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Bank Lending Effect on German Commercial Property Prices

Gruber Johannes and Gabriel S. Lee*

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*University of Regensburg, International Real Estate Business School (IREBS), Universitaetsstrasse 31, 93053 Regensburg, Germany, Tel: +49.941.943.5063/ 5060, e-mail: johannes.gruber@wiwi.uni-r.de, gabriel.lee@wiwi.uni-r.de

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Abstract

This paper analyzes the effects of bank lending on German commercial property prices. The theory on the role of financial intermediaries in business cycle activity states that lending activity is characterized by asymmetric information between borrowers and lenders. As a consequence, interest rates may not move to clear lending markets (as in models with moral hazard and adverse selection elements) or firms' net worth may play a critical role as collateral in influencing lending activity (as in models with agency costs). While the theory is concrete, the debate on the empirical support for these models continues. In this paper, our goal is to continue in exploring this debate by estimating a recursive VAR model using German (both aggregate and regional level) commercial property data from 1975 to 2004. Unlike other previous empirical results in commercial real estate literature, our main results show a weak negative correlation between growth in property prices and growth in credit, especially at the regional level.

Johannes Gruber and Gabriel S. Lee
University of Regensburg
IREBS
Universitaetsstrasse 31
93053 Regensburg, Germany
Tel: +49.941.943.5063/5060
Fax: +49.941.943.4134
Email: johannes.gruber@wiwi.uni-r.de, gabriel.lee@wiwi.uni-r.de,
JEL Classification: R33, C53
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1 Introduction

Interest in modeling the relationship between the macroeconomy and the real estate economy has risen steadily in the last ten years with a proliferation of macroeconomic models that highlight the role of financial intermediaries in business cycle activity. With variations on this theme referred to as models of the credit channel, agency cost models, or financial accelerator models, the common element is that lending activity is characterized by asymmetric information between borrowers and lenders. As a consequence, interest rates may not move to clear lending markets (as in models with moral hazard and adverse selection elements) or firms' net worth may play a critical role as collateral in influencing lending activity (as in models with agency costs): borrowers' financial positions affect their external finance premiums and thus their overall cost of credit. While debate on the empirical support for these models continues, there is little doubt that, as a whole, they have improved our understanding of financial intermediation and broadened the scope of how monetary policy, through the impact of interest rates on firms' net worth, can influence macroeconomic performance.[1]

The objective of this paper is to study the potential effects of macro-policy and bank shocks on the German real estate sector. In particular, we estimate a recursive vector autoregression model using both aggregate German and two largest regional states of Bavaria and Nordrhein - Westfalen (NRW) data for commercial property, bank loan, and other macro-policy variables from 1975 to 2004. Numerous authors have examined the effects of bank loans and general price level shocks on both residential and commercial real estate variables with a bag of non-resolute results (e.g. Iacoviello (2005), Davis and Zhu (2004), Tsolacos and McGough (1999), Hoffman (2002)). A variety of techniques have also been used to examine these relationships. Structural econometric models and time series approaches have both been employed. Among the previous studies, it

[1] The credit channel literature is large and continues to expand. Some prominent contributions are: Williamson (1987), Bernanke and Gertler (1989, 1990), Bernanke, Gertler, and Gilchrist (1999), Kiyataki and Moore (1997), Carlstrom and Fuerst (1997), Cooper and Ejarque (2000), and Dorofeenko, Lee and Salyer (2007). Walsh (1998) presents an overview, both theoretical and empirical, of the literature.

is well known that analysis that employs a single equation setup (Goodhard, 1995) potentially suffer from simultaneity problems. Consequently, we use a VAR approach to analyze the dynamic relationship between bank lending, commercial property prices, investment in construction, and GDP for Germany, Bavaria, and NRW.

The commonly used VAR model in most real estate economics applications uses an identification which implies the system being modeled has a recursive structure: variables affect each other in the order specified by the modeler. This recursive structure implies that the variable at the top of the ordering will have a contemporaneous effect on all the variables in the model, and that the variable at the bottom of the ordering will have a contemporaneous effect on itself only. Most evaluations of the importance of this assumption have relied on changing the order in the recursive specification and examining the impact on the model. In this paper, since our objective is to analyze the effect of bank loans for commercial real estate sector on property prices, the principal ordering of variables[2] is the gross domestic product (in aggregate as well as for regional level), aggregate investment, the amount of bank loans to commercial real estate sector, and property prices. This ordering makes economic sense, in that it can be thought of as corresponding to an ordering of "increasing endogeneity": Commercial real estate decision makers are more likely to have a large impact on commercial property prices than on the gross domestic product.

Our empirical results show that on the aggregate level, bank (credit) loan shocks have a small but positive effect on property prices up to about eight periods and a negative effect afterwards. Other macro (e.g. GDP and Investment) shocks have the expected effect on the prices: a positive investment shock decreases prices whereas a positive shock to income increases prices in the medium-run. These effects are reinforced in the variance decomposition analysis. We observe that nearly 70% of the variance in property prices comes from price shocks initially. However, after a while shocks in bank loans start to gain importance in explaining volatility in property prices: The bank loan share is increasing up to nearly 30%. The shocks to GDP and investment have a

[2] For the Identification Restricion, the Cholesky factorization is used to orthogonalize the residuals.

weak or less meaningful impact on the forecast error variance of commercial property prices.

In regards to the regional level[3], our empirical results indicate somewhat different effects. From the impulse response analysis of Bavaria, we observe a negative response of prices to a shock in credits. Moreover, from the variance decomposition analysis we also get a different picture at the regional level. First, the proportion of the variance in prices due to shocks in prices is much lower initially, and is decreasing sharply to around 20% after three periods. Second, shocks to income seems to have much more influence on the variance of prices then for Germany(GDP starting form 33%, reaching a peak of 65% after 3 periods and staying at a level of more then 50% after 10 periods). And lastly, credit volatility does not seem to be sensitive to price shocks as observed at the national level. In contrast, for NRW property price shocks seem to explain some of the variance in bank loans.

The next section provides a short description of the data set as well as the German commercial property development. The third section introduces a linkage between the macroeconomy, bank lending and real estate with a brief review of previous studies. The fourth section then outlines VAR models and the role of identification restrictions. The empirical analysis, results and some discussion of their implications are also reported in this section. The final section concludes the paper.

2 Some words on Data and German Commercial Property Development

2.1 Data Description

All variables are real using the consumer price index. We use annual series from 1975 to 2003 for Germany and from 1980 to 2003 for Bavaria and NRW. For the aggregate German data, commercial

[3] We describe here only for Bavaria since the NRW's empirical results pretty much follow similar pattern as Bavaria.

property prices is an index series form Bulwien AG, Germany. Bank lending data corresponds to credit in real estate construction from the Deutsche Bundesbank. For the measure of aggregate economic activity, we use investment in construction from the Federal Statistical Office of Germany, and gross domestic production (GDP) obtained from the International Financial Statistical Office.

For Bavaria , commercial property prices are again from Bulwien AG. We take an average of the eight largest cities in the region. Bank lending is defined as the commercial credits in construction form, which is obtained from the regional bank "Landeszentralbank Bayern" (LZB). As a proxy for investment in construction, we use the order inflow in the construction sector from the LZB. Bavarian GDP is obtained from the State Offices for Statistics of Baden-Würtenberg and Bayern (Statistischem Landesamt Baden-Würtenberg, and Bayrischen Landesamt für Statistik and Datenverarbeitung).

Commercial property prices for NRW are constructed as an average of prices of the twelve largest cities in the region, prices are from the Bulwien AG. For the remaining series the same proxies are used as for Bavaria and are taken from the State Office for Statistics of Nordrhein-Westfalen (Landesamt für Datenverarbeitung und Statistik Nordrhein-Westfalen).

2.2 German Commercial Property Development

Figure 1 shows some of the data in annualized form to exhibit the cyclical patterns most clearly. The main series to be explained is the German commercial property price index in relation to the amount of bank loans.[4] The property prices peaked whereas the bank loan was at the trough in 1992 (two years after the German unification). The bank loan peaked in 1999 and took a steep downturn. Until 1999, there is a clear negative correlation between the bank loans and property prices. The second panel in figure 1 shows the time series for the construction investment and prices: the two series move counter-cyclically informally indicating that investment series serve as a supply for prices. The last panel in figure 1 shows the co-movement between the GDP (proxy

[4] All series are in logs and detrended using Hodrick-Prescott filter.

Figure 1: Germany - Plot of Commercial Property Prices (PP) against Bank Lending (CR), Investment in Construction (CR), GDP

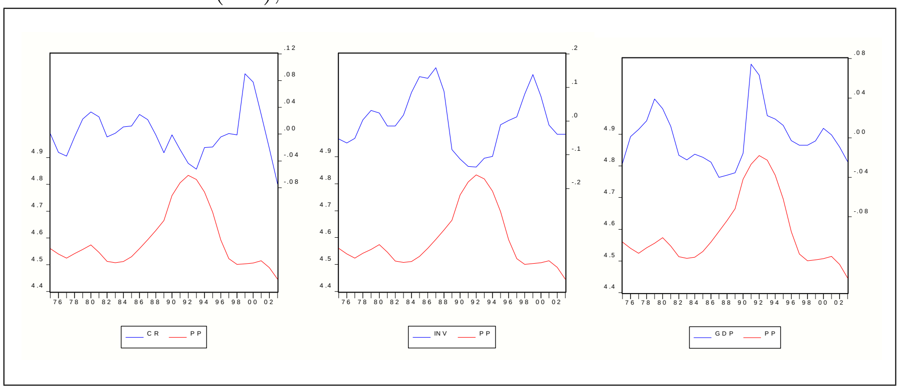
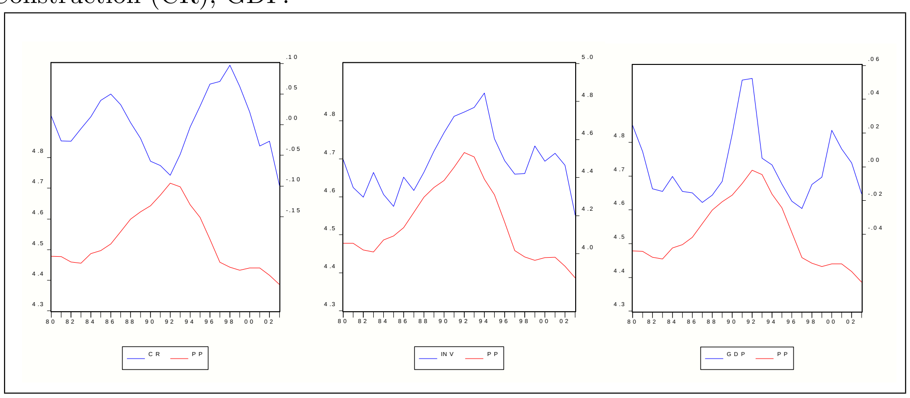


Figure 2: Bavaria - Plot of Commercial Property Prices (PP) against Bank Lending (CR), Investment in Construction (CR), GDP.

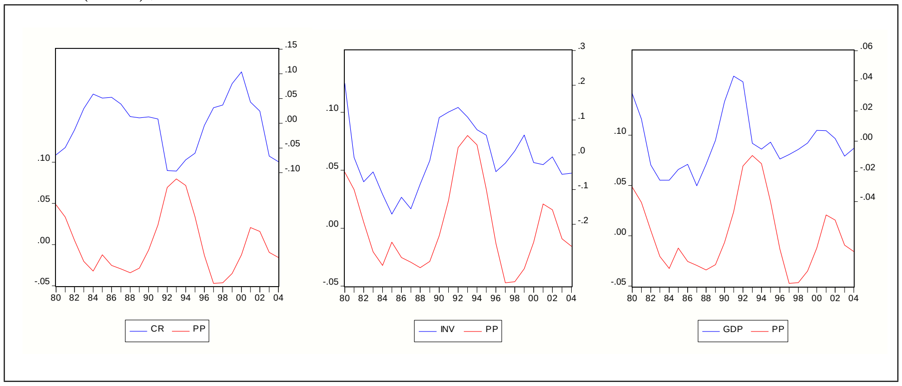


for real income) and prices.

Figure 2 shows the regional level time series for Bavaria, where we observe a somewhat different picture than at the aggregate level. The bank loans and GDP in relation to the property prices are in line with the aggregate level: the bank loans being counter - and GDP being pro-cyclical to the prices. But the construction investment co-moves with the property prices, and hence giving informal doubts as to the supply side story.

For Nordrhein - Westfalen (NRW), in Figure 3, we observe similar swings for commercial property prices. The co-movement for prices, investment and income is very distinctive for this region.

Figure 3: NRW - Plot of Commercial Property Prices (PP) against Bank Lending (CR), Investment in Construction (INV), and GDP



Concerning the stability of the data in use, we applied the ADF unit-root test. As a lag-length selection criterion, the Schwarz Information Criterion (SIC) was chosen. The tests in Table 1 indicate that all variables are stationary for Germany, Bayern, and NRW.[5]

Table 1: Dicky-Fuller Unit Root Test

	Germany		**Bavaria**		**NRW**	
	Level	P-value	Level	P-value	Level	P-value
PP	-4.40	0.00	-3.26	0.00	-4.27	0.00
CR	-2.79	0.01	-3.70	0.00	-2.57	0.01
INV	-2.78	0.01	-2.80	0.01	-2.94	0.00
GDP	-3.11	0.00	-3.20	0.00	-3.58	0.00
PP = Commercial Property Prices, CR = Bank Lending in the RE-Sector, INV = Investment in Construction in the RE-Sector						

[5] Enders (1995), for example, shows that the power of the unit root tests is very limited when sample size is small at a lower frequency. Moreover, Sims (1980), for example, argues against diffenencing variables even if the variables contain a unit root, because the goal of VAR analysis is to determine the interrelationship among variables and not to determine the parameter estimates.

3 Macroeconomics, Bank Lending and Real Estate Linkage

In recent years a number of theoretical models that highlights the role of an financial accelerator in propagating and amplifying macroeconomic shocks has further casted doubts on aggregate technology shocks in the standard real business cycle model as the driving force in business activities.[6] This literature addresses the question ”can credit constraints and (or) asymmetric information between borrowers and lenders propagate and amplify business cycles?” Although the theoretical contributions have improved our understanding of the propagation mechanism, the lack of empirical support has led many to question the relevance of financial accelerator type models.[7]

Empirical support for or against credit channel effect in real estate literature is, however, less prominent. Among few is Davis and Zhu (2004), who study on the bank lending and property prices, both for the commercial and the residential sector. In their commercial real estate paper, they develop a reduced form theoretical model, based on the financial accelerator framework. The model suggests that bank lending is closely related to commercial property prices, and their interaction can develop cycles given plausible assumptions (e.g. lags of supply and property evaluation based on current prices). Their study of 17 different countries shows a strong link of commercial property prices to credit in commercial property in the countries that have experienced banking crises linked to property losses in 1985-95. They found a significant impact of prices on bank credit. However, the impact in the reverse direction is less clear. In addition, they found GDP to be an important factor for commercial property prices and bank credits. Peng, Cheung and Leung (2001) also report similar result for Hong Kong: they state that excessive bank lending was not the main reason for the boom and bust cycle of the Hong Kong residential property market. Hoffman (2004) uses both time series and panel data estimation and distinguishes between long and short run causality. In 15 out of 20 cases, he finds that long-run causality goes from property

[6] Financial accelerator models are usually clasified into two catergories: agency costs models and credit constraint models.

[7] See, for example, Kocherlakota (2000), Cooper and Ejarque (2000), and Cordoba and Ripoll (2004) for a negative stance on the role that financial sector plays in the actual economy. Carlstrom and Fuerst (1997) and Dorofeenko, Lee and Salyer (2007) are the only few that document the empirical relevance for financial acceleration.

prices to bank lending. He also states that property price bubbles are rather caused by property prices then by bank lending. Short-run causality is going in both directions, which supports the theoretical argument of self-reinforcing cycles in property markets. Gerlach and Peng (2004) find a similar result as in Peng, Cheung and Leung(2001) for residential properties in the Hong Kong market. They have large contemporaneous correlation between bank lending and property prices, but they argue their results (of an Vector Error Correction Model) suggest that the direction of influence goes from prices to credits rather than converse.

4 Vector Autoregression (VAR) and Empirical Analysis

This section begins with a brief introduction to a recursive VAR that we base our empirical analysis. We then discuss results and some of their implications

4.1 VAR

The VAR approach provides an alternative to the structural econometric approach. As outlined briefly below, VAR models are a form of dynamic simultaneous equations model. As in any simultaneous equations exercise, the VAR model requires identification restrictions to interpret the model in a causal framework. The approach in VAR modeling is to develop a statistical model before the imposition of identification restrictions.

In VAR the dependent variables are, by definition, all endogenous variables and the independent variables are lagged observations of all variables in the system.[8] All variables affect each other through a system of lags. This allows the data to provide a representation of the changes in the system without "zero restrictions" (i.e. restricting the coefficient of some explanatory variables in an equation to zero) as required in traditional simultaneous equation techniques. While VAR models do not impose zero restrictions on the parameters in the traditional simultaneous equation

[8] Where they are considered to be important, exogenous (or deterministic) variables may be included in the set of independent variables in the system.

fashion, the model does require identification restrictions to provide information on the response of system variables to shocks.

Traditional econometric modeling of a simultaneous system would require the construction of a structural model using theory and the placement of restrictions on this structural model in order to be able to identify the parameters of the structural model from the reduced form or statistically estimated model. Typically, the reduced form is based on a reduced parameter space and the identifying restrictions are used to derive the structural parameters (see for example Sims, 1980). The VAR approach uses the set of lags of all of the endogenous variables in each behavioral equation as the reduced form. The economic structure is identified using the covariance matrix of the residuals to place identifying restrictions on the matrix of contemporaneous coefficients. For example, the Cholesky decomposition of the covariance matrix results in orthogonal behavioral shocks and a contemporaneous coefficient structure that implies a recursive ordering between variables.

While both the VAR approach and traditional econometric approaches require identification restrictions, the nature of these restrictions are quite different. The traditional approaches tend to place little emphasis on lags in equations while the VAR approach emphasizes it. The traditional approach places strict interpretations on the parameters of each equation while the VAR approach interprets the system as a whole and analyzes responses to the behavioral shocks. The traditional approach uses zero restrictions on parameters for identification while the VAR approach uses the covariance matrix of the reduced form residuals and the assumption of orthogonal behavioral shocks to establish identification. In VAR models, the statistical model is developed first and then the structural model is identified. This approach is opposite to that followed in traditional econometrics and is favoured by some statistical theorists.

The VAR approach begins with a dynamic equation system of the form

$$\sum_{s=0}^{\infty} A(s)Y(t-s) = \varepsilon(t) \tag{1}$$

where $Y(t)$ and $\varepsilon(t)$ are $k \times 1$ vectors and $A(s)$ is a $k \times k$ matrix of coefficients for each time period (s) previous to current time (t). Equation (1) relates the observable data $Y(t)$ to sources of variation in the economy $\varepsilon(t)$. The shocks in $\varepsilon(t)$ are assumed to represent behaviorally distinct sources of variation that drive the economy over time. The vector $\varepsilon(t)$ has an expected value of zero and an assumed diagonal covariance matrix, Ω. The covariance matrix is assumed to be diagonal so that individual shocks $(\varepsilon(t))$ apply to only one behavioral equation at a time. Thus we can evaluate the effect of shocks to each behavioral equation on each variable in the system.

Equation (1) can be rewritten in autoregressive form as

$$A(L)Y(t) = \varepsilon(t) \tag{2}$$

The matrix $A(0) = I$,and $A(L), L \geq 1$ represents the lag. Equations (1) and (2) are the autoregressive equations which are estimated given an assumption on the lag length. It is the reduced form model.

Since all the variables are related in the system, it is not possible to disentangle the effects of one variable on another using the autoregressive representation. However, one could orthogonalize the shocks of a VAR system as follows: Rewrite equation (2) as $QA(L)Y(t) = Q\varepsilon(t)$, where Q is a matrix, and call the new matrices $C(L)Y(t) = \eta(t)$ with $C(L) = QA(L)$ and $\eta(t) = Q\varepsilon(t)$. The new system will then have the properties $C(0) = Q, E(\eta(t)\eta(t)') = Q\Omega Q'$. The new system and the old one are observationally equivalent (so long as Q is not singular). In particular, a convenient choice for Q is a Q such that $Q^{-1}Q^{-1\prime} = \Omega$. With this Q, $E(\eta(t)\eta(t)') = Q\Omega Q' = I$. Thus, it makes the shocks orthogonal. One way to construct such a Q is via the Cholesky decomposition. The Cholesky decomposition produces a lower triangular matrix Q^{-1}, and thus a lower triangular Q. This implies that, for example, in a 2×2 equation the second variable is not included in the first equation, but the first variable is included in the second equation.

Given a stable VAR, the autoregressive representation can be used to find the moving average representation which expresses the level of a particular variable as a function of the error process. Inverting the autoregressive system in (2) into a moving average representation results in:

$$Y(t) = \sum_{s=0}^{\infty} C(s)^{-1} \eta(t-s) \tag{3}$$

Moreover, this moving average representation is the impulse response function (IRF), which describes the effect of shocks to the behavioral relations on variables in the system The IRF summarizes the dynamic multipliers as implied by our identification. A shock may be represented by the placement of the value unity in one element of the vector $\varepsilon(t)$. The IRF provides the response of all variables in the system to this unit shock.

The moving average representation can also be used to decompose the forecast error variance of one of the variables in the system into portions attributable to each element in $Y(t)$. Using the autoregressive structure of the VAR model, the conditional expectation of $Y(t+h)$ given $Y(t), Y(t-1), \cdots$, can be determined. These are the h-step ahead forecasts of the series $Y(t)$. The forecast error covariance can also be established since it depends only on information up to time t. Forecast error decompositions are derived from the result that the contribution of each variable to forecast error is linear thus allowing the evaluation of each separate variable's impact on forecast error. This linearity of forecast error results from the orthogonalization procedure used in VAR models explained above.

The forecast error variance decompositions provide a useful measure of the strength of explanation between variables at different forecast horizons. Interpreted together with IRFs, decompositions can provide valuable insight into the dynamics of variables under investigation.

4.2 Empirical Results and Implications

The VARs are estimated for 1975 to 2004 for Germany and for 1980 to 2004 for Bavaria and NRW. A system was selected with one lag for both the aggregate and regional models. For diagnostic purpose, we find that the VAR(1)'s estimates are stable for Germany and Bavaria but VAR(2)'s estimates are statistically more appropriate for NRW. Moreover, the residuals are checked for autocorrelation, conditional heteroscedasticity as well as for the deviations for the Gaussian assumption, as proposed by Johanson (1995).

4.3 Germany: Impulse Response Analyses and Variance Decomposition

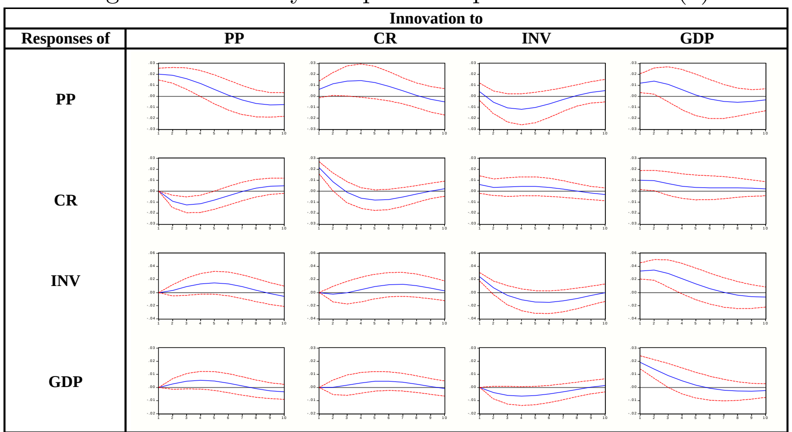
For the identification restriction a Cholesky factorization is used to orthogonalize the residuals. We specified the Cholesky Ordering by: GDP, investment in construction (Inv), bank lending (CR), commercial property prices (PP). This ordering implies that a shock to GDP effects all other variables contemporaneously, a shock to investment in construction effects bank lending and property prices contemporaneously, and a shock to credits does the same for property prices[9]. Also the impulse responses are not very sensitive to the ordering. Additionally we tried other orderings but the pattern of the responses do not change.

The impulse responses are shown over 10 periods in Figure 4. On the national level, we observe that a one-standard deviation shock to credits has a small positive effect on property prices up to about eight years, and afterwards the response becomes negative. This response could imply that in the early periods, prices are increasing due to a weaker conditions in the credit market, but the result of persistence in high prices probably then lead to an over-supply of properties and subsequently a downward pressure on prices.

However, we see a negative effect of credits due to an increase in prices. This result could imply that commercial properties are not an important component in the portfolio of German banks and so they do not react as expected to an increase in property prices. For Investment and GDP, we have the expected impulse responses: a positive shock to investment decreases prices,

[9] The economic reasoning for this ordering is the well known fact, that income can have immediate impacts on credits, investment and prices, whereas this is not so clear in the other direction.

Figure 4: Germany - Impulse Responses from VAR(1)



Variables: PP - Commercial Property Prices, CR - Bank Lending, INV - Investment in Construction.

and a positive shock to income will increase prices in the medium-run.

The reaction of investment to a positive price shock is also as expected, it leads to an increase in commercial property investment for some periods.

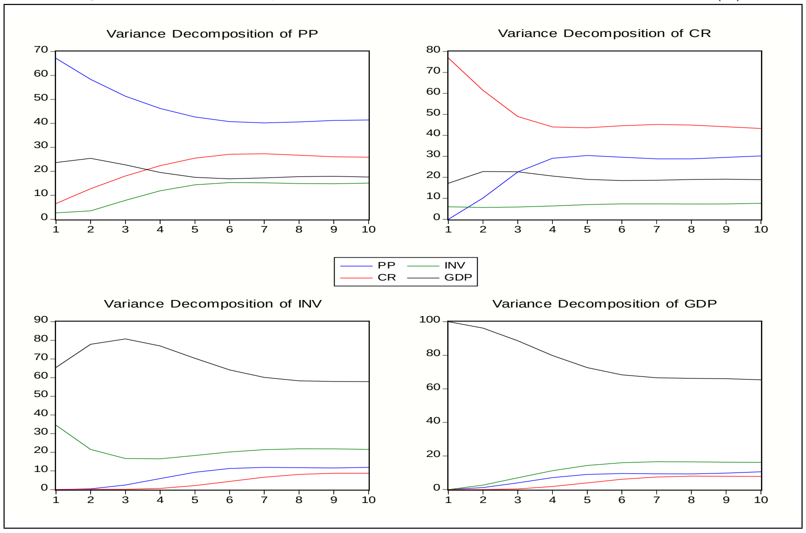
From the forecast error variance decomposition in Figure 5, we observe that nearly 70% of the variance in property prices comes from a shock in this prices. However, after some periods, shocks in credits for commercial properties start to gain importance in explaining volatility in commercial property prices; the share is increasing up to nearly 30%. For the variance decomposition of credits we can observe the opposite pattern. Within three to four periods, price shocks help to explain nearly one third of credit volatility, a result which strongly supports the hypothetical interrelation of price and credits. For the investment volatility in the commercial property sector the variance decomposition indicates a minor role of price shocks and a dominant role of income shocks.

4.4 Bavaria: Impulse Response Analyses and Variance Decomposition

For the impulse responses for Bavaria[10], we obtain different results than for the national level. Figure 6 shows a negative response of property prices to a shock in credits. Since the credit series represents credit outstanding we can not distinguish whether this effect is due to a change

[10] The Cholesky Ordering for Bavaria is the same as for Germany.

Figure 5: Germany - Variance Decompositon from VAR(1)



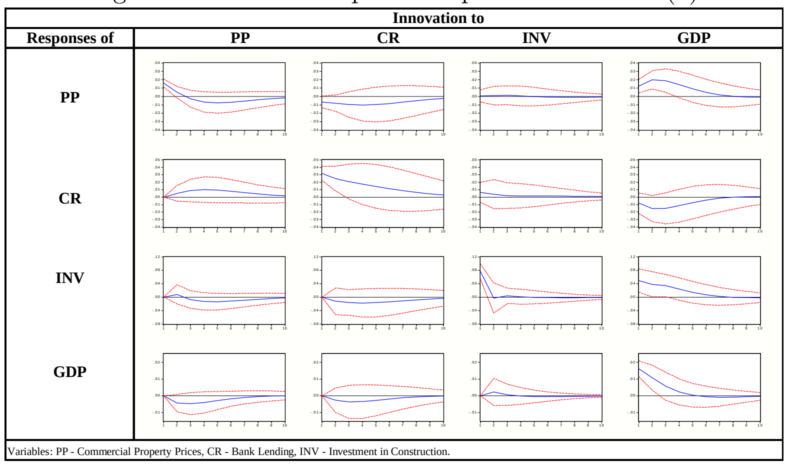
in demand or supply. The demand side argument is that credits will increase if property prices moves up and therefore demand will increase since new loans are available. Thus, prices will rise further. But here we see that a positive shock to credits has a negative effect on prices. Consequently, a supply side effect also needs to be examined.

In Figure 6, we see an immediate impact on prices of credit shocks. Since we have this immediate impact of credit shocks on prices we provide an empirical justification of the supply side story: if more credits are available, the supply of properties will increase due to increase in investment in commercial properties, therefore the prices will decline.

This supply side argument is also supported by the positive response of credits due to a price shock. If prices move up, the default risk of banks decreases and therefore credit supply increase.

From the variance decomposition, in Figure 7, we also get a different picture on the regional level. First, the proportion of the variance in prices due to shocks in prices is much lower (only about 57% at the first period). Second, the forecast error variance is decreasing sharply to around 20% after three periods. Third, shocks to income seems to have much more influence on the variance of prices than for Germany.(GDP starting form 33%, reaching a peak of 65% after 3

Figure 6: Bavaria - Impulse Responses from VAR(1)



periods and staying at a level of more then 50% after 10 periods). And lastly, credit volatility seems not so sensitive to price shocks as observed on the national level.

Figure 7: Bavaria - Variance Decompositon from VAR(1)

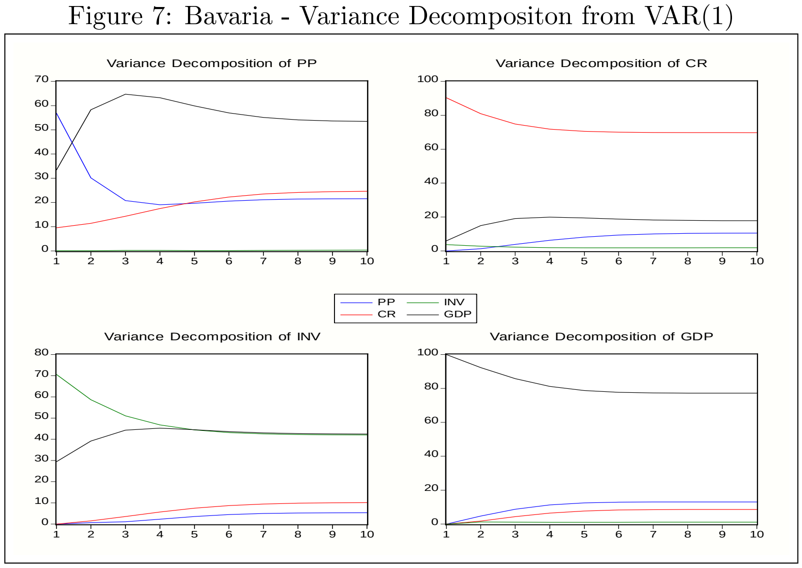
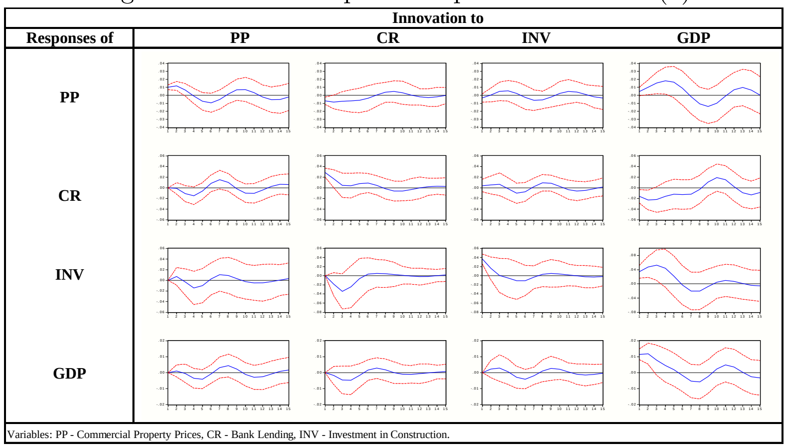


Figure 8: NRW - Impulse Responses from VAR(2)



4.5 Nordrhein - Westfalen: Impulse Response Analyses and Variance Decomposition

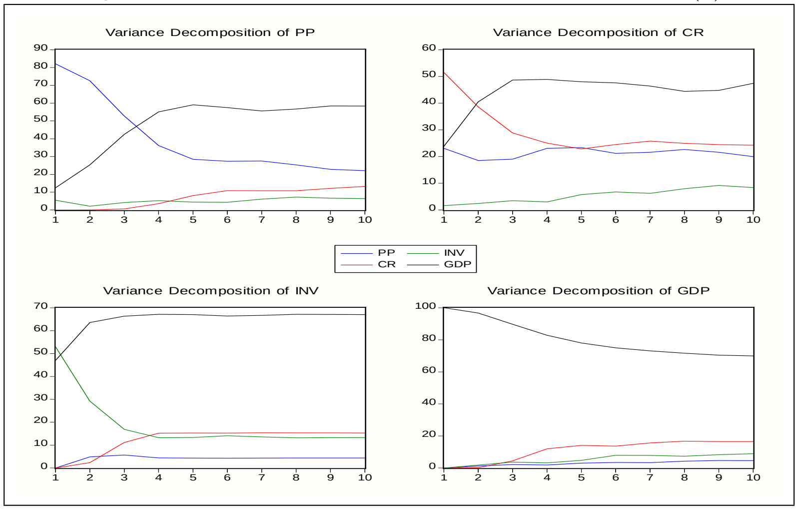
Since we observe cyclical swings for the VAR(2) system, we find it appropriate to consider 15 periods for the impulse responses for Nordrhein - Westfalen (NRW)[11]. In the first column of Figure 8, a price shock leads to a slight increase of property prices for two periods. Afterwards, prices swing around the equilibrium level. There is nearly no contemporaneous effect of prices on credits (which would be possible due to the ordering implied). After two periods, credits decrease and start to rise after four periods prior to the price increase, the same is true for investment. With the construction lag in mind, these responses are plausible, since they could indicate an inverse price response due to changes in credit supply and investment which lead to a lagged variation in the real estate stock. For investment and GDP we observe similar patterns as above.

In column two, a credit shock leads to a decrease of property prices again. The difference here is the reaction of bank lending to a credit shock. For NRW we observe a slight increase of credits after three periods.

The variance decomposition for NRW in Figure 9 indicates that the regional GDP is the most

[11] For the last region under investigation we use the same Cholesky Ordering as for the other two cases.

Figure 9: NRW - Varaince Decomposition from VAR(2)



important variable for property prices and bank lending in this country. In contrast to Bavaria, shocks to property prices seem to explain some of the variance in bank loans

5 Conclusion

In this article we study the importance of a number of macroeconomic factors, in particular the bank shocks, affecting the dynamics of German commercial real estate prices for both national and regional levels. Our results can be summarized as follows. On the aggregate level, bank (credit) loan shocks have a small but positive effect on property prices up to eight periods and negative effect afterwards. Other macro (e.g. GDP and Investment) shocks have the expected effect on the prices: a positive investment shock decreases prices whereas a positive shock to income increases prices. These effects are reinforced in the variance decomposition analysis. We observe that most of the variance in property prices comes from a shock to itself. Thus, the shocks to other variables have a weak or less meaningful impact on the forecast error variance of commercial property prices. In regards to the regional level, our empirical results indicate somewhat different effects. From the impulse response analysis, we observe a negative response of prices to a shock in credits.

Moreover, from the variance decomposition analysis we also get a different picture at the regional level.

As much as we would like to draw a resolute conclusion and lesson from our study, one has to acknowledge that the empirical results are highly dependent on the availability of the commercial real estate data in Germany. One could, however, draw a plausible conclusion that there is a long-lasting link (either positive or negative) between bank loans and property prices in Germany. The feedback from property prices to credit growth is strongest in places with a greater prevalence of variable rate mortgages and more market-based property valuation practices for loan accounting.

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