THE REAL ESTATE MARKET RISK OF BANKS

- Evidence of its Importance and Consequences for Managing Risk in Real Estate Lending -

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Real Estate Lending is a risky business. There is ample evidence from many countries for heavy bank losses or even failures caused by defaulted real estate loans. Particularly during real estate crises the losses tend to rise dramatically so that in some cases the banking system as a whole is endangered. It seems that lenders do not have the right instruments for managing all the risks inherent to real estate loans. On the other hand proper instruments cannot exist if the nature of real estate risks is not completely known. Therefore it is necessary to create new risk management instruments—based on a sound analysis of real estate risks and of the demands on risk management.

1. The real estate-related assets of banks and their risks

In countries with a large scope of permissible real estate activity, real estate often constitutes a major part of the banks’ balance sheet. In Germany, for instance, housing loans alone make up over 40 percent of all loans; add to this loans for commercial real estate, loans to the construction industry, direct real estate investments or revenue from real estate-related services (real estate brokerage, real estate trusts, etc.)\(^1\), and you can safely assume that most Geman banks are dominated by their real estate holdings.

<table>
<thead>
<tr>
<th>Type</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Direct investment</strong></td>
<td></td>
</tr>
<tr>
<td>Real estate for investment purposes</td>
<td>Acquisition of a property to rescue a loan</td>
</tr>
<tr>
<td>Other real estate owned</td>
<td>Bank headquaters</td>
</tr>
<tr>
<td>Real estate leasing</td>
<td>Construction and leasing of buildings</td>
</tr>
<tr>
<td><strong>Loans</strong></td>
<td></td>
</tr>
<tr>
<td>Loans to the construction and real estate industry</td>
<td>Loans to real estate developers</td>
</tr>
<tr>
<td>Mortgage loans</td>
<td>Housing Loans to private customers</td>
</tr>
<tr>
<td><strong>Indirect investments</strong></td>
<td></td>
</tr>
<tr>
<td>Fee income from real estate-related activities</td>
<td>Real estate brokerage</td>
</tr>
<tr>
<td>Income from Real estate trusts</td>
<td>Fees as the initiator of a REIT</td>
</tr>
<tr>
<td>Capital investments in real estate companies</td>
<td>Dividends from REITs</td>
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</table>

\(^1\) Precise figures for these activities are not available because they are not separately stated on the balance sheets of German banks or in statistics of the Deutsche Bundesbank.
The link between the various types of real estate activities as shown in figure 1 is that they are exposed to the risks inherent to real estate: specific risks (e.g., vacancy risk) and systematic risk ("real estate market risk"). Banks have long concentrated on the management of specific risks and have developed many suitable instruments. The real estate market risk, however, has been widely neglected by both practitioners and academics. This is all the more surprising as its importance for financial institutions becomes painfully evident in every downturn of the real estate cycle, when falling real estate prices cause loans to default and banks to fail.

In the language of the Modern Portfolio Theory the **market risk** is *that part of the total risk that cannot be eliminated by diversification* since it is caused by economic changes that influence all investments. Analogous to that definition, **real estate market risk** can be defined as *the non-diversifiable risk that can be attributed to the fluctuations of the real estate market*.

A closer look reveals that the real estate market risk appears in several variations:

- There is a **direct real estate market risk** if the value of an asset corresponds directly with the real estate market—without anybody being able to influence this effect.
- There is an **indirect real estate market risk** if the value of an asset corresponds only indirectly with the real estate market since there are other factors that also exert an influence. Four types of indirect real estate market risk can be found: **Credit risk** is the danger that real estate market fluctuations reduce the creditworthiness of a borrower. A **collateral risk** exists if the value of the secured property could be reduced by an adverse market trend. If there is a **profitability risk**, real estate market variations endanger the profitability of an investment, and if the real estate market has a negative influence on other market prices, such as stock prices, there is a **price risk**.

Figure 2 shows the effects of the different risks: If the real estate market fluctuates (gray arrow), the value of a real estate-related asset directly (straight black arrow) or indirectly (broken black arrows) also fluctuates. The dotted black arrows indicate that there are still other factors not mentioned here.

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2 Especially in the US literature, several articles deal with or at least mention real estate market risk; see, for example, Froland/Gorlow/Sampson (1986). However, a comprehensive analysis of the topic and an application on banks is still missing.
This systematics is new. Previously, when the real estate market risk was mentioned in the literature on (real estate) finance, it was generally without an explanation of the diverse effects of that risk. And when the literature on bank management or property management dealt with real estate risks, it usually contained no explicit link to the real estate market. Our classification connects the cause-oriented with the effects-oriented view. This is necessary for real estate risk management because it allows us to calculate the total market risk of a bank, which is a function of its assets’ volume and specific sensitivity to the real estate market.

2. Evidence of the importance of real estate market risk for banks

The real estate market risk of financial institutions cannot be measured from information generally available to the public. Therefore indirect ways have to be found to assess its importance, for instance by comparison to other types of market risk.

- Several studies indicate that the systematic portion of total real estate risk is lower than that of comparable risks, e.g., the stock market risk. \(^3\) This finding alone doesn’t answer our question

\(^3\) See, for instance, Capozza/Schwann (1990). This phenomenon can be explained by the extreme heterogeneity of the real estate market, where—due to the immobility of the traded assets—each asset is unique and hence has its own market which an overall market index cannot fully represent.
because we don’t know how much of the total risk banks can diversify away and how much risk remains after using hedging instruments.

- Other studies show a significant correlation between the systemic risk in the financial services industry and the real estate market.\(^4\) It can be concluded that one of the major reasons for most prominent banking crises of the last two decades were real estate crises, which is a strong indication for the importance of the real estate market risk on the macro level.

- On the level of the individual banking firm, there is also plenty of evidence for the strong influence that fluctuations of the real estate market have on the performance of mortgage loans.\(^5\)

Yet again, those studies provide no measure for the importance of real estate market risk. For that, we have to use methods from capital market research, such as factor models based on the Arbitrage Pricing Theory (APT). In the past, bank stock returns were mostly explained by two-factor models with a market factor and an interest-rate factor.\(^6\) Some researchers have tried to refine this method by adding a third factor, e.g., foreign currencies, inflation or real estate. The basic form of such a model is:

\[
R_{it} = \beta_0 + \beta_1 R_{Mt} + \beta_2 I_t + \beta_3 R_{Rt} + \epsilon_{it}
\]

where \(R_{it}\) represents the return on a portfolio of bank stocks \(i\) in period \(t\), \(R_{Mt}\) is the stock market return, \(I_t\) stands for the interest rate, \(R_{Rt}\) is the real estate market return, \(\epsilon_{it}\) is an error term, and \(\beta_0, \beta_1, \beta_2, \beta_3\) are the intercept and the respective sensitivities. There are two preconditions for this equation to hold: (1) real estate activities and interest-bearing assets and liabilities must be sufficiently important for the banks; (2) real estate market and interest rate fluctuations must have a significant influence on those activities.

Concerning the interest rate factor, the first precondition can be taken for granted for most banks since interest income is their major source of revenue. This income is subject to interest rate changes, if the bank has a maturity-mismatch in assets and liabilities.\(^7\) In the case of real estate, the

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\(^4\) Cole/Fenn (1994), for example, look into the relationship between commercial real estate lending and bank failure, during the US banking crisis of the late 1980s; Ghosh/Guttery/Sirmans (1994) find similar evidence for the UK.

\(^5\) An example is the empirical study of commercial mortgage defaults by Vandell (1992).

\(^6\) Examples are the articles by Bae (1990) and Hies/Oertman (1995), who also give an overview of the current literature.

\(^7\) Some studies have found a declining influence of the interest rate in recent years, probably as a consequence of the broader use of hedging instruments; see--for instance--Allen/Jagtiani (1996).
principle relationship is the same as for interest rates, only that all positions are "open" because tools for hedging the real estate market risk do not exist yet.

Therefore one can hypothesize that the bank stock returns are positively related to the real estate market. "The degree to which commercial bank values are related to real estate values should be a function of bank exposure to real estate risk, just as sensitivity to an interest-rate factor was sometimes found to be a function of bank exposure to interest-rate risk."\(^8\)

2.1. Evidence from the USA

So far, the real estate market factor has been tested by only a few researchers and mainly for the US. Table 1 gives a short summary of the most important American studies in chronological order:

<table>
<thead>
<tr>
<th>Authors</th>
<th>Data</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mei/Saunders (1991/1995)</td>
<td>• indices: returns on different portfolios of 180 US-banks ($R_i$), dividend yield on a market portfolio ($R_m$), t-bill rate ($R_T$), ACLI cap-rate ($R_{ACL}$), spread between AAA bonds and t-bills (default risk factor), January variable (dummy); • other: return on portfolios of the stock market, government bonds, and REITs; • period: 1971-1989</td>
<td>A premium for real estate risk is increasingly apparent in bank stocks, presumably reflecting these banks’ growing exposures in this area; it could be as high as the premium for interest rate risk.</td>
</tr>
<tr>
<td>Mei/Lee (1994)</td>
<td>• indices: return on a stock index ($R_i$), dividend yield on a market portfolio ($R_m$), t-bill rates ($R_{T, i}$), income yield on the Wilshire real estate index ($R_{R}$); spread between AAA bonds and t-bills (default risk factor); • other: return on portfolios of the stock market, government bonds, REITs, small caps, and on the Russell-NCREIF portfolio; • period: 1978-1989</td>
<td>There is a real estate risk premium for all stocks in addition to the stock market and the interest rate risk premia.</td>
</tr>
<tr>
<td>Allen/Madura/Wiant (1995)</td>
<td>• indices: returns on 125 US-banks, separately and divided into portfolios ($R_i$), S&amp;P 500 index ($R_m$), actual T-bond rates and unexpected T-bond yield changes ($R_{T, u}$), NAREIT Equity REIT Index ($R_{R}$); • other: balance sheet data; • period: 1979-1992</td>
<td>There is a positive relationship between monthly bank returns and the real estate index; the sensitivity of bank values to the real estate market has increased over time; the bank-specific sensitivity is positively related to the bank’s balance sheet exposure to real estate.</td>
</tr>
<tr>
<td>He/Myer/Webb (1996)</td>
<td>• indices: returns on various portfolios of 166 US-bank holding companies ($R_i$), various stock market, interest rate, and real estate market indices; • other: balance sheet data; • period: 1986-1991</td>
<td>Bank stocks are very sensitive to changes in real estate returns; banks with a larger portion of their total loans invested in real estate are more sensitive.</td>
</tr>
</tbody>
</table>


\(^9\) See Lausberg (1997) for a detailed discussion of the studies.
All these studies use multi-factor models. The variables used and the time periods covered, however, differ greatly. This lends credibility to their unanimous finding: there is a significant real estate market risk for American banks.

Unfortunately, the transferability of this insight to other countries, times and conditions may be limited because the late 1980s, which all studies include, saw a nationwide real estate crisis of unparalleled dimensions. It had a tremendous effect on the banking industry and certainly also on the banks’ valuation by investors. Therefore we cannot assume that the relationship between banks and the real estate market observed in the US is the same in other countries.

2.2. Evidence from Germany

A recent study by the author chose a similar three-factor model to examine the real estate sensitivity of German bank stock returns. One challenge was to allow for national differences (e.g., in the banking systems or in the available data) without giving up the similar design that was facilitating an international comparison.

Methodology

Preliminary work showed that there had been only a few APT-studies for Germany, so there was no consensus regarding the relevant risk factors for German bank stocks. The use of a dummy variable to take into account the effect of the German reunification was common, but not always significant. We therefore used only the three factors that were assumed to be the most important (stock market, interest rate, and real estate market) and the equation mentioned above.

Indices

Since there is no organized market for land, real estate indices are constructed on the basis of other data that reflect the price changes of the market. The three basic types are: 1) appraisal-based indices, 2) transaction-based indices, 3) indices based on share prices of institutional real estate investors. There are several real estate indices in Germany; however, reliable monthly data is only available from two indices of real estate companies ("property stocks"). Theoretically, if such an index is stripped of all other influences—which is possible by employing some statistics—it is a pure real estate index. We used the property stock index of Westdeutsche Landesbank (WestLB) because at that time the other index of Ellwanger & Geiger contained too many illiquid stocks.

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10 Lausberg (1997).
Many studies have found a near-perfect correlation of the various stock market indices. Our calculations confirmed this for the most widely used indices. For our analysis we chose the CDAX because it is a price index (like the WestLB property stock index), it has a bank sub-index, and a broad basis.

In previous studies, a great variety of interest rate factors were successfully tested, indicating that the negative relation between bank stock returns and interest rates is stable and independent from the index used. This finding allowed us to use actual interest rates although they do not meet the APT criterium of unpredictableness--primarily because we were not mainly interested the interest rate factor. We used the "REX-10", a 10-year bond-price-index of synthetic government bonds because it was the only index of long-term interest rates which was available over a longer period.

Data and Sources

The study covers the period from January 1990 thru April 1996, the longest availability of the indices at that time. To account for a variation of the sensitivities over time, we formed 2 sub-samples; more would not have been meaningful because the statistical methods required a certain minimum number of observations. Mid-1992 was used for partitioning since this seemed to be the turning point of both the long-term economic trend and the real estate market trend, as several indices showed.

In April 1996, there were 34 bank companies listed on German stock exchanges. For 30 of them, information about real estate loans was available from the Hoppenstedt-database. The banks were divided into 3 equally weighted portfolios, depending on the percentage of real estate loans in their balance sheet. The separation points (10 and 55%) were chosen in a way that the portfolios were homogeneous (mortgage banks ["Hypothekenbanken"], universal banks ["Universalbanken"], and special banks ["Spezialbanken"]). Share prices were obtained from the "Deutsche Finanzdatenbank" at the University of Karlsruhe

Results

The test of the premises of the linear regression model showed a normal distribution of residuals and no signs of autocorrelation or heteroscedasticity. However, as was expected, there was

\textsuperscript{11} See Bae (1990), whose 2-factor model worked with most kinds of interest rate factors. The same may be true for Germany; our preliminary examinations yielded high correlations between various German interest rate indices--including a series of unpredicted changes that were constructed with an autoregressive integrated moving average model (ARIMA).
some evidence of collinearity. To address this issue, we used an orthogonalization procedure to strip the real estate factor from the influence of the other factors. The residuals of the new regression analysis were then used as the real estate factor for further analysis.

The results of the three-factor model show only a weak influence of the real estate factor in the first period, but a higher importance in the second. From 1992 till 1996, the sensitivities are fairly large and significant for three of the four portfolios. In the case of the portfolio of special banks the results are contradictory, which is most likely due to the fact that they do not fulfill one of the preconditions ("sufficiently important real estate activities"). Furthermore, in the second period the banks with the highest percentage of real estate loans (mortgage banks) have the highest real estate market sensitivity. The market index shows the greatest influence and significance in all portfolios and in both periods; this is consistent with the current literature. Interest rates seem to be less important for German banks, especially for the mortgage banks.

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Intercept</th>
<th>Market Coefficient (t-Statistic)</th>
<th>Interest-Rate Coefficient (t-Statistic)</th>
<th>Real Estate Coefficient (t-Statistic)</th>
<th>Adjusted $R^2$ (in %)</th>
<th>$F$-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Banks</td>
<td>-0.0034 (-1.172)</td>
<td>0.772 (11.092)***</td>
<td>0.277 (3.971)***</td>
<td>0.122 (1.840)*</td>
<td>80.1</td>
<td>61.35***</td>
</tr>
<tr>
<td>Mortgage Banks</td>
<td>0.005 (1.543)</td>
<td>0.578 (4.809)***</td>
<td>-0.061 (-0.507)</td>
<td>0.358 (3.114)***</td>
<td>40.6</td>
<td>11.247***</td>
</tr>
<tr>
<td>Universal Banks</td>
<td>0.0024 (0.973)</td>
<td>0.731 (10.682)***</td>
<td>0.334 (4.873)***</td>
<td>0.175 (2.673)***</td>
<td>80.8</td>
<td>63.988***</td>
</tr>
<tr>
<td>Special Banks</td>
<td>-0.000069 (-0.029)</td>
<td>0.571 (4.346)***</td>
<td>0.005 (0.035)</td>
<td>0.102 (0.809)</td>
<td>29.1</td>
<td>7.15***</td>
</tr>
</tbody>
</table>

* = significant at the 0.10 level  
** = significant at the 0.05 level  
*** = significant at the 0.01 level

The $F$-statistics are significant on the 0.01 level for all portfolios in both periods, which demonstrates the ability of the model to describe reality reasonably well. Furthermore, the three-index model proved to be superior to a two-index-model, consisting of the same market and interest rate factors, which was also tested: The three-index model showed higher $R^2$ for all portfolios except for special banks.

**Conclusions**

The results of this study basically confirm our expectations and the findings of the US studies: Bank stock returns are—at least during certain time periods—sensitive to fluctuations of the
real estate market. Especially the stock returns of German mortgage banks were found to depend upon a real estate factor. This leads to the question whether banks have the right instruments in place to handle real estate market risk.

3. Managing the real estate market risk

3.1. Status quo

According to the current literature and the author’s own empirical research the state of real estate risk management can be characterized as follows:

Regarding the different types of real estate-related business, a wide range of risk management instruments is in place only in real estate lending, while direct investments are often left out of risk management systems, and the risk attached to fee-generating real estate business is completely ignored.

Regarding the typical elements of risk management—(1) risk identification and measurement, (2) risk controlling and hedging—the degree of risk management also varies. First of all, a quantitative approach to the management of real estate risks, which is the precondition for measuring and controlling market risk, is fairly new to most banks; sophisticated instruments, therefore, are not readily available. Second, as long as the risks cannot be calculated correctly, it is natural that correct risk controlling is hindered. Theoretically, measuring the real estate market risk of direct investments would be relatively easy since banks could use similar instruments as for managing the stock market risk, but in reality only few applications are known. For real estate loans matters are more complicated because the default risk is not normally distributed and market prices are even harder to construct. Therefore banks often use instruments from commercial lending that are adapted to real estate lending, for example: analysis of financial statements, rating or scoring instruments, sensitivity analysis, and early warning systems. Mostly, these instruments concentrate on the specific risks of real estate and do not measure the systematic risk. Controlling real estate market risk is mainly done by naive diversification within the portfolio of direct

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12 Caveats: Further tests with other variables and other periods are necessary to assure that the relationship found between real estate markets and bank stock returns is valid and stable. So far, the results cannot be regarded as representative for all German banks because only 30 out of 3500 are listed on a stock exchange. Moreover, the results do not say anything about the risk premia that investors demand when holding bank stocks.

13 See Lausberg (2001) for more details.
investments and loans. Only very few banks seem to regularly use instruments to hedge the real
estate market risk.\textsuperscript{14}

Regarding the \textbf{level of risk management} most instruments are used on the \textit{level of the individual asset}, while a \textit{portfolio view} of real estate activities is but slowly gaining acceptance. Some of the leading banks experiment with the value-at-risk methodology they use for their loan portfolios, but many issues concerning portfolio risk are not yet solved.

In short, the instruments in place today at most financial institutions are not able to measure or control real estate market risk effectively.

\textbf{3.2. Consequences for risk management}

The logical consequence from the results of this study—the high importance of the real estate market risk and the deficits in managing the risk—is that there is an urgent need for new instruments. Ideally the development of a complete risk management system for real estate risks, especially for the real estate market risk, should start with the definition of the most basic parameters used in portfolio management—risk and return. At present, different definitions exist, but none is able to fulfill the demands of both researchers and risk managers. Connected to this, new ways to measure real estate risk are to be developed, which implies new forms for market valuation of all real-estate related assets.

In most countries outside the US and the UK another precondition for better risk management is the improvement of the data base. This is not only a quantitative problem because of limited historical data, but also a qualitative one; major research has to be done on fields such as the distribution of real estate returns, methods to forecast the real estate market, the characteristics of real estate cycles and crises, and capital markets-based real estate research.

Compared to that, the problems of risk controlling and hedging are small. Here, it is most important to create a liquid market for real estate market instruments. The methodological problems are similar to the ones that were solved long ago for stock and bond markets. It can be assumed that financial institutions and real estate investors will soon start to create derivative real estate market instruments to hedge their positions.

Another unsolved problem is the integration of all bank risks into an overall bank risk management system. There has been a lot of progress recently in this direction, although some

\textsuperscript{14} In 1994, Barclays bank was one of the first banks to issue capital market instruments that were tied to a real estate index, thus providing the bank with a means to hedge its exposure to the real estate market. Other banks are following slowly, but concentrating on inter-bank transactions, e.g., with asset-backed securities.
major parts of the puzzle—e.g., operating risks—are still hard to integrate. If real estate risk management is further developing as described above, it should not be too complicated to integrate the real estate market risk because after all it is just one more market risk.

Finally, it will be important for the future development of real estate risk management that the instruments produce results that are meaningful and can easily be interpreted and used by the banks’ employees. At the end of the day the success of risk management does not depend on the degree of sophistication of its tools, but on a culture in which risk is consciously dealt with and the chances and limits of risk management are understood.

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