Part I
Introduction

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Credit Securitizations and Derivatives

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The Global Financial Crisis (GFC) led to an unprecedented and, by most of us, unexpected increase of impairment and loss rates for securitizations and derivatives. The disappointment of investors manifested in the criticism of models applied for measuring credit portfolio risk in relation to credit securities and derivatives.

Credit portfolio securitizations and derivatives are primarily OTC market instruments with exposures totaling approximately $40 trillion. Securitizations involve the sale of assets into bankruptcy-remote special purpose vehicles, which are funded by investors of different seniorities (tranches). Based on the nature of the securitized asset portfolios, important transaction types include asset-backed securities, collateralized debt obligations, home equity loan-backed securities and mortgage-backed securities. On the other side, credit derivatives are generally unfunded contracts and share similar structures and appraisal challenges with securitizations.

This exciting and timely book provides regulators with an overview of the risk inherent in credit securitizations and derivatives. The book aims to help quantitative analysts improve risk models and managers of financial institutions evaluate the performance of existing risk models and future model needs. The book addresses challenges in relation to the evaluation of credit portfolio securitizations and derivatives and covers the following areas:

- credit portfolio risk measurement,
- credit portfolio risk tranching,
- credit ratings,
- credit default swaps, indices and tranches,
- counterparty credit risk and clearing of derivatives contracts,
- liquidity risk,
- regulation.

The following provides a first introduction to some of these areas.

1.1 ECONOMIC CYCLES AND CREDIT PORTFOLIO RISK

The Global Financial Crisis (GFC) had its origin in the US mortgage market. During the GFC various changes in key macroeconomic variables were observed: (i) declining house prices, where changes in house prices often exceeded their equity finance, (ii) higher mortgage reset rates despite declining risk-free interest rates, (iii) decreases in GDP coinciding with higher unemployment rates and lower per capita earnings. This economic downturn spread to other

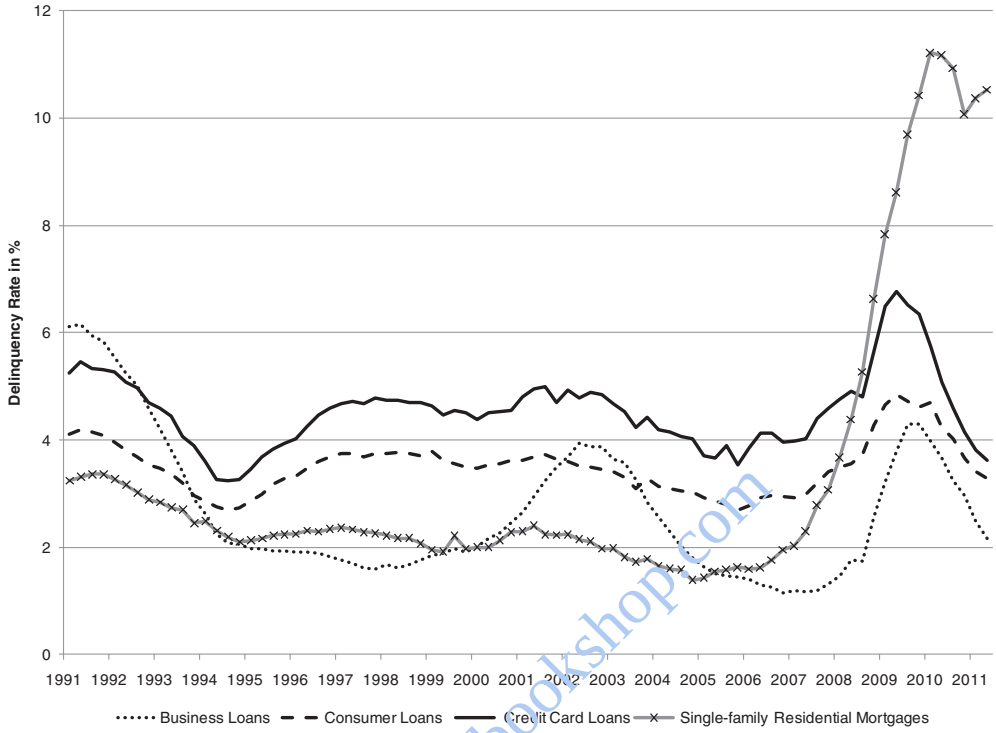

Figure 1.1 Delinquency rates, all commercial US banks, seasonally adjusted.
Note: This chart shows the delinquency rates for business loans, consumer loans, credit card loans and single-family residential mortgages. Delinquency rates are the ratios of the dollar amount of a bank's delinquent loans to the dollar amount of total loans outstanding in that category.
Source: Board of Governors of the US Federal Reserve System.

asset classes, financial products and eventually financial markets in many other countries through various mechanisms.

Figure 1.1 shows the delinquency rates for business loans, consumer loans, credit card loans and single-family residential mortgages. Traditionally, credit risk moves in parallel for the various loan classes. This trend was reversed in 2007 when delinquency rates for single-family residential mortgages dramatically increased to historically unprecedented levels (gray line with black markers).

Demyanyk et al. (2011) and others confirm that house prices are a major driver of mortgage credit risk. Figure 1.2 compares the delinquency rates for single-family residential mortgages with the growth rate of the Case–Shiller house price index for 10 major Metropolitan Statistical Areas in the United States (Greater Boston, Chicago metropolitan area, Denver-Aurora Metropolitan Area, Las Vegas metropolitan area, Greater Los Angeles, South Florida metropolitan area, New York metropolitan area, San Diego County, California, San Francisco–Oakland–Fremont, CA and Washington Metropolitan Area). The negative correlation between the two variables is apparent. More interestingly, the decrease in growth rates in 2006/07 anticipates the subsequent increase in mortgage delinquency rates.

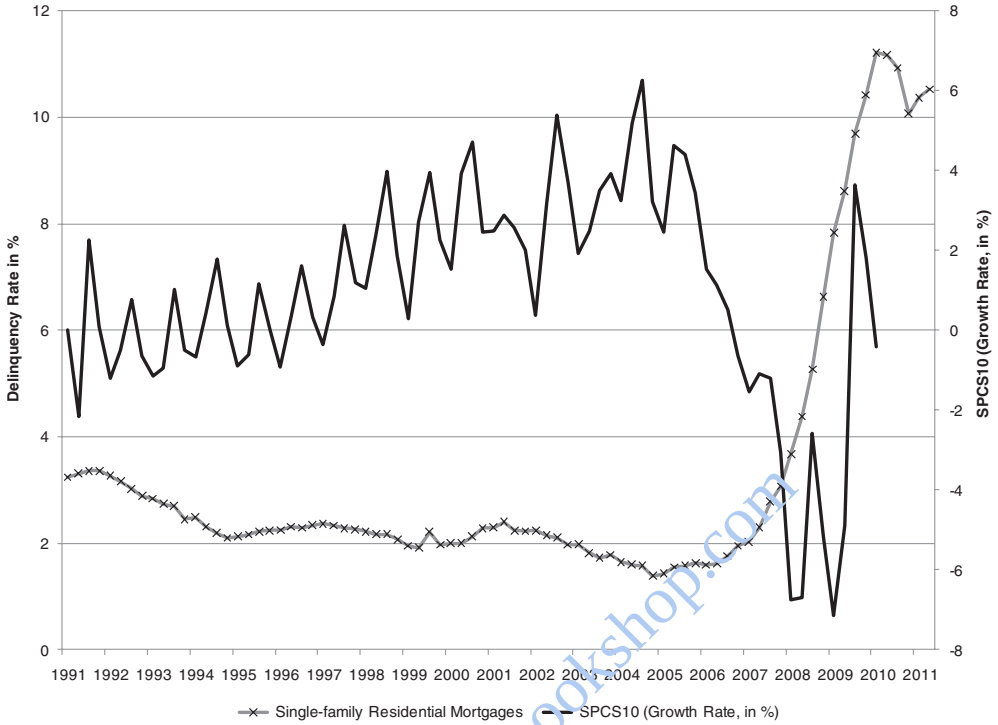

Figure 1.2 Delinquency rates for single-family residential mortgages with the Case–Shiller house price index.
Note: This chart shows the negative relationship between delinquency rates for single-family residential mortgages and the Case–Shiller house price index.

The cyclical movement of credit risk poses a challenge to practitioners, prudential regulators and academics as cyclical patterns may be included to various degrees in risk measures. Rösch and Scheule (2005) highlight the two extremes. The first extreme is the through-the-cycle (TTC) approach, which averages over the business cycle and is often promoted by banks in order to avoid cyclical regulatory capital requirements. The problem with cyclical regulatory capital requirements is that banks may be exposed to raise capital during economic downturns (when risk is high) when share prices are low and when capital supply is limited.

The second extreme is the point-in-time approach (PIT), which makes a prediction for future periods. PIT models are more accurate as they are generally based on forecast models, which explain the credit risk for a future point in time by information which is available at the time when the forecast is made.

Similar model approaches are common for other risk dimensions such as loss rates given default, and exposures given default (compare Bade, Rösch and Scheule, 2011 and Rösch and Scheule, 2010). Many recent current contributions in literature aim to improve the measurement of mortgage risk by building PIT risk models which include dynamic risk drivers such as real estate prices.

1.2 CREDIT PORTFOLIO RISK MEASUREMENT

Credit portfolio risk models measure the risk for loan portfolios. Such models are generally based on a set of parameters such as probabilities of default, loss rates given default, exposures at default and default correlations. Mortgage portfolios are retail portfolios and are characterized by a large number of mortgages. The US delinquency rates, which are presented in Figure 1.1, may be used as proxies for the portfolio default rate as they average over many individual exposures. Default rates are low in economic booms and high in economic downturns. Financial institutions generate default rate distributions around the current default rate and derive key portfolio measures, such as expected loss or value at risk. In addition, economic and regulatory capital may be derived from such distributions.

Figure 1.3 shows the default rate distribution for delinquency rates for single-family residential mortgages in the first quarter of 2006, which represents the economic boom state and 2011, which represents the economic downturn state. The application of TTC models will lead to time-invariant measures of portfolio risk while the application of PIT models will lead to time-varying measures of portfolio risk. Real-world models have mixed properties and the PIT-character of risk models accelerated the need for financial institutions to recapitalize during the GFC. The current discussion in literature focuses on the trade-off between (i) achieving

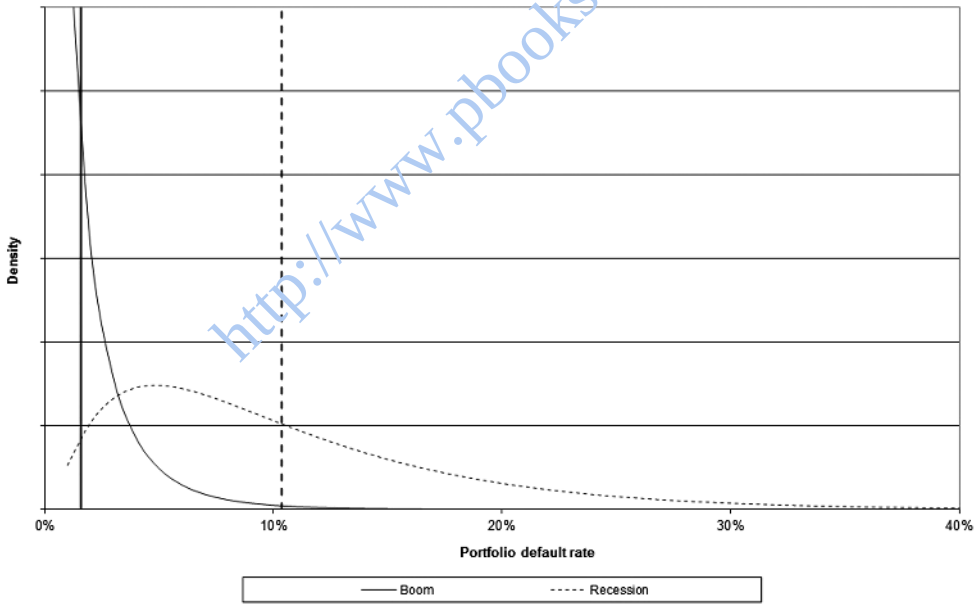

Figure 1.3 Credit portfolio loss distributions.
Note: The application of TTC models will lead to time-invariant measures of portfolio risk while the application of PIT models will lead to time-varying measures of portfolio risk.
Source: Own calculations based on delinquency rates for single-family residential mortgages in the first quarter of 2006 (expected default rate: 1.59%), which represents the economic book state, and 2011 (expected default rate: 10.37%), which represents the economic downturn state. A Basel II asset correlation for residential mortgage loans of 15% and the Vasicek density was assumed in deriving the numbers underlying the figure.

model accuracy and therefore capital adequacy, and (ii) a reduction of capital cyclicality. A Basel II asset correlation for residential mortgage loans of 15% and the Vasicek density was assumed in deriving the numbers underlying the figure. The vertical lines indicate the expected default rates of 1.59% and 10.37% for the two states.

1.3 CREDIT PORTFOLIO RISK TRANCHING

Credit derivatives and securitizations are often subject to tranching, which is highly sensitive to the systematic exposure. The interaction between states of the economy and the risk exposure for tranches is forcefully shown in Figure 1.3. The attachment risk increases for senior tranches more so than for junior tranches from economic booms to economic downturns. For example, if a structure has an equity, mezzanine and junior tranche with attachment levels 0%, 5% and 20%, then the attachment probability for the mezzanine tranche is 5.18% in a boom and 74.55% in a recession. The attachment probability for the senior tranche is 0.02% in a boom and 10.53% in a recession. The attachment probability for the equity tranche is converging to one for large portfolios in both economic scenarios. Rösch and Scheule (2012) analyze the risk, capital adequacy and policy implications in relation to securitizations.

1.4 CREDIT RATINGS

The disappointment of investors also manifested in the criticism of models applied by credit rating agencies (CRAs). First contributions analyze the ratings of securitizations in more general terms or in relation to different asset classes such as collateralized debt obligations. Benmelech and Dlugosz (2009) analyze collateralized loan obligations (CLOs) rated by Standard & Poor's and find a mismatch between credit ratings and the quality of the underlying loan portfolios. Bolton et al. (2011) analyze CRA securitization rating performance with regard to the business cycle. Griffin and Tang (2012) compare CRA model methodologies with CRA ratings for collateralized debt obligations. Coval et al. (2009) argue that model risk and the exposure to systemic risk of securitization may explain the increase of impairment rates during the GFC.

1.5 ACTUARIAL VS. MARKET CREDIT RISK PRICING

So far, we have focused on actuarial, so-called real-world risk measures. Credit risks are priced in many markets such as lending markets, deposit markets, corporate bond markets, securitization markets or credit derivatives markets. Many risk models rely on market prices to measure the inherent level of risk. However, Figure 1.4 shows that a gap between actuarial and market priced losses exists and that this gap widens during an economic downturn. In addition, the volatility of market-based risk measures is larger than the volatility of real-world risk measures.

Market participants as well as researchers are currently scrutinizing the accuracy of market-based risk models and implications on financial institutions' risk measurement, management and reporting.

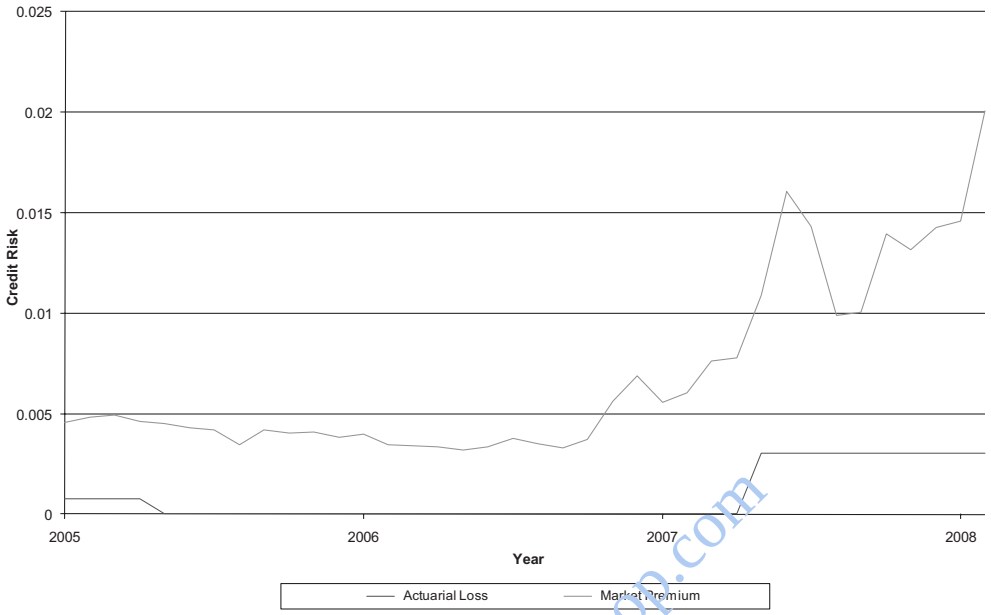

Figure 1.4 Actuarial losses and market premiums.
Note: Actuarial loss rates are calculated as default rates multiplied by average loss rates given default for on BAA-rated bonds. Market premium is calculated as the average credit spread of credit default swaps of BAA-rated bonds.
Source: Bloomberg and Moody's rating agency.

1.6 REGULATION

Prudential regulators of financial institutions aim to ensure that, under all reasonable circumstances, financial promises made by the institutions are met within a stable, efficient and competitive financial system. The enhancement of prudential regulations is an important element in ensuring the stability of financial institutions, markets and instruments.

In response to the GFC, the G-20 countries have proposed a new set of regulatory requirements with regard to (a) capital, (b) accounting and (c) liquidity of financial institutions, also known as Basel III. These revised requirements are based on national feedback such as the Turner Review (FSA 2009). For example, the Turner Review outlined various changes for prudential regulation: (i) increasing the quantity and quality of bank capital, (ii) increasing the trading book capital, (iii) avoiding pro-cyclicality in relation to bank capital regulations, (iv) creating counter-cyclical capital buffers, (v) offsetting pro-cyclicality in published accounts, (vi) implementing a gross leverage ratio backstop and (vii) containing liquidity risks in individual banks and at the systemic level.

These new rules have been expressed under Basel III, which aims to increase capital and liquidity of banks as well as in national regulations such as the Dodd–Frank Wall Street Reform and Consumer Protection Act of 2010 in the US.

Surprisingly, few measures relate to minimum standards for financial risk models. It is this area where research may make a major contribution. New policies require the understanding of the characteristics of financial risks with regard to level, idiosyncratic and systematic risk,

as well as the impact on the capital adequacy of banks and risk transfer mechanisms such as securitizations.

1.7 THANK YOU

It is apparent from these examples that many global challenges for credit securitizations and derivatives persist and that more knowledge on these issues is required. This book is a first step into this direction. Leading academics and practitioners from many institutions and places have come together over the past two years to share their insights and recent research findings on credit securitizations and derivatives. This book aims to transfer this knowledge to the wider community. This research was supported by the Centre for International Finance and Regulation (project number E001) which is funded by the Commonwealth and NSW Governments and supported by other Consortium members (see www.cifr.edu.au). We would like to thank the Centre for International Finance and Regulation and the Hong Kong Institute for Monetary Research for their support. We hope you have a great reading time and that the book will provide further stimulus for research and impact in the practice of credit securitizations and derivatives.

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