

Theissen, Erik

Working Paper

Organized equity markets in Germany

CFS Working Paper, No. 2003/17

Provided in Cooperation with:

Center for Financial Studies (CFS), Goethe University Frankfurt

Suggested Citation: Theissen, Erik (2003) : Organized equity markets in Germany, CFS Working Paper, No. 2003/17, Goethe University Frankfurt, Center for Financial Studies (CFS), Frankfurt a. M., <https://nbn-resolving.de/urn:nbn:de:hebis:30-10227>

This Version is available at:

<https://hdl.handle.net/10419/25393>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



No. 2003/17

Organized Equity Markets in Germany

Erik Theissen



Center for Financial Studies

an der Johann Wolfgang Goethe-Universität ■ Taunusanlage 6 ■ D-60329 Frankfurt am Main
Tel: (+49)069/242941-0 ■ Fax: (+49)069/242941-77 ■ E-Mail: ifk@ifk-cfs.de ■ Internet: <http://www.ifk-cfs.de>

Organized Equity Markets in Germany

Erik Theissen*

March 2003

Abstract:

The German financial system is the archetype of a bank-dominated system. This implies that organized equity markets are, in some sense, underdeveloped. The purpose of this paper is, first, to describe the German equity markets and, second, to analyze whether it is underdeveloped in any meaningful sense. In the descriptive part we provide a detailed account of the microstructure of the German equity markets, putting special emphasis on recent developments.

When comparing the German market with its peers, we find that it is indeed underdeveloped with respect to market capitalization. In terms of liquidity, on the other hand, the German equity market is not generally underdeveloped. It does, however, lack a liquid market for block trading.

JEL Classification: G 51

Keywords: Market size, liquidity, floor versus screen trading

* Prof. Dr. Erik Theissen, Universität Bonn, BWL 1, Adenauerallee 24-42, 53113 Bonn, Germany
Email: theissen@uni-bonn.de.

Forthcoming in: The German Financial System by Jan P. Krahn and Reinhard H. Schmidt, Oxford University Press, August 2003

Organized Equity Markets

Erik Theissen, University of Bonn
March 2003

I.	Introduction	2
II.	The German Equity Market.....	2
III.	The (micro)structure of the German equity markets	5
III.1.	Trading Venues	5
III.2.	Floor Trading.....	7
III.3.	Screen Trading	10
III.4.	Governance Structure of the Exchange	14
III.5.	The Liquidity of the German Equity Market: International Comparison	15
III.6.	Recent Developments.....	17
IV.	Conclusion.....	18
	References	20

I. Introduction

The German financial system is the archetype of a bank-dominated system. This implies that organized capital markets are, in some sense, underdeveloped. Underdevelopment can, however, mean different things. In the present case two interpretations are potentially relevant:

1. A capital market may be underdeveloped in terms of volume. In a bank-dominated financial system one would expect the market for equity and corporate bonds to be smaller than they would be under a market-oriented system.
2. A capital market may be underdeveloped in terms of the organization of trading, of its operational efficiency and, as a result, in terms of liquidity and transaction costs.

The objective of this chapter is to take a closer look at the German capital market. The attention is limited to the equity markets. Corresponding to the two interpretations given above we address two specific questions. First, we present evidence on the volume of the German equity markets. Second, we describe the organization of the German equity markets, giving special attention to recent developments. We further present empirical evidence on the operational efficiency and liquidity of the German equity market.

The chapter is organized as follows. In section II we present empirical evidence relating to the volume of the German equity markets and, in particular, to the changes in the recent past. Section III describes the microstructure of the German equity markets and presents evidence on their liquidity. Section IV concludes and discusses the implications of our findings for the organization of equity markets in Germany.

II. The German Equity Market

One would expect that in a bank-dominated financial system internal financing and bank loans are the dominant sources of funds whereas equity and bond issues are likely to play a much lesser role. The empirical results of Hackethal / Schmidt (2000) clearly support that view. They find that securitized funds account for 12% of the volume of physical investment in Germany as compared to 48% in the US.¹ Rajan / Zingales (1995), using data from 1991, analyze the capital structure of non-financial exchange-listed companies in 7 countries. The

¹ Note that this result stands in contrast to the findings by Mayer (1988). Hackethal / Schmidt (2000) argue that this is due to implicit assumptions in his methodology. See their paper for a detailed discussion of this issue.

ratio of book equity to total capital is lowest in Germany, amounting to 28%. Figures for non-listed companies are far lower than that. In 2000, the average ratio (over all companies) of book equity to total capital was a mere 17% (DAI Factbook 2002, relying on data from Deutsche Bundesbank).

It is obvious that these financing patterns have implications for the volume of the securities markets. This conjecture is corroborated by the figures in Table 1. The corporate bond market is, despite an almost thirtyfold increase in volume since 1995, still negligible. The market value of exchange-listed equity has more than doubled in the last decade and now amounts to 647.5 billion € (year end 2001). This increase is not due to the bull market of the nineties. This is evidenced by the fact that the nominal value of equity² increased at about the same rate.

In spite of this increase the market capitalization of listed German firms is low in comparison to other countries. Table 2 presents figures on market capitalization as a percentage of the gross domestic product (GDP). The figures for Germany are way below the figures for the UK or the US (the archetypes of market-dominated financial systems). They are even lower than the average for the Euro countries. The increase in the market capitalization documented in Table 1 has not led to a convergence because the market capitalization in the other countries has increased at about the same rate.

Insert Table 1 about here

Insert Table 2 about here

The low market capitalization does, of course, have implications for the portfolios of German households. Table 3 documents that less than 10% of the population over 14 own shares. In 2001, share holdings and mutual fund holdings together amounted to slightly more than 20% of the financial assets. When interpreting this figure, note that total financial assets do not include the value of pension claims against the state-run social security system.

The host of the financial assets is made up by bank deposits, bonds,³ and life insurance contracts (see Börsch-Supan / Eymann 2000 for a more detailed analysis). Despite a recent in-

² The nominal value of the equity is a part of the book equity shown on the balance sheet. It is equivalent to the “gezeichnetes Kapital” (nominal capital) of the firm defined in the corporate charter.

³ This statement does not stand in contrast to the low volume of the corporate bond market. There are large markets for government bonds and bonds issued by banks. The latter market comprises, among others, mortgage-backed bonds (Pfandbriefe).

crease in private share ownership, figures for Germany are, again, lower than those for the US and the UK. For example, in 1998, 33.8% of the individuals in the US owned shares directly, 48.5% owned shares and / or mutual funds (New York Stock Exchange 2000).

Insert Table 3 about here

Since households only invest a small percentage of their wealth in the stock market, the fraction of households in total shareholdings is low. Figure 1 shows the distribution of shareholdings. Households directly hold 15.3% of the shares (compared to 39.1% for households and non-profit organizations in the US). An additional 14.0% (US: 19.3%) is held by mutual funds which, in turn, are at least partially held by households. Nonfinancial firms own 32.5% of the shares. Banks and insurance companies hold 13.0% and 9.7%, respectively (US: 1.9% and 6.5%, respectively). Shareholdings of the state are negligible.

Insert Figure 1 about here

The analysis of the market capitalization and the structure of household portfolios leads to a picture that is consistent with what one would expect to find in a bank-oriented financial system. The corporate bond market is close to non-existent, equity market capitalization is low and only a small fraction of physical investment is financed by securitized funds. Household portfolios are tilted towards bank deposits, (government and bank-issued) bonds and insurance contracts. The conclusion thus is that the German equity market is indeed underdeveloped in terms of volume.

There is a second dimension along which the German capital market has been underdeveloped (as compared to US standards, at least): the legal dimension. The degree of shareholder protection is low in Germany, as is evidenced by the international survey in La Porta et al. (1998). Things are beginning to change, however.⁴ For example, non-voting preferred stock is coming out of fashion, disclosure requirements have been increased and a takeover law is in effect since 2002. Also in 2002, the 4. Finanzmarktförderungsgesetz was passed. It comprised changes to the Exchange Law (Börsengesetz) and to the Securities Trading Act (Wertpapierhandelsgesetz) aiming at more flexibility for the organization of exchanges, higher transparency and more stringent insider trading regulation. Actually, a new law (5. Finanzmarktförderungsgesetz) is in preparation. One of its main objective is to strengthen shareholder rights.

⁴ See Nowak (2001) for a detailed description and interpretation of recent legal changes.

Insider trading has not been prohibited until the mid-nineties. The Wertpapierhandelsgesetz (Securities Trading Act) was passed in 1994 (at least in part as a response to international pressure). Among the "developed countries" listed in table 1 of Bhattacharya / Daouk (2001), Germany was, together with Spain, the last country to pass insider trading laws. The Wertpapierhandelsgesetz prohibits insider trading and enacted the Bundesaufsichtsamt für den Wertpapierhandel, based in Frankfurt, as a supervisory unit. In 2002 the Bundesaufsichtsamt für den Wertpapierhandel was merged with the banking supervisory unit (Bundesaufsichtsamt für das Kreditwesen) and the insurance supervision (Bundesaufsichtsamt für das Versicherungswesen) to form the Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin), located in Bonn and Frankfurt. The number of investigations in 2001 [2000] was 55 [51]. 25 [22] cases were handed over to the court.⁵

The recent increase in market capitalization, the number of listed companies and private share ownership together with changes in legislation may be indicating a convergence of the German equity market towards a more market-oriented system. The increase in market volume is, however, not markedly different from the growth in other countries and it may, therefore, be premature to conclude that the financing patterns of German corporations are really changing on a broad basis.

III. The (micro)structure of the German equity market

III.1. Trading Venues

Stock trading in Germany is fragmented both vertically and horizontally. In the vertical dimension there have traditionally been three market segments. The most liquid stocks are listed in the "amtlicher Markt".⁶ The "geregelter Markt", created in the mid-eighties, is a segment for mid- and small-caps. Finally, the "Freiverkehr" is the least regulated segment. In 1997 Deutsche Börse AG has created the "Neuer Markt", a segment for growth stocks that has attracted approximately 350 companies since its inception. Listing requirements in the Neuer Markt were stricter than in other segments. Inspired by the initial success of the Neuer Markt, Deutsche Börse AG has created an additional segment called SMAX. This was a segment for

⁵ The figures are taken from Bundesaufsichtsamt für den Wertpapierhandel (2002).

⁶ "Most liquid" is a euphemism because a considerable number of these stocks are rather illiquid in terms of market capitalization and trading volume.

small caps in more traditional (“old economy”) industries. Listing requirements were lower than in the Neuer Markt but higher than in the geregelter Markt.

Following the slump of “new economy” share prices, a large number of bankruptcies of Neuer Markt firms and several cases of fraud, investors lost confidence in the growth segment. Consequently, Deutsche Börse AG closed both the Neuer Markt and the SMAX. At the same time, market segments were re-organized. This was facilitated by a change in law that gave the exchange more discretion in setting the listing requirements. Besides the unregulated Freiverkehr, there are two segments:⁷

General standard is the basis category. It is designed for smaller companies with a domestic focus. Listing requirements are low, and are not tailored to the needs of international investors. The **Prime standard** is designed for companies aiming at international visibility. Listing requirements include

- application of international accounting standards (IFRS or US-GAAP)⁸
- quarterly reporting
- publication of a “financial calendar” listing the most important corporate events (shareholders’ meeting, analyst conferences etc.)
- regular analysts conferences (minimum one per year)
- current reporting and ad-hoc disclosure in English.

A prime standard listing is required for a stock to be included in one of the indices calculated and published by Deutsche Börse AG.⁹ Figure 2 shows the most important members of the

⁷ Strictly speaking there are four segments. The amtlicher Markt and the geregelter Markt are defined by law (Börsengesetz, Börsenzulassungs-Verordnung). Any company seeking a listing may choose either of the two. In both cases, the company may opt for a “general standard” or a “prime standard” listing. This results in a total of four segments. However, the differences between amtlicher Markt and geregelter Markt *within* either the general standard and the prime standard category are immaterial. Note that the segments amtlicher Markt and geregelter Markt, since they are defined by law, exist at all German exchanges. The categories general standard and prime standard are specific the markets operated by Deutsche Börse AG, i.e., to the Frankfurt Stock Exchange and Xetra.

⁸ Leuz / Verrecchia (2000) present evidence that switching from the German to an international reporting regime is associated with lower bid-ask spreads and higher trading volume.

⁹ An exception is the CDAX, a broad index that includes all listed companies, i.e., those with a prime standard listing as well as those with a general standard listing. Even before the inception of the new segmenta-

index “family”. At the very top there is the DAX, a blue chip index comprising the 30 most liquid forms. The MDAX contains the following 50 “old economy” firms. The SDAX is comprised of an additional 50 “old economy” firms. The TecDax contains the 30 most liquid high tech (“new economy”) firms. All firms listed in the prime standard segment are contained in the prime all share index, which is subdivided into 18 industry indices. All indices are calculated as performance indices.¹⁰ Besides these stock indices, Deutsche Börse AG publishes the VDAX, a volatility index calculated from implied volatilities inferred from equity option prices.

Insert Figure 2 about here

As to the horizontal dimension, trading is fragmented between eight exchanges and the electronic trading system Xetra. The most liquid stocks are traded on all markets. Among the eight exchanges the Frankfurt stock exchange is by far the largest.¹¹ We therefore restrict the description of the trading protocol to the Frankfurt Stock Exchange (FSE) and Xetra. Both markets are run by Deutsche Börse AG¹² which, since February 2001, is itself a listed company.

III.2. Floor Trading

The trading system of the Frankfurt Stock Exchange bears many similarities to the one of the New York Stock Exchange. The stocks are handled by a specialist, the Skontroführer (formerly Makler). He conducts an opening call auction at 9:00 a.m. After the opening auction,

tion did Deutsche Börse AG use its discretion in the composition of its indices to exert pressure on companies. This pressure aimed at increased information disclosure and compliance with certain codes of conduct. For example, in order to be included in the DAX or MDAX a company had to publish quarterly reports. In 2001, the car manufacturer Porsche AG was excluded from the MDAX because the company refused to comply with this requirement. As Porsche still refuses to publish quarterly reports, Deutsche Börse AG declined a prime standard listing.

¹⁰ For details on the indices published by Deutsche Börse AG, see Deutsche Börse AG (2003).

¹¹ Regional exchanges exist in Berlin, Bremen, Düsseldorf, Hamburg, Hannover, Stuttgart and München. Some of them have specialized on specific financial instruments. The Stuttgart Stock Exchange, for example, operates the warrant market EUWAX, the world’s largest derivatives exchange in terms of listed instruments.

¹² The fact that Deutsche Börse AG operates a floor-based and an electronic market is, at least in part, due to the legal nature of the Frankfurt Stock Exchange. See section III.4 for details.

the continuous trading session starts.¹³ The specialist has exclusive access to the limit order book. He is allowed to (but, unlike the NYSE specialist, not obliged to) trade for his own account. He announces bid and ask prices which may represent either orders in the limit order book or his willingness to trade for his own account. The trading day ends with a closing auction which is held after 7:30 p.m.

It is worthwhile to ask whether the specialist system offers specific advantages that may explain its survival despite the competition of the electronic trading system. Some papers have addressed this issue and analyze the floor-based trading system of the Frankfurt Stock Exchange in detail.

Kehr / Krahnen / Theissen (2001) analyze the role of the specialist in the call auctions on the floor. They find that specialist participation reduces return volatility. They further document that the specialists do, on average, not earn profits on the trades they make on their own accounts. Their income thus appears to be restricted to the commissions they receive. A similar result for the continuous trading session is found by Freihube et al. (1999). Their findings also suggest that the specialist is the dominant supplier of liquidity on the floor of the Frankfurt Stock Exchange. The quoted spread is narrower than the spread obtained from the orders in the limit order book maintained by the specialist in more than 55% of the cases.¹⁴ In these cases the spread represents the willingness of the specialist to trade on his own account rather than on behalf of a customer. Further, more than 46% of the transactions occur at prices inside the quoted spread. In many of these cases the specialist is trading on his own account. In fact, Freihube et al. (1999) find that the specialist participates in more than 80% of the transactions and accounts for more than 40% of the trading volume. These figures are higher than the comparable figures for the NYSE reported by Madhavan / Sofianos (1998).

These results lead to the question of whether there is any advantage in having one dominant supplier of liquidity. A starting point for answering that question is the observation that specialist systems like those of the NYSE and the Frankfurt Stock Exchange are not anonymous.

¹³ For a large number of less liquid stocks there is only one daily call auction and no continuous trading session. The same applies for Xetra.

¹⁴ Chung / Van Ness / Van Ness (1999) report a comparable figure for the NYSE. There, the quoted spread is narrower than the spread calculated from the best bid and offer in the limit order book in only 29.3% of the cases.

The non-anonymity may allow the specialist to identify informed traders *ex ante* or *ex post*.¹⁵ Ex-ante identification may be based on observed trader behavior and enables the specialist to offer less favorable prices to those traders that he considers to be informed. Ex-post identification of informed traders allows reputation building. The specialist will offer less favorable prices in future transactions to traders that have traded on private information in the past.¹⁶ The specialist's sanctioning power may induce traders to trade less aggressively on their information in order to retain their reputation and thus receive favorable prices in future transactions. This, in turn, decreases the degree of adverse information and may lead to a lower adverse selection component in effective bid-ask spreads. To fully exploit the information inferred (or, at least, inferable) from trader identities, it is advantageous to centralize the order flow. In a decentralized dealer market (like, e.g., NASDAQ) each dealer only knows the identities of a subset of those who have traded. In the more centralized specialist system, on the other hand, the information is centralized at the specialist's desk.¹⁷

If the specialist is to make use of his information he must be able to price-discriminate. This is, however, easily achieved. The specialist may quote a large spread and offer price improvement to counterparties deemed uninformed (i.e., he executes transactions initiated by these traders at prices inside the quoted spread). Price improvement is thus explained by lower adverse selection costs. This has two testable implications.

1. Granting price improvement does not reduce the specialist's profits.
2. Since price improvement is offered because the adverse selection risk is lower, price-improved transactions contain less information about the future price of the stock. Consequently, there is less need to adjust the quoted prices after the transaction.

¹⁵ Note that it is not required that the specialist is able to identify informed traders with certainty. It is sufficient if he is able to correctly assign to some traders a higher probability of trading on private information.

¹⁶ See Benveniste / Marcus / Wilhelm (1992), Chan / Weinstein (1993) and Desgranges / Foucault (2002) for a detailed analysis. The first two papers take into account the fact that traders on the floor are often brokers that represent customer orders.

¹⁷ The empirical results in Garfinkel / Nimalendran (2003) are consistent with this interpretation. They analyze spreads on insider trading days, defined as days on which officers or directors have traded in shares of their company. They find that, in response to the higher degree of informational asymmetry, spreads increase both on the NYSE and in Nasdaq, but that the increase is more pronounced on the NYSE. The order flow is more centralized on the NYSE than in NASDAQ. This may enable the specialist to better exploit the potential benefits of non-anonymity.

Theissen (2003) uses data from the Frankfurt Stock Exchange to test these hypotheses empirically. He first documents that price improvement is frequently granted. On average, more than 40% of the transactions are price-improved. Average effective spreads are 30% lower than average quoted spreads. He then decomposes the spread into two components. The realized spread measures the revenue of the specialist whereas the adverse selection component measures the amount lost to informed traders.

The results are fully consistent with the first implication. The realized spread on price-improved transactions is not smaller than the corresponding figure for non price-improved trades. A regression analysis including several control variables also yields the conclusion that there is no systematic relation between price improvement and specialist revenue. The second implication is tested by relating the adjustment of the quote midpoint after a transaction to the price improvement. It is found that the quote adjustment is significantly larger after transactions at a price equaling the bid or ask quote than after price-improved transactions. Again, the result is confirmed by a regression analysis including control variables.

The empirical work thus suggests that the specialist function is beneficial and may help to reduce adverse selection costs.

III.3. Screen Trading

In 1991 the electronic trading system IBIS was introduced. IBIS was an anonymous electronic open limit order book, organized as a “hit-and-take” system in the terminology of Domowitz (1992).¹⁸ In November 1997, IBIS was replaced by Xetra (Exchange Electronic Trading). Xetra is also used by the Austrian Stock Exchange and the Irish Stock Exchange. It is an anonymous electronic open limit order book with embedded call auctions. All stocks that are listed on the Frankfurt Stock Exchange are also traded in Xetra. Further, there are specific segments for foreign stocks (Xetra Stars). Table 4 presents a detailed description of the trading protocol.

Insert Table 4 about here

Trading starts at 8:50 a.m. with an opening call auction. A second and a third call auction are held between 1:00 p.m. and 1:15 p.m. and between 5:30 p.m. and 5:45 p.m., respectively. The trading day ends with a closing auction at 8 p.m. Between the call auctions, continuous trading takes place. The trading session is organized as a continuous auction where investors can

¹⁸ For a detailed description of IBIS see Schmidt / Iversen (1993).

place limit orders or accept orders which were submitted by others. Trading is completely anonymous.

Since October 1998 there are designated sponsors for many stocks outside the DAX. In the (now defunct) market segments Neuer Markt and SMAX, each listed company was required to have at least one (SMAX) or two (Neuer Markt) sponsors. Since March 2003, firms are sorted into two categories according to their liquidity. Those in the low-liquidity category are only traded continuously when they have at least one designated sponsor. The institution of the sponsor has been introduced in order to increase market liquidity. The sponsor has to quote bid and ask prices and participate in the call auctions. There are minimum requirements, differentiated by stock liquidity, for the spreads, the quoted depths and the participation frequencies in the call auctions. The sponsors are regularly rated by the exchange. The ratings are made public.

The co-existence of floor and screen trading raises the question of whether one of the systems is generally superior. The German market offers almost ideal conditions to compare floor and screen trading. Since both markets are liquid, operate in parallel and are based in the same country,¹⁹ many of the ambiguities present in other studies are absent.²⁰ Empirical research has addressed two issues, liquidity and informational efficiency.

Screen-based trading systems are likely to offer higher operational efficiency. The possibility of remote access to the system may increase the number of market participants and, thereby, liquidity. On the other hand, a floor-based specialist system may (as argued in the preceding section) be better suited to cope with adverse selection problems. When comparing floor and screen trading systems we should therefore expect

1. to see a larger fraction of informed traders in the electronic trading system than on the floor,
2. to find a larger adverse selection component of the bid-ask spread in the electronic trading system and

¹⁹ Quite a number of papers (see Breedon / Holland 1998 for a survey) analyze the parallel trading of German Bund futures on the (floor-based) LIFFE and Eurex (formerly Deutsche Terminbörse). These studies are potentially affected by the facts that, first, Germany is the home market of the contract (although the contract has been “invented” by the LIFFE) and, second, that the market shares of the two markets have differed substantially in almost every sample period.

²⁰ One limitation remains, however. Results of a comparisons of two markets that exist in parallel do not necessarily carry over to a situation in which a floor-based or an electronic exchange operates in isolation.

3. to find that floor trading is particularly advantageous for stocks with high adverse selection risk.

Empirical research into these issue has been (and, to a certain extent, still is) complicated by the non-availability of comprehensive data sets including quote data from the floor. Schmidt / Iversen / Treske (1993) and Schmidt / Oesterhelweg / Treske (1996) compare floor and screen trading for German stocks. They relate transaction prices from the floor to spreads from the screen trading system and find that transaction prices from the floor tend to lie inside this spread. This allows conclusions about the relative magnitude of the spreads in the two trading systems, but it does not allow to decompose the spreads into its components.²¹

Grammig / Schiereck / Theissen (2001) have access to a more comprehensive data set. They extend the method developed by Easley et al. (1996) to compare the probability of informed trading on the floor of the Frankfurt Stock Exchange and in IBIS (the predecessor of Xetra, in operation from 1991 through 1997). They find that, first, the probability of informed trading is significantly lower on the floor and, second, that both the size of the spread and the adverse selection component are positively related to the estimated probabilities of information-based trading.

Theissen (2002a) uses the same data set to analyze the bid-ask spreads in the two trading systems directly. He confirms the hypothesis that the adverse selection component is larger in IBIS than on the floor. The effective spreads tend to be larger on the floor for large stocks and larger on IBIS for small stocks. To the extent that firm size is a valid proxy for the adverse selection risk (an assumption substantiated by, among others, the results of Easley et al. 1996 who show that the probability of informed trading is negatively related to firm size) this confirms the conjecture that floor trading is better suited for stocks with high adverse selection risk. This conclusion is corroborated by an analysis of market shares. The market share of the electronic trading system is negatively related to the total trading volume of the stock and is at least partially negatively related to return volatility. Finally, it is documented that spreads in the electronic trading system respond more heavily to changes in return volatility.

What do these results imply for price discovery in floor and screen trading systems? As documented by Grammig / Schiereck / Theissen (2001), the anonymous electronic trading

²¹ Besides that, there is a potential bias in the methodology. Observations are recorded conditional on a transaction occurring on the floor. If transactions on the floor occur when the floor spread is low, this may bias the results in favor of the floor.

system attracts a higher fraction of informed traders than the floor. This entails the prediction that the electronic trading system impounds new information faster into prices. Three further arguments corroborate this prediction. Orders can be entered faster into an electronic system and the execution of an order is immediate. Further, it is easier to disseminate market information, thereby increasing the transparency of the market and the information available to the traders. Finally, greater pre-trade transparency allows to more accurately estimate the price impact of a trade.

The magnitude of the transaction costs determines whether a trader can profitably trade on a given piece of information. Given the results on the relation between spreads and firm size described above, one should therefore expect the share of the electronic trading system in the price discovery process to be positively related to firm size.

Grünbichler / Longstaff / Schwartz (1994) were the first to analyze price discovery in floor and screen trading systems using data from the German market. They compare prices of the DAX index calculated from stock prices on the floor to the prices of the DAX futures contract which is traded electronically. They find that the screen-traded future leads the stock market. The Bund futures contract, traded on the floor of the LIFFE and in the electronic DTB (now EUREX), has been analyzed in several papers (Breedon / Holland 1998, Fraser-Jenkins 1998, Kofman / Moser 1997, Martens 1998, Shyy / Lee 1995). Although the conclusions reached in these papers differ (partly due to different sample periods), the balance of the results indicates that the electronic market leads the floor. It should be noted, however, that the electronic market is the home market. Therefore, it may be the price-leader for reasons other than the trading mechanism.

The German stock market with its unique feature of parallel floor and screen trading has also been subject to empirical investigation. Kirchner / Schlag (1998) document that the prices in the electronic trading system adjust to the price established in the opening auction on the floor. Both Kempf / Korn (1998) and Freihube / Theissen (2001) compare the two markets using stock index data. Kempf / Korn (1998) find that the integration between the electronic trading system and the (equally electronic) futures market is higher than the degree of integration between the floor and the futures market. Freihube / Theissen (2001) document that the screen-based XETRA system contributes more to the price discovery process than the floor for the blue-chip index DAX. The reverse is true, however, for the mid-cap index MDAX.

Stock-level analyses are provided by Bühler / Grünbichler / Schmidt (1995), Kehr (1997), Kirchner (1999) and Theissen (2002b). The results do not support the hypothesis that one of

the markets is the leader in the price discovery process. The latter paper provides evidence that the contribution of the electronic trading system to the price discovery process is positively related to firm size.²²

Taken together, the empirical results support the hypothesis that floor trading has specific advantages that are most evident for stocks with high adverse selection risk. This does not necessarily yield the conclusion that floor trading should be retained. This is unlikely to be an efficient solution because it would entrench the coexistence of two trading systems for the same stocks. The results may, however, yield insights into the appropriate design of electronic trading systems. What appears to be important is to reduce the anonymity of the trading system. It may also be worthwhile to consider the introduction of a specialist into the system, at least for less liquid stocks.

III.4. Governance Structure of the Exchange

We restrict the description to Deutsche Börse AG. Deutsche Börse AG operates the Frankfurt Stock Exchange, the electronic trading system Xetra and has a 50% stake in the Zürich-based EUREX, the world's largest derivatives exchange. It is thus by far the most important exchange in Germany.

The roots of the Frankfurt Stock Exchange go back to the 16th century. The exchange was governed by public law and was, until 1991, run by the Industrie- und Handelskammer (Chamber of Commerce and Industry) Frankfurt. Deutsche Börse AG was founded in 1990 as Frankfurter Wertpapierbörse AG and renamed Deutsche Börse AG in 1992. It took over the operation of the Frankfurt Stock Exchange and also operates the electronic trading system Xetra. Besides its stake in EUREX, Deutsche Börse AG owns a number of subsidiaries and holds stakes in a variety of companies, the most important being its 100% stake in Clearstream International.

Deutsche Börse AG is owned by banks and other financial institutions. Until early 2001, banks owned 81.9% of the capital. The regional exchanges held another 10.1% and the specialists owned 5.3%. In February 2001 Deutsche Börse AG went public. Approximately 25% of the capital were offered to the public. This reduced, but did not eliminate, the majority

²² Grammig / Melvin / Schlag (2001) analyze price discovery of dually listed stocks in Xetra and on the New York Stock Exchange (which is organized in a way similar to the Frankfurt Stock Exchange). They find that Xetra dominates the price discovery process. The authors point out that this result is at least in part due to the fact that Germany is the home market.

control exerted by banks. The stake of the four largest German banks was reduced from 35.2% to 25.1%. According to German corporate law, a 25+% stake (“Sperrminorität”) is sufficient to block important decisions like changes in the corporate charter or seasoned equity offerings. In October 2002, Deutsche Bank AG sold its 9.3% stake to institutional investors.²³ Therefore, banks are losing their role as the dominant owner group. However, the supervisory board of Deutsche Börse AG is still dominated by banks. It consists of 21 members, 7 of which are employee representatives. The remaining 14 members are appointed by the shareholders’ meeting. 12 of them are members or former members of the executive board of a bank or a bank subsidiary.

Although Deutsche Börse AG is a privately owned company, it is not completely free in the strategic decisions it takes. This is due to the ambiguous legal status of the Frankfurt Stock Exchange. Deutsche Börse AG clearly favors electronic trading and would probably dispense with the trading floor. There is, however, a juridical debate about whether Deutsche Börse AG is allowed to do so. The Frankfurt Stock Exchange is governed by public law and is only operated (but not owned) by Deutsche Börse AG. Some authors argue that the allowance to operate the exchange entails the obligation to do so and thus prevents a closure of the floor. Therefore, legal action may be required in order to promote some of the necessary changes in the structure of the German equity markets.

III.5. The Liquidity of the German Equity Market: International Comparison

In this section we present descriptive statistics on the liquidity of the German Stock Market using both trading volume and execution costs as measures of liquidity. Table 5 compares the trading volume (in US-\$ million) and the turnover (the ratio of trading volume to market capitalization) for four major exchanges. The figures indicate that turnover is higher in Germany than in other countries. It should be noted, however, that volume figures are known to be unreliable and should, therefore, be interpreted with caution.

Insert Table 5 about here

Booth et al. (1999) compare quoted spreads for the 30 most liquid stocks from Germany's IBIS system (which, in 1997, was replaced by Xetra) to those from the 30 most liquid Nasdaq stocks. Spreads in IBIS are lower (0.83% as compared to 1.07%). Part of this difference is

²³ When the transaction became known, Deutsche Bank stated that the transaction would not impair the good relation to Deutsche Börse AG. Only some days later, however, Deutsche Bank announced that it would introduce a system to introduce in-house internalization of customer orders.

likely to be due to the fact that the German stocks are more liquid (in terms of volume) than their Nasdaq counterparts. In addition, the data used is from 1991. Using data from 1996, El-lul (2002) compares transaction costs in IBIS with those in the French CAC system and in SEAQ. Again, transaction costs turn out to be lowest in IBIS.

Jain (2001) collected data from Bloomberg for 51 exchanges. Table 6 summarizes some of his results on transaction costs. The German market is characterized by high turnover (defined as the ratio of trading volume to market capitalization). Transaction costs are measured by quoted and effective bid-ask spreads. Both measures indicate that transaction costs in Germany are lower than in the UK but higher than in the US (and, particularly, at the NYSE) and in Japan.²⁴

Insert Table 6 about here

The Plexus Group (2000) also conducted an international comparison of execution costs based on the company's database. Table 7 is based on data which the Plexus Group, Inc., generously provided. The Table reports transaction costs, measured in basis points, for large, mid, and small cap stocks. Negative figures correspond to positive transaction costs.²⁵ Figures are differentiated with respect to the relative order size (order size in relation to average daily volume of the stock in question). This differentiation results in a more detailed picture. The results indicate that trading midcaps in Germany is expensive. Execution costs for small and medium sized orders in both large and small caps are similar to those in the US. Large orders (where "large" means orders exceeding 50% of the average daily trading volume) are associated with high execution costs.

We do not have an explanation for the high transaction costs associated with trading mid caps. The high costs for large trades lead to the conclusion that Germany is in need of a cost-efficient market for block trades.

Insert Table 7 about here

²⁴ London Economics (2002) also compared transaction costs in different markets. Their approach does, however, suffer from methodological problems. To give just one example: The authors claim to have calculated effective spreads for far more German and French stocks than are continuously traded in these markets. We therefore disregard their results.

²⁵ The data is based on the costs of institutional trades reported to the Plexus Group, Inc., by its clients. A positive number indicates that the transaction costs were negative. This may happen if the institutions acted as suppliers of liquidity, thereby earning, rather than paying, the spread.

III.6. Recent Developments

Recently, the exchange came under pressure from different sides. Institutional investors throughout Europe are pushing towards a unified equity market at least for blue chips. They aim at a decrease in transaction costs, most notably clearing and settlement costs. Deutsche Börse AG has reacted to that pressure with its attempted merger with the London Stock Exchange (LSE) and its acquisition of the 50% of Clearstream it did not yet own. After the failure of the merger with the LSE there is room for speculation about future developments. Whether Deutsche Börse AG, which, as it stands, is isolated, can successfully prevent potential competitors from successfully entering the market is an open question. In a publication on behalf of Deutsche Börse AG, dated December 1999 (Dornau 1999), it is argued that Xetra is the cost leader and, therefore, the potential for new entrants is limited. This conclusion stands in contrast to the claim by some institutional investors that clearing and settlement costs are much higher in Germany (and Europe in general) than in the US.

On the retail end of the market, both some of the regional exchanges (most notably Stuttgart) and a number of broker-dealers are competing for retail order flow. The Stuttgart Stock Exchange has taken several measures to increase its attractiveness for private investors. The exchange extended the trading hours, abolished minimum trade size requirements and guaranteed execution at a price no worse than the prevailing Xetra quotes. As a consequence, the Stuttgart Stock Exchange has substantially increased its market share and has forced Deutsche Börse AG to take similar measures. Very recently, NASDAQ has joined with the regional exchanges in Berlin and Bremen and three banks (Dresdner Bank, Commerzbank and comdirect, a subsidiary of Commerzbank) to form NASDAQ Deutschland. Since March 21, 2003, NASDAQ Deutschlands operates an electronic auction market with additional liquidity supply through mandatory market making. Whether the new trading system will attract sufficient order flow remains to be seen.

Some broker-dealers, in conjunction with direct brokers, offer OTC trading for retail customers, mainly in blue chips. As there is no such thing as the US intermarket trading system, best execution is not legally enforced (but may be guaranteed by the broker-dealer). It appears that the economics behind this OTC trading is not dissimilar to the economics underlying the payment for order flow arrangements in the US. Retail orders are less affected by adverse selection problems and are, therefore, profitable. It may thus pay to improve the service for retail investors in order to attract and execute their orders.

Large banks (most notably Deutsche Bank AG) were striving towards inhouse execution of orders. Inhouse execution may mean crossing of customer orders or execution of customer

orders against the book of the bank (i.e., the bank acts as a market maker). Apparently, Deutsche Börse AG considered this to be a serious threat to its position. In September 2002, Deutsche Börse AG therefore introduced a system called Xetra Best that enables participating “best executors” to internalize customer order flow (or purchased order flow) and execute the orders in Xetra. The customer is guaranteed a price that improves by at least one Cent over the price the order would have received had it been routed to the Xetra order book. By creating this system, Deutsche Börse AG supports the diversion of order flow from its own trading platforms, but participates, through royalties, in the profits generated by inhouse execution.²⁶

However, the inception of Xetra Best came too late to prevent Deutsche Bank from introducing its own system, called Price Improvement System (PIP). Furthermore, NASDAQ Deutschland also allows internalization through a system called BestEx.

Internalization, if performed on a large scale, potentially impairs overall market quality by cream-skimming uninformed order flow. Liquidity providers in the main market face higher adverse selection risks and may respond with higher spreads. These spreads, in turn, determine the prices at which the internalized orders will be executed. It is thus possible that internalization may lead to a general increase in transaction costs. The US experience with purchased order flow has, however, shown that this is not a necessary consequence. Therefore, empirical studies are required before the economic consequences of internalization can be assessed.

IV. Conclusion

The purpose of this chapter was to describe the German equity market and to analyze whether it is underdeveloped in terms of volume or operational efficiency and liquidity. The German equity market is, if related to the size of the economy, small. This is a natural consequence of a bank-dominated financial system.

The microstructure of the German equity market exhibits a number of peculiarities that make it a worthwhile object of empirical investigation. In particular, the co-existence of floor trading and electronic trading is a rather unique feature. Empirical research, briefly surveyed in section III.3, supports the conclusion that floor trading has specific advantages that are most evident for stocks with high adverse selection risk. These results yield insights into the appro-

²⁶ For a detailed account of Xetra Best (though in German) see Theissen (2002c).

priate design of electronic trading systems. They should be interpreted as a guideline towards the improvement of electronic trading systems rather than as a defense of floor trading.

An international comparison of execution costs leads to the conclusion that trading midcaps and executing large orders is expensive on the German market. We do not have a good explanation for the first result. The second result, however, points to a deficiency of the German market, namely, the non-existence of a cost-efficient market for block trades.

An analysis of recent trends yields a somewhat diffuse picture. On the one hand, there is a trend towards an international consolidation of markets in Europe, evidenced, e.g., by the creation of Euronext. On the other hand, proprietary trading systems and internalization lead to a fragmentation at least at the retail end of the market. In light of this the creation of an intermarket trading system that serves as a verifiable benchmark for best execution for customer orders should be considered.

Some of the recent developments in Germany bear many similarities to the evolution of trading systems in the US. Much of the research devoted to the US market (dealing with, e.g., payment for order flow) may thus ultimately become highly relevant for the German market and may provide useful guidelines for the future development.

References

- Benveniste, L., A. Marcus and W. Wilhelm (1992): What's Special About the Specialist? *Journal of Financial Economics* 32, 61-86.
- Bhattacharya, U. and H. Daouk (2001): The World Price of Insider Trading. *Journal of Finance*, forthcoming.
- Booth, G., P. Iversen, S. Sarkar, H. Schmidt and A. Young (1999): Market Structure and Bid-Ask Spreads: IBIS vs Nasdaq. *European Journal of Finance* 5, 51-71.
- Breedon, F. and A. Holland (1998): Electronic versus Open Outcry Markets: the Case of the Bund Futures Contract. Working Paper No. 76, Bank of England, January.
- Bühler, A., A. Grünbichler and H. Schmidt (1995): Parkett und Computer im Preisfindungsprozeß. *Zeitschrift für Bankrecht und Bankwirtschaft*, 7, 234-243.
- Bundesaufsichtsamt für den Wertpapierhandel (2002): Jahresbericht 2001. (Download under: www.bafin.de).
- Chan, Y.-S. and M. Weinstein (1993): Reputation, Bid-Ask Spread and Market Structure. *Financial Analysts Journal* July / August, 57-62.
- Chung, K., B. Van Ness and R. Van Ness (1999): Limit Orders and the Bid-Ask Spread. *Journal of Financial Economics* 53 (1999), 255-287.
- Desgranges, G. and Th. Foucault (2002): Reputation-Based Pricing and Price Improvements in Dealership Markets. Working Paper, Université de Cergy and Groupe HEC, January.
- Deutsche Börse AG (2003): Guideline to the Equity Indices of Deutschen Börse, Version 5.1, March.
- Deutsche Bundesbank: Monatsberichte, various issues.
- Deutsches Aktieninstitut: DAI Factbook 2002.
- Domowitz, I. (1992): Automating the Price Discovery Process: Some International Comparisons and Regulatory Implications. *Journal of Financial Services Research* 6, 305-326.
- Dornau, R. (1999): Alternative Handelssysteme in den USA und in Europa. Published by Deutsche Börse AG, December.
- Easley, D., N. Kiefer, M. O'Hara and J. Paperman (1996): Liquidity, Information, and Infrequently Traded Stocks, *Journal of Finance* 51, 1405-1436.

- Ellul, A. (2002): The Dominance of Hybrid Trading Systems: An Analysis of Execution Costs, Market Depth and Competition. Working Paper, Indiana University, October.
- Fraser Jenkins, I. (1998): Open Outcry versus Electronic Screen Trading: A Comparison of Trading on LIFFE and the DTB between 1995 and 1998. Working Paper, Bank of England.
- Freihube, Th. and E. Theissen (2001): An Index Is an Index Is an Index? Working Paper, University of Frankfurt, February.
- Freihube, Th., C.-H. Kehr, J. Krahnen and E. Theissen (1999): Was leisten die Kursmakler? Eine empirische Untersuchung am Beispiel der Frankfurter Wertpapierbörse. Kredit und Kapital, 32, 426-460.
- Garfinkel, J. and M. Nimalendran (2003): Market Structure and Trader Anonymity: An Analysis of Insider Trading. Journal of Financial and Quantitative Analysis, forthcoming.
- Grammig, J., M. Melvin and Ch. Schlag (2001): Price Discovery in International Equity Trading. Working Paper, CORE at Catholic University of Louvain, University of Arizona and University of Frankfurt, February.
- Grammig, J., D. Schiereck and E. Theissen (2001): Knowing Me, Knowing You: Trader Anonymity and Informed Trading in Parallel Markets. Journal of Financial Markets, 4, 385-412.
- Grünbichler, A., F. Longstaff and E. Schwartz (1994): Electronic Screen Trading and the Transmission of Information: An Empirical Examination. Journal of Financial Intermediation, 3, 166-187.
- Hackethal, A. and R. Schmidt (2000): Financing Patterns: Measurement Concepts and Empirical Results. Working Paper, University of Frankfurt, May.
- Hasan, I. and M. Malkamäki (2001): Are Expansions Cost Effective for Stock Exchanges? A Global Perspective. Journal of Banking and Finance 25, 2339-2366.
- Huang, R. and H. Stoll (1996): Dealer versus Auction Markets: A Paired Comparison of Execution Costs on NASDAQ and the NYSE. Journal of Financial Economics 41, 313-357.
- Jain, P. (2001): Institutional Design and Liquidity on Stock Exchanges. Working Paper, Indiana University, April.
- Kehr, C.-H. (1997): Preisfindung bei verteilter Börsenstruktur. Wiesbaden (Gabler-Verlag).
- Kehr, C.-H., J. Krahnen and E. Theissen (2001): The Anatomy of a Call Market. Journal of Financial Intermediation, forthcoming.

- Kempf, A. and O. Korn (1998): Trading System and Market Integration. *Journal of Financial Intermediation*, 7, 220-239.
- Kirchner, T. (1999): *Segmentierte Aktienmärkte*. Wiesbaden (Gabler-Verlag)
- Kirchner, T. and Ch. Schlag (1998): An Explorative Investigation of Intraday Trading on the German Stock Market. *Finanzmarkt und Portfolio Management*, 12, 13-31.
- Kofman, P. and J. Moser (1997): Spreads, Information Flows and Transparency Across Trading Systems. *Applied Financial Economics*, 7, 281-294.
- La Porta, R., F. Lopez-de-Silanes, A. Shleifer and R. Vishny (1998): Law and Finance. *Journal of Political Economy* 106, 1113-1155.
- Leuz, Ch. and R. Verrecchia (2000): The Economic Consequences of Increased Disclosure. *Journal of Accounting Research* 38, Supplement, 91-124.
- London Economics (2002): Quantification of the Macro-Economic Impact of Integration of EU Financial Markets. Final Report to the European Commission, November.
- Madhavan, A. and G. Sofianos (1998): An Empirical Analysis of NYSE Specialist Trading. *Journal of Financial Economics* 48, 189-210.
- Martens, M. (1998): Price Discovery in High and Low Volatility Periods: Open Outcry versus Electronic Trading. *Journal of International Financial Markets, Institutions and Money*, 8, 243-260.
- Mayer, C. (1988): New Issues in Corporate Finance. *European Economic Review*, 32, 1167-1188.
- New York Stock Exchange (2000): Shareownership 2000. Download: www.nyse.com/marketinfo/shareownersurvey.html.
- Nowak, E. (2001): Recent Developments in German Capital Markets and Corporate Governance. *Journal of Applied Corporate Finance* 14, Fall, 35-48.
- Pagano, M. and B. Steil (1996): Equity Trading I: The Evolution of European Trading Systems. In: Steil, B. et al. (eds.): *The European Equity Markets*, London, S. 1-58.
- Plexus Group (2000): The Cost of International Liquidity. *Commentary* 61, April.
- Rajan, R. and L. Zingales (1995): What Do We Know about Capital Structure? Some Evidence from International Data. *Journal of Finance* 50, 1421-1460.

- Schmidt, H. and P. Iversen (1992): Automating German Equity Trading: Bid-Ask Spreads on Competing Systems. *Journal of Financial Services Research*, 6, 373-397.
- Schmidt, H., O. Oesterhelweg and K. Treske (1996): Deutsche Börsen im Leistungsvergleich: IBIS und BOSS-CUBE. *Kredit und Kapital*, 29, 90-122.
- Schmidt, H., P. Iversen and K. Treske (1993): Parkett oder Computer? *Zeitschrift für Bankrecht und Bankwirtschaft*, 5, S. 209-221.
- Shyy, G. and J.-H. Lee (1995): Price Transmission and Information Asymmetry in Bund Futures Markets: LIFFE vs. DTB. *Journal of Futures Markets*, 15, 87-99.
- Theissen, E. (2002a): Floor versus Screen Trading: Evidence from the German Stock Market. *Journal of Institutional and Theoretical Economics* 158, 32-54.
- Theissen, E. (2002b): Price Discovery in Floor and Screen Trading Systems. *Journal of Empirical Finance* 9, 455-474.
- Theissen, E. (2002c): Internalisierung und Marktqualität: Was bringt Xetra Best? *Kredit und Kapital* 35, 550-571.
- Theissen, E. (2003): Trader Anonymity, Price Formation and Liquidity. *European Finance Review* 7, 1-26.

Table 1: Market volume

Source: Deutsche Bundesbank, Monatsberichte, Deutsche Börse AG, Historical Statistics Cash Markets. The figures for corporate bonds exclude bonds issued by banks. GDP for 1990 is for West Germany only.

	1990	1995	2002
corporate bonds, face value, € Mio	1,331	1,404	36,646
outstanding equity, nominal value, € Mio	73,977	108,001	168,716
outstanding equity, market value, € Mio	286,938	422,523	647,492
market value of equity as a percentage of GDP	23.1%	23.5%	30.7%
number of domestic listed companies	649	678	867

Table 2: Market capitalization: International comparison

Source: Deutsches Aktieninstitut: DAI-Factbook 2002.

The table shows the market capitalization as a percentage of GDP

	1990	1995	2001
Germany	25.0	23.9	58.1
€ countries	27.4	28.8	70.7
UK	88.2	121.6	152.0
US	48.7	95.2	136.3
Japan	98.6	71.4	55.4

Table 3: Share ownership

Source: Deutsches Aktieninstitut: DAI-Factbook 2002

	1992	1997	2001
percentage of population over 14 with share-holdings	6.4%	6.2%	8.9%
percentage of population with mutual fund holdings	n.a.	3.6%	15.2%
percentage of population with mutual fund and / or share holdings	n.a.	8.9%	20.0%
private shareholdings			
• € billion	124.2	293.7	347.3
• in % of total monetary wealth	5.69	9.53	9.47
private mutual fund holdings			
• € billion	108.8	243.7	429.4
• in % of total monetary wealth	4.99	7.91	11.71

Table 4: Equity trading in Xetra

nature of trading system	• Electronic open limit order book
trading mechanism by stock groups	• Liquid stocks: call auctions (open, intradaily, close) and continuous trading • Illiquid stocks: call auction
call auctions	• Pre-trading phase with closed book, allows entry and modification of orders • Indicative prices are disseminated • Order imbalance information provided for DAX stocks and stocks with designated sponsors (see below) • Price determination based on volume maximization / order imbalance / reference price • Random price determination time
admissible order types	• Market, limit, market-to-limit, stop orders • Additional execution conditions admissible: immediate-or-cancel, fill-or-kill • Validity constraints: good-for-day, good-till-date, good-till-cancelled (maximum validity 90 days) • Admissible trading restrictions, e.g. auction only, opening only • Iceberg orders: specify overall volume and peak volume; iceberg orders are not identified in the book; time stamp equal to time at which peak appears on the screen
trading hours	• 8.50 a.m. (beginning opening auction) to 8.05 p.m. (end closing auction) • Stocks traded by call auction only: 1.20 - 1.25 p.m. • Xetra XXL (block trading facility): crossings each 15 minutes from 9.30 a.m. to 6.00 p.m.
priority rules	• Price, time (except hidden parts of iceberg orders)
transparency in continuous trading session	• open book • Exception 1: hidden parts of iceberg orders • Exception 2: liquidity provided by designated sponsors upon quote request
Anonymity	• Anonymous • Exception: Designated sponsors know identity of quote requesting party
clearing settlement	• Settlement two workdays after transaction • Central counterparty to be introduced in 2003
minimum tick size	• € 0.01 • € 0.001 for instruments with prices below € 0.1
minimum order size	• 1 share
designated sponsors / liquidity providers	• Mandatory for “low liquidity” stocks that are to be traded continuously (Stocks are categorized as high or low liquidity stocks according to execution costs and trading volume) • Must participate in auctions and volatility interruptions

	• Minimum quote quantities, maximum spreads (differentiated according to liquidity) and maximum response time specified • Regular performance measurement, published quarterly • Privileges: reduced fees, designated sponsors learn identity of quote-requesting trader
domestic parallel trading venues	• Floor trading on the Frankfurt Stock Exchange and seven regional exchanges; NASDAQ Deutschland • OTC trading • Internalization of orders through XetraBest, PIP and BestEx
circuit breakers	• Volatility interruption if potential price outside pre-defined range around reference price 1 (the last determined price) or reference price 2 (last auction price) • The width of the ranges are not disclosed to market participants and are adapted to market conditions • Market order interruption: when market orders exist that are not executable • Trading resumes with call auction • Exchange can suspend trading in case of information events; orders in the system are deleted
handling of block trades	• Specific block trading segment (Xetra XXL) • Matching of orders at the Xetra quote midpoint (i.e., Xetra XXL itself does not contribute to price discovery) • Anonymous, closed order book

Table 5: Turnover (Trading volume in % of market capitalization): International comparison

Source: DAI Factbook 2002, original source of data: F.I.B.V. We only include countries for which volume figures according to the Trading System View (as opposed to the Regulated Environment View) were given. Figures for France are for 2000.

	Germany	France (year 2000)	Japan (Tokyo)	US (NYSE)
Volume in 2001 (million US-\$)	1,439.9	1,064.9	1,656.7	10,388.9
turnover in 2001	118.3%	71.9%	60.0%	86.9%

Table 6: Liquidity: International comparison I

Source: Jain (2001), Table 2.

	volatility	turnover	quoted spread all stocks	quoted spread top 15 stocks	effective spread top 15 stocks
Germany	0.11%	2.38	3.65	0.86%	0.73%
UK	0.12%	0.42	5.21	1.46%	1.25%
US – NYSE	0.12%	0.65	0.74	0.20%	0.09%
US – Nasdaq	0.42%	0.61	2.67	0.52%	1.02%
Japan	0.105	0.39	2.13	0.80%	0.72%

Table 7: Liquidity: International comparison II

Data source: The data was generously provided by the Plexus Group, Inc.

The figures represent trading costs in basis points. For Germany (Ger), the UK and Japan (Jap), small caps are defined as companies with market capitalization less than US-\$ 1 billion, mid caps have market capitalization between US-\$ 1 and 10 billion and large caps have market capitalization of more than US-\$ 10 billion. For the US, the respective figures are (in billion US-\$) less than 1, between 1 and 5, and between 5 and 25. Very large US stocks are those with market capitalization in excess of US-\$ 25 billion.

Trade size is defined relative to the average daily trading volume. The six groups are defined as less than 10%, between 10% and 25%, between 25% and 50%, between 50% and 100%, between 100% and 250%, and more than 250% of the average daily volume.

trade size	Ger	small caps			Ger	mid caps			Ger	large caps			US very large
		US	UK	Jap		US	UK	Jap		US	UK	Jap	
smallest	na	1,19	-39,61	na	-44,77	-10,20	-13,70	42,32	-13,21	-2,84	-0,47	-3,98	-1,02
2	-26,42	-31,59	-12,76	na	-54,50	-9,05	-9,89	-1,11	-7,00	-2,26	-15,32	6,30	-3,49
3	-33,76	-26,35	-42,88	na	-35,75	-8,34	-5,37	-28,98	-4,88	-9,50	0,13	-39,87	-10,36
4	-90,27	-18,84	-76,05	na	-31,79	-14,97	-19,05	-18,11	-24,83	-4,51	-12,89	-41,14	-15,12
5	-55,24	-25,88	-29,91	-73,00	-63,00	-20,13	-8,84	-23,49	-50,90	-13,22	-24,84	-47,21	-24,45
largest	-180,00	-119,55	-55,20	-196,00	-162,88	-92,53	-35,52	-152,78	-117,11	-84,30	-61,52	-170,02	-51,00

Figure 1: Shareholdings (% of total shareholdings, year end 2000)

Source: Deutsches Aktieninstitut: DAI-Factbook 2002

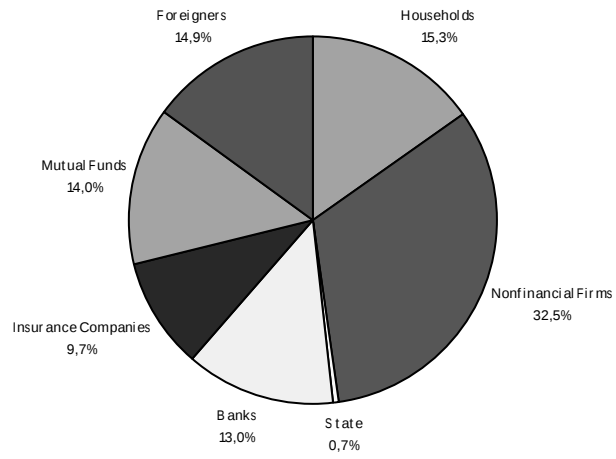
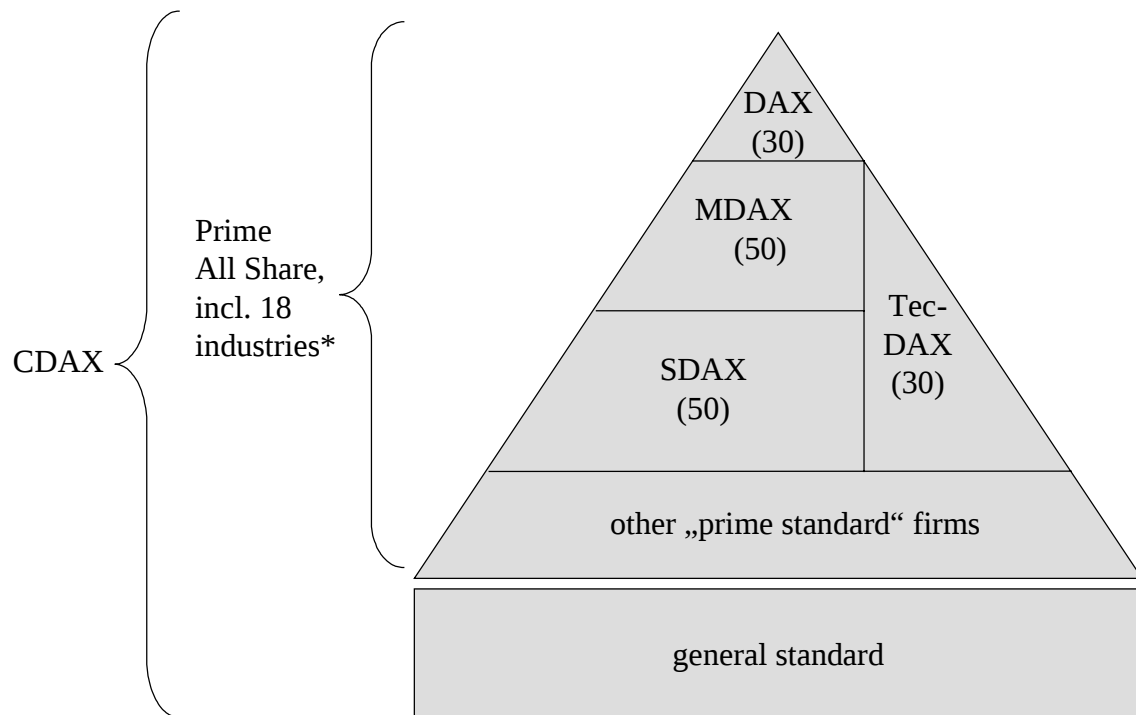


Figure 2: Equity indices

* Automobile, Banks, Basic Resources, Chemicals, Construction, Consumer, Financial Services, Food & Beverages, Industrial, Insurance, Media, Pharma & Healthcare, Retail, Software, Technology, Telecommunication, Transport & Logistics, Utilities.

CFS Working Paper Series:

No.	Author(s)	Title
2003/07	Günter Coenen Andrew Levin Volker Wieland	Data Uncertainty and the Role of Money as an Information Variable for Monetary Policy
2003/08	Günter Coenen Volker Wieland	A Small Estimated Euro Area Model with Rational Expectations and Nominal Rigidities
2003/09	Günter Coenen Volker Wieland	The Zero-Interest-Rate and the Role of the Exchange Rate for Monetary Policy in Japan
2003/10	Stefan Reitz Frank Westerhoff	Nonlinearities and Cyclical Behavior: The Role of Chartists and Fundamentalists
2003/11	Stefan Reitz Ralf Ahrens	Heterogeneous Expectations in the Foreign Exchange Market Evidence from the Daily Dollar/DM Exchange Rate
2003/12	Klaus Adam	Optimal Monetary Policy with Imperfect Common Knowledge
2003/13	Günter Coenen Athanasios Orphanides Volker Wieland	Price Stability and Monetary Policy Effectiveness when Nominal Interest Rates are Bounded at Zero
2003/14	Raimond Maurer	Institutional Investors in Germany: Insurance Companies and Investment Funds
2003/15	Daniel Schmidt Mark Wahrenburg	Contractual Relations between European VC–Funds and Investors: The Impact of Reputation and Bargaining Power on Contractual Design
2003/16	Christian Leuz Jens Wüstemann	The Role of Accounting in the German Financial System
2003/17	Erik Theissen	Organized Equity Markets in Germany

Copies of working papers are available at the Center for Financial Studies or can be downloaded (<http://www.ifk-cfs.de>).