DEPARTMENT OF ECONOMICS

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Financial Predictors of Real Activity and the Propagation of Aggregate Shocks

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Working Paper No. 0616
September 2006

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Abstract: Bond yield and retail interest rate spreads are presumed to lead real activity on the basis of financial accelerator mechanisms, markup cyclicality or simply because they are forward-looking. Empirical results for Austria show that retail rate spreads outperform many other indicators in this respect. Nevertheless, there is no evidence for a financial accelerator being behind this finding.

Keywords: Leading indicator, business cycle, shock propagation, financial accelerator, bank markup.

JEL classification: E 32, E 44, G 12, G 21.

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1 Introduction and Literature Review

As economic policy is interested in the information content of financial variables for real activity and inflation, numerous studies have examined which variables have a "useful role in a policy-maker's information set" (Gertler and Lown 1999, p. 133). Since empirical evidence for the USA suggests that 'traditional' financial indicators, like short-term interest rates or the term spread, seem to have lost forecasting power for real activity (Gertler and Lown 1999, Mody and Taylor 2004),[1] measures drawing on the financial accelerator (premiums for external funds) have attracted considerable attention in this respect. Arguments therefore are as follows.[2] Due to some friction in financial markets or the market for loans, there exists a wedge between the cost of external and the opportunity cost of firm-internal funds, the external finance premium (EFP).[3] This premium therefore is prevalent with bank-based financing (Bernanke, Gertler and Gilchrist 1996) as well as on the market for corporate bonds (de Bondt 2004). As it is argued in the literature on the balance sheet channel of monetary policy transmission, the EFP is endogenous because one of its main determinants, the creditworthiness of the (potential) borrowers, is influenced by monetary policy and the business cycle. If interest rates rise or economic activity shrinks, corporate borrowers' net worth and credit ratings deteriorate and default probabilities rise. The balance sheet strength of borrowers, which is procyclical, induces the countercyclicality of the external finance premium that amplifies the fluctuations of economic activity via its effects on borrowers' spending decisions. Additionally, the cost of external financing may also be affected by the ability and the willingness of the banking sector to provide loans. However, the bank lending channel mainly emphasizes the direct effects of monetary policy on the aggregate spending of bank-dependent borrowers if the aggregate supply of credit is not fully decoupled from open market operations (Kashyap and Stein 1994).

Another strand of the literature describes the cyclicality of markups (price-cost margins) as a propagation channel of aggregate shocks. Especially in economies with bank-based financial systems, countercyclical markups in the pricing of loans (e.g. measured by spreads of lending over deposit rates) could contribute to an amplification of macroeconomic fluctuations. Adapting the possible reasons for markup countercyclicality put forward in the literature to the banking sector, such a channel could be operative with loan pricing if also banks act more competitively in periods of high demand. This might be due to collusion being harder to be maintained then (Rotemberg and Woodford 1991), or because of variations in the price elasticity of loan demand (also as a consequence of the changing availability and attractiveness of other forms of corporate finance over the cycle). Thirdly, capital market imperfections also matter in this context (Chevalier and Scharfstein 1995). Switching costs, for example, give banks some market power that allows them to charge borrowers, who were previously locked in through lower loan rates and markups, with higher payments in recessions (Dueker and Thornton 1997).

Empirical work mainly deals with external finance premiums in the bond market and banks' interest rate spreads to examine their predictive content for real activity (the growth rate of GDP, or

the output gap as in Gertler and Lown 1999). The yields of low-rated corporate bonds represent the relevant cost of external funds in Gertler and Lown (1999), de Bondt (2004) and Mody and Taylor (2004), the opportunity cost of internal finance is usually a risk-free rate (government bond yield). These studies generally find that their ('high-yield') corporate bond spreads have predictive content for future output growth. Guha and Hiris (2002) show that the credit spread (the term they use for the EFP on bond markets) is significantly higher during recessions than during expansions and that its turning points contain significant information about future turning points of the U.S. business cycle. Complementing the results of de Bondt (2004) for the euro area, Davis and Fagan (1997) show that the long-term private-public bond spread leads output growth in Denmark and the UK, but not in Germany (these are the three countries for which they had data on the EFP). Interest rate spreads between lending and deposit rates are, for example, applied by Shan and Morris (2002). They use data for 19 OECD countries, China and South Korea, and find little evidence for spreads (which are interpreted as indicators of financial development and the efficiency of financial intermediation) leading output growth.

In this paper, various proxies of external finance premiums and banking sector markups are employed to examine whether they and which of them have predictive content for real activity in Austria. These financial measures, which are described in section 2, also contain external fincance premiums for intermediated borrowing (which mostly have been neglected in the empirical literature), as well as interest rate spreads relating to consumer and housing credit. By means of impulse response functions from bivariate vector autoregressions (see section 3 for the methodological framework used) it is found that, above all, interest rate spreads are significantly leading real output growth in Austria. In this respect, interest rate spreads have superior explanatory power compared to the EU Economic Sentiment Indicator and the OECD Composite Leading Indicator for Austria. As will be argued in section 4, this is not sufficient to conclude that financial (and markup) accelerator mechanisms are at work. Results show that interest rate spreads (and other financial measures) lose their leading indicator property in statistical terms in more sophisticated multivariate models. However, this may be due to overfitting (as in Estrella and Mishkin 1998), and it can be observed that the estimates of GDP growth responses for shocks in interest rate spreads are surprisingly robust to the inclusion of additional variables. Further investigation reveals that many of the proposed financial measures do not vary significantly with the business cycle, a precondition for playing a role in the propagation and amplification of aggregate shocks. Interest rate spreads behave even procyclically, which is against a bank-based financial accelerator mechanism in Austria.

2 Examined Predictors of Real Activity

The potential leading indicators of Austrian output growth proposed can be classified as follows. First, there are measures of financial conditions prevailing for security-based as well as intermediated financing. The *corporate bond spread* (the external finance premium in the bond market), defined as

the difference between the yields of corporate and government bonds, might not be very informative about a financial accelerator as mainly high-quality borrowers have issued market debt in Austria. However, even in this case it could lead real activity because it contains expectations about future default (Gertler and Lown 1999). Additionally, if financial conditions are correlated across markets, the corporate bond spread could be informative with respect to future growth even if bond financing is small relative to bank finance (Gertler and Lown 1999). The difference between the commercial credit interest rate and the corporate bond yield is referred to as *bank finance premium* here. Kashyap and Stein (1994) suggested this measure to identify potential effects of changes in loan supply on bank finance conditions. Measures derived from retail interest rates, however, have to be carefully interpreted as banks may also vary the non-price terms of bank loans. This concern also applies to *interest rate premiums*, the spreads of contractual retail rates (on commercial, consumer, housing, hypothecary and municipal loans) over the government bond yield. Such premiums were also calculated using ex-post data from the banking-sector balance sheet and its income statement, called *interest income premiums*. For the more general one, the risk-free rate was deducted from the average interest rate on interest-earning assets of the banking sector (total interest income divided by the level of interest-earning assets). A similar premium, which is more specific to corporate and household borrowing, is based on the average interest rate earned on loans to non-banks.

Second, measures of markups in the banking sector contain interest rate spreads, proxies of Lerner indices, and net interest margins (spreads). *Interest spreads* are calculated as the differentials between lending rates and the interest rate on savings deposits with an agreed maturity of over twelve months (as correlations of the lending rates are highest for this deposit rate). The *Lerner indices* used are only proxies for the difference between price and marginal cost (weighted by price) and, as in Gischer and Jüttner (2003), apply solely to banks' interest business. Total interest income divided by total assets replaces the price of bank production and marginal cost is approximated by the average interest cost per unit, interest expenses divided by total assets.[4] Consequently, these Lerner indices can be calculated by dividing net interest income by interest revenues, which is done for the total net interest income and the net interest income from business with non-banks only. *Net interest margins* (net interest income of the banking sector relative to its total or interest-earning assets) and spreads (the difference between the average interest realized on interest-earning assets and the average interest paid for interest-bearing liabilities) complete the list of bank markups. The net interest spread (non-banks) is the average lending rate less the average deposit rate in the interest business with non-banks.

A third group contains other potential predictors of real activity. The term spread is calculated as the difference between the yield of government bonds and the overnight money market rate. Additionally, we apply the real returns on the WBI share price index, the EU Economic Sentiment Indicator and the growth rate of the OECD CLI (Composite Leading Indicator, trend restored).

Table 1: Descriptive statistics and length of time series

Variable	N	Availability	Mean	Std.Dev.	Minimum	Maximum
Net interest margin	77	87:1-06:1	0.37	0.07	0.24	0.49
Net interest spread (non-banks)	69	89:1-06:1	0.73	0.15	0.47	0.94
Lerner index (NII)	77	87:1-06:1	27.02	4.20	18.87	36.00
Lerner index (NII from non-banks)	69	89:1-06:1	55.41	4.50	44.94	62.40
Corporate bond spread	53	93:1-06:1	0.46	0.50	-0.13	2.29
Bank finance premium	34	95:1-03:2	1.25	0.53	0.12	2.27
Commercial credit spread	34	95:1-03:2	3.37	0.31	2.92	4.02
Consumer credit spread	34	95:1-03:2	4.45	0.48	3.85	5.57
Housing credit spread	34	95:1-03:2	2.96	0.26	2.57	3.53
Commercial credit premium	34	95:1-03:2	1.72	0.43	0.80	2.41
Consumer credit premium	34	95:1-03:2	2.80	0.54	1.75	3.59
Housing credit premium	34	95:1-03:2	1.32	0.45	0.34	2.04
Interest income premium (non-banks)	69	89:1-06:1	0.95	0.51	0.05	2.04
Term spread	68	89:2-06:1	0.69	1.02	-1.53	2.41
Real stock returns	77	87:1-06:1	0.50	10.13	-18.47	40.22
Economic sentiment	42	95:4-06:1	100.39	10.02	75.87	118.90
Leading indicator growth	77	87:1-06:1	1.08	1.33	-2.35	4.32
GDP growth	77	87:1-06:1	2.28	1.35	-0.65	4.65

Real activity is measured by the growth rate of real GDP (quarterly level), relative to GDP in the same quarter of the previous year. Descriptive statistics as well as information about data availability can be found in Table 1, the data sources are quoted in the appendix. Measures derived from the income statement of the Austrian banking sector are so small because they display quarterly levels of flow variables. As Table 1 foretells, results will not be reported for all of the measures described above. For example, results for the general interest rate premium are similar to those obtained for the measure specific to the non-bank business. A similar argument applies to the remaining neglected measures.[5]

3 Methodological Framework

Unrestricted vector autoregressions (VAR), with their orders chosen by use of the Schwarz information criterion, form the basis of the empirical investigation. The predictive content of the proposed (financial) measures for output growth is evaluated by means of generalized impulse responses (GIR) and variance decompositions (GVD), as proposed by Koop, Pesaran and Potter (1996) and Pesaran and Shin (1998). Generalized impulse response functions are said to describe how a typical historical innovation affects the dynamics of the model. Compared to responses and variance decompositions obtained from shocks orthogonalized by Choleski decomposition, the GIR and GVD do not depend on the variable ordering.[6] The innovations are scaled to represent unit shocks (the means and standard

deviations in Table 1 give a hint on how large or, respectively, typical such a unit shock is for each variable). Corresponding error bands were simulated via Monte Carlo Integration with 2000 draws. To assess statistical significance, we approximate 95% confidence intervals by means of the 0.025 and 0.975 fractiles of the response distribution. GIR are reported for the quarter the shock occurs and quarters 1, 2, 4 and 8 thereafter, the reported GVD are the ones prevailing two years after the shock.

4 Results: Impulse Responses and Variance Decompositions

The first part of the empirical strategy to assess the predictive content of financial variables for output growth in Austria is to evaluate impulse responses from bivariate vector autoregressions. The VAR order chosen by means of the Schwarz information criterion is one throughout. From Table 2 it can be inferred that changes in the EU Economic Sentiment Indicator and the growth rate of the Composite Leading Indicator precede the business cycle, although with different time horizons. Impulses in the corporate bond spread, the bank finance premium, the term spread as well as in real stock returns, on the other hand, have no information content for future output growth in Austria (that would imply statistically significant responses at the 5% level). Shocks in premiums for intermediated credit, apart from the one in consumer credit rates, entail one statistically significant response of GDP growth. However, some of the bank markup measures, the commercial and the housing credit spread, perform best in terms of the forecast error in real activity they determine, as well as in terms of statistical and, in all probability, practical significance.

Next, results are reported for what Gertler and Lown (1999) call 'horse races' of two predictors against each other (and undertake for the high-yield spread against oil prices, the term spread and other indicators of the monetary policy stance). Corresponding results can be found in Table 3, which reports generalized impulse responses and variance decomposition from trivariate VAR models including ouput growth and two predictors at a time. Three financial indicators were selected for this exercise, the commercial and the housing credit rate spread over the savings interest rate and, as representing the bank finance premium comparable with other measures for a longer time period, the interest income premium for the non-bank business. The pairwise comparisons in the different panels of Table 3 show that, in general, the interest rate spreads outperform the sentiment and the composite indicator, whereas the responses of real activity to shocks in the interest income premium lose their statistical significance in this setting.[7]

Now that we have seen that certain financial measures negatively lead real GDP growth, how might this finding relate to financial factors being at work in shaping the business cycle? It certainly is 'compatible with' or 'in line with' the predictions of the financial accelerator theory, as it is cautiously worded by Gertler and Lown (1999) or Mody and Taylor (2004). At least two objections would be raised against any bolder statement.

Table 2: Responses of GDP growth (bivariate VAR)[a]

After quarter	0	1	2	4	8	GVD
Net interest margin	-9.648 *	-8.059	-6.212	-3.308	-0.802	7.37
Net interest spread (non-banks)	-2.737	-5.544	-6.164	-5.032	-2.136	10.46
Lerner index (NII)	-0.142	-0.078	-0.039	-0.004	0.007	3.86
Lerner index (NII from non-banks)	-0.071	-0.027	-0.005	0.010	0.007	1.18
Corporate bond spread	-0.218	-0.308	-0.257	-0.127	-0.023	1.42
Bank finance premium	-0.516	-0.668	-0.624	-0.412	-0.134	19.69
Commercial credit spread	1.201	-1.574	-3.067	-3.465 *	-0.951	30.36
Consumer credit spread	0.677	-0.756	-1.464	-1.714	-0.898	18.90
Housing credit spread	-0.483	-3.184 *	-4.240 *	-3.678 *	-0.716	43.94
Commercial credit premium	-0.726	-0.974 *	-0.973	-0.713	-0.242	24.09
Consumer credit premium	-0.591	-0.850	-0.878	-0.683	-0.271	23.64
Housing credit premium	-0.794	-0.960 *	-0.925	-0.665	-0.234	24.21
Interest income premium (non-banks)	-0.697 *	-0.554	-0.440	-0.276	-0.108	0.40
Term spread	0.449	0.224	0.101	-0.001	-0.031	3.67
Real stock returns	0.001	0.025	0.022	0.008	0.000	4.74
Economic sentiment	0.063 *	0.045 *	0.032	0.018	0.010	14.24
Leading indicator growth	0.082	0.247 *	0.287 *	0.206 *	0.029	13.65

[a] Asterisks indicate statistical significance at the 5% level.

Table 3: Responses of GDP growth (trivariate VAR)[a]

After quarter	0	1	2	4	8	GVD
Commercial credit spread	1.513	-1.234	-2.532	-2.822	-1.231	24.17
Economic sentiment	0.032	0.029	0.025	0.018	0.008	9.05
Commercial credit spread	0.724	-1.039	-2.851	-3.968 *	-0.797	31.49
Leading indicator growth	0.039	0.258	0.234	0.022	-0.092	8.94
Housing credit spread	-0.230	-2.805	-3.613 *	-2.962 *	-0.960	32.53
Economic sentiment	0.034	0.032	0.029	0.022	0.010	11.23
Housing credit spread	-0.494	-2.694	-3.995 *	-3.809 *	-0.522	38.90
Leading indicator growth	0.034	0.277	0.310	0.159	-0.036	14.01
Interest income premium (non-banks)	-0.706	-0.499	-0.357	-0.188	-0.056	6.15
Economic sentiment	0.063 *	0.045	0.032	0.017	0.005	13.44
Interest income premium (non-banks)	-0.424	-0.647	-0.493	0.118	0.421	7.81
Leading indicator growth	0.292 *	0.423 *	0.411 *	0.196	-0.100	22.94

[a] Asterisks indicate statistical significance at the 5% level.

First, as Davis and Fagan (1997, p. 705) note, conclusions from an assessment of forecasting power are "only valid with respect to the information set included in the analysis". As a bivariate analysis can only examine whether the financial predictors have forecasting power beyond that of lagged economic activity, this first objection points to a richer model on two grounds. On the one hand, it is, at least hypothetically, possible that a 'third variable' drives both the financial measure and GDP growth. Even if this is not the case, the inclusion of other variables (to reduce the bias

from omitted variables in the reduced-form VAR) may let the marginal predictive content of financial indicators disappear. On the other hand, a multivariate model is also warranted with regard to the interpretation of the shocks. Determinants of financial spreads and premiums that do not directly relate to the financial accelerator should therefore be endogenized. Table 4 reports estimation results from various enlarged systems evaluating the predictive content of the three measures selected before. The significance level is increased to 10% accounting for that, endorsed by the small sample sizes, indicators may lose much of their predictive power when an even parsimonious model is enlarged (as argued by Estrella and Mishkin 1998).[8] When sticking to the 5% level, one could not observe any statistically significant responses in Table 4. From its first panel it can be seen that the inclusion of the inflation rate, above all, induces changes in the predictive content of the housing credit spread. When the OECD indicator and the REER are added to the VAR model, no statistically significant effects remain at the 10% level. An interesting result, however, is that the magnitudes of the GDP growth responses to impulses in the interest spreads are quite robust for the fourth post-shock quarter.

Still richer models contain two additional sets of variables. Set A contains some factors that the literature (Gischer and Jüttner 2003, Maudos and de Guevara 2004)[9] proposes as determinants of interest rate margins and spreads. The concentration in as well as the cost-income ratio of the banking sector are included. The other two measures should also account for changes in financial spreads due to structural developments as financial liberalization (proxied by banking sector openness) and the reduced importance of interest income (measured by the share of non-interest income in the total operating income of the banking sector). Resulting changes in the responses of real activity are rather minor. The alternatively used set B includes interest spread determinants that are related to the bank lending channel, the shares of loans, secured debt and equity capital in the balance sheet total of the banking sector. Magnitudes of some of the responses are now reduced still more, but especially the effects on GDP growth after four quarters are still very large, indicating that there is room left for a financial accelerator mechanism at work. However, none of the responses is statistically significant at the 10% level, and if they were, the evidence for an operative balance sheet channel would still be incomplete.[10]

The second objective to hastily concluding that financial accelerator mechanisms are causing interest (yield) spreads and premiums to predict growth is related to the direction of 'causality'. To conclude that such a mechanism is operative, it has to be verified that the relevant financial measures themselves vary with the interest rate level or the business cycle. The leading indicator property then describes the macroeconomic relevance of the balance sheet channel (de Bondt 2004). Gertler and Lown (1999) refer to the negative correlation of the high-yield spread with a measure of corporate balance sheet strength in this respect. A related issue is that a negative lead of financial variables for activity is compatible with an accelerator as well as with a dampening effect. As Braumann (2004) argues, Austrian interest rate spreads between lending and deposit rates (contrary to those in Canada, Sweden and the USA) rise with credit growth, which can be interpreted as pointing to a financial de-celerator in Austria.

Table 4: Responses of GDP growth in multivariate VAR[a]

After quarter	0	1	2	4	8	GVD
VAR includes the inflation rate						
Commercial credit spread	1.790	-0.377	-1.892	-2.954 *	-1.129	17.85
Housing credit spread	0.241	-2.030	-2.824 *	-2.278	0.044	13.68
Interest income premium (non-banks)	-0.614 *	-0.745 *	-0.604 *	-0.115	0.449	13.03
VAR additionally includes the REER and leading indicator growth						
Commercial credit spread	2.631	1.226	-1.013	-3.399	-1.463	22.09
Housing credit spread	0.295	-1.540	-2.563	-2.473	-0.396	15.40
Interest income premium (non-banks)	-0.030	-0.355	-0.125	0.547	0.272	9.58
VAR additionally includes banking-sector variables (set A)[b]						
Commercial credit spread	3.503	2.292	-0.665	-3.817	-1.081	19.20
Housing credit spread	1.646	-0.316	-2.263	-3.326	-0.580	12.38
Interest income premium (non-banks)	-0.250	-0.565	-0.347	0.508	0.424	11.60
VAR additionally includes banking-sector variables (set B instead of set A)[c]						
Commercial credit spread	2.223	0.705	-0.147	-2.579	-1.551	12.89
Housing credit spread	0.012	-0.870	-1.004	-3.100	-0.784	14.51
Interest income premium (non-banks)	0.235	-0.215	-0.060	0.466	0.093	4.50

[a] Asterisks indicate statistical significance at the 10% level.

[b] Set A contains banking sector concentration and openness, the cost-income ratio and the share of non-interest income.

[c] Set B contains the shares of loans, secured debt and equity capital in the balance sheet of the banking sector.

The responses of the financial measures to unit shocks in GDP growth are reported in Table 5. Four of these variables seem to vary significantly (in statistical terms, at the 5% level) with the business cycle. However the countercyclicality of the net interest margin comes about (from assets or liabilities, volumes or interest rates, new business or outstanding amounts, non-interest-bearing assets, etc.), the corresponding responses are practically small. A fall in the Lerner index is hard to interpret as it may shrink also for trivial reasons. Everything else equal - especially volumes and the structure of banks' balance sheets, even a rise in the (average) interest rate spread may cause the Lerner index to decrease, for example, if the percentage rate of increase for the lending rate is smaller than that of the deposit rate. However, impulses in the Lerner indices do not significantly lead output growth, as we have seen. Also the limited forecasting power of the interest income premium was demonstrated above, and the last of the predictors which is found to behave cyclically, the commercial credit spread, rises during an upswing. So, in the end, there is no stringent evidence to be found from this exercise in favor of a financial accelerator being at work in Austria, neither through the bond market nor through the banking sector. On the other hand, the increases of the interest rate spreads due to shocks in GDP growth are too small as well to be seen as part of a bank-based stabilization mechanism.

Table 5: Responses of financial measures to shocks in GDP growth (bivariate VAR)[a]

After quarter	0	1	2	4	8	GVD
Net interest margin	-0.005	-0.008 *	-0.008 *	-0.005 *	-0.001	21.92
Net interest spread (non-banks)	-0.003	-0.005	-0.006	-0.004	-0.002	5.89
Lerner index (NII)	-0.330	-0.790 *	-0.953 *	-0.873 *	-0.415 *	39.67
Lerner index (NII from non-banks)	-0.218	-0.343	-0.361	-0.277	-0.099	8.49
Corporate bond spread	-0.019	-0.051	-0.047	-0.024	-0.004	6.72
Bank finance premium	-0.148	-0.128	-0.103	-0.061	-0.019	12.84
Commercial credit spread	0.015	0.039	0.048 *	0.042 *	0.007	24.54
Consumer credit spread	0.017	0.025	0.027	0.023	0.010	5.68
Housing credit spread	-0.008	0.015	0.026	0.015	0.006	8.13
Commercial credit premium	-0.108	-0.067	-0.041	-0.014	-0.001	6.66
Consumer credit premium	-0.101	-0.078	-0.060	-0.034	-0.011	6.93
Housing credit premium	-0.127	-0.088	-0.061	-0.030	-0.007	9.80
Interest income premium (non-banks)	-0.094 *	-0.097 *	-0.092	-0.072	-0.035	12.18

[a] Asterisks indicate statistical significance at the 5% level.

5 Concluding Remarks

This study has examined the forecasting power of several financial measures with respect to real activity. In this respect, retail interest rate spreads perform best and are therefore suited to enrich the information set of economists and policy-makers. The second aim pursued has been to examine the potential role of external finance premiums and interest rate spreads for business cycle amplification. We find no evidence for financial accelerator mechanisms and countercyclical markups in the banking sector representing significant channels for the propagation of aggregate shocks in Austria.

Notes

[1]The literature review of Stock and Watson (2003) reveals that the term spread has more information content for real output growth in non-U.S. OECD countries, whereas Davis and Fagan (1997) argue that the forecasting power of the term spread is also limited for European countries. Crespo Cuaresma, Gnan and Ritzberger-Grünwald (2005), however, show that adjusting the term spread for time-varying risk premia increases its predictive content for real activity in the euro area. Davis and Fagan (1997) also argue that researchers and policy-makers have searched for indicators also to supplement monetary aggregates (their information content has reduced due to financial innovation) and exchange rates (which lost forecasting power due to their increasing volatility). Advantages of asset prices and returns are their swift availability and negligible measurement error (Stock and Watson 2003).

[2]Despite referring to firms here, a similar reasoning may apply for household borrowing.

[3]Among the synonyms for the EFP are 'default spread', 'credit spread' or 'credit quality spread'.

[4]Gischer and Jüttner (2003) argue that replacing marginal by average (ex-post) interest rate costs works well if interest rates, across the board, adjust swiftly to key interest rate changes.

[5]Other bank markup measures, like the spreads of lending rates over bank bond yields, do not appear at all. Results which are not reported show that these are neither practically nor statistically significant indicators of future growth in Austria.

[6]The impulse response function (IRF) for variable y_i due to a shock in variable y_j describes the deviations of the response variable from its no-shock path over time. Forecast error variance decomposition (FEVD) splits the mean squared forecasting error of variable $y_{i,t+s}$ into the contributions of the individual endogenous variables' innovations.

[7]The commercial interest premium (results not reported), exemplary for the ex-ante finance premiums in intermediated credit, 'beats' the Economic Sentiment, but not the Composite Leading Indicator.

[8]From this perspective, it is more understandable that Shan and Morris (2002) find only little evidence for interest spreads leading output growth. Among the 'control variables' included in their VAR models are the interest rate level, stock prices and the inflation rate.

[9]For the determinants of corporate bond spreads, see e.g. de Bondt (2004) and the references therein.

[10]In these described settings, the inflation rate is the best-performing predictor of real activity in terms of the statistical significance of GDP growth responses and as measured by variance decompositions. As regards the size of the responses of real activity to shocks in the interest rate spreads, it is tempting to believe that responses from orthogonalized shocks in the context of a structural VAR might differ significantly from the generalized ones presented here. From an agnostic shock identification scheme (Choleski decomposition, interest rate spreads and GDP growth ordered last), however, it can be inferred that these differences are rather small.

References

Bernanke, B., M. Gertler and S. Gilchrist (1996), The Financial Accelerator and the Flight to Quality, *The Review of Economics and Statistics* 78, 1–15.

Braumann, B. (2004), Tu Felix Austria: Evidence for a de-celerator in financial reform, *International Economics and Economic Policy* 1, 53–72.

Chevalier, J.A. and D.S. Scharfstein (1995), Liquidity Constraints and the Cyclical Behavior of Markups, *American Economic Review* 85, 390–396.

Crespo Cuaresma, J., E. Gnan and D. Ritzberger-Grünwald (2005), The Term Structure as a Predictor of Real Activity and Inflation in the Euro Area: A Reassessment, *Review of World Economics (Weltwirtschaftliches Archiv)* 141, 318–342.

Davis, E.P. and G. Fagan (1997), Are financial spreads useful indicators of future inflation and output growth in EU countries?, *Journal of Applied Econometrics* 12, 701–714.

de Bondt, G. (2004), The balance sheet channel of monetary policy: First empirical evidence for the euro area corporate bond market, *International Journal of Finance and Economics* 9, 219–228.

Dueker, M.J. and D.L. Thornton (1997), Do Bank Loan Rates Exhibit a Countercyclical Mark-up?, Working Paper 1997-004A, Federal Reserve Bank of St. Louis.

Estrella, A. and F.S. Mishkin (1998), Predicting U.S. recessions: Financial variables as leading indicators, *Review of Economics and Statistics* 80, 45–61.

Gertler, M. and C.S. Lown (1999), The information in the high-yield bond spread for the business cycle: Evidence and some implications, *Oxford Review of Economic Policy* 15, 132–150.

Gischer, H. and D.J. Jüttner (2003), Global Competition, Fee Income and Interest Rate Margins of Banks, *Kredit und Kapital* 36, 368–394.

Guha, D. and L. Hiris (2002), The aggregate credit spread and the business cycle, *International Review of Financial Analysis* 11, 219–227.

Kashyap, A.K. and J.C. Stein (1994), Monetary Policy and Bank Lending, in: Mankiw, N.G. (ed.), *Monetary Policy*, NBER Studies in Business Cycles, Volume 29, University of Chicago Press, Chicago, 221–256.

Klein, A., A. Schubert and G. Swoboda (2003), New Harmonized Interest Rate Statistics for the Euro Area: Framework, Implementation in Austria and First Results, in: *Focus on Austria 4/2003*, Oesterreichische Nationalbank, Vienna, 106–128.

Koop, G., M.H. Pesaran and S.M. Potter (1996), Impulse response analysis in nonlinear multivariate models, *Journal of Econometrics* 74, 119–147.

Maudos, J. and J.F. de Guevara (2004), Factors explaining the interest margin in the banking sectors of the European Union, *Journal of Banking and Finance* 28, 2259–2281.

Mody, A. and M.P. Taylor (2004), Financial predictors of real activity and the financial accelerator, *Economics Letters* 82, 167–172.

Pesaran, H.H. and Y. Shin (1998), Generalized impulse response analysis in linear multivariate models, *Economics Letters* 58, 17–29.

Rotemberg, J.J. and M. Woodford (1991), Markups and the Business Cycle, in: Blanchard, O.J. and S. Fisher (eds.), *NBER Macroeconomics Annual 1991*, The MIT Press, Cambridge, Massachusetts, 63–129.

Shan, J. and A. Morris (2002), Does Financial Development 'Lead' Economic Growth?, *International Review of Applied Economics* 16, 153–168.

Stock, J.A. and M.W. Watson (2003), Forecasting Output and Inflation: The Role of Asset Prices, *Journal of Economic Literature* 41, 788–829.

Data Description

The source of the data is the Austrian Central Bank (OeNB), except for the following series. Real GDP and the real effective exchange rate (1999=100) come from the Austrian Institute of Economic Research (WIFO). From 1999 on, the overnight money market rate (for the calculation of the term spread) is the EONIA published by the European Central Bank (ECB). Bond yields are volume-weighted averages of the yields of fixed-interest bonds with more than a year to maturity (corporate bonds are bonds issued by private non-financial enterprises) and the source of the series is the Oesterreichische Kontrollbank (OeKB). The consumer price indices to be chained for calculating the inflation rate (relative to the same quarter of the previous year) come from the Statistik Austria. To calculate real stock returns, the WBI share price index of the Wiener Boersekammer (WRBK) was used. The Economic Sentiment Indicator (the data source is the European Commission) is a composite indicator based on consumer and business surveys. Its dimension is balance of opinions in percent. Component series of the OECD Leading Indicator for Austria (trend restored) are opinions from consumer and business surveys, the IFO business climate index for Germany, unfilled job vacancies and the term spread of interest rates.

Retail interest rates come from the national interest rate statistics and were, in this form, compiled from 1995 until June 2003 (from January 2003 on, the national statistics were replaced by a harmonized system for the euro area). Rates are nominal (plus certain fees, but commissions on turnover are not included), expressed as annual percentages and contain the commercial credit rate (on floating-rate loans to enterprises, usually short-term), the consumer credit rate (on secured consumer loans - but not necessarily secured by mortgage, which are usually long-term), the housing credit rate (on all floating-rate, long-term loans to households used for purchasing housing space which are not mortgage loans), the hypothecary credit rate (on floating-rate, long-term mortgage loans to households and enterprises - secured by a mortgage recorded in the land register), the municipal credit rate (on loans to public-sector authorities, usually long-term) and the interest rate on savings deposits with an agreed maturity of over twelve months. *Business coverage:* Banks report the interest rate charged most frequently for new business (renewals are not considered). *Institutional coverage:* Sample of 43 Monetary Financial Institutions (had decreased to 37 banks in 2003 because of mergers). As

Klein, Schubert and Swoboda (2003) argue, this sample of banks consisted of the major joint stock banks, the state mortgage banks as well as the largest institutions of the savings bank, Raiffeisen credit cooperative and Volksbank credit cooperative sectors. *Aggregation method:* Arithmetic averages excluding 5% of the rates at both ends of the range.

Data on profit and loss account items for the banking sector comes from quarterly bank reports, balance sheet data from monthly balance sheet reports (almost all banks operating in Austria report on the legal basis of the Austrian Banking Act). Balance sheet items are quarterly averages of monthly (of three end-of-month) figures and, as the items from the income statement, in millions of euros.

Real activity is measured by the percentage growth rate of real (quarterly level) GDP relative to real GDP four quarters ago. The money market rate is the overnight VIBOR (Vienna Interbank Offered Rate) and the EONIA, respectively. The remaining time series (which are also measured as percentages) are the openness of the banking sector (foreign assets plus foreign liabilities of the banking sector divided by total assets), the concentration ratio in the banking sector (the share of the 10 largest banks' assets in the balance sheet total of the banking sector), the share of non-interest income in total operating income of the banking sector, the cost-income ratio for the Austrian banking sector (operating expenses divided by operating income), and the respective shares of loans, secured debt and equity capital in the balance sheet total of the banking sector.