

European Structured Finance Special Report

German Residential Mortgage Default Model

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■ Summary

Fitch IBCA has developed a new model for evaluating credit loss levels on securities backed by German residential mortgage-backed securities (MBS). The model calculates credit enhancement requirements to support ratings on investment-grade classes of residential MBS. It incorporates a loan-by-loan analysis that takes into account the characteristics of each individual property, borrower, and loan.

To determine rating guidelines that reflect the unique characteristics of mortgages and lending practices in the German market, Fitch IBCA conducted a study of the residential mortgage industry. The study included an examination of residential mortgage portfolios from several mortgage lenders. In addition, Fitch IBCA analysed data and research from the European Mortgage Federation, Statistisches Bundesamt, the International Monetary Fund, private research companies, and banks active in the German mortgage market.

Fitch IBCA's German mortgage default model calculates credit losses for residential MBS based on the probability of borrower default and loss severity. The model focuses on the interaction of two factors that together serve as the primary determinants of default:

- The affordability of a loan to borrower, as evidenced by their debt-to-income ratio.
- Amount of equity borrowers have invested in their home (or loan-to-value ratio [LTV]).

Loss severity is determined by considering regional market value trends, the costs involved once a borrower has defaulted, such as carrying costs and legal expenses, and LTV at time of default. Fitch IBCA's market value assumptions are based not only on traditional determinants, such as regional economic stability, but also on historical home price volatility by region and historically sustainable growth.

This report describes some of the unique features of the mortgage market in Germany. It also sets out Fitch IBCA's guidelines and methodology for rating German residential mortgage loans, as well as Fitch IBCA's checklists for reviewing the origination and administration of the loans. Residential MBS ratings are based on three fundamental aspects of the transaction: the credit quality of the collateral; the financial structure of the transaction; and the legal framework. This report focuses on Fitch IBCA's approach to determining the credit quality of the collateral.

■ German Mortgage Market

Approximately EUR925 billion of residential property loans, including approximately EUR606 billion of private residential mortgage loans, is currently outstanding in Germany, making it the largest market in Europe, followed by the UK and France. The market is highly fragmented by lender type. The savings bank sector holds the largest market share, with

approximately 25% (at the end of 1997), followed by mortgage banks (22.6%), universal banks (19.4%), and cooperative sector banks (13.1%).

The level of home ownership in Germany is the lowest in the European Union (EU), at approximately 42% in western Germany and 31% in eastern Germany. After a long-term decline of home ownership, demand for owner-occupied housing started to pick up again in the 1980s and 1990s.

The relatively low home ownership rate in Germany is a reflection of economic policy, tax regime, building quality, property development laws, and individual preferences. Historically, economic policy was targeted toward low rent levels rather than increased home ownership. Tenant protection laws are relatively tenant-friendly and rent increases are limited and subject to various restrictions. Tax incentives have been relatively large for investment property, whereas tax breaks for owner-occupied homes have been small compared with some other European countries.

Various tax savings are available for real estate investors, therefore, the yield of a residential property is relatively low pretax, but can be attractive from an after-tax yield perspective and from a price appreciation perspective. The average quality of new buildings is comparatively high, making German properties expensive in an international comparison. There is virtually no cheap housing segment that would be targeted toward young first-time buyers. Various building regulations effectively limit the creation of such a lower cost, entry-level housing market. In addition, prices for land are, on average high, given the dense

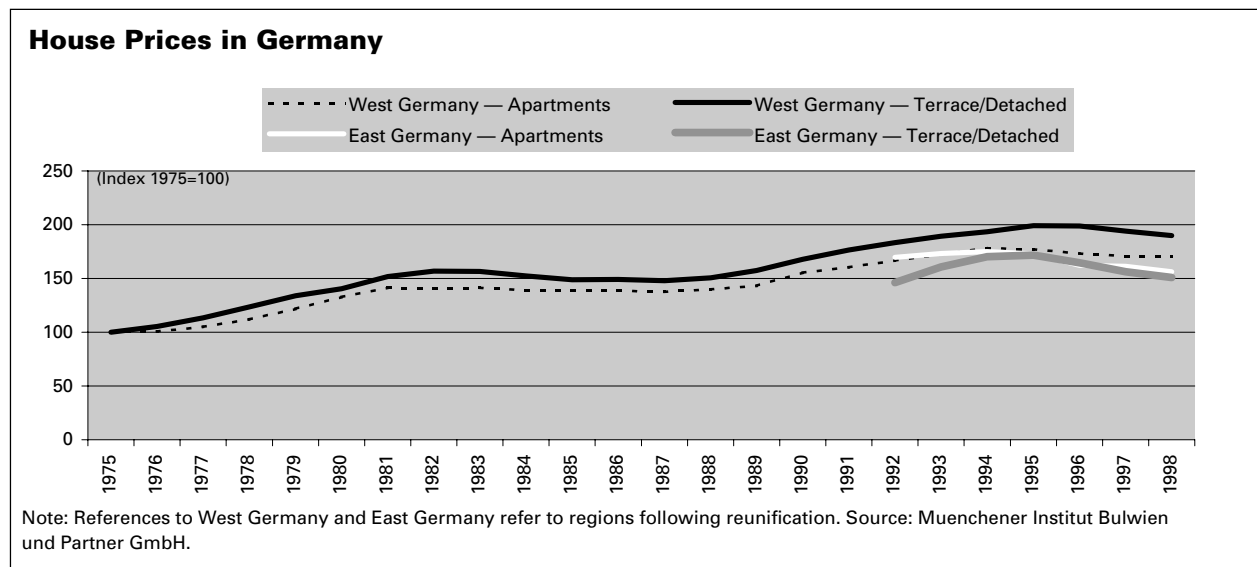
population in most regions in Germany and the restrictions on land development.

The tenant-friendly legislation and tax incentives for investment properties mentioned above lead to relatively low rent levels when compared with the cost of owner-occupied housing. Most individuals buying property for their own use do so more as a result of personal preferences (living in their own home) rather than pure economic considerations. Given the mechanics of the German mortgage market, first-time buyers are, on average, considerably older than in other European countries.

Home ownership might further rise in the long-term due to the perception that the state pension fund system will experience significant constraints in the long run. Purchasing property is seen as one of the possibilities to complement state and, if applicable, company pension schemes. However, it is not expected that home ownership will increase dramatically in the near future.

■ House Prices

One of the difficulties Fitch IBCA faced when determining house price trends is the lack of long-term quantitative data on a regional level. There are no official national house price statistics. Fitch IBCA reviewed data provided by broker associations and private research firms. In particular, Fitch IBCA used house price data for 49 cities in Germany (see *House Prices in Germany chart below*). Data on house prices were available starting in 1975 for the former West Germany and starting in 1992 in the former East Germany. Prices provided generally cover the upper segment of the residential real estate market (average to above-average quality in average to above-average location). Fitch IBCA did not find any



conclusive house price statistics that cover rural areas in Germany.

Generally, house price movement has shown stable growth. After 1975, there have been four phases of price development in western Germany. The first phase is characterised by a significant increase of (nominal) house prices in the late 1970s to early 1980s. After this period, prices started to consolidate, but there was no dramatic price drop. The third phase started approximately in 1987. Given a healthy economy and an increasing shortage of housing due to higher demand levels and limited supply, prices increased again. In the early 1990s, the unification of West Germany and East Germany further boosted the economy and led to overall higher home prices. The fourth phase, which started in 1993–1994, brought another consolidation of home prices, caused by a recessionary environment, higher unemployment, and economic difficulties in eastern Germany, as well as a higher supply of homes.

Price decreases in eastern Germany have been more pronounced than in western Germany, where prices went down to a lesser extent. Prices in eastern Germany had also been fueled by tax incentives and optimistic rental expectations, which proved to be too aggressive in some cases. While there is no clear consensus where prices might head, most research indicates that prices have generally bottomed out and might increase, but that uncertainty in the eastern German market remains relatively high.

■ Historical Defaults and Losses

Information about historical defaults of residential borrowers in Germany is not publicly available. Fitch IBCA looked at the performance of several bank portfolios and some industry estimates. Loss data on residential pools has also been difficult to assemble, although Fitch IBCA used bank provisioning and writeoff data. Overall, historical information is still relatively limited and most banks have just started to systematically record more data to evaluate borrower and/or property specific default behaviour. The dearth of historical information is also a result of losses being historically low in the German residential mortgage market. Fitch IBCA's analysis of borrower default and loss data in Germany shows that default and loss risks are relatively low, particularly when compared with the US and the UK.

Fitch IBCA also conducted a qualitative analysis of the German market to substantiate the lower levels of default and loss that have been experienced in Germany. Fitch IBCA found various reasons why defaults have been low in the long run, including a

strong social and cultural aversion to defaulting on debt obligations. The main reasons for low default and loss levels follow.

Credit Underwriting Practices: There has been virtually no subprime mortgage market in Germany. Credit impaired borrowers generally do not have access to a mortgage loan. There is also a sentiment that subprime borrowing is generally not to the advantage of the borrower nor the lender. In addition, low-income borrowers are less likely to have the financial means to afford owner-occupied housing due to relatively high home prices. Underwriting practices have generally been conservative, and ability to pay calculations on a monthly basis (remaining income after mortgage payment) are an industry standard.

Recourse: In case of a borrower default and a subsequent foreclosure of the mortgaged property, any outstanding amounts must be paid by the borrower. The borrower still remains liable and the lender has recourse to other assets of the borrower, including future earnings. This allows the lender legal recourse to a proportion of a borrower's salary and other income. The ability to seize a portion of the borrower's earnings from his employer acts as a strong disincentive to default and limits losses if the borrower defaults for any reason other than unemployment. Given that there is no "exit" option, borrowers are generally more reluctant to assume an aggressively high level of indebtedness. With the introduction of a new insolvency law in Germany in 1999, private individuals now have the possibility of a private bankruptcy within certain limits. It remains to be seen if this will have an effect on overall borrower behaviour.

First-Time Buyer Age and Financial Standing: Given that owning tends to be more expensive than renting a property, first-time buyers are generally older than in other countries, and their financial standing tends to be above average. Housing for lower income groups is generally not owner-occupied, particularly in urban areas. Therefore, mortgage borrowers are more resilient to changes in the economy, as their income provides more cushion against economic downturns.

In addition, welfare benefits are relatively high compared with other countries. Therefore, unemployment may be somewhat less likely to lead to a mortgage loan default.

Branch-Based Banking: Although the market is slowly changing to adapt new distribution channels such as telephone banking, direct sales, or Internet-based distribution, a large proportion of mortgage lending is still carried out through the local branch of a

borrower's bank. This results in lower levels of default probability, as the borrower has a greater tendency to make payments under a mortgage if the relationship with the borrower's bank is perceived as a personal relationship between borrower and bank manager.

Regional Effects: With the exception of eastern Germany, the economy in Germany was more influenced by national rather than regional factors. Although there are stronger and weaker regions, the differences have not been as pronounced as in other countries (particularly the US). In addition, even if a region is relatively weak, most people do not necessarily consider moving to other regions. The low mobility is based on cultural sentiment and comparatively generous social welfare benefits. These factors have an overall stabilising effect on the housing market and lead to lower loss levels.

■ Market Comparisons

Fitch IBCA considered the social, economic, and cultural features of the German mortgage market and compared and contrasted this market to other European markets and to the US market. In terms of default probability, Fitch IBCA believes that German borrowers have shown different patterns of behavior to that of borrowers in the UK and the US, but similar patterns to Belgium and the Netherlands. Property market value trends have been different to Germany's neighbouring market

■ Prepayments

Under lending legislation in Germany, a borrower is permitted to prepay a loan subject to certain prepayment penalties for fixed-rate loans. There are generally no prepayment penalties for variable-rate loans or fixed-rate loans at their reset date. Prepayment penalties for fixed-rate loans before the reset date are calculated based on the interest rate differential to current interest rates until the reset date.

■ New Insolvency Law

A new insolvency law was enacted in Germany, effective 1 Jan. 1999. One of the new features of the insolvency law is the possibility of a private bankruptcy. Up to 1999, a borrower could not legally opt for a private bankruptcy. Generally, an overly indebted borrower could try to settle outstanding financial obligations out of court, potentially

with the help of a nonprofit debt counseling service (Schuldnerberatungsstelle). According to the new law, if a settlement out of court has been unsuccessful, a defaulted borrower can apply for a court settlement. After all assets have been foreclosed upon (within certain limits given by law), the borrower has to fulfill certain obligations for a period of seven years; for example, handing over all earnings (subject to certain limits) to a trustee who will distribute the income to the various creditors. After seven years, the remaining debt obligations can be waived.

Currently, there is no consensus if and to what extent the new insolvency law will affect borrower default behaviour. For mortgage loans, the possibility of recouping any outstanding amounts after foreclosure of the property will be generally more limited than in the past. In any case, Fitch IBCA does not give credit for post-foreclosure recoveries in its mortgage default model.

■ Guidelines and Model Development

Model Approach

To determine loss coverage for residential MBS, Fitch IBCA's default model employs a loan-by-loan review, examining several loan-, borrower-, and property-specific factors that most influence default probability and loss severity. Fitch IBCA's base default probability analysis focuses primarily on the borrower's debt-to-income ratio, in conjunction with the loan's LTV. Fitch IBCA's believes that these two measures are interdependent and should not be examined separately. These expected default rates are then adjusted further by loan, borrower, and property attributes.

A large component of Fitch IBCA's recovery value analysis is market value trends (recovery value is the inverse of loss severity). Fitch IBCA's market value assumptions focus on historical volatility and sustainable growth, while also including traditional measures of market value decline. Market value projections are then adjusted by loan and property attributes, including loan size and property ownership. Fitch IBCA's German mortgage default model can be characterised as a worst-case, loss-driven model that calculates investment-grade credit enhancement requirements for residential mortgage securitisations.

■ Default Probability

Determinants of Default

Fitch IBCA believes the primary indicators of delinquency and default are a combination of the following factors:

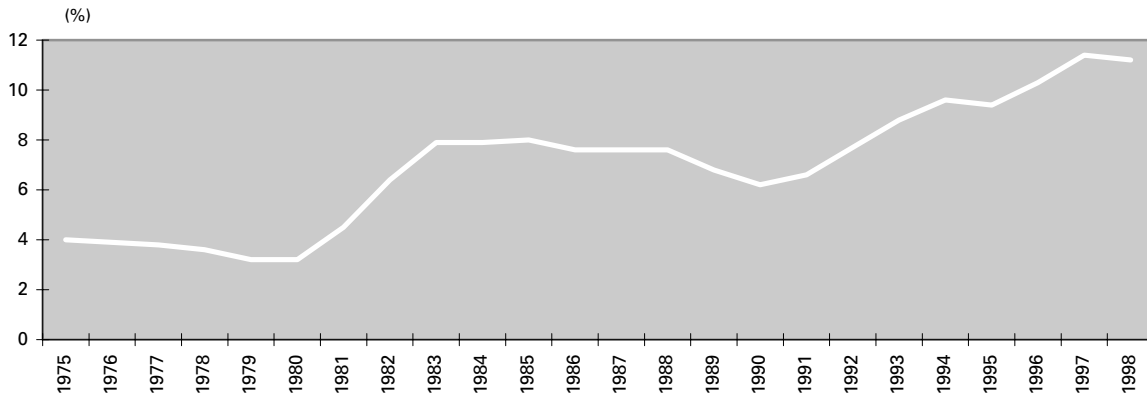
Debt-to-Income Ratio*

(%)

Class 1	< 20.00
Class 2	20.00–29.99
Class 3	30.00–39.99
Class 4	40.00–49.99
Class 5	50.00–59.99

*Monthly mortgage payment/monthly net income (after taxes).

Unemployment in Germany (At Year End)



Note: Data include East Germany since 1991. Source: Statistisches Bundesamt.

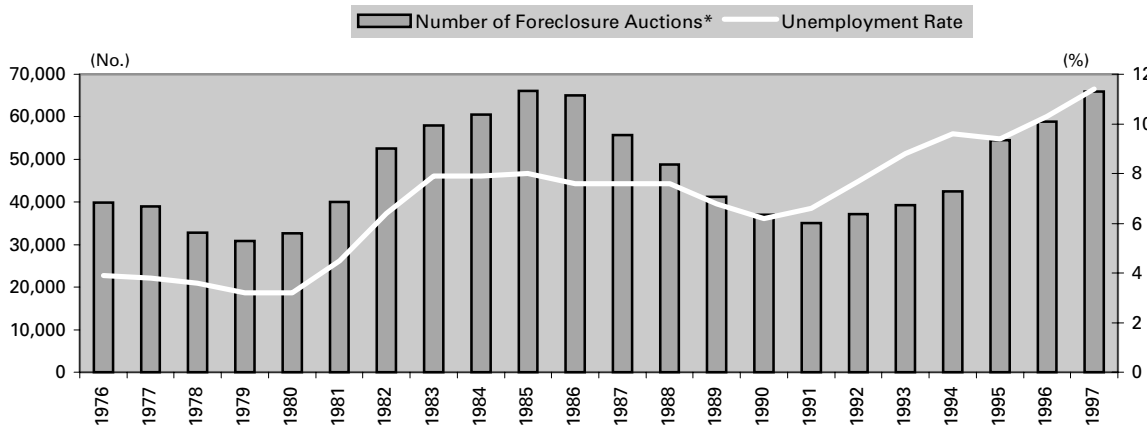
- The financial resilience of borrowers, as evidenced by their debt-to-income ratio.
- The effect of unexpected financial stress on the borrower, such as divorce or unemployment.
- The amount of equity invested in the home (LTV).

Fitch IBCA incorporates the two basic theories of mortgage default in its model, namely the borrower's ability and willingness to make monthly payments. Borrowers' ability to pay is largely dictated by their income in relation to their debts; the more income, the better.

Lower debt-to-income ratios also allow for the greater absorption by the borrower of financial shocks, such as divorce or unemployment. This is important in

Germany, as the primary reasons borrowers default on their monthly mortgage payments are divorce and unemployment. While statistics indicate that, as in most western economies, divorce rates consistently went up over the past decades and that most divorces occur between four and six years after marriage, Fitch IBCA does not attempt to link divorce statistics to default probabilities. Historical German unemployment rates are shown in the Unemployment in Germany chart above. Unemployment has an impact on defaults, but there is no exact quantitative relationship between unemployment rates and foreclosures. Although the Foreclosure Auctions vs. Unemployment in Germany chart below indicates a certain relationship, there are many factors that influence foreclosure rates. In addition, the German foreclosure statistics do not

Foreclosure Auctions vs. Unemployment in Germany (At Year End)



*Residential and commercial. Source: Statistisches Bundesamt.

'AAA' Default Matrix

(%)

Loan-to-Value Ratio	Class 1	Class 2	Class 3	Class 4	Class 5
< 40.01	5	5	6	7	8
40.01–50.00	5	6	7	8	9
50.01–60.00	5	6	7	9	11
60.01–65.00	6	7	8	11	14
65.01–70.00	6	7	9	13	17
70.01–75.00	7	8	11	15	20
75.01–80.00	8	9	13	17	23
80.01–85.00	9	11	15	20	26
85.01–90.00	10	13	18	23	30
90.01–95.00	13	17	22	28	35
95.01–98.00	17	21	26	33	40
98.01–100.00	21	26	31	38	47
> 100.00					

Analysed on an Individual Basis

differentiate between foreclosures for residential and commercial property.

The equity, or willingness-to-pay, theory states that the borrower's perceived equity in the property dominates the decision to default if the borrower is in financial distress. Therefore, the borrower's incentive to avoid foreclosure is affected by home price fluctuations over time. Additionally, the equity theory assumes that a large initial down payment reflects a borrower of higher financial means. Fitch IBCA believes borrowers are more willing to pay if they have made a substantial downpayment at origination, regardless of declines in home prices that might cause the erosion of equity over time. Consequently, lower LTV loans are expected to have lower default rates. There are certain exceptions for investment properties based on tax advantages. As there are more significant tax benefits for investment property, a borrower might be able to make a large downpayment, but prefers not to do so to use the full tax benefit. In these cases, default probability might not be directly linked to the LTV. In a securitisation, Fitch IBCA will take this into consideration if borrower-specific information is available on a loan-by-loan basis.

Fitch IBCA uses these primary indicators of default (LTV and debt-to-income ratio) in the German mortgage model to determine base default rates, which are then modified to reflect the risk associated with specific loan, borrower, and property attributes.

Default probability matrices for rating levels other than 'AAA' are listed in Appendix II on page 13.

■ Default Probability Adjustments

Fitch IBCA adjusts the base default rates on a loan-by-loan basis to account for individual loan characteristics of the collateral across all rating levels. Default rates may be adjusted for product type, repayment type, loan purpose,

second home/investment property, borrower profile, seasoning, arrears status, and underwriting quality.

Product Type: German lenders offer fixed- and variable-rate mortgage loans. The majority of mortgages have fixed interest rates with the option to reset the interest rate. Resets typically occur after three to 10 years. Fitch IBCA increases default probability on fixed-rate mortgages with reset options owing to the risk of borrower payment shock caused by resetting the interest rate to prevailing market rates. This is particularly relevant for low interest rate periods. Default probability adjusted between 5%–25% above the respective base default probability (depending on the length of the fixed term). Fitch IBCA will not increase the default probability if the lender can demonstrate that a potential higher interest rate at reset is taken into account when calculating the ability to pay at origination. Fitch IBCA default probability adjustments on variable-rate mortgages range from 15%–25%.

Repayment Types: The most common type of mortgage in the German market is a repayment mortgage in the form of an annuity mortgage. Linear repayment type mortgages are rare in the residential market. Another relevant mortgage type is an interest-only mortgage linked to life insurance, whereby repayment of the mortgage will be made by the maturing life policy. Fitch IBCA will generally increase default probabilities for mortgage types with no or variable repayment features. Interest-only mortgages (not linked to life insurance) are secured solely by the property value, and principal is repaid in one lump sum by the borrower upon loan maturity. Fitch IBCA increases default assumptions for these loans to take into account the potential payment shock to the borrower at the time of refinancing, as well as the strong reliance on the borrower's equity in the property. Fitch IBCA will also increase default probabilities for other mortgages where balloon risk (lump sum payment at the end) exists.

In cases where a life insurance policy is used to repay the principal in full at maturity, Fitch IBCA might increase default probability according to the rating of the insurance provider and the nature of the life assurance scheme owing to the increased market risk or third-party risk involved. In addition, Fitch IBCA requires that the bonds issued against the collateral mature approximately one to two years after the last mortgage maturity date to provide time to repossess properties in the event of an insurance company default. In all cases, the insurance benefit should be equal to the full amount of principal outstanding on the loan.

Loan Purpose: Fitch IBCA views mortgage loans advanced to release equity in the home (equity refinance mortgages) as risky because the homeowner is essentially borrowing back his equity based on the home's price appreciation. Because the loan is advanced on the basis of the home's appreciated value, appraisals on refinancings are critical to the underwriting process. Fitch IBCA reviews the issuer's appraisal process and all underwriting guidelines when meeting with the originator's management. On completion of this review, if Fitch IBCA believes these loans have an increased likelihood of default, the base default probability will be adjusted 10%–25%. Fitch IBCA does not penalise mortgage loans advanced to purchase a home or those advanced to refinance existing loans. For loans advanced to construct homes, Fitch IBCA expects construction to be completed prior to the loan being included in the pool for securitisation.

Mortgages Up to 90 Days in Arrears: When rating a portfolio combining current and arrears mortgages, Fitch IBCA increases base default rates for mortgages in arrears up to 90 days by 25%–75% above base default probability.

Second Homes and Investment Properties: While information about mortgage performance for second homes is limited, Fitch IBCA assumes that second homes are considerably more susceptible to default. A financially distressed borrower is more likely to default on a second home than on a primary residence. Fitch IBCA believes a borrower is even more likely to default on an investment property than on a second home. Accordingly, Fitch IBCA increases base default rates by 15%–25% for this type of loan.

Borrower Profile: Fitch IBCA believes that self-employed borrowers have a greater probability of default than borrowers who are paid a salary, depending on the nature of their business. Self-employed borrowers are more sensitive to changes in their respective industry and/or the general economy and their income is generally more volatile. In addition, welfare benefits are

not available to the same extent as for employees. For these reasons, Fitch IBCA increases default probability on loans to self-employed borrowers by 33%–50%.

Underwriting Quality: When applying the default probability matrix, Fitch IBCA also considers a lender's underwriting guidelines. Default probabilities stated in the tables are based on market standard origination and servicing guidelines, including, inter alia, a thorough review of the ability to pay, a credit history check at the Schufa register, the national credit register, and proof of income and asset position of the borrower.

Fitch IBCA's review and analysis of the originator of this process determines whether Fitch IBCA decreases default rates by up to 25% or increases them by 5%–200%. The areas of focus for Fitch IBCA's review of an originator and servicer are summarised in Appendix III, page 14.

Seasoning

Mortgage default behaviour generally also depends on how long a mortgage loan has been performing. Mortgage loans that have been originated 10 years ago and have never missed a payment are more likely to perform for the remaining mortgage life than newly originated mortgages. However, it is difficult to quantify the benefit of seasoning, as there is generally no static pool information available to perform a quantitative analysis of default probabilities according to the age of a mortgage loan. Based on limited data and qualitative research, Fitch IBCA estimates that mortgage defaults peak approximately three to five years after origination. Given the data limitations, Fitch IBCA does not assume a specific default probability reduction for mortgages that are seasoned, but might give credit for seasoning on a case-by-case basis, depending on the data that can be presented by the originator/servicer. In particular, credit might be given for mortgages that have been fully performing for more than five years.

■ Loss Severity

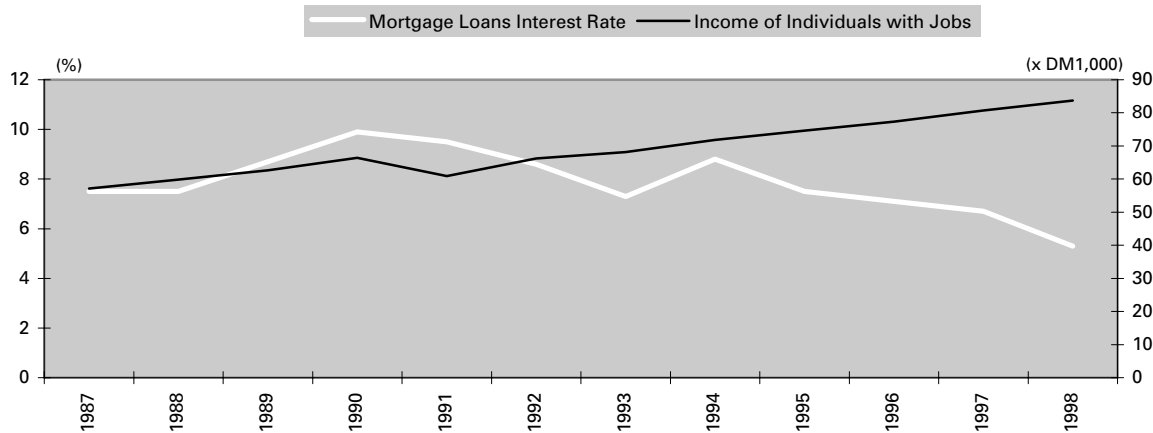
Components of Loss Severity

Fitch IBCA's German default model quantifies loss severity (or, conversely, recovery value) by focusing on several factors, including market value trends, foreclosure and carrying costs, and LTV.

Market Value Trends and Market Value Declines

To capture market value movements for each region, Fitch IBCA employs a methodology that focuses not only on traditional determinants, such as regional economic stability, but also on historical regional changes in home prices and historical steady state growth.

Interest Rates vs. Income (At Year End)



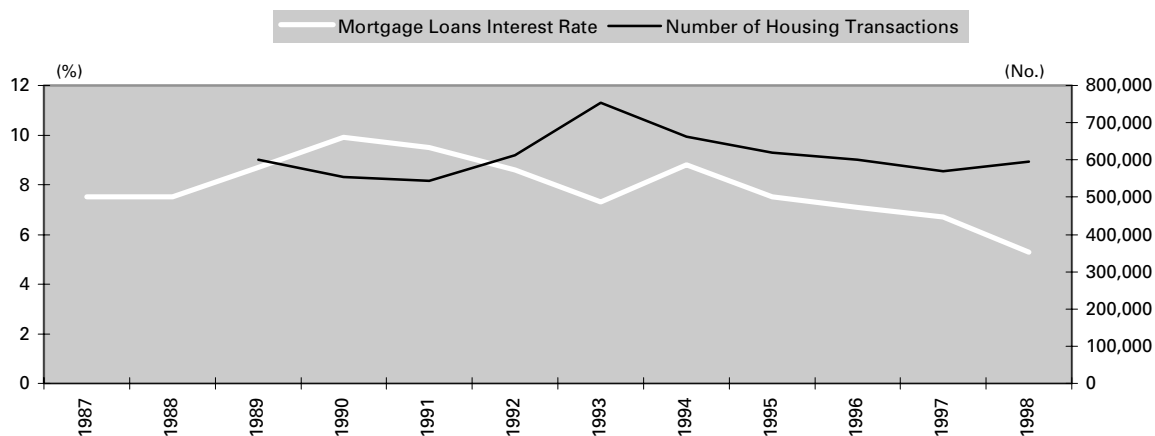
Note: Data include East Germany since 1991. Source: Statistisches Bundesamt/European Mortgage Federation.

Many variables influence home price movements, such as sudden, volatile changes in housing demand brought about by government policy and speculation, variations in disposable income induced by fluctuations in interest rates and wages, and changes in lending practices. Moreover, while influential parameters such as building permissions, construction prices, micro-location, property-specific supply, and demand characteristics are important to establish a worst-case estimate for a specific property, a broader methodology was developed for large aggregate pools of residential mortgages. In addition, Fitch IBCA does not want to predict market values for specific property segments, but rather define investment-grade worst-case stress scenarios for the German property market as a whole. Since all property-relevant parameters are reflected in actual historical prices, Fitch IBCA's

model focuses on historical home price movements rather than the events that may have influenced them.

Based on the house price development over the past years (starting in 1975 for West Germany), Fitch IBCA determined a long-term growth path for cities in which Fitch IBCA was able to collect house price information. Fitch IBCA then analysed the variations around this long-term growth path to come up with market value declines for various rating categories. Generally, the more volatility in home price development, the higher the market value decline for a particular rating category. Current market value declines also take into account if and to what extent current house prices are above or below their long-term growth path.

Interest Rates vs. Transactions



Note: Data include East Germany since 1991. Source: Statistisches Bundesamt/European Mortgage Federation.

Market Value Declines

(%)

	'AAA'		'AA'		'A'		'BBB'	
	T&D	AP	T&D	AP	T&D	AP	T&D	AP
By Region								
North	41	36	37	32	33	29	30	26
West	38	35	34	31	30	28	28	26
Southwest	37	35	33	31	29	28	27	26
South	35	34	32	31	28	27	26	25
East	45	45	38	38	33	33	29	29
By City								
Hamburg	43	36	39	32	35	29	32	26
Düsseldorf	39	34	35	30	31	27	29	25
Köln	42	37	38	33	34	30	32	28
Frankfurt (Main)	36	35	32	31	28	28	26	26
Stuttgart	40	34	37	31	33	27	31	25
München	34	40	31	37	27	33	25	31
Berlin	44	45	40	41	36	38	33	35

T&D – Terrace and detached. AP – Apartments.

As a next step, Fitch IBCA grouped the cities into four regions for western Germany. While there are not clear and distinctive differences regarding the trends for the cities across regions (market value declines for cities within a region can, in some instances, vary more than across regions), Fitch IBCA found that there are some differences for the respective average market value declines for the regions defined. Given the lack of data for rural areas on a more aggregate basis, Fitch IBCA could not take into account differences between the cities in a region and the rural areas in the same region and employs the same market value declines for the rural areas. This is conservative, as house prices in rural areas tend to develop on a more stable basis than in urban areas. Fitch IBCA has also broken out market value declines for certain cities.

Unlike other European models, Fitch IBCA has differentiated market value declines for apartments/flats and terraced/detached houses, as there are some observable differences in price development. While market value declines in the south are not substantially different for flats versus terraced/detached, terraced/detached houses in the north historically have been more volatile than flats.

Fitch IBCA could not use this methodology for eastern Germany, mainly due to the lack of long-term historical data on house prices. Therefore, market value declines assumed for eastern Germany are more subjective than for western Germany. As there are more uncertainties in the eastern German market based on the facts and observations stated above, Fitch IBCA assumes higher market value declines than for the regions in the west.

In addition to a decline in house prices, Fitch IBCA assumed a foreclosure adjustment of 20%. This adjustment reflects the fact that properties sold via an auction generally result in lower sale proceeds than a private sale in the open market. Although in reality auction discounts often exceed 20% of the then current appraised value, Fitch IBCA believes that an average of 20% is conservative, given that not all terminated loans necessarily take the foreclosure route via an auction but a private sale of the property can be arranged. While there is no conclusive quantitative research showing how many properties are sold via an auction as opposed to a private sale, practitioners estimate that approximately 30%–40% of foreclosed property is sold privately in the open market. Fitch IBCA's model assumes that default is not final foreclosure via auction but rather the termination of a loan after nonpayment of several installments.

Market value declines stated take into account both parameters; a general decline in house prices and a foreclosure adjustment. In developing market value declines, Fitch IBCA has also considered the parameters in other European countries and has compared the characteristics of the different markets.

Postal Codes

Region	Postal Code
North	20000–32999/37000–38999/ 49000–49999
West	33000–33999/40000–48999/ 50000–53999/57000–59999
Southwest	34000–36999/54000–56999/ 60000–69999/76000–76999
South	70000–75999/ 77000–97999
East	0–19999/39000–39999/ 98000–99999

Lending Value vs. Market Value

Fitch IBCA's model generally works with market values, as opposed to the lending value (Beleihungswert) used by German lenders. Fitch IBCA recognises the fact that property valuations done by lenders are typically lower than the purchase price and generally understate the market value of a property. Fitch IBCA will make a conservative estimation of the market value by taking the lending value and estimating a market value, depending on the valuation methods employed by the lender.

Market Value Adjustments

Fitch IBCA adjusts the base market value assumptions on a loan-by-loan basis to account for individual loan characteristics of the collateral across all rating levels.

Property Valuations: Given the development of house prices in the German market in past years, Fitch IBCA has to estimate current market values if the property valuation is older than one year. This is particularly relevant for eastern Germany, where prices have partially decreased. As a consequence, Fitch IBCA will adjust market values for older valuations where necessary. As it is difficult to base a current market value for a specific property on general developments in the market, Fitch IBCA conservatively assesses the potential current market value for older valuations (only very limited credit for price increases; full adjustment for price decreases).

High Value Properties: Homes with relatively high market values within a region are generally subject to higher market value declines in a deteriorating market than homes with average or below-average market values due to a limited demand for such properties. Imprecise pricing information, caused by the lack of comparable benchmark homes, also influences the amount of price volatility during a market downturn. On the other hand, the German property market for owner-occupied housing is generally more concentrated in the upper housing segment. Moreover, home prices for good quality property in good locations can be more stable due to a general demand from more wealthy individuals than home prices in the lower housing segment. Unlike its other European mortgage defaults, Fitch IBCA does not employ standard market value decline increases for high value properties, but rather looks at the pool composition on a case by case basis. Generally, homes with a value of more than DM800,000 will result in an increase in market value declines. Fitch IBCA will differentiate any increases by region/city.

Geographical Diversification

Fitch IBCA's model is based on the assumption that a mortgage portfolio is generally broadly diversified in geographical terms. From a historical perspective, there have been certain regional fluctuations, but they have

been lower overall than in other countries (apart from the different development in the eastern German market). However, a region might be more sensitive to economic downturns and/or other negative developments in the property and mortgage market for this region. If a portfolio has significant regional concentrations, Fitch IBCA will evaluate the respective regions in more detail and will make adjustments on a case-by-case basis. Generally, for pools with high concentrations in specific regions, credit enhancement necessary for a particular rating level will be higher than for geographically diversified portfolios.

Foreclosure and Carrying Costs

When calculating recovery value, Fitch IBCA's model reduces the property valuation by foreclosure costs and the cost to the administrator of "carrying" the loan from delinquency through to default. Fitch IBCA assumes external foreclosure costs amount to 2% of the property value. Internal foreclosure costs are assumed to be covered by the servicing fee in the securitisation. In case there are additional foreclosure costs, Fitch IBCA will take them into account and reduces further the recovery proceeds from the property foreclosure.

To calculate carrying costs, Fitch IBCA assumes the borrower does not pay interest for 24 months and that the interest rate on all loans during this time is the respective loan interest rate for fixed-rate loans and at 11% for variable-rate mortgages. The 24-month time frame is based on worst-case estimates obtained from German mortgage lenders. Although the foreclosure time can be longer in selected cases, the vast majority of properties can be foreclosed upon in a 24 month period. Fitch IBCA does not necessarily give credit for shorter foreclosure times for a particular lender as in a recession scenario with a high level of defaults foreclosure times could widen. The 11% interest rate is based on worst-case historical interest rate data.

■ Second-Lien Mortgage Securitisation

Traditionally, mortgages have been financed in Germany partially by the issuance of Pfandbriefe (*for a discussion of Pfandbriefe from a credit perspective, see Fitch IBCA Research titled "Pfandbriefe Rating Methodology," dated 7 July 1998, available on Fitch IBCA's web site at www.fitchibca.com*). While the main bulk of the residential mortgage market is actually not financed by Pfandbriefe, Pfandbriefe as a funding tool have been more prevalent than residential mortgage securitisations, but are limited to 60% of a conservatively assessed lending value of a property pool. Banks have a capital risk weighting of 50% for mortgages of up to 60% of the lending value. These factors indicate that securitisation of second-lien mortgages will become more relevant for the

German market. Fitch IBCA differentiates between two types of second-lien mortgages:

- A “true” second mortgage, whereby a separate mortgage as a security is registered in the land registry (Grundbuchamt).
- An “upper LTV” second mortgage, whereby only one mortgage is registered in the land registry as a security.

In the first case, the lender for the first-lien mortgage can be different. For a true second mortgage, Fitch IBCA assumes that prior ranking mortgages are fully funded and that interest accrues at least at the respective interest rate for the second-lien loan for at least 24 months plus external and potentially internal foreclosure costs. It is further assumed that all amounts due to the prior ranking creditor have to be fully paid before any recovery proceeds can go to the second-lien lender.

In the second case, only the upper LTV part (typically above 60% LTV) of one mortgage loan is securitised. The mortgage lender in this case is the same for both first- and second-lien mortgage part. For an upper LTV second mortgage, it is assumed that interest accrues at the respective rate for the whole loan for 24 months plus external foreclosure costs. Depending on the transaction structure and data provided by the originator, Fitch IBCA’s loss severity calculations for upper LTV mortgage securitisations can differ slightly on a case-by-case basis.

For investment-grade stress scenarios, loss severities for second-lien mortgages are inevitably high, given the lower property values in conjunction with prior ranking rights.

■ Credit Enhancement

Fitch IBCA calculates credit enhancement for each loan in a mortgage pool by multiplying default probability by loss severity. Worked examples of this calculation are set out in Appendix I, page 12.

■ Liquidity Coverage

MBS transactions require liquidity to cover short-term delinquencies. Assumptions regarding liquidity requirements can vary dramatically because the timing of delinquencies and shortfalls is difficult to predict. For this reason, Fitch IBCA uses a worst-case methodology to determine the level of liquidity required to cover delinquencies and defaults, and takes the weighted average default probability for a given pool of mortgages as the base indicator. Because liquidity coverage is closely related to the quality and efficiency of mortgage administration, as well as the quality of the collateral, Fitch IBCA tailors the calculation of liquidity to the particular dynamics of each transaction that it rates.

■ Operations Review

A key factor in evaluating and rating a pool of mortgage loans is the quality of the operations and procedures of the underlying mortgage originator/administrator. There is a direct correlation between the origination and servicing functions and the performance of a collateral pool. Fitch IBCA may increase or reduce credit enhancement based on the quality and experience of the originator and administrator. Underwriting guidelines, appraisals, and collection procedures are particularly important.

As part of its rating process for each transaction, Fitch IBCA reviews the operations of the originator/administrator, determining whether the company’s procedures, controls, and performance are acceptable. Interviews, procedural reviews, and loan level analyses are performed, not only to determine if operations comply with industry and investor guidelines, but also to ensure that the proper controls are in place for a given transaction.

Fitch IBCA tailors its review to the requirements of each issuer and investor, as well as the nature of the transaction involved. However, the key aspects of its approach are summarised in the checklist in Appendix IV, page 15.

■ Appendix I: Loan-Level Credit Enhancement Calculations

First Lien Mortgage

Desired Rating	'AAA'
Appraised Market Value (DM)	490,000
Lending Value (90%)	441,000
Region	North
Loan Advanced (DM)	375,000
Loan-to-Value Ratio (Market Value)	76.50%
Debt-to-Income Ratio	35.00%
Product Type	Fixed Rate
Repayment Type	Annuity
Fixed Rate	7.00%
Reset	Five Years

Default Probability Calculation (%)

'AAA' Base Default Probability		13.00%
Interest Rate Reset Hit		1.15%
Default Probability	=	13.00% x
		115.00%
	=	14.95%

Loss Severity Calculation (DM)

Loan Balance	375,000
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Property Type	Terrace and Detached
Appraised Value	490,000
Less: MVD (41%)	200,900
Less: Foreclosure Costs (2%)	9,800
Less: Carrying Costs	52,500
Recovery Value	226,800

Loss Severity	=	$\frac{\text{Loan Balance} - \text{Recovery Value}}{\text{Loan Balance}}$
	=	39.50%

Credit Enhancement Required	=	Default Probability x Loss Severity
	=	5.90%

MVD – Market value decline.

Upper LTV Second Mortgage

Desired Rating	'AAA'
Appraised Market Value (DM)	400,000
Lending Value (90%)	360,000
Region	South
Total Loan Advanced (DM)	288,000
Upper LTV Loan (> 60%) Portion	72,000
LTV (Market Value)	72.00%
Debt-to-Income Ratio	33.00%
Product Type	Fixed Rate
Repayment Type	Annuity
Fixed Rate	6.00%
Reset	Five Years

Default Probability Calculation (%)

'AAA' Base Default Probability		11.00%
Interest Rate Reset Hit		1.15%
Default Probability	=	11.00% x
		115.00%
	=	12.65%

Loss Severity Calculation (DM)

Loan Balance Upper LTV Loan	72,000
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Property Type	Apartment/Flat
Appraised Value	400,000
Less: MVD (34%)	136,000
Less: Foreclosure Costs (2%)	8,000
Less: Prior Ranking Loan	216,000
Less: Carrying Costs Prior Loan	25,920
Less: Carrying Costs Upper Loan	8,640
Recovery Value	5,440

Loss Severity	=	$\frac{\text{Loan Balance} - \text{Recovery Value}}{\text{Loan Balance}}$
	=	92.44%

Credit Enhancement Required	=	Default Probability x Loss Severity
	=	11.69%

LTV – Loan-to-value ratio. MVD – Market value decline.

■ Appendix II: Default Matrices

'AA' Default Matrix

(%)

Loan-to-Value Ratio	Class 1	Class 2	Class 3	Class 4	Class 5
< 40.01	4	4	5	6	6
40.01–50.00	4	5	6	6	7
50.01–60.00	4	5	6	7	9
60.01–65.00	5	6	6	9	11
65.01–70.00	5	6	7	10	14
70.01–75.00	6	6	9	12	16
75.01–80.00	6	7	10	14	18
80.01–85.00	7	9	12	16	21
85.01–90.00	8	10	14	18	24
90.01–95.00	10	14	18	22	28
95.01–98.00	14	17	21	26	32
98.01–100.00	17	21	25	30	38
>100.00		Analysed on an Individual Basis			

'A' Default Matrix

(%)

Loan-to-Value Ratio	Class 1	Class 2	Class 3	Class 4	Class 5
< 40.01	3	3	4	4	5
40.01–50.00	3	4	4	5	5
50.01–60.00	3	4	4	5	7
60.01–65.00	4	4	5	7	8
65.01–70.00	4	4	5	8	10
70.01–75.00	4	5	7	9	12
75.01–80.00	5	5	8	10	14
80.01–85.00	5	7	9	12	16
85.01–90.00	6	8	11	14	18
90.01–95.00	8	10	13	17	21
95.01–98.00	10	13	16	20	24
98.01–100.00	13	16	19	23	28
>100.00		Analysed on an Individual Basis			

'BBB' Default Matrix

(%)

Loan-to-Value Ratio	Class 1	Class 2	Class 3	Class 4	Class 5
< 40.01	2	2	2	3	3
40.01–50.00	2	2	3	3	4
50.01–60.00	2	2	3	4	4
60.01–65.00	2	3	3	4	6
65.01–70.00	2	3	4	5	7
70.01–75.00	3	3	4	6	8
75.01–80.00	3	4	5	7	9
80.01–85.00	4	4	6	8	10
85.01–90.00	4	5	7	9	12
90.01–95.00	5	7	9	11	14
95.01–98.00	7	8	10	13	16
98.01–100.00	8	10	12	15	19
>100.00		Analysed on an Individual Basis			

■ Appendix III: Originator and Servicer Due Diligence Checklists

Mortgage Origination Checklist

Underwriting

- Underwriting experience
- Adequate training
- Compliance with guidelines
- Guidelines ability to pay calculations
- Credit bureau checks

Appraisal

- Management experience
- Formal review process
- Appraisal examples
- Use of approved appraisers
- Completion of appraisals to industry standards
- Computation lending value

Quality Control

- Management and staff expertise
- Conformity with guidelines
- Documented procedures
- Involvement in early payment defaults and foreclosures

Servicing Checklist

Collections/Workout

- Management experience
- Collector experience
- Formal collection strategy
- Familiarity with industry guidelines
- Tracking system
- Level of borrower contact

Foreclosure/Bankruptcy

- Management and staff experience
- Committee foreclosure approval
- Familiarity with state requirements
- Selection of lawyer and monitoring
- Property inspections

Property Management (If Applicable)

- Marketing strategy
- Compliance with industry and government guidelines
- Expense management
- Security, protection, and repair of properties

Servicing Quality Control

- Management involvement and reporting structure
- Formal review process
- Compliance with government guidelines
- Number and severity of quality control exceptions and adequate follow-up

■ Appendix IV: Collateral Information Checklist

Collateral Information Checklist

Loan Attributes

- Current loan balance
- Original loan balance
- Mortgage balance
- Mortgage type (if applicable)
- Market value, lending value (if applicable)
- Appraisal date
- Original loan-to-value ratio
- Original loan term
- Remaining loan term
- Origination date
- Months in arrears (if applicable)
- Arrears balance (if applicable)
- Mortgage rate and description (e.g. fixed or variable, resets, etc.)

- Loan type (e.g. repayment type)
- Loan purpose (e.g. refinance, purchase, etc.)
- Loan status (e.g. performing, repossession, etc.)

Borrower Attributes

- Profile (e.g. first-time home buyer)
- Status (e.g. self-employed or salaried)
- Debt-to-income ratio or monthly debt payments to net income

Housing Attributes

- House type
- Occupation (e.g. owner-occupied, second home or investment property)
- Region
- Geographic location (postal code)

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