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**Working Paper**

## The German entrepreneurial index (GEX®): a primer on an ownership-based style index in Germany

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**Working Paper No. 2009-13**

**The German Entrepreneurial Index (GEX<sup>®</sup>) –  
A Primer on an ownership-based style index in Germany**

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**WORKING PAPER SERIES**



**Center for Entrepreneurial and  
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## **The German Entrepreneurial Index (GEX<sup>®</sup>) – A Primer on an ownership-based style index in Germany**

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### **Abstract:**

Recent research indicates that the majority of listed firms in Germany (and also in many other countries around the world) have a dominant owner rather than being widely-held. Hence, owner-dominated firms comprise an important subset of listed companies. This article introduces the concept of an ownership-based style index of listed firms in Germany, the German Entrepreneurial Index (GEX<sup>®</sup>). Introduced in 2005, the GEX<sup>®</sup> represents recently listed, owner-dominated firms in the German Prime Standard. We review the theoretical foundation and the index construction of the GEX<sup>®</sup>. In addition, we provide an overview of its development and performance between index inception and end of 2008 and relate this to properties of the German financial market. Finally, we conclude with a critical outlook for the index future against the background of recent developments.

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## I. Introduction

In early 2005, Deutsche Börse supplemented its index family by the German Entrepreneurial Index (GEX<sup>®</sup>), which had been developed by the Center for Entrepreneurial and Financial Studies (CEFS) at the Technische Universität München (TUM) for Deutsche Börse.<sup>1</sup> The GEX<sup>®</sup> measures the performance of all owner-dominated German companies that are listed in the Prime Standard<sup>2</sup> of the Frankfurt Stock Exchange and whose IPO or first quotation of its common stock occurred at most ten years ago. As a style index, the GEX<sup>®</sup> markedly differs in its construction from the existing indices of Deutsche Börse and other institutions. This article wants to explain the motivation for the introduction of the index, its construction criteria, and provide a comment on its development during the first four years while relating this to properties of the German financial market.

The remainder of the article is structured as follows: Section II gives an overview about the motivation and the theoretical foundation for the GEX<sup>®</sup>, section III explains the construction criteria of the index and puts it in context to the German index family of Deutsche Börse. Section IV analyses changes in and development of the index composition. Section V analyzes the past performance in comparison to other indices of Deutsche Börse, while section VI provides a short conclusion based on our findings.

## II. Motivation and theoretical foundation of the GEX<sup>®</sup>

The GEX<sup>®</sup> is motivated based on (i) empirical findings for the relationship between shareholder structure and corporate performance and (ii) characteristics of entrepreneurial firms.

### 1. Ownership structure and corporate performance

During the past 25 years, agency theory has supplied important explanations for the fact that ownership structure is an important determinant of corporate performance. For the analysis of the relationship between shareholders and management, the manager-owner conflict (agency conflict I) and the majority-minority shareholder conflict (agency conflict II) have become the two decisive paradigms.

Regarding the agency conflict I, the behavior of salaried managers (the agent) cannot be sufficiently controlled by the shareholders (the principals) for a variety of reasons. Salaried managers retain a non-negligible scope for increasing their own benefits at the expense of the

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<sup>1</sup> The index-calculation of the GEX<sup>®</sup> and the related real-time distribution of GEX<sup>®</sup> index levels by Deutsche Börse officially started on January 3, 2005. The concept was first introduced to the public at the Deutsche Eigenkapitalforum in Frankfurt/Main, Germany, on November 23, 2004.

<sup>2</sup> The Prime Standard is the stock market segment on the regulated market of the Frankfurt stock exchange with the highest transparency requirements. For further information see p. 11.

shareholders.<sup>3</sup> Of course, the latter will anticipate such exploitation potential. This is why, over time, mechanisms have been developed by financial markets to reduce the welfare costs of these agency conflicts. A distinction is frequently made between mechanisms of internal and external corporate governance. Among the former are, in particular, the activities of the supervisory board, like setting the top management's compensation, whereas the latter comprises the activities of investors in financial markets. In recent years, however, the empirical literature has supplied ample evidence for the, at least partial, failure of these mechanisms.<sup>4</sup> A prominent example is stock options. Meanwhile, various findings have shown that their growth is rather due to a failure of corporate governance than due to the implementation of compensation structures that are in the interest of the shareholders.<sup>5</sup> Thus, today's corporate governance debate may also be understood as a discussion of the deficiencies and possible improvements of these mechanisms. The importance of a functioning corporate governance structure becomes even more prominent during the course of the current financial crisis. In this context, Lo (2009) states very clearly that in the financial crisis of 2007 – 2008 the lack of independence between risk and reward in the corporate governance structure is of high concern. This lack caused agency conflicts especially in financial institutions and facilitated risky behavior by the company's management.<sup>6</sup>

In theory, managerial ownership is one possibility to improve the inducement effects on management. If this mechanism works, the interests between shareholders and management are aligned and firm's capital costs are expected to decline. In contrast, managerial entrenchment can counteract the effect of reducing the cost of capital mentioned before. The cost of capital rises due to lacking diversification of idiosyncratic risks when ownership is concentrated.<sup>7</sup> This effect can be reinforced if the owner is subject to funding constraints that prevent him from raising equity necessary for new investments, which otherwise would result in an undesired reduction of his ownership stake.

Even supposing that, given these two opposing effects, the first one dominates as a rule, there are good reasons why an increase in management's equity position does not result in a reduction of the cost of capital. It is likely that this effect will be working when the equity ratios are initially rather low; as equity ratios rise, however, management will increasingly act like majority shareholders. This raises new problems which in the literature are subsumed under the agency

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<sup>3</sup> Among the important contributions in this context are Berle/Means(1932) and Jensen/Meckling (1976), pp. 305 ff.

<sup>4</sup> On this issue see the fundamental contribution of Jensen (1993), pp. 831 ff. A survey of the deficiencies of corporate governance in Germany is contained in Wenger/Kaserer (1998), pp. 499-536. There has been a large debate on corporate governance in the aftermath of several corporate scandals during the last decade (such as Enron, Worldcome or Parmalat). For evidence on recent changes in corporate governance in Continental Europe cf. Enriques and Volpin (2007).

<sup>5</sup> See Bebchuk/Fried (2004). Kaserer/Wagner (2004) show that introduction of share options has reduced the dependence of executive compensation on performance in Germany.

<sup>6</sup> See Lo (2009), p. 36.

<sup>7</sup> This effect is weakened if the owner includes in his estimate a sale of the firm in the foreseeable future.

conflict II between majority and minority shareholders. Such constellations may have the undesirable consequence that the major shareholder exploits the scope for corporate action at the expense of the minority shareholders.<sup>8</sup> It should also be considered that with management's rising equity ownership the corrective effects of the labor market and the market for corporate control will increasingly be weakened because the manager/owner is protected against dismissal and the company is protected against acquisition. Although there might be an optimal ownership structure from a theoretical point of view (where agency costs from both agency conflicts are minimised), we know very little about how to determine it.

The interesting empirical question is to which extent there is a relationship between managerial ownership and the firm value. Among the most important papers is without any doubt that of Morck/Shleifer/Vishny (1988),<sup>9</sup> who show that there is a non-monotonous relationship between managerial ownership and the value of the firm as measured by Tobin's Q. Starting from managerial ownership of zero, the value of the firm initially rises with increasing managerial share ownership, only to fall later. The seminal work by Morck/Shleifer/Vishny (1988) was just the starting point for a large strand of literature dealing with the relationship between shareholder structure and corporate performance. Although evidence for the impact of insider ownership is mixed, the majority of studies assume that the incentive alignment effects dominate the entrenchment effects of insider ownership.<sup>10</sup>

Due to the potential reverse causality between insider ownership and corporate performance more recent studies deal primarily with the performance of family-managed companies.<sup>11</sup> One reason for this is that studies have shown that in many countries a large fraction of firms are family firms. Also, the methodological problem of endogeneity is not as prominent as it is for insider dominated firms: The existence of a founding family within a firm can influence the performance, and not vice versa. Within that strand of literature there seems to be a consensus that family firms show a superior performance especially if the founder is still present in firm

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<sup>8</sup> Hecker (2000).

<sup>9</sup> Morck/Shleifer/Vishny (1988), pp. 293, ff.

<sup>10</sup> For a review of this literature, see Demsetz and Villalonga (2001). As discussed in Demsetz and Villalonga (2001), the aspect whether endogeneity between shareholder structure and performance affects the results is addressed to a different degree across various studies. For a discussion on the endogeneity of ownership structures see e.g. Himmelberg/Hubbard/Palia (1999), p. 357-360 or Demsetz (1985). A more recent approach is to analyse the impact of changes in managerial ownership on corporate performance as for example in Fahlenbrach (2009). This approach is intended to reduce concerns of endogeneity.

<sup>11</sup> Although the definitions of a family-managed company used in these studies vary, their common denominator is that they are based on the share ownership of the founding family – quite distinct from the GEX<sup>®</sup> definition of owner-managed firms. Many of the GEX<sup>®</sup> firms may, however, also be family firms in the above sense.

management.<sup>12</sup> As Kaserer/Moldenhauer (2008) have shown there exists a relationship between owner dominance and performance in Germany.<sup>13</sup> Overall, it is likely that notable insider ownership has positive effects on corporate performance.<sup>14</sup>

This fact might pose an opportunity for an investment strategy. But one should keep in mind, however, that it is not the function of an index to define an investment strategy. Rather, it has an information, a benchmarking, an investment, and a trade function. These aspects were of central importance in the construction of the GEX<sup>®</sup>. The criterion of owner dominance is to be seen primarily against this background. The fact that there are empirically founded reasons for a long-term out-performance of owner-managed companies suggests the construction of a corresponding index. In the final analysis, it is a question of the investment decision of the investors whether they presume such a relationship. Independently of this, the construction of a corresponding index makes sense as long as its information and trade functions are not redundant.

## 2. Limited post-IPO age

Since companies only remain in the GEX<sup>®</sup> for a limited period of time – at a maximum of ten years – the index illustrates the performance of owner-managed firms for a limited period only. Entrepreneurial firms according to the index are defined as owner-managed firms during this ten year period. One could argue that length of this ten year period is arbitrary but to determine this period, the phase of the firm ought to be identified in which it is in transition from a newly listed firm to becoming a mature listed company. Although there are no relevant definitions for this, the issuance of equity and significant changes in capital and ownership structure were identified to be the prime economic characteristics of this transition phase. Our empirical research shows that during the first ten years after their IPO, German firms increase their equity by an average 120%, whereas in the ensuing five years the average capital increase amounts to only 20% (see Fig. 1). For many firms, stock listing is therefore the beginning of an intensive growth phase,<sup>15</sup> in which

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<sup>12</sup> See among others the studies of Anderson/Reeb (2003), Villalonga/Amit (2006), Fahlenbrach (2008) for the U.S., Claessens et al. (2002) for several southeast Asian countries, Cronquist/Nilson (2003) for Sweden, Gorriz/Fumas (2005) for Spain, Ehrhardt/Nowak/Weber (2004) or Andres (2008) for Germany, Sraer/Thesmar (2006) for France, Bloom/Van Reenen (2007) for France, Germany, Great Britain and the U.S. as well as Barontini/Caprio (2006) for Europe. However, please note that the comparability of studies in this area is rather limited due i.a. to national differences, different definitions (e.g. the definition of a family firm), and different research emphases. In addition, the aspect whether endogeneity between shareholder structure and corporate performance affects the results is again addressed in the cited studies to a different degree.

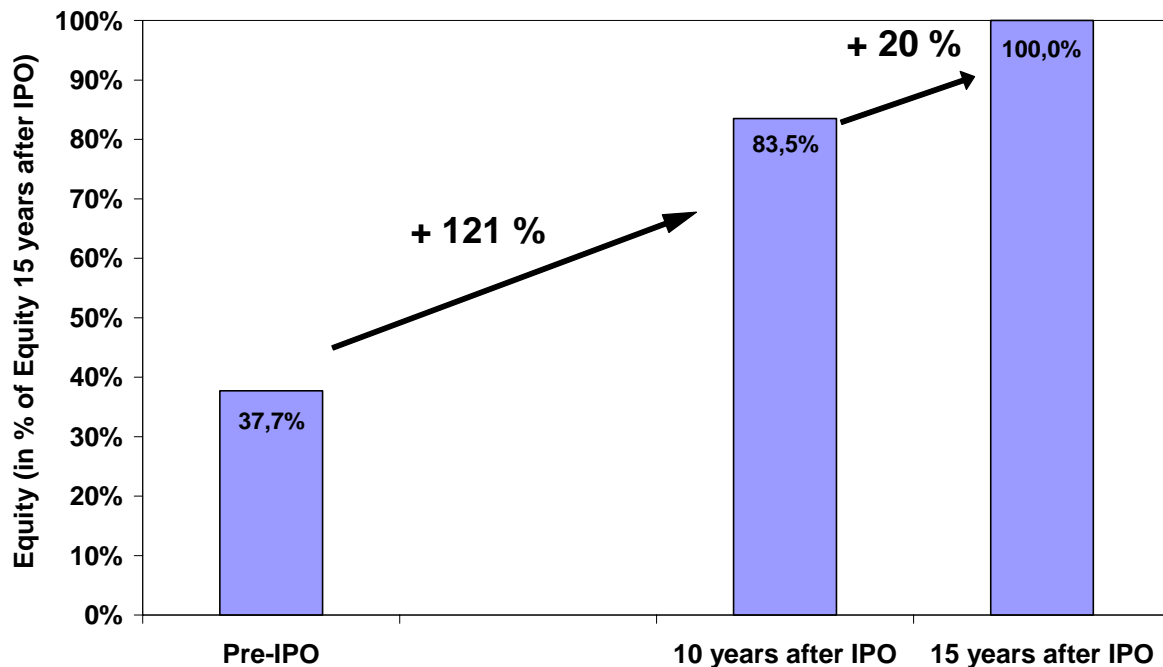
<sup>13</sup> Kaserer/Moldenhauer (2008).

<sup>14</sup> This finding is also supported by two studies focussing on newly listed firms: Ehrhardt/Nowak (2003), p. 229, show that the average rate of return over a period of 36 months after the IPO is 6.5% for companies in which the family still controls 25% to 75% of the voting rights. In contrast, the paper of Stehle/Ehrhardt/Przyborowsky (2000), pp. 173-196, shows that over the same post-IPO period the average rate of return of all German IPOs, including family and non-family firms was only -5.04%. Based on the t-values mentioned in both studies, it must be assumed that there is no statistically significant difference between these two findings. These findings support to consider newly listed and insider dominated firms in an index like the GEX<sup>®</sup>.

<sup>15</sup> Of course, the increase in equity can also be triggered by a restructuring of the liability side. But then the company is also in a special transition phase.

the transition from a purely owner-dominated entrepreneurial firm to an established public corporation takes place.

**Figure 1: Growth of equity of listed companies**



During this transition phase not only the capital structure but also the ownership structure of the firm frequently changes substantially. This development is not least triggered by the fact that shareholders on the management board do not fully participate in seasoned equity offerings for example because they want to achieve a better diversification of their private assets. As a consequence, external investors must subsequently contribute equity to the entrepreneurial firm. The analysis by Ehrhardt/Nowak (2003) of the IPOs of 105 family firms in Germany between January 1970 and December 1990 shows that the share of 98.2% held by the founding family before the IPO declines to 77.1% at the time of the IPO, to 57.9% five years later and to 40.4% ten years later.<sup>16</sup> At the same time, the equity share of new major shareholders rises to an average of 33% (17%) by the end of the ten-year (five-year) period.

These figures support that – at least with respect to family firms – there is indeed a substantial change in ownership structure within ten years after the IPO. Typically, the family has lost the majority of voting rights at the end of this period, and it has to deal with a new major shareholder who often has a blocking minority stake. In this respect, this period may well be described as a

<sup>16</sup> Ehrhardt/Nowak (2003), p. 227.



transition phase and used as a defining element of an entrepreneurial firm.<sup>17</sup> The findings of Fig. 1 further support limiting this transition phase to ten years, although this period is in fact arbitrary.

Completely giving up this criterion would naturally limit the representativeness of the GEX<sup>®</sup> with respect to the group of entrepreneurial firms. It should be noted that giving up the criterion of post-IPO age would mean that as of 30.12.2008, with BMW, Fresenius Medical Care, Henkel, Metro, SAP, Thyssenkrupp and Volkswagen, a total of seven DAX companies, would be additionally represented in the GEX<sup>®</sup>. Even given the present ceiling of 10% for the weight of an individual stock, these companies would greatly dominate the GEX<sup>®</sup>, so that it would no longer be an index of entrepreneurial firms.

### **3. Different functions of a stock index and assessment for GEX<sup>®</sup>**

As mentioned before, stock indices fulfill different functions: information, benchmark, trading and investment.<sup>18</sup>

The aggregation of individual price changes permits the market actors to get a quick overview of the market and to reduce their information costs. In this sense, the GEX<sup>®</sup> provides an overview of owner-managed, entrepreneurial firms in the German stock market which were hardly noticed in Germany before the introduction of the index.

In portfolio management, stock indices also assume a benchmarking function, serving as the reference portfolio for institutional investors pursuing an active investment strategy.<sup>19</sup> According to its design, the GEX<sup>®</sup> could also serve as a benchmark. Furthermore, management and investors of owner-managed companies that are not yet listed, could also make use of the performance of listed entrepreneurial firms as an important measure of comparison. Finally, it should be noted that the GEX<sup>®</sup> performance represents an important indicator of the present stock market environment of SMEs. Such an indicator could be important especially for private equity firms that want to sell their investments via an IPO. To illustrate the importance of the GEX<sup>®</sup> as a benchmark for private equity firms, we analyzed the ownership structure before and after the IPO for a sample of 63 GEX<sup>®</sup> firms based on the index composition after one year.<sup>20</sup> At that point of time almost half of the sample (28 firms or 44.4%) was financed by private equity firms before

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<sup>17</sup> It should be noted that besides ownership structure firm age can have a significant impact on corporate performance. In fact, Loderer and Waechli (2009) argue that corporate performance is decreasing in firm age. Based on a large database they show that in the U.S. comparatively young firms show the best corporate performance. Firms start underperforming the median industry firm roughly 37 years after their incorporation and fifteen years after their IPO. Thereby, performance is measured by Tobin's Q. Cf. Loderer and Waechli (2009).

<sup>18</sup> On the functions of stock indices see Schmitz-Esser (2001), pp. 15-98.

<sup>19</sup> On active and passive investment strategies see e.g. Bruns/Meyer-Bullerdiel (2001), pp. 104-126.

<sup>20</sup> See Kaserer/Achleitner/Moldenhauer/Ampenberger (2006).

the IPO. Since the performance of an index allows to draw conclusions on the current valuation at the capital market, the GEX<sup>®</sup> provides indications for the timing of an IPO.<sup>21</sup>

When the GEX<sup>®</sup> was introduced in January 2005, a trading function of the index was already considered as an opportunity to be developed, but was not clearly delineated from its information and benchmarking function. If it is taken into account that many indices have no direct trading function, this intention is in no way uncommon. In the context of the trading function, stock indices serve as the basis for derivatives by which the index portfolio, i.e. the stocks comprising the index, becomes tradable in a transaction.<sup>22</sup> Despite the original focus on the information and benchmarking functions, the first certificates and options based on the GEX<sup>®</sup> were offered and traded only two days after the GEX<sup>®</sup> was introduced and thus underline the trading function for the GEX<sup>®</sup> companies.<sup>23</sup>

For investors with a passive investment strategy stock indices serve as benchmark portfolios. In this context, stock indices assume an investment function. Even if the GEX<sup>®</sup> as reference index does not determine the investment decisions of institutional or private investors, the question poses itself to which extent entrepreneurial firms represent an asset class of their own<sup>24</sup> that helps investors diversify their risk and optimize their asset allocation.<sup>25</sup> In technical terms one can say that from the perspective of portfolio theory the formation of different asset classes only makes sense if the combination of N financial assets in the investment universe to  $K \leq N$  subgroups permits the same risk efficient portfolio combinations as a direct combination of the N financial assets.<sup>26</sup> This is only possible if there are linear dependencies among or linear combinations of the financial assets. Since such constellations occur at best in exceptional cases, the formation of asset classes is also accepted in practical asset allocation if diversification advantages are thereby lost. There is a trade-off between subdividing the investment universe into asset classes that reduce the degree of complexity of portfolio decisions and the transaction costs of an investment

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<sup>21</sup> For the analysis of the ownership structures before and after the IPO, the IPO prospectuses of the GEX<sup>®</sup> companies served as the source. These are only available publicly for present IPOs on the homepage of Deutsche Börse. Since no historical records must be kept, full coverage has not been possible. 90% of the IPOs in the sample took place in the boom years 1998, 1999 and 2000. 75% of the sample firms were initially listed in the Neue Markt. In the distribution by industry, the manufacturing industry (at 17.5% in the sample vs. 33.7% in the total set) is underrepresented, while the media (at 9.5% in the sample vs. 1.5% in the total set) are overrepresented. The sample could therefore have a selection bias regarding the industry.

<sup>22</sup> Particularly All Share indices, the category to which the GEX<sup>®</sup> belongs to as well as indices like the CDAX or the Technology All Share of Deutsche Börse, serve in the first place for measuring the development of all stocks of a segment or sub-segment without serving as underlying for financial products.

<sup>23</sup> On January 5, 2005, the Société Générale started with three GEX<sup>®</sup> options and one GEX<sup>®</sup> certificate followed by several more options and certificates with various issuers. As to our knowledge there are two options issued by Société Générale, three certificates by HSBC Trinkhaus and one certificate by each Société Générale and HVB available and tradable as of January, 2009.

<sup>24</sup> An asset class is comprised by assets which, on the one hand, have a homogenous risk-return profile vis-à-vis one another and, on the other hand, have a heterogeneous risk-return profile vis-à-vis other assets. See Bruns/Meyer/Bullerdiel (2003), p. 126.

<sup>25</sup> On risk diversification see the contributions on portfolio selection by Markowitz (1952), pp. 77-91, and Markowitz (1959). On asset allocation see e.g. Rudolph (2003), pp. 3-26.

<sup>26</sup> Huberman/Kandel (1987).

strategy on the one hand and small diversification disadvantages on the other hand. Against this background, two questions must be discussed: First, do entrepreneurial firms contribute notably to diversification and are thus entirely or in part contained in one of the K subgroups? If the answer is yes, then the next question is: is it appropriate to call entrepreneurial firms a separate asset class? Although we regard these questions mainly as avenues for further research both theoretically and empirically, we analyse the GEX<sup>®</sup> with respect to risk, return and correlation to several other indices of Deutsche Börse in section V.

### **III. Concept and construction of the GEX<sup>®</sup>**

For the construction of the GEX<sup>®</sup>, the problem to be solved is to distinguish the relevant firms (owner-managed as described in Section II, during their transition phase to becoming established listed companies) from the other listed companies. A sub-market – that of the entrepreneurial firms – is to be defined with the help of the five criteria described below. The technical aspects of the GEX<sup>®</sup>, i.e. its calculation as well as the rules on chaining and to enter and exit the index, are only considered in passing, since they can be found in detail online at the Deutsche Börse homepage.<sup>27</sup>

#### **1. The five selection criteria of the GEX<sup>®</sup>**

The novelty of the GEX<sup>®</sup> is primarily based on its particular selection criteria. There are two major criteria (owner dominance and post-IPO age) and three minor criteria (minimum liquidity, Prime Standard listing, German headquarters) to define a firm as an entrepreneurial firm and thus being eligible to become a GEX<sup>®</sup> constituent.

##### **a) Owner dominance**

A company is owner dominated according to the GEX<sup>®</sup> definition if the so-called GEX<sup>®</sup>-relevant share of common stock amounts to at least 25%.

- GEX<sup>®</sup>-relevant share: This is the cumulated share ownership of the GEX<sup>®</sup>-relevant group of persons in the voting stock of a company. The group includes the active members of the management board (and their families), active members of the supervisory board (and their families) as well as former members of the management and supervisory boards

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<sup>27</sup> On the technical details of index calculation, Deutsche Börse publishes so-called index guidelines that describe the calculation of the indices as well as the procedures regarding special events like dividends, equity increases and reductions see Deutsche Börse, Leitfaden zu den Aktienindizes der Deutschen Börse, [http://deutsche-boerse.com/dbag/dispatch/de/binary/gdb\\_content\\_pool/imported\\_files/public\\_files/10\\_downloads/50\\_informations\\_services/30\\_Indices\\_Index\\_Licensing/21\\_guidelines/10\\_share\\_indices/equity\\_indices\\_guide.pdf](http://deutsche-boerse.com/dbag/dispatch/de/binary/gdb_content_pool/imported_files/public_files/10_downloads/50_informations_services/30_Indices_Index_Licensing/21_guidelines/10_share_indices/equity_indices_guide.pdf) (as of January 1, 2009).

(and their families).<sup>28</sup> It also includes indirect equity holdings of the above mentioned groups and imputed shares. In this context, shares are imputed if an owner-dominated firm owns at least 30% of shares in another firm.<sup>29</sup> The decision to include, besides active board members, also former members of the organization and family members is supported by the observation that former members of the organization still have substantial influence on “their” company after departure and the shares – not least for tax purposes – are often in part transferred to family members.

- The 25% minimum threshold: The absolute size of the required GEX<sup>®</sup>-relevant share cannot be conclusively explained theoretically. Requiring 25% is justified by the fact that 25% of voting rights suffice to block certain company decisions (e.g. alteration of the statutes according to § 179, Section 2 AktG) and de facto – if account is taken of the fact that as a rule only 60% of the voting capital is represented at the general meeting<sup>30</sup> – also guarantee a substantial controlling influence on the company. Sensitivity analyses of the empirical data show that variations by five percentage points around the basis value of 25% result in only relatively small changes in the number of firms fulfilling this criterion.

To determine the GEX<sup>®</sup>-relevant share, only publicly available information is used on the composition of the shareholders and of the company boards of all German corporations listed in the Prime Standard.<sup>31</sup>

## **b) Maximum post-IPO age**

The ten-year ceiling regarding the post-IPO age refers to the initial quotation of the common stock, as no transition to a public corporation takes place by the mere issue of preferred stock and the growth potential remains limited.<sup>32</sup> In addition, the “relevant” IPO age is considered that may diverge from the true IPO date of the company.<sup>33</sup>

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<sup>28</sup> Germany has a two-tier board structure in its corporate governance system. It consists of a management board and a supervisory board (so called Vorstand and Aufsichtsrat) whereas the latter one consists of shareholder and employee representatives. While the management board is responsible for the decisions concerning the daily business, the supervisory board is responsible for appointing the members of the management board and for monitoring them. For further information on this, see Goergen/Manjon/Renneboog (2004), p. 13 ff.

<sup>29</sup> Example: Executives of company A together own 20% and company B holds 50% in company A. The rest, i.e. 30% is free-float. 60% of company B belong to the chairman of the supervisory board of company B. In this case, the GEX<sup>®</sup>-relevant share of company A amounts to 50% (= 20% + (60% x 50%)). The 30% ownership threshold was determined by § 35, Section 2 WpÜG, that prescribes the mandatory preparation and publication of an acquisition offer if the marginal limit is exceeded.

<sup>30</sup> Research by Baums/Fraune is based on a 1992 study of general meetings of the 24 biggest German corporations. See Baums/Fraune (1995), pp. 97 ff.

<sup>31</sup> On the particularities and on the suitability of these data sources regarding the composition of German shareholders see Bott (2002), pp. 172-240.

<sup>32</sup> According to § 139 Section 2 AktG, preferred stock may be issued at the nominal value of the common stock at a maximum.

<sup>33</sup> If, for example, a firm chooses to be listed via the acquisition of an empty corporate shell, the point in time at which the active firm is entered into the shell is considered the relevant IPO date. The merger of two companies (of which at least one is already listed) into a newly founded company means that the IPO date of the already listed (dominant) company is used as the relevant date.

### **c) Minimum liquidity**

The introduction of the first minor criterion “minimum liquidity” serves to filter out those firms that do fulfil the two major criteria but do not fit the type of entrepreneurial firm described. Companies that are almost exclusively in the hands of the GEX<sup>®</sup>-relevant group of persons do not, as a rule, enter a very expansive growth phase, as the sale of minority shares can only result in a limited injection of equity capital, or they rely primarily on other kinds of capital (e.g. debt). The ceiling for the maximum permitted GEX<sup>®</sup>-relevant share is fixed at a flat 75%.<sup>34</sup> Here, sensitivity analyses show that variations by five percentage points around the threshold value of 75% cause only relatively small changes in the number of firms fulfilling this criterion.

It should further be noted that this criterion also plays an important part in connection with the theoretical remarks of Section II.1. There it was pointed out that an increase in the share ownership of company executives can have negative results if it causes a majority/minority shareholder conflict. The latter may certainly be expected if the majority shareholder owns shares that exceed the blocking minority threshold of 25%. Additionally, according to German stock corporation law, a super majority level of 75% is required to change a firm’s charter.<sup>35</sup> Therefore, this ceiling also makes sense from this point of view.

### **d) Prime Standard listing**

The second minor criterion requires that the common stock of a GEX<sup>®</sup> company is listed in the Prime Standard of the Frankfurt stock exchange. To highlight the implications of this restriction we would like to give some background information on the stock market segmentation in Germany. In a first step, the German stock market can be divided into the regulated unofficial market (Open Market) which captures all listings regulated by the stock operators itself and the official market legally regulated by the European Union. The latter one in turn is divided into two market segments which differ in terms of transparency requirements by Deutsche Börse: The General Standard with lower transparency requirements and the Prime Standard with higher

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<sup>34</sup> In addition, companies, which are shortly to be delisted or squeezed out by an owner-dominated parent company, are not to be included in the GEX<sup>®</sup>. This is to guarantee the ability to invest in firms contained in the GEX<sup>®</sup>. Since this criterion is to safeguard a certain minimum liquidity, the directly held share as well as the calculated share must be below the 75% ceiling.

<sup>35</sup> Thresholds exceeding 75% are also called a ‘qualified’ majority. See Gorton/Schmid (2000), p.31, or Becht/Röll (1999), p. 1055.

transparency requirements.<sup>36</sup> The restriction of GEX<sup>®</sup> companies to be listed in the Prime Standard is explained as follows:

- Shareholder composition data are available from various sources in Germany.<sup>37</sup> Comparing these reveals in part substantial differences that cannot always be explained by further research. Because of their higher visibility, Prime Standard companies have better quality data than General Standard companies.
- The transparency requirements for listed companies are highest in the Prime Standard. By limiting GEX<sup>®</sup> companies to those in the Prime Standard, it is emphasized that these are companies for which investors benefit from the advantages of highest listing and transparency requirements.

### e) German headquarters

As the third and last minor criterion, all GEX<sup>®</sup> companies must have their headquarters in Germany. This geographic restriction is chosen because it is the performance of entrepreneurial firms headquartered in Germany that is to be presented. This corresponds to the geographic delineation chosen, for example, by Deutsche Börse for the DAX.

## 2. Calculating the GEX<sup>®</sup>

For the GEX<sup>®</sup>, as for all stock indices of Deutsche Börse, the weight of the individual stock in the index is determined by their market capitalization, with only the free-float share counting, i.e. the share of freely tradable stocks<sup>38</sup>. Furthermore, the weight of a single stock is limited to a maximum of 10%. As index formula for calculation at time  $t$ , a quarterly chained Laspeyres formula is used

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<sup>36</sup> Firms in the General Standard have to fulfil the minimum requirements for EU-regulated markets, such as IFRS-reporting, disclosure of director dealings, ad hoc disclosure, compliance with disclosure of ownership stakes beyond legally defined control thresholds according to Wertpapierhandelsgesetz (*WpHG*) or compliance with mandatory takeover-bid rules according to Wertpapiererwerbs- und Übernahmegesetz (*WpÜG*). In addition to these minimum requirements, Prime Standard firms are, for example, required to report company news in English language, publish quarterly reports in German and English language, record a company calendar in the internet and organise at least one analyst conference per year. For further information on the German stock market segments as well as its different legal transparency requirements, refer to the online publication by Deutsche Börse, General und Prime Standard – Zugang zum europäischen Kapitalmarkt, [http://deutsche-boerse.com/dbag/dispatch/de/binary/gdb\\_content\\_pool/imported\\_files/public\\_files/10\\_downloads/33\\_guing\\_being\\_public/40\\_stock\\_market\\_segmentation/sm\\_rcm\\_broschuere.pdf](http://deutsche-boerse.com/dbag/dispatch/de/binary/gdb_content_pool/imported_files/public_files/10_downloads/33_guing_being_public/40_stock_market_segmentation/sm_rcm_broschuere.pdf) (as of January 1, 2009).

<sup>37</sup> Besides the database on important voting right shares, run by the Federal Financial Services Supervisory Authority (Bafin), based on the statutory provisions of § 21 ff. *WpHG*, information on shareholder composition is also offered by private providers (e.g. Hoppenstedt Aktienführer). Furthermore, some annual reports also contain data on shareholder composition, albeit in very different amount of detail.

<sup>38</sup> The free-float share is calculated as the difference between total shares and those owned by major stockholders. On the definition of free float see Deutsche Börse online publication cited in fn 25, p. 14 f.

$$Index_t = K_T \times \frac{\sum_{i=1}^n P_{it} \times q_{iT} \times ff_{iT} \times c_{it}}{\sum_{i=1}^n P_{i0} \times q_{i0}} \times Basis$$

where  $K_T$  is the index specific chaining factor from time  $T$ ,  $T$  is the time of the previous chaining,  $P_{it}$  (or  $p_{i0}$ ) is the price of stock  $i$  at time  $t$  (or the final price of stock  $i$  on the trading day before the first trading inclusion in an index),  $q_{iT}$  (or  $q_{i0}$ ) is the number of underlying stocks of company  $i$  at time  $T$  (or the number of stocks of company  $i$  on the trading day before the first trading inclusion in an index),  $ff_{iT}$  is the free-float factor of type  $i$  at time  $T$ ,  $c_{it}$  are the present correction factors of company  $i$  at time  $t$ ,  $n$  is the number of stocks in the index and on base 1000, which for the GEX<sup>®</sup> was set at July 7, 2004.

The GEX<sup>®</sup> is calculated as a performance and as a price index. Whereas the former measures performance in terms of total return, i.e. potential income from dividend and premium payments are reinvested in the index portfolio (“operation blanche”), the latter calculates the true price changes, only taking account of corrections for income from stock purchase warrants and special payments. The technical GEX<sup>®</sup> regulations (e.g. regarding exactness of the calculations, adjustments, capital increases and reductions, readjustments of the nominal value, etc.) correspond to the regulations for the other indices of Deutsche Börse and are therefore not considered in detail here.<sup>39</sup>

### 3. Updatings and chaining rules

Usually, the composition of selection indices is readjusted in regular intervals, quarterly in the case of the selection indices of Deutsche Börse, in order to guarantee that the index fulfils e.g. its information function with an always representative index portfolio. The readjustment is combined with a chaining<sup>40</sup> in the respective index formula and is done at the DAX futures expiry dates (the third Friday of the end-of-the-quarter month). In contrast, for benchmark indices the readjustments are done at the end of each day, as the number of companies in the index is not restricted.

The composition of the GEX<sup>®</sup> is adjusted only quarterly corresponding to the selection indices. This restriction is necessary because the criteria (see Section IV.2) cannot be reviewed on a daily basis. Instead, whether index and non-index companies are fulfilling the GEX<sup>®</sup> criteria is checked on a key date that is about seven weeks before the next chaining date. Since the GEX<sup>®</sup> criteria refer to dynamic company characteristics (ownership structure and age), there is a continuous need for readjustment. Here, the hybrid character of the GEX<sup>®</sup> becomes evident: On the one hand the number of stocks is not limited (analogously to the benchmark indices), on the other hand readjustments are done only quarterly at known dates (analogously to selection

<sup>39</sup> Deutsche Börse online publication cited in fn 25, pp. 31-39.

<sup>40</sup> Deutsche Börse online publication cited in fn 25, pp. 39-41.

indices). The continuity and transparency of the index composition, which is thus guaranteed, lets the range of usage exceed the pure information and benchmarking function.

#### **4. The German index family of Deutsche Börse**

##### **Selection and benchmark indices**

In its role as market organizer of security trading, Deutsche Börse calculates selection as well as benchmark stock indices. Besides the well known DAX, MDAX, SDAX and TecDAX (so-called selection indices), it also calculates expanded selection indices (such as HDAX and MID-CAP-Market index) and all-share or benchmark indices (such as CDAX, Prime, Technology, and Classic All-Share). In the selection indices, the number of index members is limited in order to guarantee a high degree of tradability. Benchmark indices do not limit the number of index members and therefore measure, on a broad base, the performance of a market (e.g. CDAX), of a segment (e.g. Prime All Share) or of a partial segment (e.g. GEX<sup>®</sup>).

##### **Fitting the GEX<sup>®</sup> into the index landscape of Deutsche Börse**

By definition, selection indices only represent samples of the entire set of listed firms. The selection procedure is therefore of prime importance. Selected are the biggest corporations of a market (e.g. in the DAX the 30 biggest companies of the classical and technology industries) or sub-markets (e.g. in the MDAX the 50 biggest companies of the classical industries below the DAX), according to their market capitalization and the size of their order books. It should be noted that the selection – aside from the industry division – is done purely according to size, which is to be considered endogenous to the trading. In contrast, the benchmark indices are divided into 18 industries or two branches of industries, respectively (i.e. classical and technological). There is no further selection of index members.

In the GEX<sup>®</sup>, criteria of owner dominance and post-IPO age are defined as index-relevant for the first time. Thus, firm-specific characteristics, which are not revealed by the listing as such, are used in the construction of an index for the first time. Because of this special feature the development of the criteria as well as the regular examination of the composition of the index are done every quarter by the Center for Entrepreneurial and Financial Studies (CEFS) at the Technische Universität München as an independent scientific institution. The use of qualitative characteristics is necessary in order to filter out the so-called entrepreneurial firms (see Section II) from the entire set of listed companies. Thus, the GEX<sup>®</sup> is a hybrid between a selection and a benchmark index: On the one hand, the relevant total set is limited in a selection process with the help of qualitative criteria, on the other hand, all companies that fulfil the criteria are included in the GEX<sup>®</sup>.<sup>41</sup> The following section now shows characteristics of listed entrepreneurial firms in the index and how the index composition has changed over time.

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<sup>41</sup> Examples of other share indices containing qualitative selection criteria are the Sustainability indices and Islamic Market indices published by Dow Jones.



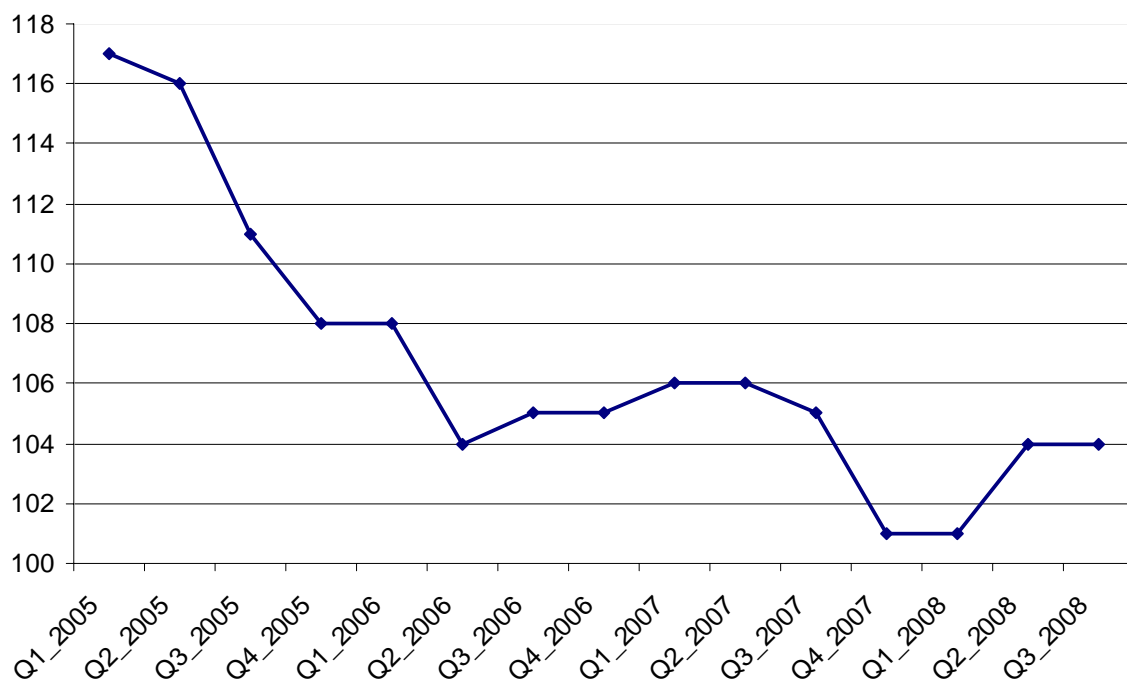
## IV. Changes in the index composition over time

This section shows how the GEX<sup>®</sup> index composition has developed over time in the first four years of its existence. Thereby, we refer to the time horizon in this section between January 3, 2005, and June 24, 2008: the date of index inception and the latest reference point of the analysis in this section, shortly after the re-weighting of the index for Q3 2008. Hence, if we use the terms Q1 2005 and Q3 2008, we refer to the starting of points of the respective quarter.<sup>42</sup>

### 1. Number of entries and exits

During the four years of existence of the index there have been cumulative 56 entries and 69 exits of constituents. This led to an absolute decrease of the number of constituents from 117 down to 104. Figure 3 even confirms a steady decrease quarter over quarter. This fact gives rise to the question what is driving this development.

**Figure 3: Total number of GEX<sup>®</sup> constituents since index inception (Q1 2005 – Q3 2008)**



A split of the total numbers mentioned above shows that the main reason for entries was 29 new IPOs in the German Prime Standard relevant for the GEX<sup>®</sup>, representing about 52% of total GEX<sup>®</sup> entries. This is followed by 17 (about 30%) entries due to changes in the GEX<sup>®</sup> relevant

<sup>42</sup> For the exact dates of the quarterly re-weightings of the index see Deutsche Börse, *Leitfaden zum German Entrepreneurial Index GEX der Deutschen Börse*, [http://deutsche-boerse.com/dbag/dispatch/de/binary/gdb\\_content\\_pool/imported\\_files/public\\_files/10\\_downloads/50\\_informations\\_services/30\\_Indices\\_Index\\_Licensing/21\\_guidelines/10\\_share\\_indices/gex\\_guide.pdf](http://deutsche-boerse.com/dbag/dispatch/de/binary/gdb_content_pool/imported_files/public_files/10_downloads/50_informations_services/30_Indices_Index_Licensing/21_guidelines/10_share_indices/gex_guide.pdf) (as of January 1, 2009).

shareholder structure and 12 entries (about 21%) due to transfers into the German Prime Standard.<sup>43</sup>

The main reason for its exits was 51 (about 74% of all exits) companies of which their GEX<sup>®</sup>-relevant share dropped below the minimum 25% or exceeded the maximum 75% threshold. This is followed by 11 (about 16% of total exits) exits due to exceeding the post-IPO age of 10 years.<sup>44</sup>

These statistics show that the main driver for GEX<sup>®</sup> entries since its inception was new IPOs and less so changes in the owner dominated share or transfers into the Prime Standard. This is opposite to the main reasons for GEX<sup>®</sup> exits. Most of the exits were driven by non-fulfillment of the GEX<sup>®</sup>-relevant owner dominance criterion rather than by non-fulfillment of the maximum post-IPO age of ten years. Simulations have shown that a continuing lack of new IPOs in the German Prime Standard would ceteris paribus represent a major reason for a further decreasing number of GEX<sup>®</sup> constituents.

A possible indication on the future development of the German IPO market is the IPO-Sentiment-Indicator (ISI).<sup>45</sup> The value of December 2008 is the second-lowest since inception of the indicator in March 2005 and thus gives no reason to assume a more active primary market in Germany within the near future. Another reason besides fewer IPOs – a declining number of GEX<sup>®</sup> constituents – is shown by a more detailed analysis of the constituents' post-IPO age.

## 2. Post-IPO age

Figure 4a) clearly shows that the average post-IPO age of the GEX<sup>®</sup> constituents has continuously increased since inception of the index. This is due to a changing cross-section distribution of constituents over their post-IPO age shown in figure 4 b).

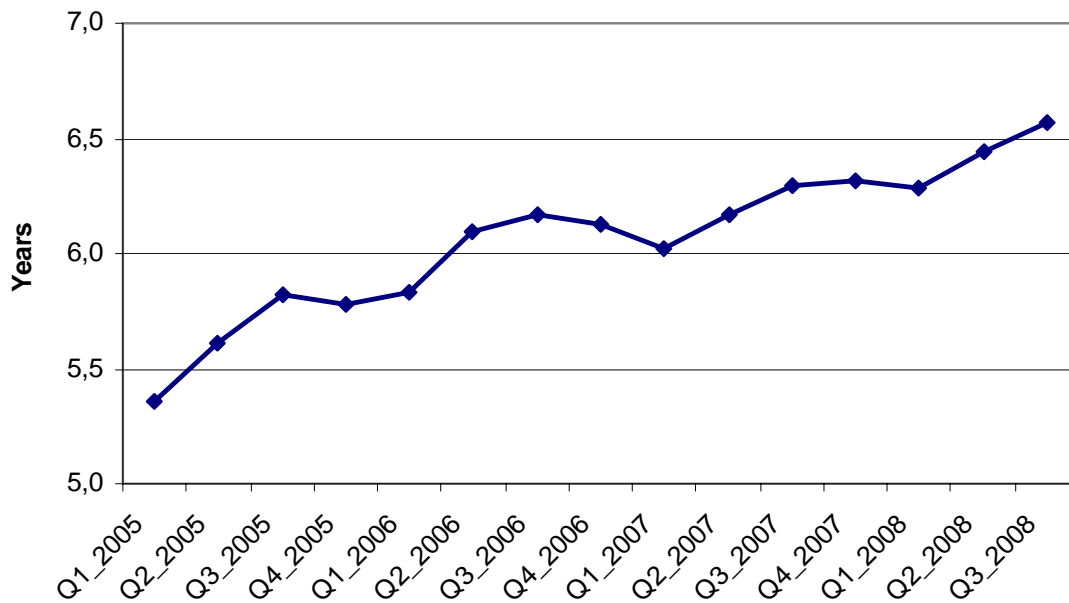
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<sup>43</sup> Two entries were due to adjustments of the GEX<sup>®</sup>-relevant IPO date in Q2 2005: for the Fielmann AG from the IPO date of its preferred stocks to the IPO date of its common stocks, for the Marseille-Kliniken AG from the IPO date of its acquired corporate shell to the first day of being listed as Marseille-Kliniken AG. For details on this issue see fn. 35,

<sup>44</sup> One exit was due to a delisting in Q2 2006.

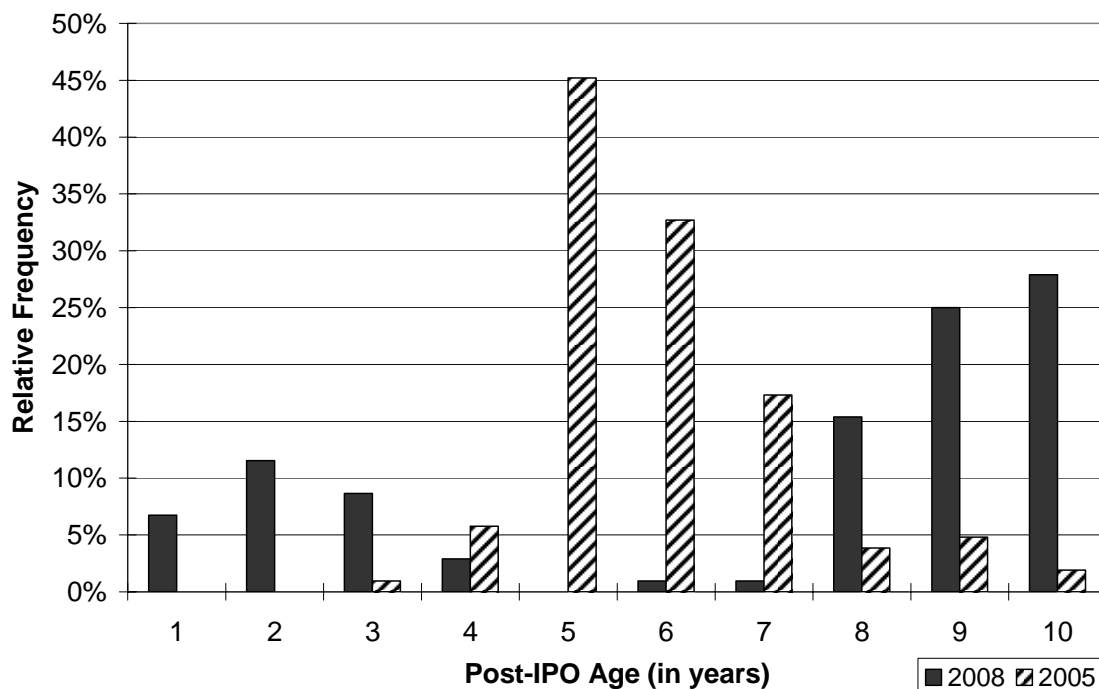
<sup>45</sup> The ISI is a mood barometer for the primary market developed by Deutsche Börse joint with Prof. Kaserer (CEFS). It consists of two components, namely the IPO climate and the perceived underpricing. It is published quarterly and expressed in a point value. For further information see [http://deutsche-boerse.com/dbag/dispatch/de/kir/gdb\\_navigation/listing/20\\_Going\\_Public/03\\_I-POint/59\\_IPO\\_Sentiment](http://deutsche-boerse.com/dbag/dispatch/de/kir/gdb_navigation/listing/20_Going_Public/03_I-POint/59_IPO_Sentiment) (as of January 1, 2009).

**Figure 4a): Average post-IPO age since index inception (Q1 2005 – Q3 2008)**



**Figure 4b):**

**Cross-section distribution of GEX<sup>®</sup> constituents' post-IPO age in Q3 2005 and Q3 2008<sup>46</sup>**



Whereas in 2005 more than 75% of all GEX<sup>®</sup> firms have an IPO age between five and six years, the distribution becomes more left-skewed over time. In fact, in 2008 more than 65% of the constituents are listed for at least eight years. Germany experienced a boom period of IPO activity during 1998 and 2000 when many firms went public at the so called ‘Neuer Markt’ – a

<sup>46</sup> Q3 2005 refers to the index weighting as of June 24, 2005, Q3 2008 refers to the index weighting as of June 24, 2008.

special market segment for high-technology companies.<sup>47</sup> Not surprisingly, the majority of GEX<sup>®</sup> firms went public during this booming IPO-period. Hence, many GEX<sup>®</sup> companies with a post-IPO age of 5 to 7 years in 2005 continue to be index members through 2008. They still represent the major part of GEX<sup>®</sup> constituents three years later – now with a post-IPO age ranging between 8 and 10 years.

In general, the distribution of post-IPO age is related to the cyclical nature of stock exchange activity.<sup>48</sup> The fact that the GEX<sup>®</sup> hardly contains any firms with a post-IPO age of 5 to 7 years is partly due to an almost inactive German IPO-market in the years following the burst of the high-tech bubble (in the years 2002 and 2003).<sup>49</sup> About 25% of all GEX<sup>®</sup> firms have a post-IPO age of one to four years in 2008 and reflect the more active IPO market in the German regulated market between the four years 2004 and 2007 with a total number of 91 IPOs during that time frame. In contrast within the four years of 1998 through 2001 before the burst of the high-tech bubble there were a total number of 494 IPOs which underlines the cyclicity of stock markets.<sup>50</sup>

The fact that the absolute level of IPO-activity is low relative to other countries is related to the financial system and corporate governance in Germany. The German stock market can be seen as a rather underdeveloped market compared to other ones, especially the Anglo-American stock markets. In this context Morck/Steier (2003) also refer to the German corporate governance system as bank capitalism in contrast to shareholder, family or state capitalism observed in other countries.<sup>51</sup> The reason for this is that German firms are historically more bank financed than firms e.g. in the US. These two countries can even be considered as the two extremes of bank oriented vs. capital market oriented financial systems.<sup>52</sup> Numerically this is underlined by a market capitalization relative to the GDP of only 67.8% in Germany and 181.8% in the US. But even within Europe the German level of market capitalization is low compared to France (103%) and the UK (203.4%).<sup>53</sup> The low level of market capitalization is also reflected in the absolute number of IPOs within Europe. A study by Kaserer/Schiereck (2008)<sup>54</sup> compares the IPO activity of the three major European stock exchanges, Deutsche Börse, Euronext and London Stock Exchange between 01.01.2005 and 31.03.2008. The authors show that the EUR 18.69bn raised

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<sup>47</sup> The public statistics by Deutsche Börse report 84 IPOs in 1998, 204 IPOs in 1999 and 179 IPOs in 2000 for the whole German regulated market (Regulierter Markt).

<sup>48</sup> It is a well-known fact that stock market activity – both for initial and seasoned public offerings – is highly cyclical, see. e.g. Bayless and Chaplinsky (1996) or Lowry and Schwert (2002).

<sup>49</sup> The public statistics by Deutsche Börse report 7 IPOs in 2002 and 1 IPO in 2003 for the whole German regulated market.

<sup>50</sup> The public statistics by Deutsche Börse are reported for the whole German regulated market which is equivalent to the then introduced General and Prime Standard since 2003.

<sup>51</sup> Morck/Steier (2003), pp. 5 ff.

<sup>52</sup> Antoniou/Guney/Paudyal (2009), pp. 5 f.

<sup>53</sup> The data are from 1999 collected by the World Bank, see also Antoniou/Guney/Paudyal (2009), p. 31.

<sup>54</sup> Kaserer/Schiereck (2008), p.16

through 135 IPOs at Deutsche Börse<sup>55</sup> were by far outnumbered by EUR 40.975bn (EUR 55.752bn) through 206 (183) transactions at Euronext (London Stock Exchange).

Summing up for the case of the GEX<sup>®</sup> index, the stock exchange development might give some explanation for the level of IPOs in Germany relevant for GEX<sup>®</sup> entries. As for the GEX<sup>®</sup> exits, the look at the post-IPO age of the GEX<sup>®</sup> constituents shows that ceteris paribus within the next 3 years 65% of the current GEX<sup>®</sup> constituents will exit the index due to non-fulfillment of the 10 years post-IPO criterion. A full compensation for this through new GEX<sup>®</sup>-relevant IPOs – the reason for most of the new entries so far – would be unlikely given the historical levels of new IPOs in Germany as well as the current market outlook.

### **3. Concentration data and industry weightings**

In contrast to the average post-IPO age, the index concentration in terms of market capitalization of constituents has been almost unchanged between 2005 and 2008: Nevertheless, in comparison to all other main stock indices in Germany, the GEX<sup>®</sup> remains the index with the highest degree of concentration.<sup>56</sup> This concentration shows that the largest share of market capitalization in the index is accumulated on a few large entities, besides many relatively small companies contained in the index. This underlines the goal of the index to capture entrepreneurial firms within the first 10 years after its IPO. By nature, owner-dominated firms are usually smaller in terms of market capitalization than widely held firms so that large companies such as the German multinational software company SAP are rather the exception than the rule within the German Entrepreneurial Index.

**Insert Figure 5 about here.**

Although the concentration in terms of size remained basically unchanged between 2005 and 2008, there can be seen a clear change in terms of the index industry weightings. The sector Industrial<sup>57</sup> gained weighting from about 30% to about 45%. Whereas in 2005 the second to sixth largest sectors in terms of index weighting summed up to about 63% of the index weighting, they

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<sup>55</sup> In this study Kaserer/Schiereck have counted all IPOs (including issues declared as a mix of an IPO and a placing) - occurred within this timeframe. The numbers are aggregated for the small and large cap market, which in the case of Deutsche Börse corresponds to the Open Market and Entry Standard as well as the Prime / General Standard.

<sup>56</sup> These indices are DAX containing 30 blue chips, MDAX containing 50 midcaps, SDAX containing 50 smallcaps and TecDAX containing 30 Technology midcaps. All of these indices including the GEX<sup>®</sup> are contained in the German Prime Standard segment. On the Prime Standard listing refer to section III.1.d), for further information on the German indices mentioned, see Deutsche Börse, Short Information to the Equity- and Strategy Indices of Deutsche Börse [http://deutsche-boerse.com/dbag/dispatch/de/binary/gdb\\_content\\_pool/imported\\_files/public\\_files/10\\_downloads/50\\_informations\\_services/30\\_Indices\\_Index\\_Licensing/21\\_guidelines/10\\_share\\_indices/equity\\_indices\\_info.pdf](http://deutsche-boerse.com/dbag/dispatch/de/binary/gdb_content_pool/imported_files/public_files/10_downloads/50_informations_services/30_Indices_Index_Licensing/21_guidelines/10_share_indices/equity_indices_info.pdf) (as of January 1, 2009).

<sup>57</sup> The sector classification used here follows the classification by Deutsche Börse. For further information see Deutsche Börse, Leitfaden zu den Aktienindizes der Deutschen Börse, p. 44 – 46, [http://deutsche-boerse.com/dbag/dispatch/de/binary/gdb\\_content\\_pool/imported\\_files/public\\_files/10\\_downloads/50\\_informations\\_services/30\\_Indices\\_Index\\_Licensing/21\\_guidelines/10\\_share\\_indices/equity\\_indices\\_guid\\_e.pdf](http://deutsche-boerse.com/dbag/dispatch/de/binary/gdb_content_pool/imported_files/public_files/10_downloads/50_informations_services/30_Indices_Index_Licensing/21_guidelines/10_share_indices/equity_indices_guid_e.pdf) (as of January 1, 2009).

sum up to about 46% in 2008 losing their weighting in favor of the Industrial sector. This shows the increasing concentration of GEX<sup>®</sup> constituents on the sector Industrial between 2005 and 2008.

**Insert Figure 6 about here.**

It should be stated though, that the German economy as a whole is dominated by automotive manufacturers and connected industries which are part of the sector Industrial. Since this sector also includes additional sub-sectors which range from Containers & Packaging to Industrial Machinery and Renewable Energies as defined by Deutsche Börse,<sup>58</sup> the GEX<sup>®</sup> cross-section distribution as shown here is not surprising in a German All Share index with respect to the German industry structure as stated above. This trend towards an increasing weighting of the sector Industrial within the GEX<sup>®</sup> is also displayed in the overall IPO statistic provided by Kaserer/Schiereck (2008). They show that the largest IPO volume in the overall German market occurred in the Industrial Goods & Services and Chemicals sector during 2005 and 2008.<sup>59</sup> As stated before, new IPOs count for most of the constituents' entries into the GEX<sup>®</sup> and thus are one driving factor for an increasing index concentration on the sector Industrial which most of the IPOs stem from.

Kaserer/Schiereck (2008) also show that during that time frame about 98% of the equity volume raised in the sub-sector Alternative Energies<sup>60</sup> aggregated from the major European stock exchanges Deutsche Börse, Euronext and London Stock Exchange has been raised at the German Deutsche Börse amounting altogether to EUR 1.5bn.<sup>61</sup> This underlines the importance of alternative energy as a newly established growth industry in Germany. A prominent example from the sector Industrial and sub-sector Renewable Energies and contained in the GEX<sup>®</sup> is the Solarworld AG with an index weighting of about 10% and a market capitalization of about EUR 1.96bn as of 24.06.2008. The manufacturer in the field of solar technology was founded in 1998 and today employs more than 2,000 people worldwide. The production covers the whole supply chain of solar modules from production to sales of the commodity silicon to turnkey solar modules. Within the sector Chemicals, Wacker Chemie AG is a prominent example. It is a manufacturer in the fields of semiconductors, silicon and special chemicals as well as biotechnology. It has plants in Germany, the US and Asia. In the GEX<sup>®</sup> it has an index weighting of about 10%. An example from the sector Software is the Software AG which was founded in 1969 and is offering business software solutions. It currently employs 3,600 employees in 70

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<sup>58</sup> The sector Industrial includes the following sub-sectors: Advanced Industrial Equipment, Containers & Packaging, Heavy Machinery, Industrial Machinery, Industrial Diversified, Renewable Energies, Industrial Products & Services.

<sup>59</sup> Kaserer/Schiereck (2008), p. 17 f.; the sector classification here follows ICB classification ([www.icbbenchmark.com](http://www.icbbenchmark.com)), whereas figure 6 uses the Deutsche Börse classification (see page 18 for more information on this classification). Although not identical, we think that both classifications are similar enough to be compared to each other.

<sup>60</sup> The sector Alternative Energies is comprised by the sub-sectors Renewable Energy Equipment (0583) and Alternative Fuels (0587) according to the ICB classification.

<sup>61</sup> Kaserer / Schiereck (2008), p. 18.

countries and had a turnover of EUR 621mn in 2007. It is represented in the GEX<sup>®</sup> with a weighting of 6.9%. An example of the sector Retail is represented by the Fielmann AG. It manufactures glasses and runs its own branch network through which it is market leader in terms of sales of optical devices in Germany. In 2007 the group employed around 11,900 employees and yielded a turnover of EUR 839mn. Currently it has a GEX<sup>®</sup> index weight of about 5%. KWS Saat AG is a smaller company out of the sector Industrial and sub-sector Industrial Products & Services. Despite its recent IPO this company has a long history being founded in 1856. Today it is specialized on the cultivation and development of crop and grain seeds. As one of the smaller GEX<sup>®</sup> companies it has an index weighting of 2.8%

**4. Average GEX<sup>®</sup>-relevant share**

The GEX<sup>®</sup>-relevant share, one of the GEX<sup>®</sup> criteria mentioned in section III 1a), is also connected to the German corporate governance system. As for the index, the 25% minimum and 75% maximum threshold of the GEX<sup>®</sup>-relevant share are the boundaries for a company to fulfill the GEX<sup>®</sup> criteria. By nature, if calculating a cross-sectional average of GEX<sup>®</sup>-relevant shares over all GEX<sup>®</sup> constituents, this average lies within this range at each point of time. Figure 7 shows, that this has been the case at a relatively high level of between 45% and 50%.

**Figure 7: Average total GEX<sup>®</sup>-relevant share (Q1 2005 – Q3 2008)**

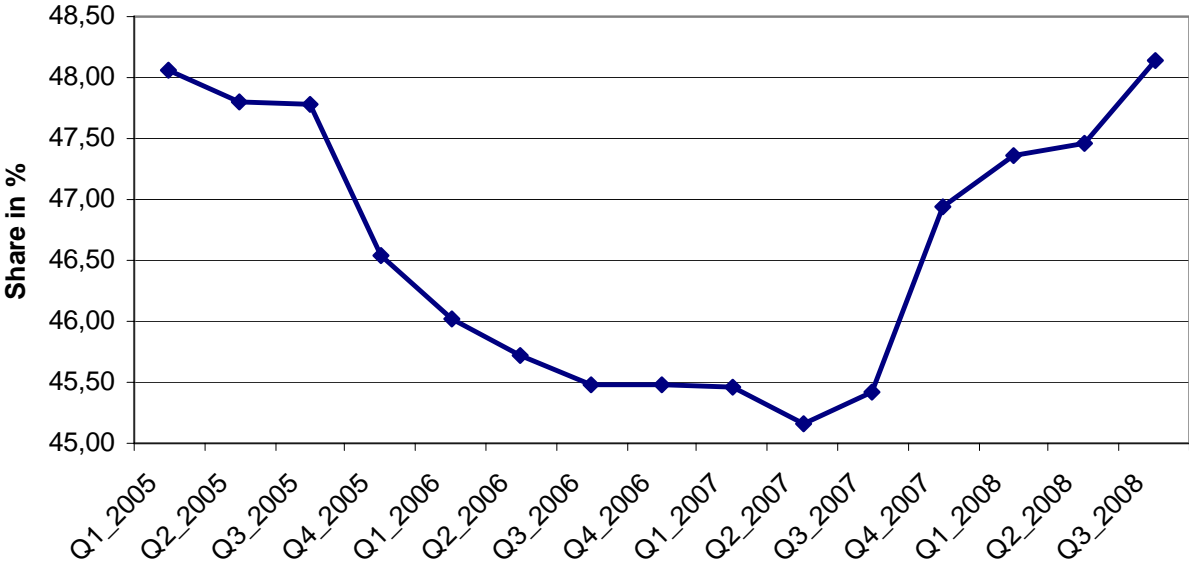


Figure 8 compares the cross-sectional distribution of the GEX<sup>®</sup>-relevant share of the GEX<sup>®</sup> constituents in Q3 2005 and Q3 2008. It shows that at both points of time the whole range of the GEX<sup>®</sup>-relevant ownership share between 25% and 75% is covered as well as that the majority of GEX<sup>®</sup> companies (around 70%) display such ownership levels between 25% and 55% – i.e. between the threshold which entitles to block certain company decisions and around the 50%

majority,<sup>62</sup> which according to the German stock corporation law is the threshold for most of the shareholder votes at the general meeting. However, in 2008 the distribution became less evenly distributed with a concentration of GEX<sup>®</sup>-relevant ownership share around the 50% majority (i.e. within the 45%-55% percentile).

**Insert Figure 8 about here.**

Putting these levels of ownership into the context of corporate governance it displays some typical properties of ownership structures in Germany and their implications on voting power and control. The observed ownership structures are in line with the previous findings in the academic literature, that in general ownership concentration is much higher in continental Europe than e.g. in the US. Becht/Röll (1999) report in their study, that the median of the largest voting stake in listed companies is in Germany amongst other European countries over 50% and that in no European country this falls below 5% – which is the case for the US.<sup>63</sup> These findings are reflected in the levels of the average GEX<sup>®</sup>-relevant ownership share between 45% and 50%. Besides the high concentration of ownership structures in Germany, it is also shown that in Germany voting blocks are clearly aligned with important control thresholds.<sup>64</sup> These are the 25% threshold for the blocking minority or the 75% threshold required to change a company's charter. As outlined in section III.1., these are the boundaries for the GEX<sup>®</sup>-relevant ownership shares. The simple majority of 50% is another important control threshold with which voting rights are clearly aligned. As for the GEX<sup>®</sup> companies, the prominent status of this threshold is reflected in the cross-section distribution of figure 8 as well as in the average GEX<sup>®</sup>-relevant share between 45% and 50% shown in figure 7. Given that on average only about 60% of the voting capital is represented at the general meetings in Germany as mentioned before, this level of shareholder voting power de facto clearly exceeds the 50% majority at a general meeting. Considering the finding mentioned above, the level as well as the distribution of the GEX<sup>®</sup>-relevant shares observed imply a substantial influence on the GEX<sup>®</sup> companies by its insider owners. As documented in academic literature, this is in line with the overall ownership structure of listed companies in Germany.

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<sup>62</sup> 50% plus one vote or 'simple majority', see Gorton/Schmid (2000), p. 37.

<sup>63</sup> Becht/Röll (1999), pp.1051 ff. Several other empirical studies show similar findings in terms of ownership concentration, see amongst others LaPorta/Lopez-de-Silanes/Shleifer (1999), Köke (2001), Faccio/Lang (2002) or just recently Franks/Mayer/Volpin/Wagner (2008).

<sup>64</sup> Becht/Böhmer (2003), pp. 10 ff.



## V. Performance and correlation analysis

Having mainly talked about corporate governance aspects of the GEX<sup>®</sup> companies we now turn to capital market data, analysing performance and correlations of the index using performance index data.<sup>65</sup>

**Insert Figure 9 about here.**

Figure 9 shows that since inception on January 5, 2005, the GEX<sup>®</sup> exhibited a significant cumulative outperformance through Q3 2007 compared to all major German stock indices considered here. In comparison to these indices the GEX<sup>®</sup> underperformed in 2008 in a way that the cumulative outperformance at year-end of 2008 decreased and the cumulative performance dropped even below the DAX.<sup>66</sup> Nevertheless, the cumulative performance at year end 2008 remains second highest amongst them and underlines the benchmark and information function for the young and insider-dominated GEX<sup>®</sup> firms in a changing stock market environment.

**Table 1: Risk and return data of daily returns**

01.01.05 - 31.12.08

|                   | <b>GEX</b>     | <b>DAX</b>    | <b>MDAX</b> | <b>SDAX</b> | <b>TecDAX</b>  | <b>CDAX</b> |
|-------------------|----------------|---------------|-------------|-------------|----------------|-------------|
| <b>Average</b>    | <b>0,0001</b>  | <b>0,0001</b> | 0,0000      | -0,0001     | 0,0000         | 0,0001      |
| annualized        | <b>0,0274</b>  | <b>0,0310</b> | 0,0103      | -0,0284     | -0,0056        | 0,0240      |
| <b>Max. Loss</b>  | <b>-0,1134</b> | -0,0716       | -0,0866     | -0,0718     | <b>-0,1127</b> | -0,0727     |
| <b>Std Dev</b>    | <b>0,0169</b>  | 0,0142        | 0,0153      | 0,0125      | <b>0,0176</b>  | 0,0137      |
| <b>Volatility</b> | <b>0,2724</b>  | 0,2284        | 0,2469      | 0,2015      | <b>0,2846</b>  | 0,2210      |

Table 1 confirms these properties with an annualised daily return of 3.10% for the DAX followed by 2.74% for the GEX<sup>®</sup> and between -2.84% and 2.40% for the other indices. Table 1 indicates that the GEX<sup>®</sup> also incorporates an above-average risk profile: With 11.34% it shows the highest maximum daily loss, with 1.69% the second highest standard deviation of daily return and an annualised volatility of 27.24%. All these three risk figures are close to the ones exhibited by the TecDAX containing 30 Technology midcaps (11.27% maximum loss, 1.76% standard deviation of daily returns and 28.46% of annualized volatility).

<sup>65</sup> Performance (price) index data can also be accessed using the ISIN DE000A0AER17 (DE000A0AER09), the Bloomberg ticker GEX (GEXK) or the Reuters ticker GEXIR (GEXI).

<sup>66</sup> As of 31.12.2008 the cumulative performance of the indices are (in descending order): DAX +12.09%, GEX +10.37%, MDAX +3.29%, TecDAX -3.98%, SDAX -10.64%.

**Table 2: Correlation matrix of daily returns**

01.01.05 - 31.12.08

|        | GEX                | DAX         | MDAX        | SDAX        | TecDAX      | CDAX |
|--------|--------------------|-------------|-------------|-------------|-------------|------|
| GEX    | 1                  |             |             |             |             |      |
| DAX    | 0,777109161        | 1           |             |             |             |      |
| MDAX   | 0,896987144        | 0,836301374 | 1           |             |             |      |
| SDAX   | 0,887911046        | 0,746159392 | 0,886117771 | 1           |             |      |
| TecDAX | <b>0,952729574</b> | 0,783697933 | 0,880275095 | 0,845008304 | 1           |      |
| CDAX   | 0,821604132        | 0,994947957 | 0,878924652 | 0,794176319 | 0,825079665 | 1    |

**Insert tables 2a) through 2d) about here.**

The similarities of risk and return data also question as to what extent the daily returns of the peer indices correlate with each other. In the first step a correlation analysis over the whole time period from index inception through 31.12.2008 in table 2 shows that the daily GEX<sup>®</sup> returns have the highest correlation with the daily TecDAX returns being about 0.95 and the lowest correlation with the daily DAX returns being about 0.78. One reason for this is that as of Q3 2008 there are no firms being listed in the GEX<sup>®</sup> and DAX at the same time, but 28 firms listed in the GEX<sup>®</sup> and TecDAX at the same time representing altogether about 21% of the GEX<sup>®</sup> index weight.

Comparing the correlation between the GEX<sup>®</sup> and the TecDAX for each calendar year from 2005 through 2008, tables 2a) through 2d) show that the correlation steadily increased starting from about 0.82 in 2005 and amounting to 0.96 in 2008. This tendency of increasing return correlation year-over-year can also be confirmed in a continuous setting. Figure 9 shows the rolling 12-months correlations between daily GEX<sup>®</sup> returns with each of the peer indices. Interestingly, each correlation has increased over time between 2005 and 2008. Additionally, the highest level of correlation is given between the GEX<sup>®</sup> and TecDAX. Since about Q2 2006, it also remains remarkably stable around 0.95.

**Insert Figure 9 about here.**

Like the high level of correlation as stated above, the development of increasing correlation over time can be explained by the development of constituents in both indices: in 2005 there were 7 firms cross-listed in both indices representing 9.72% of the GEX<sup>®</sup> index weight. Although the pure number of cross-listed firms remains constant over time, their index weight in the GEX<sup>®</sup> has significantly increased. In 2008 the 7 cross-listed firms represent 29.18% of the GEX<sup>®</sup> index weight, three times as much as in 2005. The same explanation for an increasing correlation to the GEX<sup>®</sup> over time can be given for the MDAX and SDAX, where the index weight of cross-listed firms in the GEX<sup>®</sup> has about doubled during that time.<sup>67</sup>

<sup>67</sup> In 2005 there were 5 (11) firms cross-listed in GEX and MDAX (SDAX), representing 9.2% (13.17%) of the GEX index weight. In 2008 there were 2 (12) firms cross-listed in GEX and MDAX (SDAX), representing 16.93% (30.92%) of the GEX index weight.

Nevertheless, two open questions remain: One point is that the correlation between the TecDAX and GEX<sup>®</sup> has by far the highest level amongst all indices considered, although exhibiting the second highest level of weighted cross-listed firms in the GEX<sup>®</sup>. This gives rise to the assumption that there are other factors, too, driving the high level of this correlation such as a specifically similar sector exposure. Even more obvious, although there have not been any firms cross-listed in GEX<sup>®</sup> and DAX, the correlation has similarly increased over time as it did to the other indices. This questions additionally the quick assumption that the increasingly converting set of constituents – and thus converting sector exposure – is the only reason for the increasing correlation between the GEX<sup>®</sup>. Studies show that correlations between stock markets have shifted considerably over time and do not exhibit a constant correlation structure.<sup>68</sup> Several empirical studies even find evidence that correlations between stock markets are higher in bear markets than they are in bull markets.<sup>69</sup>

Although we have considered national as opposed to international indices here, similar phenomenon might have influenced the increasing correlation between the indices, especially during the bull markets of 2007 – 2008. Nevertheless, this remains an assumption which needs to be further analysed. The analysis of the bi-partial correlations above have shown so far, that the GEX<sup>®</sup> shares most similarities in terms of risk and return with the TecDAX. From that point of view also it is not surprising that the GEX<sup>®</sup> shows the highest correlation with the TecDAX. Another possibility to show this in a non-bi-partial setting is to replicate the GEX<sup>®</sup> with other German indices (DAX, MDAX, SDAX and TecDAX) in a way that the tracking error is minimized. Hereby, the tracking error was minimized by investing in three out of the four indices (DAX, MDAX, SDAX and TecDAX). The result confirms the findings provided so far: In the time frame 03.01.2005 through 31.12.2008 the GEX<sup>®</sup> exhibits patterns quite similar to the TecDAX. In this replication analysis this is expressed by a weighted portfolio of 65% TecDAX, 22.5% SDAX, 12.5% MDAX and 0% DAX, yielding a minimized tracking error of 7.14%.

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<sup>68</sup> For changing correlation structure between international stock markets and further literature review on this see Goetzmann/Li/Rouwenhorst (2005).

<sup>69</sup> See Longin/Solnik (2001) or Ang/Bekaert (2002).

## VI. Summary and conclusion

This article has introduced the concept of an ownership-based style index for Germany. The German Entrepreneurial Index is motivated by (i) the assumption that agency costs are lower in owner-dominated than in widely-held firms and (ii) empirical evidence that shareholder structure matters for corporate performance. Hence, the Center for Entrepreneurial and Financial Studies (CEFS) at Technische Universität München in cooperation with the Deutsche Börse has developed the German Entrepreneurial Index. The Index tracks the performance of recently listed, owner-dominated companies in the German Prime Standard. Thereby, it fulfils several functions commonly associated with stock indices: (i) an information function, (ii) a benchmark function and to a certain degree (iii) a trading function.

We provide a descriptive analysis of the index composition over the first four years of its existence and analyze past performance and correlation of the GEX<sup>®</sup> in relation to other stock indices in Germany. While the majority of new entrants are owner-dominated IPOs, the (i) dispersion of ownership over time and (ii) to a much lesser degree the non-fulfillment of the post-IPO age of ten years are the two main reasons for firms exiting the GEX<sup>®</sup>. A study of index performance can show that – over the comparatively short period of time – the GEX<sup>®</sup> outperformed other German stock indices. Interestingly, the GEX<sup>®</sup> has a similar risk-return profile as the TecDAX, an index of technology stocks. Not surprisingly, the correlation of daily stock returns among all indices is the highest between the GEX<sup>®</sup> and the TecDax. In addition, we see that the performance and correlation of daily stock returns converges among all indices over time.

Our analysis of index composition indicates that the majority of GEX<sup>®</sup> firms have currently a post-IPO age between 8 and 10 years. Hence, it is obvious that the bulk of GEX<sup>®</sup> firms will leave the index in the years to come. To maintain the GEX<sup>®</sup> with a sufficient number of index firms, initial public offerings in the Prime Standard should regain momentum. Against the background of the current economic situation with the financial crisis and a bad worldwide IPO climate it is however unclear how long it would take until a sufficient number of entrepreneurial firms will again go public on the German stock market.

Regarding the future of this index one has to bear in mind that although small and mid-sized enterprises (sometimes also called family firms) are the backbone of the German economy<sup>70</sup>, many owners (founders) are often not willing to give up control over their firms.<sup>71</sup> Hence, family firms in Germany so far largely avoid outside equity financing via stock exchanges.

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<sup>70</sup> According to the Institut für Mittelstandsforschung (ifm), SMEs in Germany account for 42% of total sales and 57% of total employment.

<sup>71</sup> For example, Villalonga/Amit (2008) argue that founding families use pyramid structures, dual-class shares, voting agreements and disproportional board representation to retain control rights in excess of their cash-flow rights in large U.S. listed firms.

Nevertheless, outside equity can provide a useful alternative especially to finance growth options and investment projects or solve succession problems in family businesses. In the years to come, restricted lending due to the financial crisis can create additional financing shortage in Germany's traditionally bank-orientated financial system.

Against this background, the German Entrepreneurial Index can potentially contribute to overcoming the psychological obstacles of control loss by increasing the visibility of entrepreneurial firms for investors, analysts and the public. In addition, it offers a benchmark for potential new lists both from the portfolio of private equity firms and for private family firms. The fact, that shortly after introduction of the GEX<sup>®</sup> there has been introduced the Swiss Entrepreneurial Index (SEX<sup>®</sup>) with a similar concept of the index construction, shows also the high relevance of such a topic outside of Germany, too.<sup>72</sup> However, without the willingness of founders and dominant owners to disperse their ownership and control rights and provide company information to the public, better utilisation of stock market financing in Germany is impossible. Hence, it is questionable to what extent elements of a market-based financial system can complement elements of Germany's traditional bank-based economy in the near future.

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<sup>72</sup> For more information on the SEX<sup>®</sup> and its comparison to the GEX<sup>®</sup> see Achleitner/Ampenberger (2006.)

Figure 5: Concentration of the GEX<sup>®</sup> vs. DAX and TecDAX in Q3 2008<sup>46</sup>

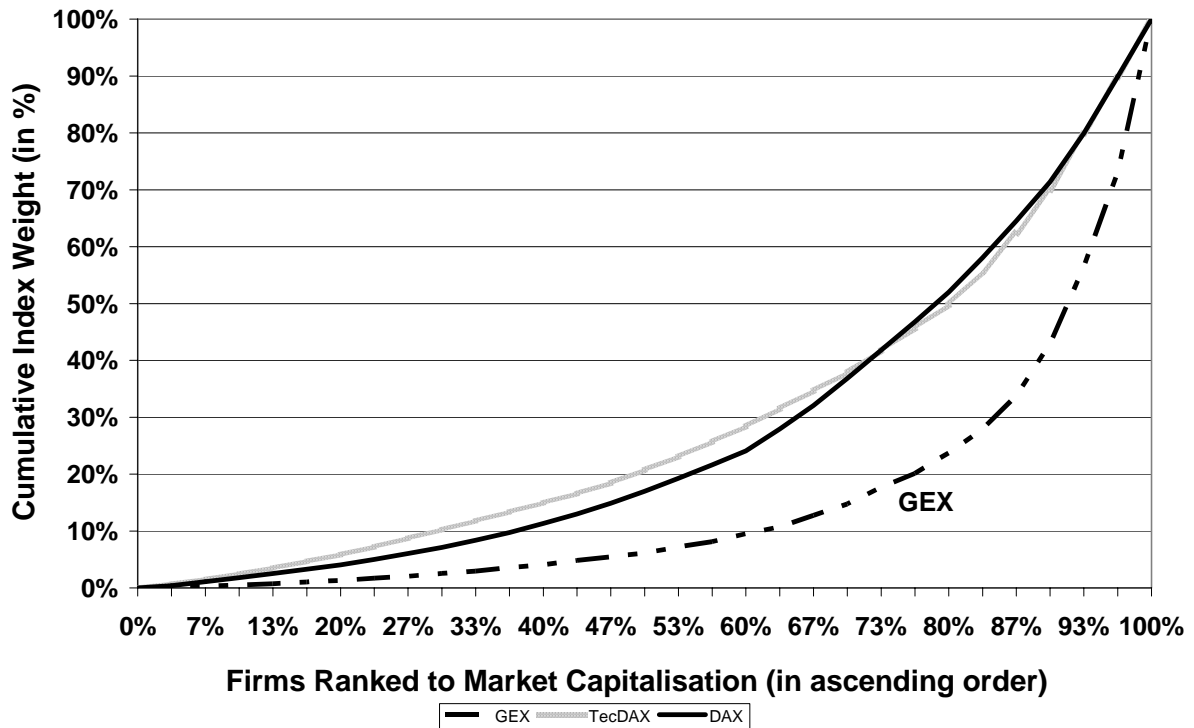
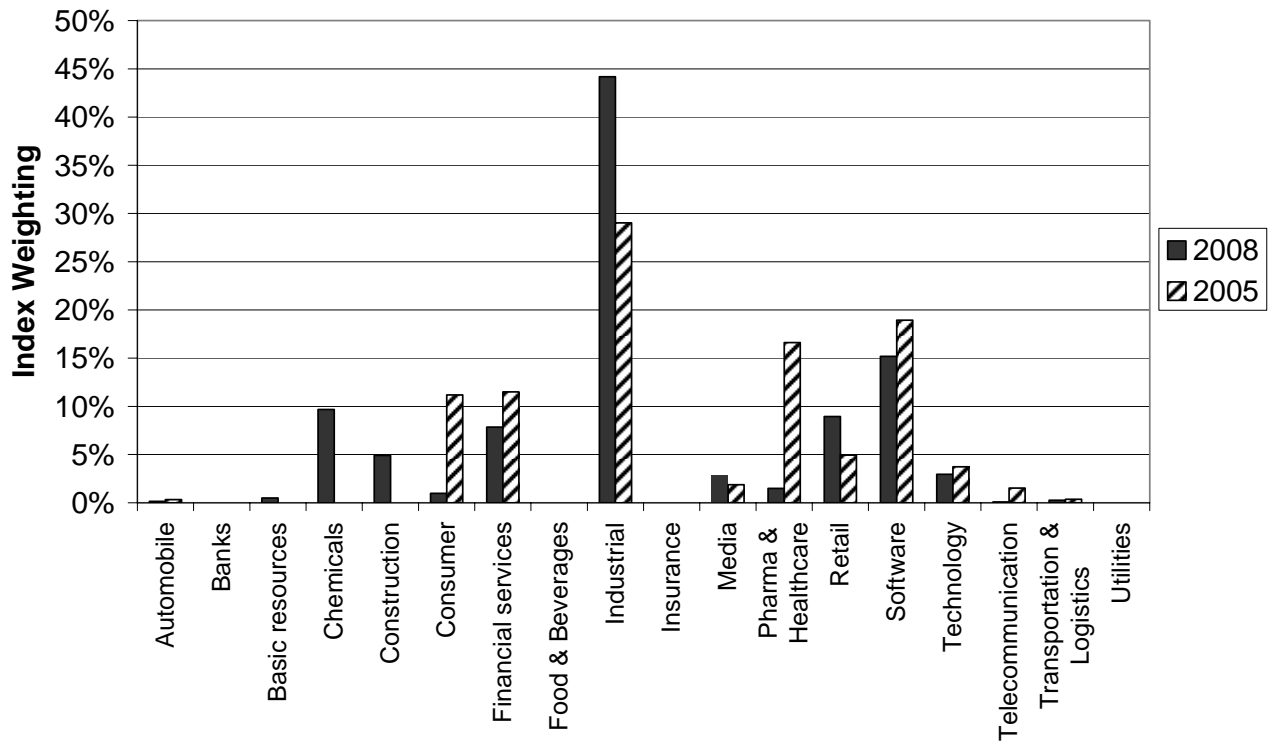
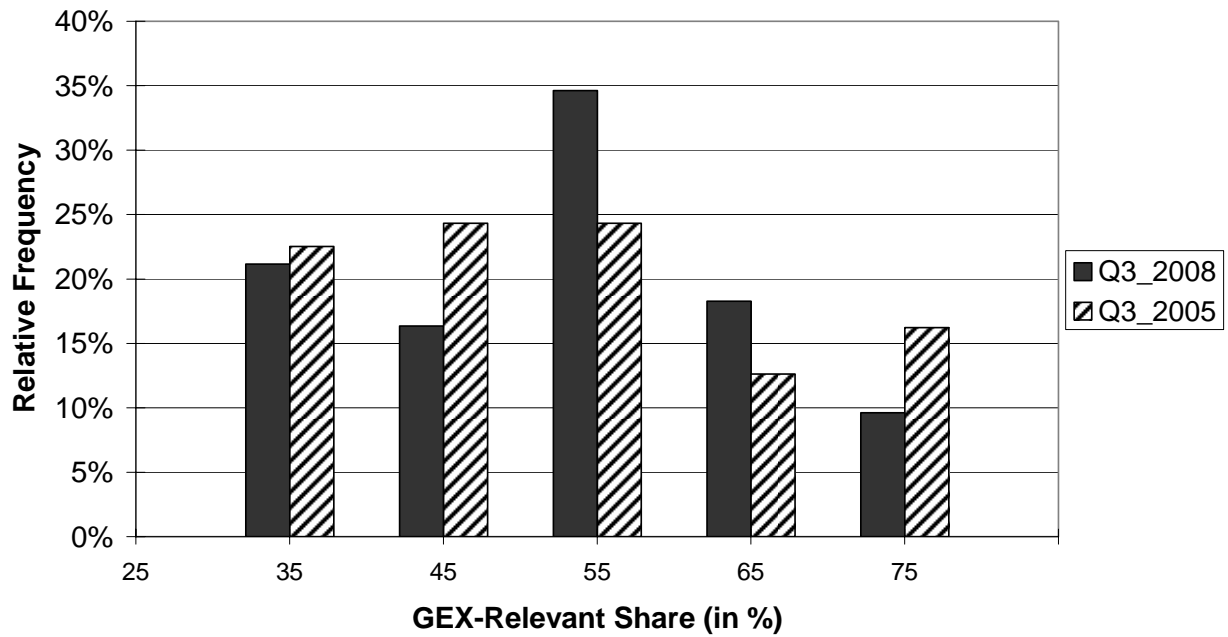


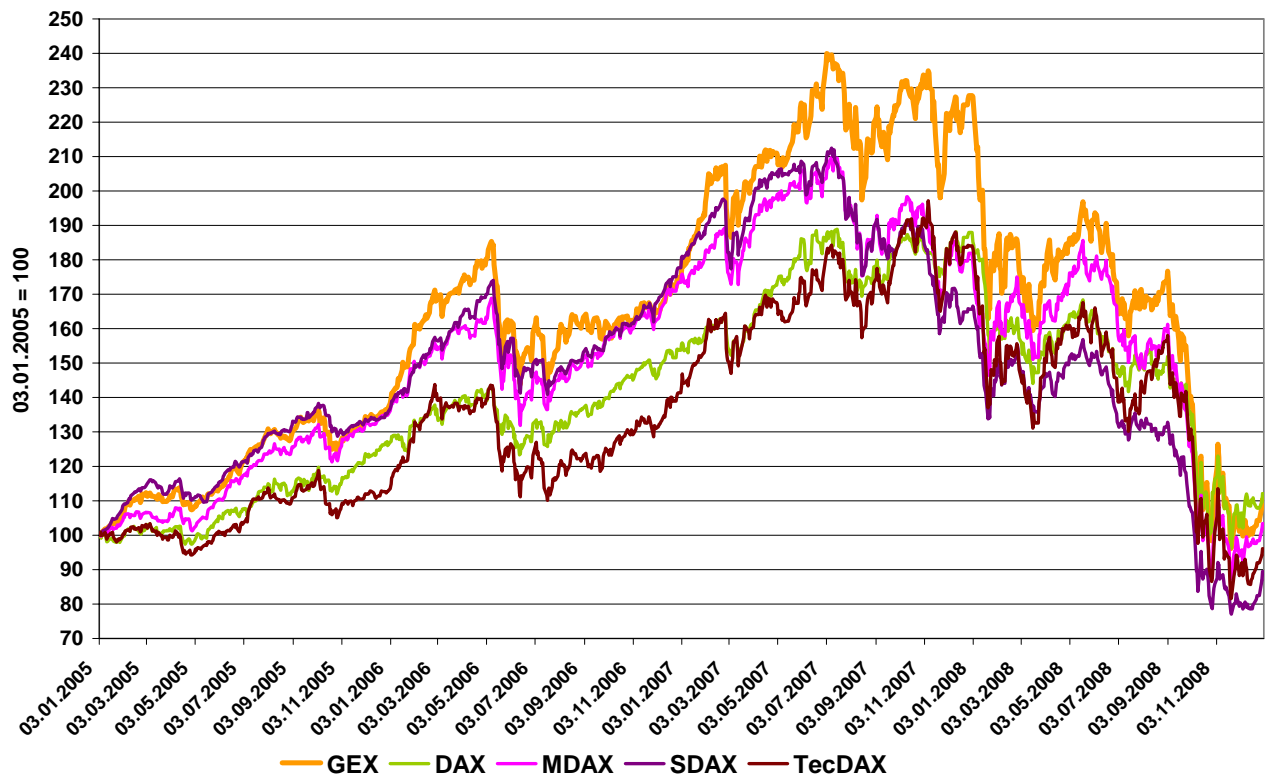
Figure 6: GEX<sup>®</sup> industry weightings in Q3 2005 and Q3 2008<sup>46</sup>



**Figure 8: Cross-section distribution of GEX<sup>®</sup>-relevant share in Q3 2005 and Q3 2008<sup>46</sup>**



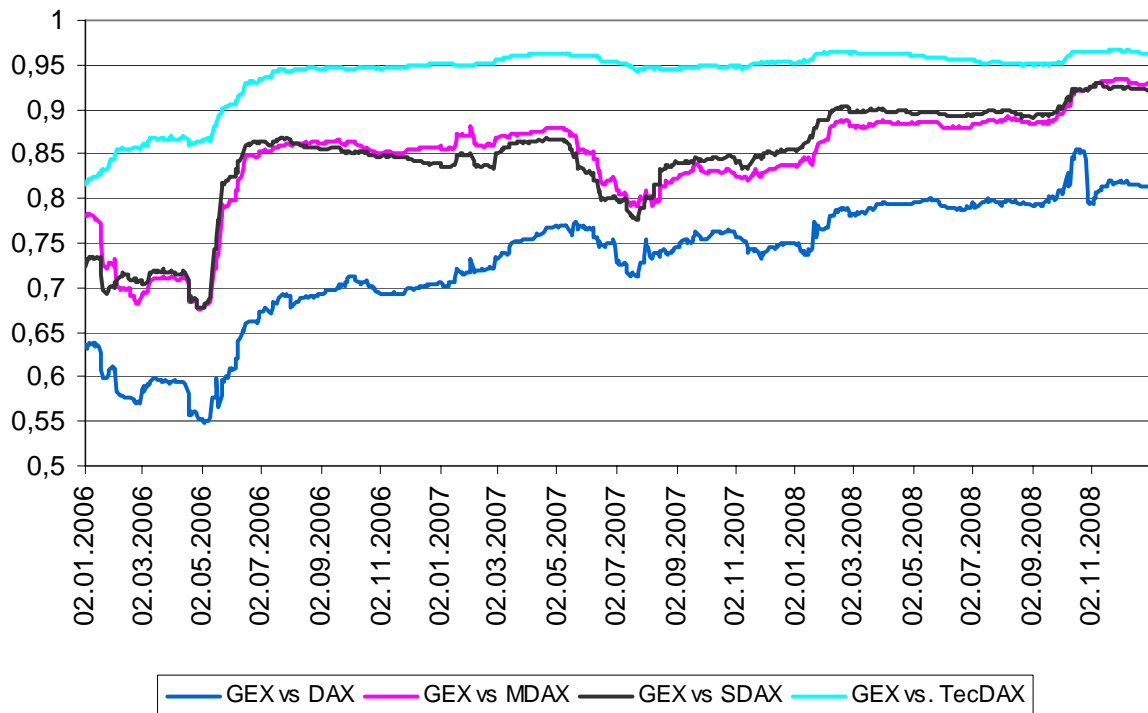
**Figure 9: Relative performance of GEX<sup>®</sup> vs. other German indices (03.01.05 – 31.12.08)**



**Tables 2a) – d): Correlation matrices of daily returns**

| 01.01.05 - 31.12.05 |                  | 01.01.06 - 31.12.06 |                   | 01.01.07 - 31.12.07 |                    | 01.01.08 - 31.12.08 |                    |
|---------------------|------------------|---------------------|-------------------|---------------------|--------------------|---------------------|--------------------|
|                     | GEX              |                     | GEX               |                     | GEX                |                     | GEX                |
| <b>GEX</b>          | 1                | <b>GEX</b>          | 1                 | <b>GEX</b>          | 1                  | <b>GEX</b>          | 1                  |
| <b>DAX</b>          | 0,63430802       | <b>DAX</b>          | 0,70585932        | <b>DAX</b>          | 0,750800423        | <b>DAX</b>          | 0,813392266        |
| <b>MDAX</b>         | 0,77869754       | <b>MDAX</b>         | 0,85841979        | <b>MDAX</b>         | 0,837686544        | <b>MDAX</b>         | 0,928904966        |
| <b>SDAX</b>         | 0,72021627       | <b>SDAX</b>         | 0,83950205        | <b>SDAX</b>         | 0,85448817         | <b>SDAX</b>         | 0,920031062        |
| <b>TecDAX</b>       | <b>0,8162408</b> | <b>TecDAX</b>       | <b>0,95135546</b> | <b>TecDAX</b>       | <b>0,952777977</b> | <b>TecDAX</b>       | <b>0,963360108</b> |
| <b>CDAX</b>         | 0,67885934       | <b>CDAX</b>         | 0,76256049        | <b>CDAX</b>         | 0,801582288        | <b>CDAX</b>         | 0,852306524        |

**Figure 9: Rolling 12-months correlations of daily GEX® returns (01.01.2005 - 31.12.2008)**





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