

Gerdemesmer, Dieter; Roffia, Barbara

Working Paper

Monetary analysis: a VAR perspective

Frankfurt School - Working Paper Series, No. 78

Provided in Cooperation with:

Frankfurt School of Finance and Management

Suggested Citation: Gerdemesmer, Dieter; Roffia, Barbara (2007) : Monetary analysis: a VAR perspective, Frankfurt School - Working Paper Series, No. 78, Frankfurt School of Finance & Management, Frankfurt a. M.,
<http://nbn-resolving.de/urn:nbn:de:101:1-20080827204>

This Version is available at:

<http://hdl.handle.net/10419/27845>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Frankfurt School – Working Paper Series

No. 78

Monetary Analysis:

A VAR perspective

by Dieter Gerdesmeier and Barbara Roffia

April 2007



**Frankfurt School of
Finance & Management**
Bankakademie | HfB

Sonnemannstr. 9–11 60314 Frankfurt an Main, Germany

Phone: +49(0)69 154 0080 Fax: +49(0)69 154 008 728

Internet: www.frankfurt-school.de

Abstract

The purpose of this study is to investigate the dynamic relationships between some key variables for the euro area by means of a systems approach (i.e. so-called Vector Autoregression) and to simulate their responses with respect to monetary policy shocks. The main result is that rather simple models can provide plausible reactions to changes in monetary policy. In particular, a positive shock in the short-term nominal interest rate is followed by a transitory decline in real income as well as a negative and permanent effect on the price level and nominal M3, leaving real M3 broadly unchanged.

Key words: Monetary analysis, VAR models, generalized impulse response functions

JEL classification: E52, F21

ISSN: 14369753

Contacts:

Dieter Gerdesmeier
Frankfurt School of Finance and European
Central Bank
E-mail: dieter.gerdesmeier@ecb.int

Barbara Roffia
European Central Bank
E-mail: barbara.roffia@ecb.int

We would like to thank P. Moutot, H. Pill and some other colleagues of the Monetary Analysis Section from the Monetary Policy Stance Division of the European Central Bank for useful comments and suggestions. The views expressed in this paper are solely the responsibility of the authors and should not be interpreted as reflecting the views of the ECB. Any remaining errors are the authors' responsibility.

Content

1. Introduction.....	4
2. VAR models and monetary policy.....	4
3. Analysis of the behaviour of M3 components	6
4. Analysis of the behaviour of M3 counterparts.....	9
5. Summary and conclusions	11
REFERENCES	12

1. Introduction

The ultimately monetary nature of inflation – i.e. the fact that prolonged periods of high inflation are associated with high monetary growth – is essentially undisputed in academic and central banking circles. While other factors (such as variations in aggregate demand or technological changes) can influence price developments at shorter horizons, this does not negate the underlying long-term relationship between prices and the money stock. As a consequence, this key relationship has also called for the assignment of a prominent role to money in the ECB’s monetary policy strategy.

In addressing the challenge of separating medium- to longer-term risks from shorter-term “noises”, a number of tools have been used. Besides a regular analysis of excess liquidity measures and the analysis of monetary variables in conjunction with variables from the real side of the economy, a thorough investigation of the components and counterparts of M3 is carried out on a regular basis by the ECB staff.

In fact, the relationship between interest rates, money, its components and counterparts, real income and, ultimately, prices forms an integral part of the transmission mechanism and, therefore, stands at the heart of monetary policy analysis. The dynamics, strength and timing of the effects of changes in policy interest rates on these variables are key questions for any central bank. When trying to quantify these effects, various econometric methods have been used, including Vector Autoregressive models (VAR models), small structural models and large macro-econometric models. This study focuses on presenting quantitative evidence on the interplay between interest rates, money, its components and counterparts, real GDP and prices in the euro area by making use of such VAR models. More specifically, the purpose is to trace out the historical relationships that have prevailed in the last two and a half decades in euro area data.

2. VAR models and monetary policy

VAR models have become very popular in empirical economics and also in the analysis of monetary policy effects.¹ The general representation of such type of model is as follows:

$$(1) \quad Y_t = A + BY_{t-1} + C(L)X_t + \varepsilon_t$$

¹ For a more detailed description, see Sims (1980).

where Y_t represents a vector of several (euro area) variables measured over the same sample period ($t = 1, \dots, T$), A is a vector of absolute terms, B is a vector of coefficients, C is a vector of exogenous variables and ε_t is a vector of error terms. The vector X is included to allow for a contemporaneous influence of exogenous variables such as, for instance, oil prices. The specification implicitly assumes that there is no feedback from the euro area to the exogenous variables. In line with these considerations, a standard VAR model widely used in the literature would read as follows:

$$(2) \quad Y_t = A + BY_{t-1} + C(L)X_t + \varepsilon_t$$

$$(3) \quad Y'_t = [s_t \quad yr_t \quad p_t]$$

$$(4) \quad X'_t = [oilp_t]$$

where s stands for a short-term interest rate, p , yr and $oilp$ stand for a consumer price index, real GDP and the oil price, respectively. The small letters – with the exception of the interest rate – denote logarithms. In such a framework, monetary policy effects have often been described in terms of reactions of the other variables in the system to an unexpected rise (i.e. a “*shock*”) in short-term interest rates. Given that the VAR system attempts to mirror the historical behaviour of the data, a contractionary monetary policy shock is then defined as a positive deviation of the interest rate from the estimated average reaction function of the central bank for the sample period.²

The dynamic response pattern of the reactions of the other variables to a shock are then often illustrated in terms of the so-called “*impulse response functions*”. The basic reason why the impulse response analysis of the effects of monetary policy focuses on the impact of the unsystematic shock to short-term interest rates is that this approach addresses the so-called “*identification problem*”. In essence, the transmission mechanism describes how a change in monetary policy affects other macroeconomic variables (in particular, prices), other things being equal. If monetary policy changes because of a shock to output or prices (as emphasized, for instance, in the so-called “*Taylor rules*” literature), it is not always possible to separate the impact of monetary policy on other variables from the impact of the initial shock. Only the unsystematic part of monetary policy is (by definition) identified separately from developments in other variables and thus allows the transmission mechanism itself to be traced out.

² It should be noted, however, that the concept of a reaction function used should not be interpreted in a structural sense. VAR models are by their very nature “reduced-form models”; therefore, the interest rate equation rather represents the derived reaction of the central bank within the system applied.

3. Analysis of the behaviour of M3 components

As a first step, we try to closely investigate the behaviour of the components of M3 for the euro area. The corresponding system thus includes as key variables the HICP index, real GDP, nominal M3, nominal M1, a long-term and a short-term nominal interest rate. In addition, a linear trend³, a commodity price index² and an oil price index are used as exogenous explanatory variables.

The linear trend allows trend long-term growth and the prolonged disinflation over the sample to be controlled for. Since the focus of this study is on the long-run relationships between the variables, a VAR in levels is estimated and solved for its dynamic responses.⁵ As is quite common in the literature, the three-month market interest rate is chosen as the policy variable.

Chart 1 below then illustrates the reaction of all variables in response to a transitory (i.e. one-off) shock in the interest rate by one standard deviation and the respective 65% confidence interval.⁶ The reactions of the variables included in the system are then shown for a time horizon of 24 quarters.

Expressed in non-technical terms, the exercise described above is reflected in an upward movement in the interest rate response by one standard deviation. The subsequent movements in the selected variables are then endogenous, which means that they are caused by the reactions of the variables in the system and the lagged values of the interest rate. By the same line of reasoning, all other variables start from the zero line, reflecting the fact that, in the first quarter, there are no deviations from the baseline since these variables are not shocked by definition.

Against this background, it is also worth mentioning that this study differs from an earlier study of Peersman and Smets (2003) – which contains a number of interesting results – for three main reasons. First and foremost, in our exercise we concentrate deliberately on the monetary analysis aspects in the VAR. Second, we make use of generalised impulse response

³ In a technical sense, the reason for introducing the trend variable is the problem of “*spurious correlation*”. This expression describes the fact that economic time series often tend to move in the same direction, reflecting a similar upward or downward trend. A simple regression of the variables may thus not reflect the true association: it may simply reflect the common trend present in them. One way of avoiding such “*spurious correlation*” is the introduction of a linear time trend into the model. Another way would be to explicitly “*de-trend*” the variables and run the regression on the de-trended variables.

⁴ As emphasised by Sims for the case of the US, the use of a commodity price index as a leading indicator for domestic inflation in the policy reaction function eliminates the positive response of prices to a contractionary monetary policy shock. See Sims (1992) for more details.

⁵ More specifically, the impulse response analysis is carried out using generalized impulse response functions. The purpose of generalized impulse response functions to circumvent the problem of the dependence of the orthogonalized impulse responses on the ordering of the variables in the VAR. See Pesaran and Shin (1998) for details.

⁶ If the usual 95% confidence interval is used, the price reaction is not significant. This is not uncommon in the literature and can be attributed to the random walk behaviour of prices. Most authors react by choosing a narrower confidence interval. We follow Bagliano and Favero (1999) who also use one standard deviation (corresponding to 65% bands).

functions which helps us to circumvent the issues related to the so-called “*ordering problem*”. Third, although somewhat less important, we use a longer sample.

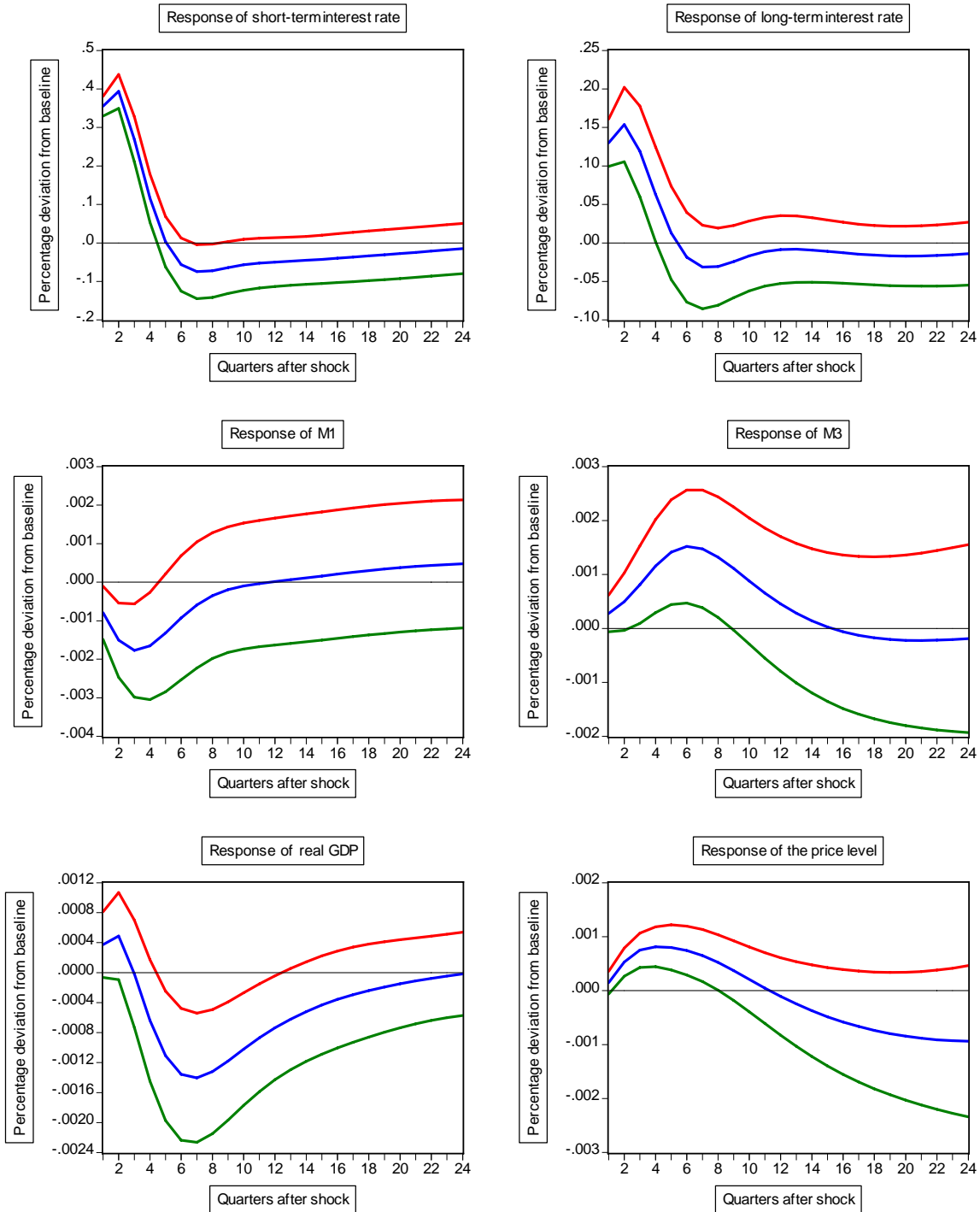
According to the results, the increase in the short-term interest rate is accompanied by a similar, albeit smaller, increase in the long-term interest rate (see Chart 1). This finding is clearly in line with the so-called “*expectations hypothesis*” of the term structure of the interest rates. Furthermore, a transitory rise in interest rates leads to an immediate decline in real income, reaching its trough after six quarters. After twenty-four quarters, however, the effect seems to have faded away, thus supporting the evidence of the long-run neutrality of money. Moreover, the rise in the short-term interest rate is followed by a notable decline in the HICP and, to a lesser extent, in the broad monetary aggregate M3. This decline starts to materialize approximately after ten quarters. With respect to the latter finding, it is particularly worth noting that both variables display an immediate rise, a phenomenon that is well-known in the literature as the “*price puzzle*”.

It is interesting to see, however, that, while M3 seems to react in a more sluggish way, euro area M1 seems to react rather immediately and in a strongly negative way to the interest rate shock. Quite obviously, the slow response of M3 is clearly due to the initial increase in the other components of M3. An interest rate tightening gives rise to substitution effects from monetary components that bear no or regulated interest into time deposits and money market funds that are also included in the broad monetary aggregates. This finding is consistent with the literature on money demand.⁷

In sum, the findings are in line with theoretical considerations stating that changes in interest rates will have no long-run effects on real economic variables, such as real output.

⁷ See Stracca (2001), Brand and Cassola (2000), Calza; Gerdesmeier and Levy (2001), Coenen and Vega (2001), Bruggeman, Donati and Warne (2003).

Chart 1: Impulse response functions following a transitory increase in the short-term interest rate by one standard deviation



Note: Sample period 1980 Q1- 2006 Q4.

4. Analysis of the behaviour of M3 counterparts

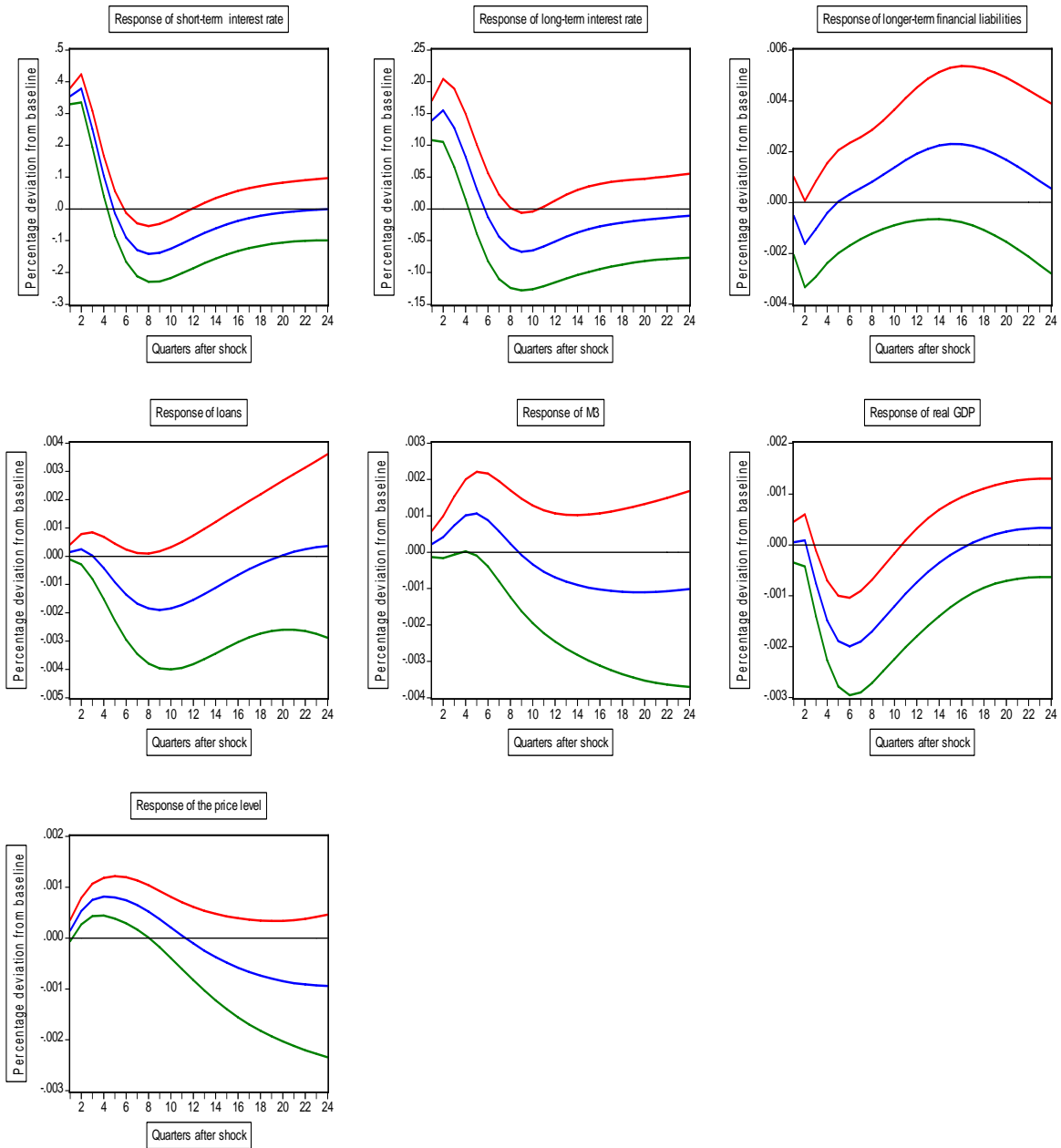
We now turn our attention to a closer investigation of the counterparts of M3. The corresponding system includes as key variables the HICP index, real GDP, nominal M3, nominal MFI loans to the private sector, MFI longer-term financial liabilities, a long-term and a short-term nominal interest rate.⁸ As before, in addition, a linear trend, a commodity price index and an oil price index were used as exogenous explanatory variables, as it was the case in the VAR model used in the previous section.

Chart 2 below illustrates the responses of the variables in the system to a transitory (i.e. one-off) shock in the interest rate by one standard deviation and the respective 65% confidence interval. The reactions of the variables included in the system are again shown for a time horizon of twenty-four quarters.

As in the case of the components' analysis, also the analysis of the counterparts seems to confirm the presence of a kind of "*expectations hypothesis*"-effect of the term structure of interest rates in the data. Moreover, a transitory decline in real income, and a permanent decline in euro area prices and M3. At the same time, MFI loans to the private sector soon start to decline while MFI longer-term financial liabilities slowly start to increase after around six quarters, reaching a peak after roughly sixteen quarters and then start to decline

⁸ It is worth noting that in the exercise related to the counterparts of M3, the net external asset position of MFIs is not included as a separate variable. This is justified in order to avoid perfect multicollinearity. Therefore, the reactions shown in the analysis do not explicitly capture the influence of this variable.

Chart 2: Impulse response functions following a transitory increase in the short-term interest rate by one standard deviation



Note: Sample period 1980 Q1 - 2006 Q4.

5. Summary and conclusions

The purpose of the study has been to investigate more closely the dynamic relationships between some key variables for the euro area. More specifically, two small models (one trying to capture the components' side of euro area M3 and one trying to capture the counterparts' side of euro area M3) are estimated by means of a VAR approach and simulated for their responses with respect to a monetary policy shock.

The main result is that these rather simple models can provide a reasonable description of the reactions of economic variables to changes in monetary policy. In particular, a positive shock in the short-term nominal interest rate is followed by a *transitory* decline in real income and loans, a *transitory* increase in MFI longer-term financial liabilities as well as a negative and *permanent* effect on the price level and nominal M3. Further work will need to focus on a further refinement of these results by imposing structural relationships and comparing them to the result reported here. Moreover, robustness tests will have to be carried out. Finally, the analysis might also focus on the inclusion of a more detailed breakdown of the instruments included in the components and counterparts of M3.

REFERENCES

- Bagliano, F.C. and Favero, C.A. (1999), Information from Financial Markets and VAR Measures of Monetary Policy, *European Economic Review*, Vol. 43, No. 4-6, pp. 825-837.
- Brand, C., and Cassola, N. (2000), A Money Demand System for the Euro Area, ECB Working Paper No.39. Published in *Applied Economics* (2004), Vol. 36, pp. 817-838.
- Bruggeman, A., Donati, P. and Warne, A. (2003), Is the demand for euro area M3 stable?, ECB Working Paper No. 255.
- Calza, A., Gerdesmeier, D. and Levy, J. (2001), Euro Area Money Demand: Measuring the Opportunity Costs Appropriately, IMF Working Paper No.01/179.
- Coenen, G., and Vega, J. L. (2001), The Demand for M3 in the Euro Area, *Journal of Applied Econometrics*, Vol. 16, pp. 727-748.
- European Central Bank (2000), Monetary policy transmission in the euro area, *Monthly Bulletin*, pp. 43-58, July.
- Issing, O. (2005), The Role of Money in the Monetary Policy Strategy of the ECB, Speech delivered at a workshop organised by the Deutsche Bundesbank on “What central banks can learn from money and credit aggregates”, Eltville, 27-28 October.
- Lucas, R.E. (1976), *Econometric Policy Evaluation: A Critique*, Carnegie Rochester Conference on Public Policy, Vol. 1, pp. 9-46.
- Peersman, G. and Smets, F. (2003), The Monetary Transmission Mechanism in the Euro Area: Evidence from VAR analysis. In: Angeloni, I.; Kashyap, A. and Mojon, B. (eds.), *Monetary Policy Transmission in the Euro Area*, Cambridge University Press.
- Pesaran, M.H. and Shin, Y. (1998), Generalized Impulse Response Functions in Linear Multivariate Models, *Economic letters*, Vol. 58, pp. 17-29.

Sims, C.A. (1980), *Macroeconomics and Reality*, *Econometrica*, Vol. 48, No. 1, pp. 1-48.

Sims, C.A. (1991), *Empirical Analysis of Macroeconomic Time Series: VAR and Structural Models: Comment*, *European Economic Review*, Vol. 35, No. 4, pp. 922-932, May.

Sims, C.A. (1992), *Interpreting the Macroeconomic Time Series Facts: The Effects of Monetary Policy*, *European Economic Review*, Vol. 36, No. 5, June, pp. 975-1000.

Sims, C.A. (1998), *Comment on Glenn Rudebusch's "Do Measures of Monetary Policy in a VAR Make Sense?"*, *International Economic Review*, Vol. 39, No. 4, pp. 933-941, November.

Stracca, L. (2001), *The functional form of the demand for euro area M1*, *The Manchester School*, Vol. 71 (2), pp. 172-204.

Taylor, J. (1995), *The Monetary Transmission Mechanism: An Empirical Framework*, *Journal of Economic Perspectives*, Vol. 9, pp. 11-26.

FRANKFURT SCHOOL / HFB – WORKING PAPER SERIES

No.	Author/Title	Year
77	Heidorn, Thomas / Kaiser, Dieter G. / Muschiol, Andrea Portfoliooptimierung mit Hedgefonds unter Berücksichtigung höherer Momente der Verteilung	2007
76	Schalast, Christoph / Ockens, Klaas / Jobe, Clemens J. / Safran, Robert Work-Out und Servicing von notleidenden Krediten – Berichte und Referate des HfB-NPL Servicing Forums 2006	2006
75	Abrar, Kamyar Fusionskontrolle in dynamischen Netzsektoren am Beispiel des Breitbandkabelsektors	2006
74	Schanz, Kay-Michael / Schalast, Christoph – Wertpapierprospekte – Markteinführungspublizität nach EU-Prospektverordnung und Wertpapierprospektgesetz 2005	2006
73	Dickler, Robert A. /Schalast, Christoph Distressed Debt in Germany: What's Next? Possible Innovative Exit Strategies	2006
72	Belke, Ansgar / Polleit, Thorsten How the ECB and the US Fed set interest rates	2006
71	Heidorn, Thomas / Hoppe, Christian / Kaiser, Dieter G. Heterogenität von Hedgefondsindizes	2006
70	Löchel, Horst / Baumann, Stefan The Endogeneity Approach of the Theory of Optimum Currency Areas - What does it mean for ASEAN + 3?	2006
69	Heidorn, Thomas / Trautmann, Alexandra Niederschlagsderivate	2005
68	Heidorn, Thomas / Hoppe, Christian / Kaiser, Dieter G. Möglichkeiten der Strukturierung von Hedgefondsportfolios	2005
67	Weber, Christoph Kapitalerhaltung bei Anwendung der erfolgsneutralen Stichtagskursmethode zur Währungsumrechnung	2005
66	Schalast, Christoph / Daynes, Christian Distressed Debt-Investing in Deutschland - Geschäftsmodelle und Perspektiven -	2005
65	Gerdesmeier, Dieter / Polleit, Thorsten Measures of excess liquidity	2005
64	Hölscher, Luise / Harding, Perham / Becker, Gernot M. Financing the Embedded Value of Life Insurance Portfolios	2005
63	Schalast, Christoph Modernisierung der Wasserwirtschaft im Spannungsfeld von Umweltschutz und Wettbewerb – Braucht Deutschland eine Rechtsgrundlage für die Vergabe von Wasserversorgungskonzessionen? –	2005
62	Bayer, Marcus / Cremers, Heinz / Kluß, Norbert Wertsicherungsstrategien für das Asset Management	2005
61	Löchel, Horst / Polleit, Thorsten A case for money in the ECB monetary policy strategy	2005
60	Schanz, Kay-Michael / Richard, Jörg / Schalast, Christoph Unternehmen im Prime Standard - „Staying Public“ oder „Going Private“? - Nutzenanalyse der Börsennotiz -	2004
59	Heun, Michael / Schlink, Torsten Early Warning Systems of Financial Crises - Implementation of a currency crisis model for Uganda	2004
58	Heimer, Thomas / Köhler, Thomas Auswirkungen des Basel II Akkords auf österreichische KMU	2004
57	Heidorn, Thomas / Meyer, Bernd / Pietrowiak, Alexander Performanceeffekte nach Directors' Dealings in Deutschland, Italien und den Niederlanden	2004
56	Gerdesmeier, Dieter / Roffia, Barbara The Relevance of real-time data in estimating reaction functions for the euro area	2004
55	Barthel, Erich / Gierig, Rauno / Kühn, Ilmhart-Wolfram Unterschiedliche Ansätze zur Messung des Humankapitals	2004
54	Anders, Dietmar / Binder, Andreas / Hesdahl, Ralf / Schalast, Christoph / Thöne, Thomas Aktuelle Rechtsfragen des Bank- und Kapitalmarktrechts I : Non-Performing-Loans / Faule Kredite - Handel, Work-Out, Outsourcing und Securitisation	2004

53.	Polleit, Thorsten The Slowdown in German Bank Lending – Revisited	2004
52.	Heidorn, Thomas / Siragusano, Tindaro Die Anwendbarkeit der Behavioral Finance im Devisenmarkt	2004
51.	Schütze, Daniel / Schalast, Christoph (Hrsg.) Wider die Verschleuderung von Unternehmen durch Pfandversteigerung	2004
50.	Gerhold, Mirko / Heidorn, Thomas Investitionen und Emissionen von Convertible Bonds (Wandelanleihen)	2004
49.	Chevalier, Pierre / Heidorn, Thomas / Krieger, Christian Temperaturderivate zur strategischen Absicherung von Beschaffungs- und Absatzrisiken	2003
48.	Becker, Gernot M. / Seeger, Norbert Internationale Cash Flow-Rechnungen aus Eigner- und Gläubigersicht	2003
47.	Boenkost, Wolfram / Schmidt, Wolfgang M. Notes on convexity and quanto adjustments for interest rates and related options	2003
46.	Hess, Dieter Determinants of the relative price impact of unanticipated Information in U.S. macroeconomic releases	2003
45.	Cremers, Heinz / Kluß, Norbert / König, Markus Incentive Fees. Erfolgsabhängige Vergütungsmodelle deutscher Publikumsfonds	2003
44.	Heidorn, Thomas / König, Lars Investitionen in Collateralized Debt Obligations	2003
43.	Kahlert, Holger / Seeger, Norbert Bilanzierung von Unternehmenszusammenschlüssen nach US-GAAP	2003
42.	Beiträge von Studierenden des Studiengangs BBA 012 unter Begleitung von Prof. Dr. Norbert Seeger Rechnungslegung im Umbruch - HGB-Bilanzierung im Wettbewerb mit den internationalen Standards nach IAS und US-GAAP	2003
41.	Overbeck, Ludger / Schmidt, Wolfgang Modeling Default Dependence with Threshold Models	2003
40.	Balthasar, Daniel / Cremers, Heinz / Schmidt, Michael Portfoliooptimierung mit Hedge Fonds unter besonderer Berücksichtigung der Risikokomponente	2002
39.	Heidorn, Thomas / Kantwill, Jens Eine empirische Analyse der Spreadunterschiede von Festsatzanleihen zu Floatern im Euroraum und deren Zusammenhang zum Preis eines Credit Default Swaps	2002
38.	Böttcher, Henner / Seeger, Norbert Bilanzierung von Finanzderivaten nach HGB, EstG, IAS und US-GAAP	2003
37.	Moormann, Jürgen Terminologie und Glossar der Bankinformatik	2002
36.	Heidorn, Thomas Bewertung von Kreditprodukten und Credit Default Swaps	2001
35.	Heidorn, Thomas / Weier, Sven Einführung in die fundamentale Aktienanalyse	2001
34.	Seeger, Norbert International Accounting Standards (IAS)	2001
33.	Stehling, Frank / Moormann, Jürgen Strategic Positioning of E-Commerce Business Models in the Portfolio of Corporate Banking	2001
32.	Strohhecker, Jürgen / Sokolovsky, Zbynek Fit für den Euro, Simulationsbasierte Euro-Maßnahmenplanung für Dresdner-Bank-Geschäftsstellen	2001
31.	Roßbach, Peter Behavioral Finance - Eine Alternative zur vorherrschenden Kapitalmarkttheorie?	2001
30.	Heidorn, Thomas / Jaster, Oliver / Willeitner, Ulrich Event Risk Covenants	2001
29.	Biswas, Rita / Löchel, Horst Recent Trends in U.S. and German Banking: Convergence or Divergence?	2001
28.	Löchel, Horst / Eberle, Günter Georg Die Auswirkungen des Übergangs zum Kapitaldeckungsverfahren in der Rentenversicherung auf die Kapitalmärkte	2001

27.	Heidorn, Thomas / Klein, Hans-Dieter / Siebrecht, Frank Economic Value Added zur Prognose der Performance europäischer Aktien	2000
26.	Cremers, Heinz Konvergenz der binomialen Optionspreismodelle gegen das Modell von Black/Scholes/Merton	2000
25.	Löchel, Horst Die ökonomischen Dimensionen der ‚New Economy‘	2000
24.	Moormann, Jürgen / Frank, Axel Grenzen des Outsourcing: Eine Exploration am Beispiel von Direktbanken	2000
23.	Heidorn, Thomas / Schmidt, Peter / Seiler, Stefan Neue Möglichkeiten durch die Namensaktie	2000
22.	Böger, Andreas / Heidorn, Thomas / Graf Waldstein, Philipp Hybrides Kernkapital für Kreditinstitute	2000
21.	Heidorn, Thomas Entscheidungsorientierte Mindestmargenkalkulation	2000
20.	Wolf, Birgit Die Eigenmittelkonzeption des § 10 KWG	2000
19.	Thiele, Dirk / Cremers, Heinz / Robé, Sophie Beta als Risikomaß - Eine Untersuchung am europäischen Aktienmarkt	2000
18.	Cremers, Heinz Optionspreisbestimmung	1999
17.	Cremers, Heinz Value at Risk-Konzepte für Marktrisiken	1999
16.	Chevalier, Pierre / Heidorn, Thomas / Rütze, Merle Gründung einer deutschen Strombörse für Elektrizitätsderivate	1999
15.	Deister, Daniel / Ehrlicher, Sven / Heidorn, Thomas CatBonds	1999
14.	Jochum, Eduard Hoshin Kanri / Management by Policy (MbP)	1999
13.	Heidorn, Thomas Kreditderivate	1999
12.	Heidorn, Thomas Kreditrisiko (CreditMetrics)	1999
11.	Moormann, Jürgen Terminologie und Glossar der Bankinformatik	1999
10.	Löchel, Horst The EMU and the Theory of Optimum Currency Areas	1998
09.	Löchel, Horst Die Geldpolitik im Währungsraum des Euro	1998
08.	Heidorn, Thomas / Hund, Jürgen Die Umstellung auf die Stückaktie für deutsche Aktiengesellschaften	1998
07.	Moormann, Jürgen Stand und Perspektiven der Informationsverarbeitung in Banken	1998
06.	Heidorn, Thomas / Schmidt, Wolfgang LIBOR in Arrears	1998
05.	Jahresbericht 1997	1998
04.	Ecker, Thomas / Moormann, Jürgen Die Bank als Betreiberin einer elektronischen Shopping-Mall	1997
03.	Jahresbericht 1996	1997
02.	Cremers, Heinz / Schwarz, Willi Interpolation of Discount Factors	1996
01.	Moormann, Jürgen Lean Reporting und Führungsinformationssysteme bei deutschen Finanzdienstleistern	1995

HfB – WORKING PAPER SERIES

CENTRE FOR PRACTICAL QUANTITATIVE FINANCE

No.	Author/Title	Year
04.	Boenkost, Wolfram / Schmidt, Wolfgang M. Interest Rate Convexity and the Volatility Smile	2006
03.	Becker, Christoph/ Wystup, Uwe On the Cost of Delayed Currency Fixing	2005
02.	Boenkost, Wolfram / Schmidt, Wolfgang M. Cross currency swap valuation	2004
01.	Wallner, Christian / Wystup, Uwe Efficient Computation of Option Price Sensitivities for Options of American Style	2004

HfB – SONDERARBEITSBERICHTE DER HfB - BUSINESS SCHOOL OF FINANCE & MANAGEMENT

No.	Author/Title	Year
01.	Nicole Kahmer / Jürgen Moormann Studie zur Ausrichtung von Banken an Kundenprozessen am Beispiel des Internet (Preis: € 120,-)	2003

Printed edition: € 25.00 + € 2.50 shipping

Download: http://www.frankfurt-school.de/content/de/research/Publications/list_of_publication?year=2007

Order address / contact

Frankfurt School of Finance & Management
Sonnemannstr. 9–11 ▪ D–60314 Frankfurt/M. ▪ Germany
Phone: +49 (0) 69 154 008–734 ▪ Fax: +49 (0) 69 154 008–728
eMail: m.biemer@frankfurt-school.de
Further information about Frankfurt School of Finance & Management
may be obtained at: <http://www.frankfurt-school.de>