Part I

Markets

1
Market Structure

In this chapter, we outline the structure of the euro credit market and provide a detailed description of market participants, which is crucial for understanding the development of the market with respect to available instruments and specific spread trends. The euro-denominated credit market was established at the beginning of 1999, when the euro was introduced. Over the last few years, the market experienced significant development as a result of regulatory changes, the introduction of new products and instruments, as well as the entry of new market participants.

The following is not only a descriptive study of the beginning of the euro credit market but also includes several facts that help to understand how we ended up where we currently are. The euro credit market is still much smaller than the US$ credit market and has fewer innovative products, especially in the credit derivatives area. Nevertheless, the euro credit market is trying to catch up with its US counterpart, primarily driven by the rising importance of the euro in the international monetary system. As the euro becomes more important as a foreign exchange reserve currency, international central banks are increasing exposure to euro-denominated assets, including corporate credits.

The EU enlargement and the accompanying monetary integration process are still in progress, which is an important factor for the utilization of the euro in the international monetary system. As a result of an increasing number of participants, euro credit markets are becoming more liquid and transparent. Understanding these developments is crucial for credit portfolio managers, as markets are not solely driven by fundamentals, but also by regulatory adjustments and structural changes. Besides a description of market developments, we also highlight the impact of specific milestones in the history of euro credit markets.

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1.1 Market Development

1.1.1 Historical Development

With the introduction of the euro on January 1, 1999, the euro credit market was born. The first members of the iBoxx universe were previously issued bonds, denominated in the pre-ecu currencies such as the Deutsche Mark, with euro bond issues following soon after the introduction of the euro: General Motors, Alcatel, and Repsol were among the first companies that tapped the euro corporate bond market in February 1999.

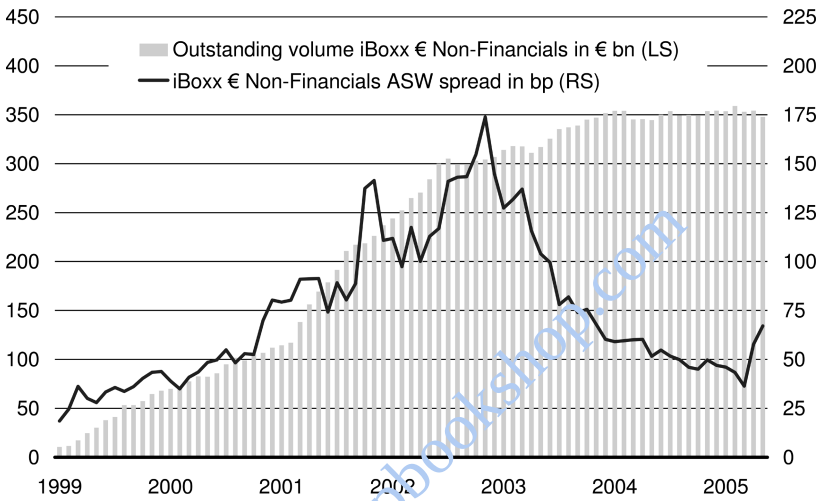

Fig. 1.1: Market growth and spread development from 1999 until 2005

In the first year of the euro credit market, secondary trading was limited, with the focus being on new issues. Any spread widening was driven by the change of the market structure (new issues from lower-rated names) rather than by a fundamental trend. In 2000, spreads started to widen as issuance quality declined, while the fundamental environment also deteriorated. Primary market activity remained strong, and credits gained in importance as a new asset class. This strength was also reflected in new market participants who wanted to benefit from the attractive risk–return profile of corporate debt. Simultaneously, credit portfolio management became more sophisticated, while liquidity in the secondary market grew rapidly and pricing became more transparent.

In 2001, the first negative company news hit the market which contributed to a deteriorating sentiment. Then 9/11 triggered a massive spread blowout, the first overshooting phenomenon the euro credit market experienced. In the aftermath of 9/11, credit spreads recovered almost completely to pre-9/11 levels. However, credit players recognized that managing alpha (the preferred strategy in the early years) might not be sufficient to properly manage credit portfolios. Beta management gained in importance in the aftermath of 9/11. The first (but certainly not the last) turmoil that hit euro markets took place in 2002, driven by rising concerns about the healthiness of companies' balance sheets (*Enronitis*). Against the backdrop of a potential credit crunch scenario, euro corporate spreads reached their historical high in October 2002. Despite the impending war in Iraq in late 2002, spreads tightened due to decelerating micro-fundamental risks as companies adopted a more bondholder-friendly policy (deleveraging and balance sheet repair).

Following the occupation of the Baghdad airport in March 2003 by US forces, which was accompanied by a sharp decline in global risk aversion, spreads knew only one direction: south. In the second half of 2004, the *technical bid* (cf. section 4.5.2) was the dominating driver for euro credits. Although credit fundamentals started to deteriorate moderately, technical-driven demand and forced-to-invest behavior kept spreads at very subdued levels. In the first half of 2005, the multiple downgrades of Ford and General Motors (GM) hit the market, accompanied by resurfacing leveraged buy-out (LBO) fears and the negative impact from correlation trades all of which combined to drive a credit spread trend reversal.

Until 2003, new issuance activity was fairly strong as more and more companies perceived corporate bonds to be an attractive funding tool. As a result of balance sheet repair via deleveraging and due to the resurrection of the syndicated loan business, primary market activity in the investment-grade universe declined by 50 percent from 2003 to 2004.

The most recent development in euro credit markets is that smaller-sized companies (e.g., German small- and medium-sized companies [SMEs]) focused increasingly on the bond market as a funding source. The rising importance of the high-yield market is also driven by *fallen angels*. Fallen angels are former investment grade-rated companies, which experienced one or multiple downgrades to junk status. Since such famous names as Fiat, Ford, and GM joined the high-yield club, there is a new depth to this sector that has contributed to the strong growth of the high-yield market. However, once *rising stars* (previously sub-investment-grade companies that have been upgraded to investment grade) will resurface and leave the high-yield segment, this trend might reverse.

The major key for the development of euro credit markets towards market completion, more transparency, and rising liquidity is the strong growth of the credit derivatives market. While we discuss single instruments in detail in chapter 2, figure 1.2 shows the time frame of the introduction of first-, second-, and third-generation credit derivatives. The basic building block for portfolio derivatives is still the single-name credit default swap (like a binary option in the equity derivatives market), launched in the mid-1990s in the US. Recently introduced instruments are constant maturity credit default swaps (CMCDSs), second-generation collateralized debt obligations (e.g., CDO squared), CDS on ABS, and credit spread options.

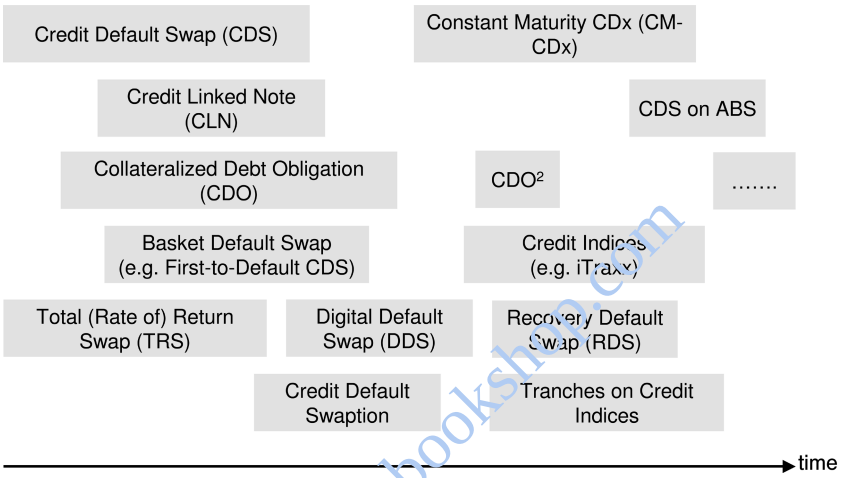

Fig. 1.2: The evolution of the credit derivatives market

While plain-vanilla derivatives experience rising liquidity, there are also tailor-made instruments which are designed to fulfill only the needs of specialized accounts (e.g., hedge funds) and hence, will experience less liquidity. A major trend is the completion of the term structure of credit risk in the most liquid instruments (which allows the introduction of forward contracts) and the rising importance of correlation as an asset class. In a future step, the introduction of options on liquid tranches would even enable investors to trade the volatility of correlation. In addition, there will be even a credit future available soon, based on the most popular and liquid instrument in the derivatives world (the iTraxx CDS indices). The contractual standard of the future will be similar to plain-vanilla fixed income futures (e.g., the Bund future) traded on the Eurex. This credit future contract will be highly appreciated by investors, as it provides a high

degree of liquidity and offers a simple way to gain exposure to directional spread risk. Pricing would be rather straightforward, in line with well-known, above-mentioned future contracts and without any sophisticated modeling needs.

A milestone for credit investors was the introduction of iTraxx indices across the whole maturity curve (3Y to 10Y contracts as it is already the case for highly liquid single-name CDS). As the iTraxx is priced along the whole curve, forward contracts can be easily introduced as well. Forward CDS contracts offer the opportunity for investors to speculate on spreads for a specific time interval in the future and are crucial for portfolio management as well as for asset–liability players. As the iTraxx family also includes tranches, a term structure of correlation can be derived. Playing the correlation curve emerged to a central trading strategy for correlation desks.

From a theoretical point of view, there is a broad range of highly interesting instruments, including floating-spread products or tranche options. However, since there is, in our view, only a small portion of the credit community that is able to correctly price and trade such exotics, we do not expect the establishment of a liquid market. The focus will remain on liquid products, which serve hedging needs, trading activities, and the exploitation of arbitrage opportunities for a larger number of credit players.

Due to the close relationship between the corporate bond and the derivatives market (ongoing market integration), these markets cannot be analyzed in isolation. This is not only the case for pricing issues but also from a strategic point of view.

The ongoing demand for leveraged credit instruments, the rising importance of correlation trading, and the market entry of new investors (which implemented internal risk management systems and solved regulatory issues) will contribute to ongoing strong growth of the credit derivatives market. This trend is favorable for credit markets as a whole, but there are also potential problems accompanying the enormous growth of the credit derivatives market, while the underlying cash market stagnates. We believe that the amount outstanding of CDx (the collective term for all credit derivatives) exceeds the amount of physical debt outstanding for many companies.

While we do not share the view that risk-transfer instruments are financial weapons of mass destruction, we pay particular attention to a general problem of accelerating activity in the credit derivatives market: rising systemic risk. This problem is directly linked to the risk transfer and dispersion function of credit derivatives. While credit risk can be divided into its components (probability of default, loss given default), which can be traded separately, the incentive to build up credit exposure will increase. While credit derivatives allow an easy risk

transfer among the investor base, reducing the unsystematic risk for a specific investor, the overall amount of originated systematic risk will rise. This could lead to increased vulnerability of the financial system as a whole.

Besides a pure pricing relationship, structural developments might also have a significant influence on the valuation, as the following example highlights. Without exactly quantifying the notional amount of CDS contracts, there are at least a few names having less deliverable obligations outstanding than the amount of CDS contracts. As physical settlement is the market standard, the question arises of what happens in case of a credit event. It is obvious that (depending on the ratio between the amount of CDS contracts outstanding and deliverable obligations) not all CDS contracts could be settled physically. Protection buyers, who do not carry the reference obligation on their books, might face a serious problem: They have to purchase the deliverable obligation. In case the notional amount of CDS contracts exceeds the amount of deliverable obligations, there will be several protection buyers who are not able to settle physically (as there is not enough paper around). Despite the ISDA (International Swaps and Derivatives Association) rules, there will be an agreement that fits the needs for both counterparties in such a case (e.g. cash settlement).

Protection buyers who do not own the deliverable obligation are looking for paper in secondary markets. In the dealer poll following the credit event, the recovery rate will be derived from prices for the outstanding bonds of the company in the aftermath of the credit event. Rising demand from protection buyers will trigger higher prices and, therefore, a higher recovery value. The worst case scenario for the protection buyer would be a price increase of up to 100. In this case, the protection buyer has to pay 100 in cash terms for the deliverable obligation, while he receives nothing from the protection seller because there is no loss! While those protection buyers who already carry the deliverable obligation are not directly affected, the beneficiary is the protection seller in this obviously unrealistic case. However, this mechanism could push up the recovery rate far above 40 percent, the standard assumption for pricing CDS contracts.

The fact that recovery assumptions are underestimated in case of a large CDS-to-cash bond ratio with respect to the outstanding amount means that spreads of outstanding issues trade above the theoretical fair level because the recovery value is higher in case of a credit event. From a relative value point of view, two obligors that have different CDS-to-cash bond ratios (all other pricing-relevant factors being equal) should trade at different levels. The higher this ratio, the lower the spread.

1.1.2 Size and Growth of the Market

Credits have become a more vital segment of European capital markets, which is reflected in their accelerating market share. Using the iBoxx € index universe as a reference, high-grade corporate debt (non-financials and financials) has the second largest share following sovereign debt. We will discuss indices in detail in section 13.1. In the iBoxx spectrum, the amount of corporate debt outstanding exceeds the amount of sub-sovereigns and agencies and also the amount of covered bonds.

Given the fact that credit derivatives are over-the-counter contracts (OTC), there is only very limited information about the size of the market. However, the Bank of International Settlement (BIS) released a new statistic[1] regarding the volume of (single-name and portfolio) CDS outstanding in March 2005. Banks, reporting dealers, and non-financial (but reporting) institutions carry more than US$ 4,500 bn each for protection long and protection short positions on their books. However, long positions exceed short positions by US$ 158 bn, reflecting that the majority of banks are still protection buyers.

1.2 Market Participants

Companies' increasing interest in bond financing (please refer to section 1.3) explains the supply side, while demand for spread products arises because credit-risky assets offer a very attractive risk–return profile, not only on an isolated basis, but also from a macroeconomic viewpoint.

Credit investors are broadly distributed across all industries, including funds, insurance companies, hedge funds and, naturally, banks. Besides pure carry strategies (picking up yield versus government debt) of yield hunters, credits also play an important role for balance sheet arbitrageurs (equity versus debt). A common practice is to split market participants into two groups: so-called real money accounts (like funds and insurance companies) and leveraged players (like hedge funds).

Especially in the credit derivatives universe, the positioning of market participants plays an important role when analyzing market moves. A study periodically published by Fitch, the *Global Credit Derivatives Survey*,[2] provides interesting insights into the growth of the market, the global positioning as well as the top reference entities. According to empirical market overviews from the British Bankers' Association and Fitch,[2] banks are the major protection buyer group hedging their lending business, whereas insurance companies

dominate protection selling activities, actively searching for income-generating opportunities.

Moreover, the 2004 survey highlights that

- the CDx market still is the fastest growing segment in the derivatives universe, with single-name CDS experiencing the largest growth: plus 100 percent to US$ 1,900 bn. Portfolio derivatives grew by 49 percent, amounting to US$ 754 bn.
- hedge-fund activity increased significantly, which has an impact on liquidity and volatility.
- although global banks remained net buyers on average, there is a rising number of entities for which banks are selling protection. This reflects the trend towards more trading-oriented CDS exposure rather than hedging positions, which dominated in previous years.
- the market share of the global insurance sector declined, indicating that interbanking transactions gained in importance.
- the credit quality of CDx exposure declined significantly, with demand for super senior protection declining and trading flows in sub-investment-grade issues rising.
- top reference entities remain benchmark issuers in the cash market, for example, Ford, General Motors, DaimlerChrysler, France Telecom, Deutsche Telekom, and Telecom Italia.

1.2.1 Banks

Besides playing the term structure of interest rates (long-term lending financed by short-term funding), the basic business of banks is lending money to companies and receiving compensation for the potential risk that the company might not be able to fulfill its obligation (e.g., in the syndicated loan business). Consequently, banks carry credit exposure on their balance sheets from their basic business operations. As a result, banks have established a sophisticated system of credit risk management with which they carefully analyze credit risk and actively manage credit portfolios. Understanding the behavior of banks is crucial for credit portfolio management as banks are still the major intermediary in the market for credits.

Besides active credit portfolio management units, also treasury departments as well as proprietary trading desks are taking part in the market for credits. While treasury departments use corporate credits (cash or synthetic) like asset–liability managers, proprietary desks act like hedge funds.

Excursus 1: The Pro-Cyclical Nature of Banking

Naturally, banking is a pro-cyclical business, as banks tend to increase their lending activity during accelerating growth periods, which augments the risk of overheating the economy. In contrast, banks reduce lending in economic downturn scenarios, aggravating an economic downturn. This is not only a hot topic in economic theory, since it affects policy actions from the government as well as from central banks, but it also has a significant impact on internal models. *Pro-cyclicality* might also raise problems on the risk management side if probabilities of default (PD) are underestimated in cyclical upturns, leading to exaggerated risk taking by banks. In sluggish growth scenarios, default rates are overestimated, leading to a further reduction of lending activity, which triggers an aggravation of companies' financial flexibility given the lack of access to funds.

This kind of self-fulfilling prophecy is also related to risk-sensitive capital requirements of banks. If internal risk models overestimate the default probability, capital requirements will be too high in bad times and too low in good times. Banks are forced to increase lending when the economy is doing well and have to decrease lending during recessions.

Therefore, cyclical factors have to be taken into account when analyzing credits, as the behavior of institutional investors has immense effects on the market for credit risk.

1.2.2 Insurance Companies

Insurance companies search for assets that match their liability side, and consequently insurance companies are, in general, investing in the cash bond market and are protection sellers in the CDx market. Insurance companies are usually buy-and-hold investors rather than trading-oriented accounts. The market impact of insurance companies is limited compared to that of banks, but the regulatory framework (for example capital requirements) might trigger a kind of lemming-like behavior in case of tail events. For example, this was the case for German insurance companies in the aftermath of the bursting of the equity bubble in 2000.

1.2.3 Funds and Asset Managers

Besides pure credit funds (e.g., asset manager and pension funds), the share of credits in umbrella funds is steadily increasing. Fund managers are highly sophisticated players who often have their own credit research teams, although their ability to use innovative instruments is limited due to regulatory constraints.

1.2.4 Retail Clients

Although credit markets have still high entry barriers (e.g., minimum transaction volumes), credits are also gaining in importance in the retail market, with many new products being placed recently for retail clients. These retail products often use credit structures as the underlying, such as first-to-default baskets.

1.2.5 Hedge Funds

Although capital structure arbitrage desks existed long before the introduction of the euro credit market, hedge funds broadly entered the credit market in 2004, as a lack of alternatives and opportunities forced them to search for carry assets. While hedge funds still focus on lower-rated names and distressed debt, capital structure arbitrage (playing equity versus debt) and correlation trading become more and more popular for hedge funds. Capital structure arbitrage as well as correlation trades are technical- and model-driven and do not directly focus on fundamental considerations, in contrast to real money accounts (banks and insurance companies).

According to a study by Fitch[3], we highlight the major topics regarding the role of hedge funds in credit markets. The report shows that leverage rose continuously during the last few years, adding to the risk of more pronounced spread moves in case tail events happen. While markets are more transparent and liquid under normal market circumstances, they also will become more vulnerable when unexpected events occur. The key findings of the report are:

- Credit-oriented hedge funds experienced strong asset growth.
- The impact of hedge funds on credits is much higher than the market share would suggest (less than 10 percent of the outstanding notional), given the high trading volume and the leverage they use.

- Hedge funds add liquidity to credit markets, especially to the high-yield universe and to the credit derivatives world.
- The major risk is a forced deleveraging of funds (e.g., via rising margin requirements) in response to market disruption.
- This might trigger second-round effects, such as rating volatility in the high-yield segment, and third-round effects, such as declining new issuance activity.

The major question is if credit risk exposure has become more diffused, or if it has become reconcentrated within certain hedge funds? The fact is that most hedge funds continue to rely on short-term funding, leveraging their credit exposure. According to Fitch, the leverage of hedge funds in the credit derivatives business amounts to about 10. Having said this, the market share of hedge funds in the credit derivatives market is around 30 percent (and more than 80 percent in the distressed debt market) on the back of much more active trading positions compared to the major market participants (banks and insurance companies). In addition, the global amount of credit derivatives outstanding is expected to have reached US$ 8,400 bn in 2004.

Although hedge funds improved their risk management systems since the Long Term Capital Management (LTCM) crisis in 1998, this does not mean that there is no remaining risk. Major concerns (e.g., by the Fed) are related to operational risk, lemming-like behavior and regulatory restrictions.

Lemming-like behavior became obvious recently when a significant share of hedge funds started to implement the same trade, which was the case in May 2005, resulting in the first so-called correlation crisis.

Regulatory restriction includes margin requirements from banks (which act as counterparties), which, in combination with high leverage, can trigger forced selling even when the price decline of the underlying is rather subdued (see Aiyagari and Gertler[4]). Margin requirements can trigger a domino effect, leading to an overshooting of credit spreads, clearly exceeding the fundamental fair value.

1.3 Issuing Debt from a Company's Viewpoint

Above, we discussed the motivation for investors to participate in the credit markets, explaining the demand for corporate bonds. The other side of the coin, however, is the supply side. Why are companies tapping the corporate bond market? Understanding the demand–supply pattern is crucial for credit

portfolio management because market technicals have a significant impact on the price-setting process in credit markets.

There are several reasons for companies to issue bonds:

- The corporate bond market might be an attractive funding source because bond issuance reduces the dependency on credit facilities of banks and hence eliminates the funding sensitivity resulting from the pro-cyclical lending behavior of banks. Against this backdrop, the availability of syndicated loans is a major driver for primary market activity of companies. A high availability of syndicated loans argues for decelerating issuance activity and vice versa.
- The company has to fulfill fewer covenants than is the case for plain-vanilla credit facilities from banks (which are often explicitly tied to balance sheet ratios). Bond issuance provides more flexibility with regard to future business operations due to the absence of such targets.
- By issuing debt, companies give an incentive for banks to provide the company with other (non-profitable) business. Bond issuance is often coupled with plain-vanilla banking services (e.g., an export facility).
- In contrast to shorter-dated credit facilities, the maturity of corporate bonds is much longer on average. Companies can exploit favorable funding levels, reflected in issuing ultra long-dated bonds, such as Telecom Italia's 50-year bond issued in March 2005.
- Optimizing the capital structure of the company using a weighted-average cost-of-capital approach (WACC). That means there is an optimal capital structure depending on the costs of equity and debt. Moreover, it might be favorable for a company to increase financial leverage in order to boost the return on equity.
- Placing corporate debt in the credit market elevates the profile of the company in the capital market, reflecting professional behavior and the ability to match the requirements that have to be fulfilled in case of a bond issue. Bond issuance is thus a preferred tool when preparing for an IPO.
- There may be only limited ability to tap the commercial paper (CP) market, which is related to the credit quality of the company. Funding through CP programs is only profitable for higher-rated companies and is too expensive for lower-rated companies in the high-yield universe.

Besides these obvious advantages, there are also limitations with a corporate bond issue: Pricing in the secondary market is rather volatile; issuance-related costs are much higher than for bank facilities; there are extra costs due to the more complex documentation; there is additional effort on the investor-relations

side given a supplementary investor group with special interests; and last but not least, management's attention is necessary during the launch of the bond.

1.4 Ratings and Rating Agencies

Bond ratings are an assessment of the issuer's ability to service a specific bond in a timely manner. Issuer ratings provide basic information about the inherent credit risk of a specific issuer, while it is only a rough indication of the inherent credit risk of a specific instrument, as subordination has to be taken into consideration. While credits are senior to equity, the level of seniority varies among different types of debt securities. Rating agencies address this problem and assign different types of ratings, including long-term and short-term ratings, as well as an instrument-specific rating. In this section, we will provide a short introduction and overview of the rating methodology, without claiming completeness. We focus on the three most popular agencies (Fitch, S&P, Moody's) and try to analyze the basic ideas and similarities of the three agencies rather than describing differences among their approaches. Although the risk assessment provided by the three agencies on single issuers and instruments can diverge, differences are, in general, rather small (one or two notches), reflecting that there is obviously a strong correlation among ratings from the big three agencies. If there is a split rating (for example, if S&P assigns an A– rating and Moody's a Baa1 rating to a company), in practice, market participants prefer a conservative approach and take the worst rating into account. In the following, we highlight the crucial factors that determine the creditworthiness of an issuer, divided into qualitative and quantitative factors:[5]

- The qualitative analysis of an issuer includes industry risk, the operating environment, the market position, the management, and the accounting policy of a company. Industry risk focuses on the current status of the industry within the economic cycle. Things to watch are the cyclical character of an industry, the market structure within a sector (from competition to monopoly), entry barriers, and the demand structure. The operating environment refers to risks and opportunities of an industry regarding social, demographic, technological, and regulatory changes. The market position is crucial to determine the company's ability to react to rising competition, which depends on the size, the market share, the products, geographical diversification, and the comparative cost position. Management is a key qualitative factor for rating agencies. Most important are the corporate strategy, the risk tolerance, and the funding policy

of a firm. When analyzing the accounting policy, different accounting standards have to be taken into consideration to accurately reflect the company's financial performance.

- Quantitative rating aspects are based on ratios that measure the profitability of a company in relation to its operating strategy, leverage targets, dividend policy, potential acquisitions, and basic financial goals. In this respect, cash-flow ratios are at center stage, with the usual cash flow terminology being used (for an example, please refer to chapter 3). Earnings and cash flows are key elements to determine the financial health of an issuer. In addition, the capital structure and the financial flexibility are taken into consideration and reflected in several ratios, which are split into earnings measures (e.g., earnings before interest, taxes, depreciation, and amortization [EBITDA] and free cash flow), coverage ratios (e.g., EBITDA divided by interest expense), leverage ratios (e.g., debt/EBITDA) and profitability ratios (operating income divided by revenues). All these ratios determine the so-called credit metrics of a company.

As mentioned above, rating agencies assign a short-term and a long-term rating to a company. The short-term rating primarily has an impact on the company's ability to tap the commercial paper market, whereas the long-term rating is more relevant for bond investors.

The main rating is the so-called issuer rating, which is in line with the rating for senior unsecured debt. Consequently, subordinated instruments carry a lower rating. In table 1.1, we refer to the rating scale of S&P, ranging from AAA to D by notches. A notch is the difference between two neighbored ratings (the gradation unit).

Without going into too much detail, there are also differences among the big three rating agencies' methodologies. This becomes obvious when we look at the rating methodology for CDOs. Given the rising importance of credit derivatives, accompanied by the relative complex valuation of structured credits, investors have to take model risk into consideration.[6]

The *weighted-average rating factor* (WARF) is a methodology to derive the credit quality of a collateral pool of assets used by Moody's and Fitch. It is based on the weighted average of each rating category to generate the expected defaults.

In contrast to Moody's, S&P addresses the first dollar loss for a given rating category as opposed to mapping expected losses into a specific rating category, implemented through its proprietary model called the CDO Evaluator. The model is based on the credit rating of each asset in the collateral pool, the

Tab. 1.1: Long-term credit ratings

S&P, Fitch	Moody's	Definition by S&P
AAA	Aaa	The obligor's capacity to meet its financial commitment is extremely strong.
AA+ AA AA–	Aa1 Aa2 Aa3	Differs from the highest rating only to a small degree. The obligor's capacity to meet its financial commitment is very strong.
A+ A A–	A1 A2 A3	Somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions. However, the obligor's capacity to meet its financial commitment on the obligation is still strong.
BBB+ BBB BBB–	Baa1 Baa2 Baa3	A BBB-rated obligation exhibits adequate protection parameters, while adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity of the obligor to meet its financial commitment on the obligation.
BB+ BB BB–	Ba1 Ba2 Ba3	Less vulnerable to non-payment than other speculative issues. However, it faces major ongoing uncertainties or exposure to adverse business, financial, or economic conditions that could lead to the obligor's inadequate capacity to meet its financial commitment on the obligation.
B+ B B–	B1 B2 B3	More vulnerable to non-payment than BB-rated obligations, but the obligor currently has the capacity to meet its financial commitment on the obligation. Adverse business, financial, or economic conditions will impair the obligor's capacity or willingness to meet its financial commitment on the obligation.
CCC+ CCC CCC–	Caa1 Caa2 Caa3	Vulnerable to non-payment and dependent on favorable business, financial, or economic conditions for the obligor to meet its financial commitment on the obligation. In the event of adverse business, financial, or economic conditions, the obligor is not likely to have the capacity to meet its financial commitment on the obligation.
CC	Ca	Highly vulnerable to non-payment.
C	C	The C rating may be used when bankruptcy petition has been filed or similar action has been taken but payments on this obligation are being continued.
D		Default.

Source: S&P, Fitch, Moody's

number of assets in the pool, industry concentration, and default correlation and uses Monte Carlo simulations to generate a probability distribution of defaults.

At Moody's, ratings are based on an assessment of the probability that the collateral will generate sufficient cash flows to meet the obligations under each class of rated notes. The valuation is based on a statistical analysis of historical

default rates with various ratings and the diversification requirements the CDO is covenanted to satisfy.

Fitch's ratings are generated by the tool VECTOR, addressing the probability of a first dollar loss (in line with S&P). The default distribution within a portfolio is calculated using Monte Carlo simulations, fed by individual default rates and correlation data. The analysis is based on historical realized defaults, while (pairwise) correlation is derived from equity markets.

1.4.1 Are Ratings an Efficient Source for Pricing Credits?

A long-lasting discussion with respect to ratings includes the question whether rating agencies are lagging behind the market. Many publications have been written on this topic using several examples. We briefly discuss the rationale of rating agencies against the background of the existence of informational inefficiencies in credit markets and identify the problem of informational asymmetries in financial markets as an important factor for the behavior of rating agencies and the market's reaction to rating decisions.

In October 2003, markets reacted very positively to better-than-expected third-quarter results for Ford on October 16, with the Ford 6.75% 01/2008 issue tightening in by about 25 bp. S&P obviously did not share the view of investors and stated concerns that the financial unit would not be able to further subsidize meager operating units. Hence, S&P put the company on Watch negative as of October 21, causing a blowout in spreads by about 100 bp. The divergence between the reaction of markets and the rating agency was directly linked to different opinions concerning the results. The question remains why thousands of investors had a different opinion than S&P's.

It is, however, not always the rating agencies that run ahead of the market. In figure 1.3, we show that markets already discounted a downgrade of Fiat to junk status in mid-2002. Moody's confirmed the market's perception by removing the company from the investment-grade universe a day before Christmas of 2002. Another example for such a front-running of markets was ABB, whose bonds already traded at junk levels in mid-2002, before both agencies (Moody's and S&P) downgraded the company to sub-investment grade in October and December 2002, respectively. This underpins market fetishists who believe in the market's function as an information intermediary: The market knows best!

From a purely theoretical standpoint, there are three parties involved: the rating agency, the rated firm, and investors. The former is a kind of intermediary, transferring information about the company to the investor. Moreover, the information from the company is converted into a rating view, which is used

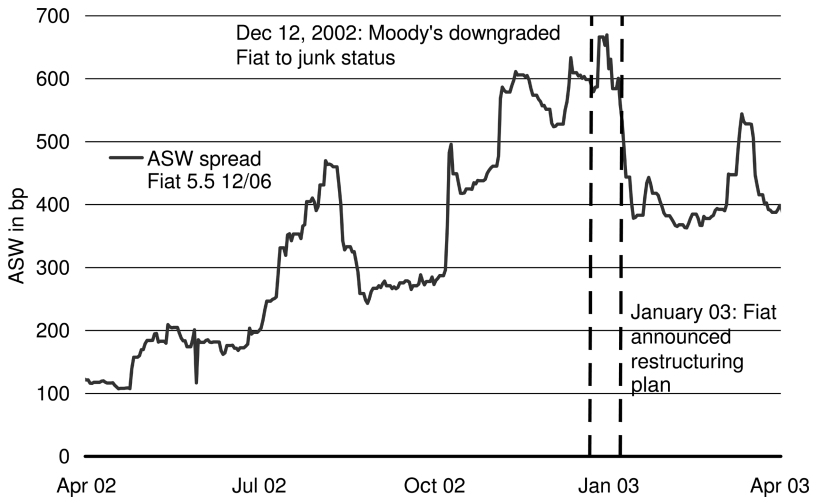

Fig. 1.3: Rating action and the market's reaction

by investors as a pricing input. In many cases, this is even the most important pricing input, for instance, if there is a downgrade to sub-investment grade and investors are forced to sell due to investment limitations. Consequently, there is a direct link between the rating agencies' view and the price of outstanding debt of the company.

Investors trust the rating agency and think that the process of converting information is efficient and leads to a correct assessment of the company. As the rating agency has inside information, the investor relies on the agency and could not (ex ante) evaluate the company on his own. Ex post, perhaps, there could be different views, as is even the case at different rating agencies, which is also reflected in the existence of split ratings.

As the rating agency has an information monopoly, the investor is dependent on the agency's ability to compile a complete and accurate report. Looking only at the agency–investor relationship and assuming the agency has the competence to efficiently process information, there is no reason for any informational asymmetries, and markets tend to be efficient. However, there remain two problems: Does the agency possess the necessary information, and does the relationship between the rated company and the rating agency have an impact on rating actions?

First, analyzing balance sheet items, especially credit protection ratios, could lead to different outcomes as there is a broad range of different opinions and not the absolute truth. If the rating terminology is publicly available and known by

all participants, there is no informational problem. If the rating agency is completely transparent, investors could follow rating actions and even anticipate future actions if they evaluate relevant balance sheet items correctly. Nevertheless, the problem remains that there could be different views (also reflected in split ratings by different rating agencies) and/or the incomplete information on how the rating process works. This is, in our opinion, not a major problem and could be solved easily by simply increasing the transparency. Different views are preferable from an investor's standpoint as it helps to improve market efficiency.

We focus rather on a structural problem. The major threat for investors is linked to the institutional agreement among the company, the agency, and the investor. There are completely different demands on the agency from the company than from investors. Such problems reflect a typical case of game theory and could be compared to widely-known standard examples. Assume a car dealer has the order from a customer to sell a car, getting ten percent of the price as a commission. Hence, the car dealer has the intention to sell the car for a high price to boost his commission, while the car owner also benefits from a higher price. Assuming further that the car owner and the car dealer have better knowledge about the condition of the car (the major price determinant) than the buyer, both have the intention to make the car better than it is. In any case, the loser is (most likely) the buyer. The good news is that there is a very simple solution to this problem: the car dealer has to provide a guarantee regarding the condition of the car.

Translating this idea to our case, with the car dealer being the rating agency, the car owner being the company, and the buyer being the investor, the information inefficiency among the three parties could be solved via a guarantee. The rating agency must guarantee that it made a best effort to use a transparent rating methodology and will provide continuous updates on the condition of the company. This will help prevent negative surprises and will tend to clarify the reasons for different views of the rating agency and the investor. The guarantee of a rating agency is simply its reputation within the market place and consequently, rating agencies have the intention to assign ratings in line with the fundamental risk assessment, which is theoretically the major factor also for the pricing of instruments in debt markets. Nevertheless, it is obvious that there are differences between markets and rating agencies with respect to information flow, which is reflected in a faster reaction of markets compared to ratings. This is rather an overshooting-like character of financial markets, while credit ratings are still good indicators of a company's creditworthiness in the long term.

1.5 Credit Classes

While we focus primarily on corporate bonds and related derivative instruments, the credit universe is very heterogeneous, including several asset classes and instruments. In this section, we provide a brief summary on instruments that are closely linked to pure corporate credits. For example, there are many issuers of bonds that are owned by governments to a certain extent and hence are classified as sub-sovereigns or agencies rather than as non-financial corporates. Especially in the utilities sector, which has historically experienced strong government participation, the classification varies among different index providers. We follow the iBoxx definition, which splits up the entire high-grade non-sovereigns universe into sub-sovereigns and agencies, collateralized debt, corporates financials, and corporates non-financials, whereas many market participants refer only to the latter when talking about credits. The iBoxx € index construction subsumes financials and non-financials as subindices of the iBoxx € Corporate index, as both financials and non-financials bonds bear corporate credit risk. With respect to sectors, the financials universe includes banks, financial services, and insurance companies. The non-financials universe is separated into industries, with telecoms and utilities being the most important.

1.5.1 High-Grade Universe

Financial companies issue paper across all subordination levels, while non-financials issue primarily senior debt and in special cases also subordinated bonds (hybrids). The majority of straight bonds issued by companies are issues from the so-called EMTN program. *Euro medium-term notes* (EMTNs) are continuously offered notes with maturities ranging from nine months to fifty years. Telecom Italia, which issued a fifty-year bond in March 2005, was the first company in this maturity bracket. EMTNs are flexible in structure and market timing because of the type of issuance (based on the mechanism of the commercial paper market). EMTNs are traded in the euro market.

Besides the high-grade spectrum, sub-investment-grade issuers are gaining market share as a rising number of smaller-sized companies discover the debt market as an attractive funding source.

1.5.2 High-Yield and Crossover Credits

High-yield or speculative-grade bonds, which are sometimes colloquially referred to as junk bonds, are characterized by significantly higher credit risk than investment-grade or high-grade bonds. The designation as speculative-grade bonds becomes apparent when examining the historic default patterns of rated bonds. Empirical evidence shows that the default rate for issuers or bonds rated sub-investment grade steeply increases compared to investment-grade rated issuers or bonds. According to a Moody's study, the default rate for North American issuers rated in the broad Ba rating category (ratings of Ba1 to Ba3; S&P and Fitch equivalent: BB+ to BB–) increases to 1.4 percent compared to 0.3 percent for Baa-rated issuers (ratings from Baa1 to Baa3) over a one-year time horizon and to 12.9 percent from 2.4 percent over a five-year time horizon. As a result, sub-investment-grade bonds have a higher yield than investment-grade-rated issues to compensate investors for the higher default risk included in high-yield bonds.

Issuers and bonds are faced with a rating downgrade if their creditworthiness deteriorates in line with, for example, a general economic downturn, changing industry fundamentals, and characteristics or changes in the regulatory environment an industry operates in. If a former investment-grade rated bond becomes downgraded to sub-investment grade, it is commonly referred to as a *fallen angel*. In fact, fallen angels are nearly twice as likely to default especially in the first three years following the downgrade, compared to a control group of original high-yield bonds. On the other hand, fallen angels are also more likely than their counterparts in the control group to migrate back to investment-grade territory again, the same study discovered. Bonds formerly rated sub-investment grade that return to investment grade are commonly referred to as *rising stars*.

Although there is no clear-cut definition, sub-investment-grade issuers that have – from a business risk perspective – investment-grade characteristics and could potentially become rising stars are commonly referred to as *crossover credits*. The characteristics displayed by such crossovers may vary among different industries, jurisdictions, and stages in the economic life of the company. Broadly speaking and at the risk of overly generalizing, they typically include the ability to generate meaningful cash flows through the economic cycle, usually facilitated by a broad and diversified business and product portfolio as well as a limited concentration in terms of customers and retail markets. However, stretched financial figures as a result of aggressive acquisition or investment activity, excessive stock buy-backs, a prolonged market downturn, and so on,

have impacted the credit profile, that is, the company's creditworthiness to such a degree that an investment-grade rating is no longer warranted. Once and if these financial issues are resolved and the financial profile stands on a sound footing again, an upgrade to investment-grade rating may be possible.

1.5.3 High-Quality Segment

Sub-Sovereigns, Agencies, and Supranationals

The European market for sub-sovereigns and agencies (SSA) consists of three main groups of issuers: *sub-sovereigns*, *agencies*, and *supranationals*. The group of sub-sovereigns consists of regional governments and municipalities like the State of Berlin, the Generalitat de Valencia, or the City of Rome. This subsegment, which makes up for around 30 percent of the market total, is dominated by German federal states (75 percent of all sub-sovereign issuers). In order to qualify as an agency, an entity has to fulfill one or more of the following criteria:

- It is fully or partly publicly owned, like Bank Nederlandse Gementeen (50 percent government-owned) or the Swedish Export Credit Corp (100 percent government-owned).
- It enjoys an explicit or implicit government guarantee or some other form of support, like the German KfW Bankengruppe, which benefits from a direct and unconditional government guarantee.
- It has a public policy mission, like the French CADES, which assumes current and future financial obligations from the social security system.
- It is established under public sector law and operates either under public sector law (like the Austrian ASFIN, which operates under a specific public ASFIN law), or under private law with a specific purpose. An example of the latter is Spain's CORES, which manages the strategic petroleum reserves; it operates in a strictly defined regulatory environment.

Agencies are the largest group of issuers, making up more than half of outstanding bonds. Again, they are heavily dominated by German issuers.

Supranationals are agencies per se, except that in terms of ownership and mission, they have been expanded from one national identity to several nations. Creditworthiness of supranational institutions is underpinned by three factors:

- They normally benefit from preferred creditor status, an implicit agreement between borrower and lender that such an institution will enjoy priority over other creditors.
- The quality of their shareholders and their proven commitment of support is very high, although in most cases no direct guarantee is given.

- The regulatory environment ensures financial stability and/or supportive mechanisms for their debt obligations.

Supranational issuers account for roughly one-sixth of the SSA market. The largest single issuer is the European Investment Bank (EIB), which accounts for more than 90 percent of all outstanding supra issues.

Covered Bonds

A *covered* or *mortgage bond* is an on-balance sheet obligation of the issuing institution. Typically AAA-rated, a covered bond receives the legal structure, the issuer's backing, and the pledge of quality assets. Assets that remain on the balance sheet of an issuing bank are employed as collateral in order to raise the credit profile of the debt product above the profile of the issuer and eventually reduce funding costs. Investors have a dual claim on (1) the issuer and (2) the cash flows of the underlying cover pool. The cash flows of the cover pool are protected from the insolvency of the issuer, who is obliged to respect certain rules that mainly refer to (1) the eligibility of assets, (2) the valuation of cover assets, (3) cash flow adequacy, and (4) over-collateralization.

Regular covered bonds are debt instruments secured against a pool of assets wherein asset quality, cash flow adequacy, and counterparty risk are purely determined by a legal framework such as the upcoming new legal frameworks in Belgium, Italy, Norway, and Portugal. Classical-styled covered bonds are issued by Austrian, Danish, German, Luxembourg, and Spanish institutions, while a subsidiary style dominates in France and Ireland.

Structured covered bonds are regular covered bonds that are structurally enhanced and include repackaged covered bonds and contractually enhanced covered bonds. *Replicated covered bonds* are debt instruments secured against a pool of assets wherein asset quality, cash flow adequacy, and counterparty risk are mainly determined through clauses regulated under private law (issued in the UK and the Netherlands).

1.5.4 Asset Backed Securities

Asset backed securities (ABS) are securities that are backed by a pool of receivables. Basically, banks or firms compile a portfolio of receivables, with either the underlying risk of such receivables being synthetically hedged by way of a credit default swap or guaranties or with the receivables being legally and economically sold to a third party by way of a true sale. True-sale ABS are more common than synthetic transactions and lead to the receivables being disposed of and removed from the originator's balance sheet.

Investors sell protection on such a portfolio by investing in issued notes, credit default swaps, or guaranties with all of these financial instruments referencing to the underlying pool of receivables. Hence, ABS investors only bear the risk that arises from such receivables, and are generally independent of the originator's potential default.

ABS offer a plethora of different receivables being securitized or structures being applied. The originators' main incentives to conduct an ABS transaction are:

- Risk management (the transfer of specific risks to third parties without recourse; structural modification of the risk of the overall or remaining credit portfolio).
- Balance sheet management (increase of liquidity in case of true-sale ABS; increase of the equity ratio by way of freeing up regulatory capital; increased profitability by way of investing freed-up capital in new investments offering a better risk–return profile).
- Liquidity and yield management (development of a broader investor base; access to cheaper funding as the respective notes typically have better ratings than the originator; generation of fee as opposed to interest income).

The investors' main incentives to invest in ABS are:

- From a single investment point of view: benefiting from the spread pick-up ABS historically offered when compared to corporate bonds with the same risk (in terms of rating) and maturity.
- From a portfolio perspective: benefiting from the plethora of asset classes ABS may be based on and structures that may be applied (e.g., by way of leveraging credit risk), leading to a potentially higher efficient line of the investor's overall credit portfolio triggered by increased investment alternatives.