighties the economy in Europe was mainly dominated by an inflationary environment due to the second oil price shock. It can be seen from figure 2 that monetary policy reacted to this situation by an overall restrictive policy stance. Policy though became significantly expansionary around 1986, as due to the then falling oil prices inflation

**Figure 2: Measure of Monetary Policy(*)**



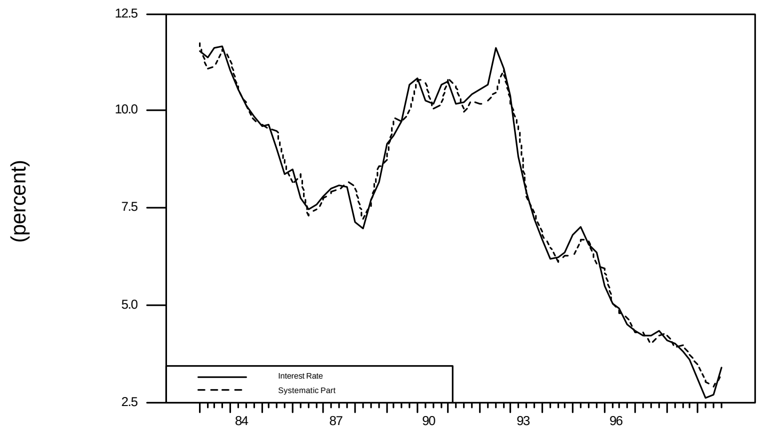

(*): solid line: interest rate; dashed line: HP-trend; broken line around zero: measure of monetary policy

rates decreased in Europe. At the end of 1987 monetary policy further eased as Europe experienced a considerable stock market crash and monetary policy reacted accordingly. This trend reversed with the economic boom that was initiated by German unification in 1990 and monetary policy again became restrictive in response to this boom. In 1992 one can observe a peak in the restrictive stance of policy, being due to the still increasing restrictive Bundesbank policy. It were the then occurring alignment problems in the EMS and the following recession in Europe that finally lead to a considerable easing of monetary policy around 1993/94. In 1995 the easing again was reversed as business cycle indicators showed inflationary tendencies around Europe. The period until the end of 1998 shows no clear trend of monetary policy, the Maastricht convergence process altogether allowed no easing of policy despite an overall weak real economy in Europe.

## 3.2 The Systematic Component of Monetary Policy

It has been discussed in section one that the indicator of monetary policy can be decomposed into a rule based systematic part and unforecasteable monetary policy shocks. Figure 3 presents this decomposition of the aggregate short-term interest rate for the European case: the solid line presents the interest rate whereas the dashed line presents the systematic part of monetary policy. One can see from the figure that the difference between the two series is rather small. This is to some extend due to the sluggishness of the short rate that is captured by the autoregressive terms in the interest rate equation of the VAR and that is motivated in

**Figure 3: Decomposition of the Interest Rate(*)**




(*): solid line: interest rate; dashed line: systematic part of monetary policy

the reaction function literature usually by interest rate smoothing behaviour of the central bank.

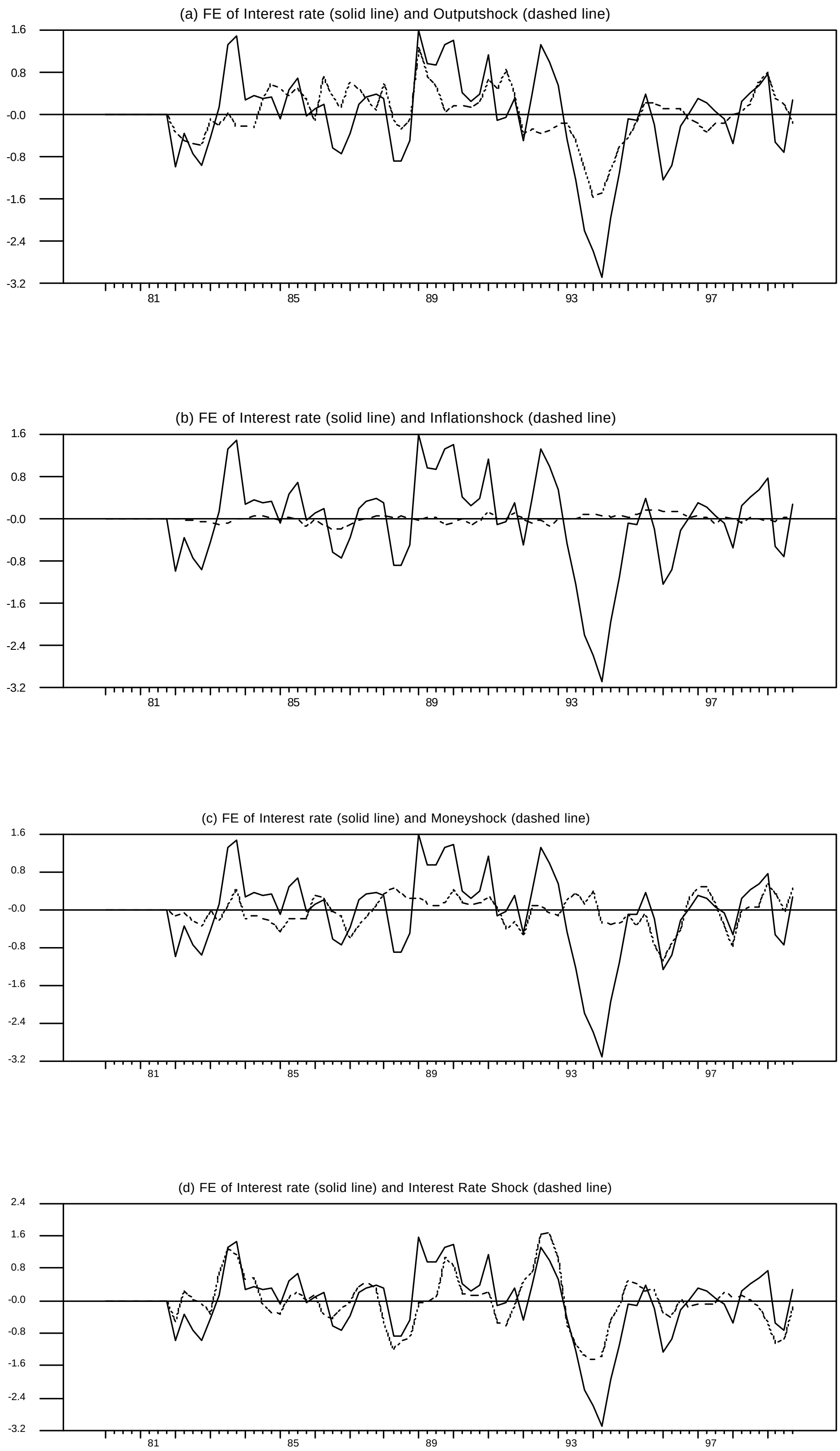
In order to get some further insights into the response of the interest rate to different shocks identified in the VAR model, figure 4 presents a historical decomposition of the interest rate. Displayed is the eight quarter ahead forecast error for the interest rate as well as the portion of this forecast error that is attributable to the structural interest rate, output, money demand and inflationary shocks respectively. The result is a picture that indicates for every time period the importance of a specific shock in driving the interest rate.[10]

One can see from figure 4 that output and interest rate shocks are the main source of the forecast error of the interest rate. That is, to one part deviations of the interest rate from the trend line are triggered by systematic monetary policy, mainly reacting to output movements, to the other part though the interest rate is driven by innovations to itself. Again, due to the persistence of the interest rate this to a great extent reflects the autoregressive structure of the interest rate, but the historical decomposition altogether indicates that deviations from the policy rule are not negligible as sources of the variation of the policy instrument.

To look at this argument from another angle, figure 5 presents the impulse response of the interest rate to a structural interest rate shock estimated from the VAR of section two. It is very apparent from the graph that following the positive policy shock the interest rate increases significantly and only comes back to its pre-shock level after five quarters, falling

[10] See e.g. King, Plosser, Stock and Watson (1991). Note that the solid line by construction roughly resembles the overall measure of monetary policy shown in figure 2 as it represents the deviation of the interest rate from some baseline trend.

# Figure 4: Historical Decomposition of the Interest Rate



below its initial level afterwards. A positive policy shock therefore is followed by higher interest rates for a period of at least one year. This indicates a close relationship between the policy shock and the policy indicator, the policy shock significantly leading the future development of the indicator variable.

### 3.3 A Measure of the Monetary Policy Stance

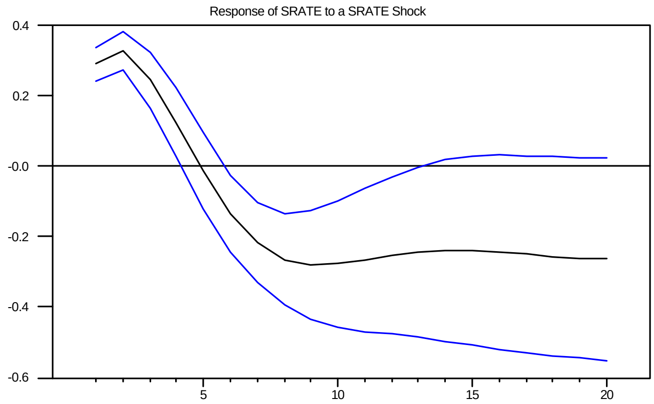
As the last step of my analysis of the short term interest rate as a monetary policy indicator in Europe, the information content of the structural policy shocks is looked at in further detail. As has been discussed in section one, the structural interest rate residuals can be interpreted as exogenous policy shocks that may indicate the unforecasteable component of monetary policy. The last section in addition has shown that there is a close connection between the policy shocks and the short term interest rate as the policy indicator variable.[11] A possible measure of the policy stance is constructed by accumulating the structural residuals of the interest rate equation of the VAR.[12] Accumulation smoothes the series so that the final series gives a clear indication of the direction of the policy shift. A considerable advantage of this measure compared to the overall measure of monetary policy of section 3.1 is that it does not rely on some notion of the neutral real interest rate. As over the sample period the residuals sum up to zero, it is though problematic to interpret the very last values of the stance measure. Also, the absolute values of the measure are sensitive to the choice of the length of the sample period, nevertheless it exhibits a stable pattern in its relative direction over time. Therefore the absolute level of the measure is of no specific meaning, only relative movements give an indication of changes in the policy stance. An upward movement represents a tightening of the policy stance, a downward movement an easing.

It has to be kept in mind that the concept of this measure rests on the assumption that the VAR innovations of the interest equation to a significant extent correctly capture exogenous and unexpected policy shifts, see section two in Christiano et al. (1999) for a general critical discussion of this issue. Besides this argument obviously the crucial question for the analysis of this paper is how important these shocks are in explaining monetary policy and the effects of it. The discussion of the last section however has shown that the shocks are a significant source of the variation of the policy instrument. A further difficulty in the context of an aggregate European analysis is noted by Coenen and Vega (1999). The point they make is that

[11] Focusing nevertheless on the policy shocks isolates this measure from the discussion about anticipated monetary policy of the preceding section.

[12] See Strongin (1995) who applies this method to his NBRX indicator of monetary policy in the US.

**Figure 5 : Impulse Response of the Interest Rate(*)**



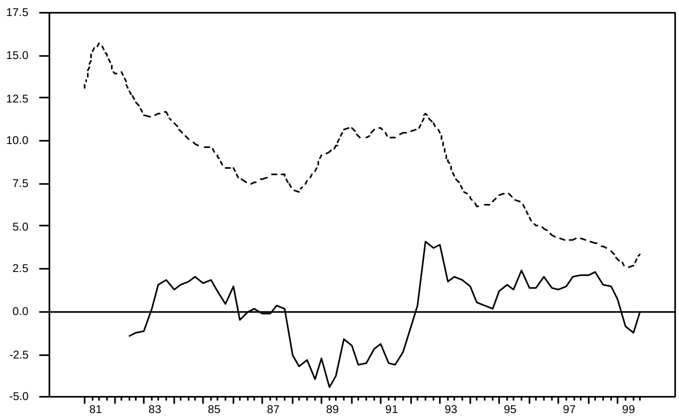

(*): impulse response and a 5% approximate confidence band

besides being the central policy instrument, the aggregate short term interest rate might also reflect movements of some individual countries interest rates that result for instance from the fixing of the exchange rate within the EMS. Altogether the proposed measure is therefore only tentative and has to be interpreted with some caution.

Figure 6 presents this measure for the EU-11 area. In the following it is also interesting to compare this measure to the overall policy measure presented in figure 2. Two clear periods of policy tightening are indicated by the measure in figure 6: from 1988 until 1992 and from 1994 until 1995. Between 1988 and 90 the overall measure exhibits a marked increase. During this period the VAR measure also increases, indicating a policy tightening, but it does so in a less pronounced way. The stance of policy, though tightening in tendency, was still relatively easy until 1990 in spite of the growing interest rate reflected in the overall measure. Only then the policy stance measure indicates a clear restrictive policy, which is not matched by even more increasing interest rates relative to the neutral rate until mid 1991. Thus judged by the measure of the policy stance the first tightening is particularly strong between 1990 and 1992, which might be due to the German unification and the restrictive policy of the Bundesbank and to the overall appearing alignment problems within the EMS.

After 1993 the level of the interest rate decreases significantly, from around 12 per cent in 1992 to the level of around 2 to 3 per cent we observe nowadays. As described above, compared to the trend neutral rate this decrease described a significant easing of monetary policy in light of the recession and this is also reflected in the measure of the stance. This can be interpreted as an easing that was in excess of a "normal" rule based easing. This

**Figure 6: A Measure of the Monetary Policy Stance(*)**




(*): solid line around zero: measure of policy stance; dashed line: interest rate

downward movement is only interrupted 1994-95 by the reoccurring attacks on some of the EMS members currencies. This little peak can also be seen in the policy stance measure.

After 1995 the tendency of a general easing of the policy stance is visible from the graph. The interesting point to note is that the policy measure indicates a new tightening from 1995 to 1997, despite an altogether neutral measure of overall monetary policy, decreasing levels of the interest rate in the light of ongoing convergence towards the EMU and overall low inflation. As has been discussed, the very last values of the measure are of no clear meaning, as the residuals sum up to zero over the sample period. Thus one must wait for more recent data to see if this trend of a still tight policy continues until the beginning of the currency union in 1999, as some economists have argued.

All in all it is interesting to note that the overall measure and the policy stance measure, though different in concept, indicate roughly the same developments of monetary policy.

## 4. Concluding Remarks

This paper dealt with the issue of measuring the monetary policy stance of an economy. It used the short term interest rate as an overall indicator of monetary policy and developed a narrow measure of the policy stance based on a structural VAR model. This measure uses the standard identification of monetary policy by the structural residuals of the interest rate equation to extract this discretionary component. Due to the increased interest and importance of a measure at the EU-11 aggregate level, the measure is applied to a constructed aggregate dataset by imposing some sort of common structure for historical data from 1983 to 1999. The cointegrating analysis in this paper confirmed the well known result in the literature of a stable money demand relationship in Europe.

The SVAR methodology is a by now well established methodology to identify exogenous policy movements within a dynamic empirical framework and it is typically used to simulate the dynamic response of key macroeconomic variables to this “policy experiment”. The interpretation of the structural residuals as policy shocks in addition suggests to use this information for the construction of a measure of exogenous policy shifts. The central aim of this paper was to construct this measure for an aggregate European dataset and compare it with a measure of overall monetary policy which includes the systematic component. Though being quantitatively different, it has been shown that both measures indicate generally the same policy directions. One argument that could be brought up against the use of the policy shocks is that not very much of the interest rate and therefore overall monetary policy is really driven by these shocks identified in the VAR. This paper for that reason also tried to demonstrate that policy shocks are indeed one significant source of the variation in the short term interest rate. Overall the analysis suggests that the information content of the policy shocks can in fact be used for the analysis of the further development of the indicator variable and monetary policy in general.

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