Finance, Investment, and Firm Value in Germany and the US

A Comparative Analysis

by

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Abstract

Germany and the United States are generally seen as the two competing systems of corporate governance. In search for a comparative welfare analysis of the financial systems, we are interested in (i) the aggregate value-added of corporate investments in the two countries and in (ii) the interaction of investment and financing decisions. This paper investigates the impact of financing, investment, and dividend decisions on the value of stock corporations in Germany and the US. The methodology is based on a cross-sectional approach proposed by Fama and French. In general, the evidence shows that relations for the German firms are statistically similar to those found for their US counterparts. In both countries, corporate investment creates value in excess of cost, but the US industrial sector seems to be more efficient in making value-enhancing investments. Robust statistical methods are applied to verify the results. They do not change the main conclusions.

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0. Introduction: Financial Systems and Corporate Governance

When Modigliani and Miller (1958) made their famous proposition about the separability of corporate financing and investment decisions, they assumed the existence of perfect capital markets. However, markets are not perfect in a neoclassical sense. Thus, the relation between a firm's financing decisions and its value is influenced by asymmetric information, agency costs, and organizational structure. The finance profession, having considered these issues,[1] now starts to discover the important impact of the financial system which firms operate in on *corporate governance*.

Germany and the United States can be seen as the two "polar extremes" of financial systems (Allen/Gale, 1995). In a so-called *bank-oriented* financial system, such as Germany's, financial intermediation and idiosyncratic long-term-relationships are said to determine the investment behavior of firms. The German financial system is characterized by industrial cross-holdings, banks being both debt and equityholders and concentrated private equity ownership (Franks/Mayer, 1993; Spremann, 1994). No active market for corporate control exists that disciplines managers and boards of companies as is the case in the US or the UK – the so-called *market-based* systems. Though the disciplining role of hostile takeovers, mergers, proxy fights, etc. is not unanimously regarded as beneficial -- even in the US --, a lot of empirical work supports the benefits of an "open market" for corporate control.[2]

In light of the obvious economic impact of different financial systems on value creation, the question is: *What determines the success or failure of a financial system to support a sufficient level and adequate kind of corporate investment activity and how can this level be measured?*

The conventional view on Germany is that financial intermediaries[3] and interlocking directorships provide sufficient corporate control and managerial

[1] Beginning with Jensen and Meckling (1976).
[2] Prominent examples are Jensen/Ruback (1983), Martin/McConnell (1993), Agrawal/Walkling (1994). Shleifer/Summers (1988) and Krugman (1994) criticize the market for corporate control for breaking up implicit contracts with stakeholders.
[3] The use of the term *financial intermediary* in this context refers not only to banks. Financial intermediation can also be exercised by large shareholders in the sense of Schleifer/Vishny (1986).

incentives, even in the absence of active capital markets.[4] Some empirical studies also suggest that -- on average -- German companies do not perform worse, if not better, than their Anglo-Saxon counterparts.[5] Colin Mayer (1988, p. 1176) finds that "What might be deemed to be rather primitive bank dominated systems in France, Germany, and Japan have supported substantially higher funding activity than either the UK or USA." An empirical study by Michael Porter (1992) claims that US firms underinvest because they overemphasize short-term results, causing a decline in their competitiveness relative to German ones. However, his *inferiority hypothesis* is heavily criticized by other economists.[6] Yanelle (1988), von Thadden (1991), and other economists present theoretical models that show how in bank-oriented financial systems intermediation can lengthen the investment horizon of firms, leading to superior project selection.

Another view is presented by Allen and Gale (1993, 1995). Comparing the welfare effects of the German and US financial systems, they find that both have benefits and disadvantages.[7] With respect to corporate control and management incentives they argue that *bank-based systems* are more suited to traditional industries characterized by consensus about the right corporate policies. *Market systems*, on the other hand, provide incentives for a wide range of people to check managerial actions and are thus more suited to dynamic industries where consensus is lacking.[8] Allen and Gale also show that competition from financial markets can cause the benefits of the intermediation mechanism to unravel.

There are remarkably few empirical studies that investigate the relations between capital structure, investments, and firm performance in Germany.[9] Even more surprisingly, there are almost no studies comparing German to US data on leverage,

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[4] See, for example, Hellwig (1990), or Mayer (1990). Edwards and Fischer (1994) have a more critical position.
[5] For example, Stehle/Hartmond (1991) address this question by calculating average annual returns of all stocks traded on the Frankfurt stock exchange for the period 1968-86. They find that returns on German stocks are sufficiently high when compared to returns on international stocks.
[6] See, for example, Kaplan (1994), Allen/Gale (1993, 1995).
[7] Space does not permit to summarize their excellent analysis. The essence of their argument is that intermediaries can provide *intertemporal* forms of risk sharing that are too expensive to hedge through the market, while financial markets provide superior opportunities for *cross-sectional* risk-sharing.
[8] They call this "diversity of opinion".

dividends, investments, and the market value added of firms. One exception is the study by Kaplan (1994) which finds that poor stock performance and negative earnings increase the likelihood of management turnover in Germany. He interprets this as evidence that the German corporate governance system does not ignore short-term performance because it penalizes bad managers in a similar way the US financial system does. Thus, he concludes that the two systems are not all that different. However, he focuses merely on executive turnover, and his results are likely to be driven by the obvious correlation between bad earnings and negative stock market reactions which exists regardless of the financial system.

In an attempt to fill the gap of papers comparing the welfare effects of different financial systems, this study investigates finance and investment patterns in Germany and the US. It is organized as follows: Section 1 formulates the hypotheses. Section 2 describes the data and the selection of the final sample. Section 3 explains the Fama-French cross-section regression approach to measuring the relations between value and financing decisions. Summary statistics in Section 4 examine the means and the correlations of the regression variables. The regression results are in Section 5. Robust statistical regression results are presented in Section 6. Section 7 links the empirical evidence to the theory, and Section 8 concludes the paper.

[9] Stehle (1994, 1995) provides evidence on the relation between capital structure and the cost of capital of German stock corporations, Bähr/Janz (1994) and Gehrke (1994) study Tobin's *q* and corporate investment in Germany.

1. Investment Decisions, Financing Decisions, and Firm Value in Germany and the US

In a recent article, Fama and French (1998) provide a new approach to explain how investment and financing decisions affect firm value.[10] In order to present evidence on the value added from investment decisions, they use year-by-year Fama-MacBeth (FM, 1973) regressions to explain differences across US companies in the spread of value over cost, V_t-A_t (market value minus book value of a firm's total assets), and the biannual change in this spread. Their approach provides a good tool to investigate if substantial cross-national differences in the interaction of investment and financing patterns exist. I also allows to address to the following questions:

(i) *Do companies in the German financial system perform better or worse than their American counterparts in making value-enhancing investments?*

(ii) *Are different dominant financing and dividend strategies in different countries eminent?*

Although these questions appear to be very ambitious, obtaining partial results are certainly worth making the effort for. In short, with some exceptions, most of the findings are rather similar to those found by Fama and French (FF, 1998).

The aim of this paper to compare my results for German firms with those of FF for US ones requires that the methodology employed follows FF,as far as it is possible and meaningful. Some more sophisticated regression techniques are applied to test the robustness of my results. The paper concentrates on distinct characteristics and differences between the American and German data sets and, most importantly, on the interpretation of these results.

2. Data Description and Sample Selection

The original sample is divided into two time periods (1967-84 and 1985-91) because the German Accounting Directives Law changed in 1985. Results from a previous study covering the time period 1985-91 are partially reported.

[10] Their article is based on an earlier working paper „Investment Decisions, Financing Decisions, and Firm Value“ (1996) on which this paper draws.

The Data for this project, covering the period 1967-84, were mainly taken from a database that was formerly used by Gehrke (1994).[11] It contains financial accounting data from unconsolidated statements (*Einzelabschlüsse*) and stock market data on 90% of all industrial stock corporations that were publicly listed in Germany from 1967 to 1984. Market values of equity for the German companies were obtained from the Hoppenstedt Stock Guide (*Börsenführer*). The financial accounting data for the previous project covering the subsequent time period from 1985 to 1991 were obtained from COMPUSTAT Global Vantage Industrial/Commercial (I/C) File, an international database, which reports figures from consolidated statements (*Konzernabschlüsse*). Fama and French (1996 and 1998), in their study use data on US-GAAP consolidated staments from the time period 1965 to 1992 (28 Years) provided by the COMPUSTAT Industrial Database. Surprising or not, for the German data it finally comes out that the choice between consolidated or unconsolidated statements does not at all change the results of the regression analysis.

To be included in the cross-section regressions for year t, a firm must have data available on all variables for the three consecutive years t to t+2. Under this requirement, the sample size for the level regressions ranges from 124 (in 1967) to 479 companies (in 1968), on average 400 firms each year. In the previous study, the sample size for the level regressions ranges from 82 (in 1985) to 134 companies (in 1991), on average 100 firms each year. Although seemingly small compared to the 1883 firms (1967) and firms 4180 (1991) in the FF sample, the number of 7200 observations in 1967-84 is reasonably good, given that there are far less stock listed companies in Germany and that German disclosure requirements and the data availability of annual reports for empirical research in finance are much better in the US. Particularly American researchers therefore tend to argue that the results of such comparative tests are somehow being driven by accounting differences in US and German GAAP. However, Harris, Lang, and Möller (1993) come to the conclusion that accounting data for German corporations “are significantly associated with stock price levels and

[11] Norman Gehrke (1994) created this database for his dissertation. It is originally based on data drawn from Hoppenstedt German Stock Guide, from the „Deutsche Finanzdatenbank“, Aachen, provided by Prof. Hans

returns". They find that the explanatory power is at least comparable to that in the United States.[12] This will be verified by the following study.

3. Cross-Sectional Regression Methodology

Event studies are the most popular empirical method from which to draw inferences about the effects of investment and financing decisions.[13] As FF point out, however, event studies face problems that cross-section regressions can overcome: "[B]ecause the regressions examine the cumulative effects of *longer-term* (two-year) *changes* in financing decisions, the observed value effects are larger and more reliable than those of event studies. Moreover, because the regressions control for earnings, dividends, debt, and investment, they better expose the richness of the information about value in investment and financing decisions."

Fama-Macbeth regressions involve a series of year-by-year cross-sectional least squares (LS) regressions of the spread of value over cost on one or more explanatory variables that are assumed to be driving factors of investment and financing decisions. The general form of the FM regressions is:

$$(V_{jt} - A_{jt})/A_{jt} = a_0 + \sum_{i=1}^{F} a_{it}X_{ijt} + e_{jt}$$

for $j = 1, 2,\ldots, R_t$, $i = 1, 2,..., F$ and $t = 1, 2,\ldots, T$

where T is the number of years, R_t is the number of firms ("records") in year t, $(V_{j,t}-A_{j,t})/A_{j,t}$ is the spread of value over cost of firm j in year t (scaled by the book value of total assets $A_{j,t}$), F is the number of explanatory variables, $X_{i,j,t}$ is the realization of explanatory factor i for firm j in year t. The predictions tested are,

$$\frac{\sum_{t=1}^{T} a_{it}}{T} = 0 \quad \text{for } i = 1, 2,\ldots, F$$

Peter Möller, and from data at the Institute of Banking and Finance at the Humboldt-University, Berlin. I am grateful to Prof. Richard Stehle for giving me the opportunity to make use of this unique data set.

[12] Trevor Harris, Mark Lang, and Hans Peter Möller. The Value Relevance of German Accounting Measures: An Empirical Analysis. *Journal of Accounting Research* 32, 1994, 187-209.

[13] Event studies are *empirical tests for abnormal stock returns during a period surrounding the announcement of identifiable events*, such as securities issues (financing decisions), capital expenditures (investment decisions), dividend changes, and so on. See Brown and Warner (1985), Marais and Schipper (1995), or Campbell/Lo/MacKinlay (1996) for comprehensive introductions to event study methodology.

i.e., the null hypothesis states that the time-series average of the year-by-year regression slopes is 0. The statistical significance is conducted by a one-sample *t*-test that assumes normality and identical independent distribution (i.i.d.) of the regression slopes. The time-series means of the slope coefficients are divided by their standard errors and then multiplied by the square root of the number of observations (T -1):

$$t(\bar{a}_i) = \frac{\bar{a}_i}{s(\bar{a}_i)/\sqrt{T-1}}$$

Following from the central limit theorem, this *t*-statistic is approximately robust with respect to deviations from normality, depending on the sample size and possible outliers in the data.[14]

Fama (1978) claims that the common goal of investment and financing decisions is to maximize the difference between total firm value and cost. Based on this assumption, firm value is best defined as V_t-A_t, the spread of total market value over the replacement cost of the assets, the assets being necessary to generate that market value. Since replacement cost is hard to calculate, it is proxied by the book value of total assets. The market value of debt is proxied by book value of total liabilities, information that can be obtained from financial statement data items. In order to allow comparisons across firms without overemphasizing the effect of very large firms, the firm value is scaled by the book value of total assets, A_t. The scaling should also weaken biases introduced by heteroscedasticity. Finally, using relative rather than absolute values allows us to ignore inflation influences.

To examine the effects of investment and financing decisions on firm value in Germany, the following cross-section FM regressions are run:[15]

$$(1)\ (V_t-A_t)/A_t = a_0 + a_1E_t/A_t + a_2(E_{t+2}-E_t)/A_t + a_3(A_{t+2}-A_t)/A_t + a_4(V_{t+2}-V_t)/A_t$$
$$+ a_5I_t/A_t + a_6(I_{t+2}/A_{t+2}-I_t/A_t) + a_7D_t/A_t + a_8(D_{t+2}/A_{t+2}-D_t/A_t) + e_t$$
$$= a_0 + a_1E_t/A_t + a_2dE_t/A_t + a_3dA_t/A_t + a_4dV_t/A_t + a_5I_t/A_t + a_6d(I_t/A_t)$$
$$+ a_7D_t/A_t + a_8d(D_t/A_t) + e_t$$

[14] See Knez and Ready (1997) or Casella and Berger (1990, pp. 216-220) for a detailed discussion of the central limit theorem.

$$(2)\ (V_t-A_t)/A_t = a_0 + a_1E_t/A_t + a_2dE_t/A_t + a_3dA_t/A_t + a_4dV_t/A_t + a_5I_t/A_t + a_6dI_t/A_t + a_7D_t/A_t + a_8dD_t/A_t + e_t$$

where E_t is earnings before interest and after taxes in year *t*; I_t is interest expense for the fiscal year *t*; D_t is total dividends paid in year *t*; dX_t/A_t is the biannual change in variable X_t scaled by total assets in year *t*, $(X_{t+2}-X_t)/A_t$; and $d(X_t/A_t)$ are the biannual changes in the ratio $(X_{t+2}/A_{t+2}-X_t/A_t)$. For example, dV_t/A_t is the two-year change in the market value of the firm scaled by the book value of total assets.

The proxy for expected investment, dA_t/A_t, seems a crude measure, but given the empirical problems in calculating comparable figures for corporate investment from German annual reports, it is not too crude as an approximation. I_t/A_t, the interest expense to assets, is used as a direct measure of book leverage. Even though it is problematic to make national comparisons on the basis of I_t/A_t, because the level of interest rates and the market conditions for debt financing may differ significantly across countries, I_t/A_t serves as a good explanatory variable for leverage effects on firm value in cross-sectional regressions.[16] Changes in absolute leverage or the level of interest expenses are consequently proxied by dI_t/A_t, whereas expected changes in leverage policy are captured by $d(I_t/A_t)$. Equivalently, dividend policy is measured by D_t/A_t, expected changes in dividend policy are proxied by $d(D_t/A_t)$, and expected dividend changes in absolute terms are captured by dD_t/A_t.

The two-year change in the market value of equity, dV_t/A_t, is included in the regressions as a *measurement error (MSE) proxy*, in order to account for the fact that expected (*ex ante*) changes in assets, earnings, dividends, and leverage are proxied by the respective realized (*ex post*) changes dA_t, dE_t, dD_t, and dI_t. Unexpected changes in these variables cannot by definition affect firm value in period *t*, and therefore have no

[15] Henceforth, the correct firm subscript *j* on all variables and the year subscript *t* on the regression coefficients will be dropped in favour of simplicity.

[16] The huge coefficients and t-values on the I_t variables in the regressions will show this. dI_t/A_t is also a direct measure of leverage, that is not subject to the problem of correctly measuring different instruments of debt financing in various countries.

effect on $(V_t-A_t)/A_t$. This leads to an errors-in-variables problem.[17] Kothari and Shanken (1992) suggest to include MSE proxies in the regression model as these *ex post* variables include the effects of unexpected changes.

In regressions (3) and (4) the dependent variable is the biannual change in the spread of value over cost, $d(V_t-A_t)/A_t = [(V_{t+2}-A_{t+2})-(V_t-A_t)]/A_t$, which is regressed on the biannual change versions of the previous explanatory variables. The intuition behind regressions (3) and (4) is that they capture the biannual change, respectively, of regressions (1) and (2).

$$(3)\ d(V_t-A_t)/A_t = a_0 + a_1 dE_t/A_t + a_2 dE_{t+2}/A_t + a_3 dA_t/A_t + a_4 dA_{t+2}/A_t + a_5 dV_{t+2}/A_t + a_6 d(I_t/A_t) + a_7 d(I_{t+2}/A_{t+2}) + a_8 d(D_t/A_t) + a_9 d(D_{t+2}/A_{t+2}) + e_{t+2}$$

$$(4)\ d(V_t-A_t)/A_t = a_0 + a_1 dE_t/A_t + a_2 dE_{t+2}/A_t + a_3 dA_t/A_t + a_4 dA_{t+2}/A_t + a_5 dV_{t+2}/A_t + a_6 dI_t/A_t + a_7 dI_{t+2}/A_t + a_8 dD_t/A_t + a_9 dD_{t+2}/A_t + e_{t+2}$$

To be included in these regressions for fiscal year *t*, a firm must provide data on all the relevant variables for five consecutive years until the year *t*+4. This data requirement is more restrictive than in regressions (1) and (2) which only required observations on three consecutive years. Thus, the sample size is smaller in regressions (3) and (4).

4. Summary Statistics

4.1 Correlations of the Regression Variables

Table 1 shows the average correlations of the regression variables on which the initial comparative analysis is based.

Similar to the findings by FF for the US sample, positive correlations between the level of earnings E_t/A_t (0.21) as well as the two-year change in earnings dE_t/A_t (0.03) and the spread of value over cost $(V_t-A_t)/A_t$ exist. In Germany, profitability -- proxied by reported earnings -- is a driving factor of firm value. Also in line with the FF results,

[17] For a general overview on *regressions with errors in variables* see Casella and Berger (1990), pp. 581-583.

the level of dividends D_t/A_t (0.42) and the two-year future change in dividends dD_t/A_t (0.04) are more highly correlated with $(V_t-A_t)/A_t$ than are earnings. The other correlations, too, are strikingly similar to those reported by FF, especially as far as positive or negative signs are concerned. A noteworthy exception is the positive correlation of the ratio of interest to assets I_t/A_t with E_t/A_t (0.04 in Germany compared to -0.13 in the US). Also, the correlation of the biannual change variables $d(I_t/A_t)$ and dE_t/A_t is 0.01 in Germany and -0.10 in the US. Higher leverage -- proxied by I_t/A_t -- is also more strongly correlated with lower spread of firm value over cost in Germany than in the US (-0.18 versus -0.09). In both countries, the biannual future change in leverage $d(I_t/A_t)$ is positively correlated with the future change in debt dI_t/A_t (0.67 versus 0.46 in the US). *The FF proposition that for US firms this negative relation between leverage and $(V_t-A_t)/A_t$ is linked to the negative correlation between* I_t/A_t and E_t/A_t *cannot be applied to the German data set where the two correlations have opposite signs.*

The Kothari-Shanken (1992) argument, cited by FF, holds in Germany as well as in the US.[18] The correlations of dV_t/A_t with biannual changes from *t* to *t*+2 in earnings (0.20), dividends (0.22), and interest expense (0.46) are positive, but the slopes on dV_t/A_t to explain $(V_t-A_t)/A_t$ in the full regressions are all negative, and more than 2.2 standard errors from 0. The future two-year change in value, therefore, seems to remove unexpected components from the future changes in other variables.

The negative correlation of the two-year future change in dividend policy $d(D_t/A_t)$ with $(V_t-A_t)/A_t$ (-0.05) and with E_t/A_t (-0.12) is not a replica of the FF sample (0.00 and 0.01, respectively). The slope on $d(D_t/A_t)$ in the full regressions is strongly positive (4.64) and more than 3.3 standard errors from 0. *Thus, (biannual) future increases in dividend policy seem to be observed after periods of poor profitability in Germany but not in the US.* However, controlling for the level of earnings and the level of dividends, a future increase in dividend policy has a positive impact on the spread of value over cost in both countries, although for the US data the coefficient is only weakly significant.

[18] See explanation above.

4.2 The Level of the Dependent and Independent Variables

Do the effects of a firm's value on investment and financing decisions differ for different types of firms in Germany and the US? Table 2 shows the ***means*** of the dependent and independent variables for the German sample, with the firms sorted by size into two groups and by book-to-market-equity (BE/ME) into another two groups. Since no CRSP tapes nor BE/ME breakdown values by size are available for German stock companies, the firms are simply divided according to their own reported figures into groups of equal size each year. Nevertheless, even this simple sorting procedure results in clear patterns. For the cross-country comparisons, the data are averaged from the FF sample across the same 18 sample years (*t*=1967-84).

Are ***investment decisions*** more effective in the US than in Germany? The simple average of $(V_t\text{-}A_t)/A_t$ is 0.501 for US firms, compared to 0.460 for German firms. On the other hand, the simple regressions reveal that a $1 increase in assets between t and t+2 adds between $.57 and $.77 to the spread of value over cost in the US, between 1967 and 1984 (not reported), whereas a DM 1.00 biannual increase in assets seems to add only DM 0.43 to $(V_t\text{-}A_t)/A_t$. A first guess leads to the conclusion that investment drives value in the US, whereas value quite possibly drives investment in Germany. The average growth rate of assets dA_t/A_t – our proxy for corporate investment -- is also much higher in the US (0.340) than in Germany (0.158), but in both countries investment rates are higher for low-BE/ME than for high-BE/ME firms.

The average level of **earnings** (reported before interest and after taxes) E_t/A_t for all size-BE/ME groups in Germany (All=0.042) is drastically lower than the corresponding level in the US (0.077), which may be attributed to the assumed conservatism in German accounting. It also supports HLM (1994), who, by matching two samples for 1981 to 1990, one consisting of 230 German firms and one of 230 US firms, find that earnings-divided-by-equity are significantly lower in Germany than in the US. However, the average level ET_t/A_t (0.080) and the average biannual growth rate dET_t/A_t (0.010) double when earnings are measured *before taxes*, in Germany but

not in the US.[19] The standard deviations of the level (growth rate) of earnings over time also increase(s) from .758% to .840% (.933% to 6.240% respectively) when German firm's earnings are measured *before* instead *after* taxes. This leads to the following conclusion: *German firms substantially decrease reported earnings through discretionary accounting techniques in order to minimize corporate income tax, which is based on reported earnings. By doing so, they also smooth earnings over time and minimize variation in earnings after taxes in order to report constant earnings figures without the threat of bad news surprises.* Furthermore, the average growth of earnings dE_t/A_t is much higher in the US (0.027) than in Germany (0.005). Yet, low-BE/ME firms (S/L and B/L) display significantly higher dE_t/A_t ratios than do high-BE/ME firms (S/H and B/H) in Germany. In other words, *separating stronger from weaker firms on BE/ME works in Germany as well as in the US.*

Dividends show other patterns. Overall, the ratio of dividends to assets D_t/A_t does not differ much between Germany (0.018) and the US (0.017).[20] In both countries, low-BE/ME firms pay much more dividends than do high-BE/ME firms. As in the US, big German firms pay on average more dividends than do small firms, so that large low-BE/ME firms pay out the highest dividends relative to their assets in both countries. All German firms experience modest growth in dividends dD_t/A_t (0.002) compared to their US counterparts (0.004).

Contrary to the conventional view that **debt** is the dominant source of **financing** in Germany, *the firms in our sample are even slightly less levered than their American counterparts,* when the ratio of interest expense to assets I_t/A_t is used as the relevant measure (0.021 vs. 0.022). This evidence is supported by Rajan and Zingales (1995) who – by using different adjusted measures of leverage -- find that across the G-7 countries German firms are relatively less levered.[21] However, given that German firms finance themselves more through directly placed bank loans and much less

[19] The corresponding average earnings *before taxes* for the US sample are ET_t/A_t = .121 (+57% compared to earnings *after taxes*) and dET_t/A_t =.040 (+48%).

[20] The slightly higher dividend payout ratio in Germany could be attributed to the fact that there is no double taxation of dividends like in the US.

[21] Their basic measure is the *ratio of total debt to capital* (debt + equity). However, they also adjust for cash balances, pension liabilities, deferred taxes, goodwill, intangibles, and provisions. Even after these adjustments, the German median ratio of debt to capital remains the lowest of all G-7 countries.

through marketable securities (Allen/Gale, 1995), an explanation of the lower I_t/A_t could be that these bank loans provide better conditions, i.e., on average lower interest rates due to the benefits of financial intermediation and closer relationships between banks and firms in Germany. However, in a study on the structure of the German banking system, Edwards and Fischer (1994) find no evidence of lower cost of bank-supplied debt in Germany than in *market-based* systems.[22] Another explanation is that American listed *stock* companies are indeed a bit more levered than are German listed *stock* companies, but mainly through the use of bond financing. The average growth of interest expense dI_t/A_t is higher for small firms than for big firms in both countries. A third interpretation of the differences in the leverage proxy is that I/A is simply not a good measure to use in international comparisons, because it is affected by national accounting definitions of interest expense as well as by varying interest rates. Despite these problems it remains a good variable to capture level and changes in the leverage policy of firms.[23]

5. Regression Results

5.1 Earnings and Dividends

In the simple regressions of Table 3, the spread of value over cost has a strong positive effect on earnings (before and after taxes) and dividends, and negative slopes on the two-year change in value. The average slopes on E_t/A_t (4.48) and dE_t/A_t (1.75) are 6.5 and 3.2 standard errors from 0. The coefficients on the level of dividends D_t/A_t are huge (>16.6) and more than 7.8 standard errors from 0. The future change in dividends dD_t/A_t (5.93, t=3.1) and the two-year change in dividend policy $d(D_t/A_t)$ (6.11, t=4.0) also have power to explain $(V_t-A_t)/A_t$ when D_t/A_t and dV_t/A_t are included in the regressions. The current coefficients on changes in earnings dE_t/A_t, dividends dD_t/A_t, and dividend policy $d(D_t/A_t)$ have significantly positive slopes on $d(V_t-A_t)/A_t$, the two-year change of the spread of value over cost. Changes in dividends dD_t/A_t and dividend

[22] They compare bank loans conditions in Germany to those in the United Kingdom.

[23] In the regression analysis, I also use book leverage instead of the interest expense to assets as an explanatory variable. Nevertheless, it does not at all change the results.

policy $d(D_t/A_t)$ still have explanatory power in the full regressions (1) and (2), and are more than 2.7 and 3.1 standard errors from 0.

In the full regressions of Table 4.a the average slopes of the coefficient on earnings *after* taxes, E_t/A_t, lose significance. However, when earnings are measured *before* taxes, the slopes on ET_t/A_t are still positive and more than 5.2 standard errors from 0.0 in the full regressions. *Thus, in Germany there is explanatory power in the future change in earnings before (but not after) taxes that is not absorbed by information in dividends or other variables.* In contrast, the level of earnings and the future change in earnings lose all explanatory power in the corresponding FF regressions for the US: Across the observation period (1967-84), none of the E_t/A_t and dE_t/A_t coefficients are significant. The high and persistent explanatory power of earnings variables in the German sample is consistent with the conclusion of HLM (1994) that due to the relative conservatism in German accounting "coefficients linking the *stock price* return or *level* to a given *level of earnings* or shareholders' equity are generally larger in Germany than in the United States." It is remarkable, though, that only earnings *before* taxes still have explanatory power when all other proxy variables are included in the regressions. Reported earnings from unconsolidated annual statements ("Einzelabschlüsse") not only are the basis for corporate income taxation in Germany, they also tie corporate management to a certain dividend payout ratio.[24] Therefore, income smoothing through discretionary accounting management may be quite possibly the explanation for this observation. This would also explain why the coefficients on dET_t/A_t (0.41) are more than ten times higher than the coefficients on dE_t/A_t (0.01), although both variables are not statistically different from 0 in the full regressions.

[24] As HLM (1994) point out: "[German] Stock Corporation Law prevents management from retaining more than half of (legal-entity) net income for the year, leaving disposition of the remaining (unappropriated) profit and certain retained earnings to the discretion of shareholders at the annual meeting. This [...] creates incentives to manage reported earnings [...] because higher reported earnings may create shareholder pressure for higher dividends."

5.2 Debt and Leverage

Leverage, I_t/A_t, is strongly negatively related to the spread of value over cost, the coefficients' standard errors being more than 6.2 standard errors from zero in the simple regressions. On the other hand, changes in interest expense, are positively correlated with changes in earnings (0.23) and changes in investment (0.63). While the coefficients on the biannual change in leverage $d(I_t/A_t)$ are always negative, the coefficient on dI_t/A_t is positive (although not significant) in the simple regressions, but switches to weakly negative when we control for profitability, investment, and dividends in the full regressions. Also, in the simple change regressions of Table 3 the corresponding coefficient on dI_{t+2}/A_t (3.21) is significantly positive, while losing significance in regression (4).

Thus, German firms seem to invest more when earnings growth is strong and partly have to finance this investment with debt, leading to higher interest expenses. A possible interpretation is that they involuntarily have to finance growth with debt, due to the lack of other external funds. Under this scenario, more debt contains positive information about profitability. Consequently, this debt financing of corporate growth is associated with increases in leverage, as evidenced by the high correlation of $d(I_t/A_t)$ and dI_t/A_t (0.67) – much higher than in the US (0.46).[25] The story seems especially likely for small low-BE/ME firms which on average have the largest change in interest expense, dI_t/A_t (0.005). Bigger firms are less levered and on average have lower dI_t/A_t and $d(I_t/A_t)$. This is consistent with the commonly held view that small firms in Germany face heavy constraints when it comes to financing corporate growth.

The negative coefficients on I_t/A_t lose much of their explanatory power when earnings, dividends, and investment are included in the full regressions. They are still negative (-1.83 to –2.52) but merely 1.8 to 2.1 standard errors from 0 and hence only weakly significant. The same pattern is observed for the US by FF (1998) who "infer that the stronger negative relations between leverage and value in the single-variable regressions are due to the negative correlations of leverage with the proxies for

[25] In a parallel study conducted for the time period 1985-91 we also find a high correlation between $d(I_t/A_t)$ and dI_t/A_t of 0.72. This sample contains fewer firms and uses consolidated statements, though.

profitability." *Regardless of the type of financial system, it is the information content of debt that seems to have a negative impact on firm value.*

5.3 Investment Decisions

What can be said on the effectiveness of *investment decisions* in Germany and the US? Following the arguments of FF, on average, investment generates value in excess of cost in both countries, a statement that is not entirely supported by the German data. The estimates of the regressions (1) and (2) in Table 4.a provide (only weak) evidence that a DM 1.00 expected increase in assets from *t* to *t*+2 adds between DM 0.43 and DM 0.38 to the spread of value over cost when controlling for profits and other variables. This is less than the corresponding American values (1.00 to 0.79) obtained from the FF sample, which also have much higher statistical significance (more than 5 standard errors from 0) in the same time period, from 1967 to 1984. The coefficients on dA_t/A_t in the regressions (3) and (4) for Germany are close to 0, the coefficient on another investment variable, namely the change in assets from *t*+2 to *t*+4, dA_{t+2}/A_t, is significantly positive (0.33, *t*=3.0). Thus, since there is a positive relation between the spread of value over cost and dA_t/A_t, and between the two-year change in the spread and dA_{t+2}/A_t, we can carefully suggest a net market value in excess of cost for investment decisions in Germany. However, the coefficient on the investment proxy dA_t/A_t (0.43) in the simple regression is almost the same as in the full regressions (a pattern not observed in the US where the slopes tend to become smaller when other variables are included). Since the results are not that straightforward, one might suppose that dA_t/A_t is indeed a noisy measure for corporate investment. Therefore, we alternatively used *net capital investments* (inv) in *t*=1 to *t*=2 as an explanatory variable instead of dA_t/A_t in the simple regressions. With a coefficient on inv/A_t of 0.11 (*t*=1.24) the results are even less significant.

Does the data on the spread of value over cost support the hypothesis that, on average, German firms undertake less profitable investments than their American counterparts? From 1967 to 1984, the average value of $(V_t-A_t)/A_t$ is 0.460 in Germany compared to 0.501 in the US, and between 1985 and 1991, 0.451 and 0.834, respectively. Taken at face value, these equally-weighted figures suggest, on average,

less profitable investments for the sample of German firms. Calculating the ratios of aggregates provides us with value-weighted results. If the spread of value over cost is estimated *per deutschmark* of total assets of all firms by summing (V_t-A_t) across firms and then dividing by the sum of A_t, it yields a ratio of only 0.256 (0.14) across the years 1967-84 (1985-91).[26] For 1991, the ratio is 0.144 compared to 0.212 for the FF sample of American firms. When firms are value-weighted, the difference between both countries gets smaller but is still impressive. If these ratios are measures of "the effectiveness of resource allocation decisions of the publicly traded corporate sector of economies"[27], then German firms fall far behind. This is especially true for high-BE/ME firms whose ratios of aggregate (V_t-A_t) to aggregate A_t are much lower than those of low-BE/ME firms, a pattern also to be observed in the US data. However, the fact that $(V_t-A_t)/A_t$ is higher for firms sorted into the low-BE/ME category is a tautology for both Germany and the US. The ratio BE/ME expanded with total liabilities more or less equals A_t/V_t, which is $1/[(V_t-A_t)/A_t]+1$, an algebraically different version of the dependent variable itself. [28]

Controlling for earnings, dividends and financing decisions, corporate investment still has significant explanatory power to explain the spread of value over cost in the US but not in Germany. *Overall it appears that a lot of German firms' investment activity in the sample period is driven by value rather than by value creation, i.e., big firms invest a lot, regardless of profitability*.[29]

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[26] This ratio is computed over all firms $(\Sigma V_i-\Sigma A_i)/\Sigma A_i$, $i = 1,\ldots, R$.

[27] Fama and French (1996) p. 30.

[28] This is due to the fact that there are no market values of liabilities on the Compustat tapes and we are only using book values as approximations. Therefore, we have V_t/A_t = (market value of debt + book value of liabilities) / total book assets, which is an expanded version of the ratio ME/BE. This is a general weakness of the FF approach. However, since BE/ME is used only as a sorting device for the descriptive statistics and not as an explanatory variable in the regressions, it does not corrupt the results.

[29] FF note that under rational pricing and a perfect control for expected profits, the relation between investment and the spread of value over cost should be negative: holding profits fixed, an increase in assets implies a roughly one-for-one decline in the spread. Contrary though, the coefficients on dA_t/A_t and dA_{t+2}/A_t in the full regressions are all positive and significantly different from -1.0. For the US, FF correctly infer that "the earnings and financing variables in the full regressions do not produce a perfect control for expected profits, and investment picks up some of the information they miss. "

6. Robust Statistical Methods

LS regressions -- like the cross-section FM method -- are sensitive to outliers in the data. *Outliers* are sample values which deviate from the majority of the sample, for example due to extreme observations or errors in the original data. This can be illustrated by introducing the concept of the *breakdown value (bv)* of an estimator, which is the proportion m/R of a sample S that can be moved to infinity without the estimator θ moving to infinity (Hampel, 1974). It is formally given by

$$bv(\theta, S) = \min \{m/R \text{ such that } b(m; \theta, S) = \infty\}$$

where $b(m; \theta, S)$ is the maximum bias that can be obtained by replacing m of the R sample points by arbitrarily large outliers. The breakdown value is thus an indicator of the (in)sensitivity of an estimator to underlying assumptions about the distribution. For example, the breakdown value for the mean is 0%, i.e., the mean can be completely corrupted by one single outlier, whereas the breakdown value for the median is 50%. The breakdown value of the LS estimator is given by $bv(\theta, S) = 1/R \approx 0\%$. Thus, one single data point can cause the regression to *break down*. Venables and Ripley (1994) give several reasons why screening data and deleting outliers alone is ineffective in these cases:

- Even expert statisticians are not always able to screen the data.
- Down-weighting observations is preferable to completely rejecting them.
- It is very difficult to spot outliers in multivariate or highly structured data.
- Rejecting outliers conflicts with the underlying distribution theory by interfering with the iid requirement necessary for the sample selection process.
- If the outliers are leverage points, they cannot be uncovered by examining the residuals.[30]

6.1 Robust Fama-Macbeth Regressions

In a recent article Knez and Ready (1997) present a robust FM *least trimmed squares regression* (LTS) technique that has high breakdown values and is robust against

outliers in the y-direction as well as the x-direction. Their LTS estimator is formally defined as

$$\hat{a} = \arg\min \sum_{i=1}^{q} (\varepsilon^2)_{[i]}$$

where $(\varepsilon^2)_{[1]} \leq (\varepsilon^2)_{[2]} \leq \ldots \leq (\varepsilon^2)_{[R]}$ are ordered squared residuals and $\hat{a}$ is a parameter vector of length p and $q \leq R$. The scalar q over which the sum is taken depends on the *trimmed portion* α of the sample:

$$q = [R(1-\alpha)] + [\alpha(p+1)]$$

The highest possible breakdown value for the LTS estimator is given by ([(*R*-*p*)/2] +1)/*R* which is approximately 50%. It can be achieved by choosing α = 0.5 which sets $q = [R/2] + [(p+1)/2]$.

Trimming half of the sample is done to see if the previous LS regression results are confirmed under robust conditions. For this purpose, the LTSREG function in S-PLUS is used which returns a regression estimate by minimizing the sum of the smallest half of the squared residuals. It can only generate an approximation to the true solution based on a genetic algorithm, developed by Burns (1992).[31] Hence, the regression results are not exactly reproducible, though the differences are negligible. Nevertheless, they are supporting the results of the initial regressions.

6.2 Robust Regression Results

By trimming half of the sample one would intuitively expect dramatic differences between the simple LS and the LTS estimators, particularly, as a trade-off exists between trimming as many outliers as possible and maintaining a sufficient amount of

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[30] Knez and Ready (1997) point out that "[a] leverage point only has the potential to exert a large influence on the regression coefficients. For some observations, the x-values may be outliers in the x direction but, because of the associated y-values the observed points lie close to the regression line determined by the rest of the data."

[31] The exact procedure is described in the S-PLUS User's Manual (*Statistical Sciences*, 1993): "The objective that least trimmed squares minimizes is the sum of the *q* smallest squared residuals. Individual solutions are defined by a set of observation numbers, which corresponds to a least squares fit with the specified observations. A stock of popsize individuals is produced by random sampling, then a number of random samples are taken and the best solutions are saved in the stock. During the genetic phase, two parents are picked which produce an offspring that contains a sample of the observations from the parents. The best two out of the three are retained in the stock. The best of all of the solutions found is used to compute the coefficients and the residuals."

degrees of freedom. Hence, some of the original LS estimators gain in significance while others become insignificant when the LTS regressions are run.

However, none of the main conclusions changes. With one exception, none of the coefficients in the level regressions switches signs. Overall, the coefficients become smaller but most the *t*-values gain in significance, as was expected given that outliers had been accounted for. For example, the coefficient of $(V_t-A_t)/A_t$ on dA_t/A_t drops from 0.43 to 0.38 (whereas the corresponding *t*-value increases from 2.23 to 3.16); the coefficient on D_t/A_t drops from 16.67 to 10.19 and the t-value rises from 7.87 to 13.56; and the coefficient on E_t/A_t is halved from 4.48 to 2.10 with the t-value increasing from 6.59 to 4.53. These deviations only show that the interactions between investment, finance, and firm value are much stronger for some firms than for the majority of the sample. The main conclusions remain the same.

7. Empirical Results and Theory

How well do these empirical results fit the theories of capital structure and dividend decisions? Fama/French (1996) and Harris/Raviv (1991) provide some excellent discussions of theory and ist evidence. Therefore, this section will simply provide a very general overview of the topics, as displayed in Panels 1 and 2. The two panels categorize but do not analyze the most important literature. However, the list of references is far from complete. The panels also serve as a summary of the empirical results of this study by showing how these results fit in with those of the body of literature at large.

***Panel 1* – Hypotheses and Empirical Evidence on the Relation between Debt and Firm Value**

(Exhibit follows Fama/French (1996) and Harris/Raviv (1991))

Model	1.Agency Benefits of Debt a) Managerial ownership[a] b) Free cash flow hypothesis[b,g] c) Transfer of control rights[h]	2. Agency Costs of Debt a) Asset substitution[a,c,l] b) Underinvestment[d,g]	3. Asymmetric Information: a) Signaling Models[q] b) Informational Aspects[e]	4. Asymmetric Information: Pecking Order Theory[d]	5. Tax Effects[f,i]
Hypothesis	a) higher leverage allows manager to hold larger fraction of stock (incentive) b) interest payouts reduce FCF and prevent overinvestment c) gives debtholders option to liquidate firm in default state	a) potential expropriation of bondholders/ cash flow to levered equity is a convex function of returns b) bankruptcy costs impose bad incentives for investing	a) debt signals quality b) cash inflows equal cash outflows ($x_t + b_t + s_t = I_t + D_t + \pi_t$) - issues are bad news about profits (x_t) - debt (b_t) is bad news	Firms prefer i. retained earnings ii. debt (bank loans) iii. debt (bonds) iv. equity issue	a) tax advantage of debt increases value in leverage[f] b) no tax benefits, since investors avoid all taxation[i]
Suggested Effect on Value	a) leverage positively affects firm value b) debt positively affects value c) debt positively affects firm value (effect should be higher for firms with high tangible assets/liquidation value)	- negative impact of leverage on firm value (puzzle: why have debt anyhow)	a) debt is good news b) negative impact of debt and leverage on firm value	+ positive impact of debt and leverage, when higher debt is good news about investment - negative impact, when higher debt is bad news about earnings	a) positive impact of debt and leverage, when earnings are before taxes b) no impact, when earnings after taxes
Empirical Evidence in the USA[j]	- little evidence of positive effects on firm value - agency benefits of debt must be outweighed by other factors	+ evidence consistent with negative effects of debt and leverage on firm value	+ evidence consistent with the story of *debt as bad news*	+ low current and expected profits for firms with higher debt/leverage	- no tax benefits of debt[i]
Other Evidence in the USA	+ increases on announcement of debt issues[k] / of debt for equity exchange[p]	+ bonds can be expected to have covenants prohibiting asset substitution[m]		+ there is a pecking order[n] + firms issue equity after abnormal price appreciation[o]	
Empirical Evidence in Germany[h]	- little evidence of positive agency effects of debt on firm value	+ evidence consistent with negative effects of debt and leverage on firm value	+ evidence consistent with the story of *debt as bad news*	+ low current (expected) profits for firms with higher debt (leverage)	- no tax benefits of debt observable

a Jensen and Meckling (1976)
b Jensen (1986)
c Fama and Miller (1972)
d Myers (1977)
e Myers and Majluf (1984), Miller and Rock (1985)
f Miller and Modigliani (1963), Miller and Scholes (1978)
g Stulz (1990)
h The author
i Miller (1977)
j Fama and French (1996)
k Kim and Stulz (1988)
l Grossman and Hart (1982), Harris and Raviv (1990), Williamson (1988)
m Smith and Warner (1979)
n Amihud et al. (1990)
o Marsh (1982), Korajczyk et al. (1990)
p Masulis (1980, 1983), Cornett and Travlos (1989)
q Ross (1977)

***Panel 2* – Hypotheses and Empirical Evidence on the Relation between Dividends and Firm Value**
(Exhibit follows Fama/French (1996))

Model[Proponent]	1.Agency Benefits of Dividends[a]	2. Information Models a) Dividends proxy Profitability[b,m] b) Target Dividend Model[c]	3. Pecking Order Theory[d,e]	4. Tax Effects[f]
Hypothesis	- dividend payouts reduce FCF and prevent wasteful investments[a] - response of value to dividends should be higher for firms with poor growth opportunities[g]	a) dividends contain information about profitability missed by reported earnings b) firms target dividends to permanent or expected earnings	i. retained earnings ii. debt (bank loans) iii. debt (bonds) iv. equity issue	- higher personal taxes on dividends (vs. Capital gains) produce negative tax effects - no tax-disadvantage for dividends in Germany
Suggested Effect on Value	+ Dividends and higher payout ratios (dividend policy) positively affect firm value	+ positive effect of dividends on firm value	+ positive effect, when higher dividends are good news about earnings - negative effect, when higher dividends bad news about investments	- negative relation between dividends and value, when controlling for the level of earnings in the US - possible positive relation in Germany
Empirical Evidence in the USA	+ evidence consistent with positive agency benefits of dividend payouts[h] - response of value to dividends is *not* related to market/book[h]	+ dividends have explanatory power when earnings are also used to explain firm value[h] + changes in dividends produce stock price changes of the same sign[i]	- no evidence of links between investment and dividend(s)/policy[j]	- possible negative tax effects must be outweighed by other factors[h] - no evidence of dividend tax penalties[k]
Empirical Evidence in Germany	+ evidence highly consistent with positive agency benefits of dividend payouts[d]	+ firms smooth dividend payments with respect to earnings and adjust dividends to long term targets[l] + dividends have explanatory power .. when earnings are also used to explain firm value[d] / ... beyond taxation[n]	- dividends correlate positively with investment + dividends correlate positively with current and future earnings[d]	+ evidence consistent with tax benefits of dividends in Germany[d,n] (for most investor classes)

a Jensen (1986)
b Miller and Modigliani (1961)
c Lintner (1956)
d The author
e Myers (1984)
f Brennan (1970)
g Firms with poor growth opportunities – with lower average Tobin's *q* (Market/Book) – should have a greater response of value to dividend payouts, because they have greater potential to waste resources.
h Fama and French (1996)
i As it is evidenced by many event-studies, e.g., Charest (1978), Aharony and Swary (1980), Asquith and Mullins (1983).
j Fama (1974)
k Fama and French (1993)
l Behm and Zimmermann (1993) test the Lintner-Hypothesis on the relationship between dividends and earnings for a sample of 32 German firms.
m Ross (1977, 1978), Bhattacharya (1979)
n Amihud and Murgia (1997)

8. Conclusion

In 1991, a dollar of assets invested in a public stock company in the United States generated $1.21 in value whereas a deutschmark invested in German stock companies generated only DM 1.14 on average. This discrepancy widens if we take into account that only industrial and commercial firms but no banks or insurance companies are found in the Global Vantage I/C File. When FF drop these “competitive service industries” from their sample, their average value added per dollar rises.

The question is whether this is an operational benchmark for the effectiveness of investment decisions either country. Yes and no. One interpretation of small spreads of value over cost is that economic activity in a country is highly competitive. It is highly doubtful that this is a reasonable explanation for the differences in the spreads between the two countries. One problem with using my results and those by FF to compare firm behavior in the two countries is that the respective sample sizes differ. There are far more firms in the FF sample than in the sample of German firms. Nonetheless, the evidence of the effects of earnings, dividends, and investment on firm value shows parallel patterns in both countries, a phenomenon that cannot be explained solely by data snooping. LTS regressions according to the “robust” Fama-MacBeth procedure by Knez and Ready (1997) do not seem not to affect qualitative results, either. Yet, the value added of the German economy as a whole is unlikely to be that inferior to that of the US economy. I will provide two interpretations that might throw some light on this issue.

First, the market value of shares of domestic companies as a percentage of GDP is only 20.3% in Germany compared to 77.3% in the US (Allen and Gale, 1994). Therefore, most of the investment activity that is going on in Germany is not reflected in the stock market, a phenomenon portrayed by the smaller size of the sample of German stock companies. Hence, the current study covers only a small part of the German economy, while FF is likely to capture most of the corporate activity in the US. Thus, the German sample is heavily biased towards big publicly quoted companies. The renownedly successful German *small and middle-sized companies* which are likely to produce most of the value added in the economy are not included in the sample. This *privacy* of a lot of corporate activity is also a very own characteristic

of the German financial system. Secondly, “maximizing shareholder value” has not always been the main objective for corporations in Germany. Traditionally, social consensus between stakeholders has been a guideline of corporate governance in Germany. For example, between one third and one half of the directors of the supervisory board in German companies are appointed by the employees. This ensures that a good part of the value added is not distributed to shareholders but rather to company employees, in the form of wages, social benefits, and job security. This share of the value added is not reflected in a company’s stock price. However, at the margin investment decisions in Germany seem to generate less value. It can be argued if this is due to the corporate governance system or to other factors, such as capital productivity. As we have seen, even with an identical empirical methodology, it is difficult to make reliable comparative statements on investment, earnings and dividend patterns prevalent in the two countries. There is a lot of research left for the future.

Table 1 – Average correlations of dependent and independent variables for the cross-section regressions (1) and (2): 1967-84.

The variables are defined as follows: D_t is total dividends paid during fiscal year t. E_t is net income before extraordinary items, plus interest expense. V_t, the total value of the firm, is its common stock price times shares outstanding at the end of fiscal year t (taken from the Hoppenstedt German Stock Guide), corrected for preferred and other classes of stock, plus total (book) liabilities. dX_t indicates the change in a variable from year t to t+2. The table shows the correlations of the regression variables, averaged across the 18 years *t*=1967-85. The sample for each year includes all German firms listed on the stock exchange that have data on the regression variables for that year.

Variable	$(V_t-A_t)/A_t$	E_t/A_t	dE_t/A_t	dA_t/A_t	dV_t/A_t	I_t/A_t	dI_t/A_t	$d(I_t/A_t)$	D_t/A_t	dD_t/A_t	$d(D_t/A_t)$
$(V_t-A_t)/A_t$	1.00										
E_t/A_t	0.21	1.00									
dE_t/A_t	0.03	-0.39	1.00								
dA_t/A_t	0.06	0.04	0.27	1.00							
dV_t/A_t	-0.07	0.05	0.20	0.72	1.00						
I_t/A_t	-0.18	0.04	0.03	-0.04	-0.06	1.00					
dI_t/A_t	0.01	-0.05	0.23	0.63	0.47	-0.14	1.00				
$d(I_t/A_t)$	-0.02	-0.09	0.01	0.05	-0.15	-0.26	0.67	1.00			
D_t/A_t	0.42	0.44	-0.07	0.04	0.05	-0.37	0.04	0.05	1.00		
dD_t/A_t	0.04	-0.02	0.34	0.21	0.29	0.02	0.01	-0.14	-0.20	1.00	
$d(D_t/A_t)$	-0.05	-0.12	0.24	0.03	0.03	0.08	-0.14	-0.18	-0.36	0.86	1.00

Table 2a – Means of the dependent and independent variables for the cross-section regressions (1) and (2)

	Spread	Earnings		Invest.	MSE	Leverage			Dividends		
	$(V_t-A_t)/A_t$	E_t/A_t	dE_t/A_t	dA_t/A_t	dV_t/A_t	I_t/A_t	dI_t/A_t	$d(I_t/A_t)$	D_t/A_t	dD_t/A_t	$d(D_t/A_t)$
D											
85-91	**0.451**	**0.046**	**0.008**	**0.257**	**0.240**	**0.017**	**0.006**	**0.002**	**0.016**	**0.002**	**-0.002**
67-84	**0.460**	**0.042**	**0.005**	**0.158**	**0.266**	**0.021**	**0.004**	**0.000**	**0.018**	**0.002**	**-0.001**
USA											
85-91	**0.834**	**0.026**	**0.013**	**0.354**	**0.700**	**0.026**	**0.007**	**0.000**	**0.018**	**0.001**	**0.001**
67-84	**0.501**	**0.077**	**0.027**	**0.340**	**0.425**	**0.022**	**0.009**	**0.002**	**0.017**	**0.004**	**0.000**

Table 2b – Means of the dependent and independent variables for the cross-section regressions (1) and (2)

	Spread	Earnings		Invest.	MSE	Leverage			Dividends		
	$(V_t-A_t)/A_t$	E_t/A_t	dE_t/A_t	dA_t/A_t	DV_t/A_t	I_t/A_t	dI_t/A_t	$d(I_t/A_t)$	D_t/A_t	dD_t/A_t	$d(D_t/A_t)$
S/L											
85-91	**0.742**	**0.060**	**0.015**	**0.408**	**0.282**	**0.016**	**0.009**	**0.002**	**0.024**	**0.004**	**-0.003**
67-84	**0.721**	**0.040**	**0.010**	**0.187**	**0.340**	**0.023**	**0.005**	**0.000**	**0.018**	**0.002**	**-0.001**
S/H											
85-91	**0.095**	**0.036**	**0.003**	**0.154**	**0.262**	**0.019**	**0.006**	**0.003**	**0.010**	**0.002**	**0.000**
67-84	**0.101**	**0.034**	**0.004**	**0.136**	**0.266**	**0.022**	**0.004**	**0.000**	**0.010**	**0.002**	**0.000**
B/L											
85-91	**0.942**	**0.051**	**0.017**	**0.299**	**0.181**	**0.015**	**0.007**	**0.002**	**0.019**	**0.002**	**-0.003**
67-84	**0.882**	**0.053**	**0.003**	**0.179**	**0.245**	**0.016**	**0.003**	**0.000**	**0.028**	**0.001**	**-0.003**
B/H											
85-91	**0.077**	**0.039**	**-0.001**	**0.171**	**0.232**	**0.017**	**0.003**	**0.000**	**0.011**	**0.001**	**-0.001**
67-84	**0.135**	**0.041**	**0.004**	**0.129**	**0.214**	**0.022**	**0.003**	**0.000**	**0.016**	**0.002**	**0.000**

For each fiscal year, all available German firms in the sample are divided by size into two groups consisting of an equal number of firms, according to their fiscal year-end market equity (ME, stock price times shares outstanding). In each group, the firms are then sorted each year into two book-to-market-equity (BE/ME) groups of approximately equal size, based on their respective figures. Four sets with an equal number of firms (S/L, S/H, B/L, B/H) are generated this way.

Table 3a – Average coefficients and their t-statistics from simple level regressions to explain (V_t-A_t) and $d(V_t-A_t)/A_t$

The variables are defined in table 1. ET_t is earnings before taxes (Et_t plus tax expense). The cross-section regressions use investment, or earnings, or interest or dividends, along with a future change in value, as explanatory variables. The regressions are run for each year t using all German firms with data available for the year on all variables in the level regressions or the change regressions. The table shows means (across years) of the regression intercepts (Int) and slopes, and t-statistics for the means (means divided by their standard errors times the square root of the number of observations/years). The time period for the level regressions is t=1967-84, T=18.

Dependent is (Vt-At)/At					
	Int	**dA_t/A_t**		**dV_t/A_t**	
Mean	**0.40**	**0.43**		**-0.29**	**Investment**
t(mean)	**10.12**	**2.23**		**-1.98**	
	Int	**E_t/A_t**	**dE_t/A_t**	**dV_t/A_t**	
Mean	**0.26**	**4.48**	**1.75**	**-0.19**	**EBI**
t(mean)	**5.74**	**6.59**	**3.22**	**-1.81**	
	Int	**ET_t/A_t**	**dET_t/A_t**	**dV_t/A_t**	
Mean	**0.12**	**4.14**	**1.53**	**-0.21**	**EBIT**
t(mean)	**4.54**	**8.41**	**3.33**	**-2.05**	
	Int	**I_t/A_t**	**dI_t/A_t**	**dV_t/A_t**	
Mean	**0.63**	**-8.99**	**2.18**	**-0.10**	**Leverage**
t(mean)	**9.39**	**-8.17**	**0.76**	**-0.86**	
	Int	**I_t/A_t**	**$d(I_t/A_t)$**	**dV_t/A_t**	
Mean	**0.63**	**-10.16**	**-4.76**	**-0.15**	**Leverage Policy**
t(mean)	**7.75**	**-6.23**	**-2.20**	**-1.53**	
	Int	**D_t/A_t**	**dD_t/A_t**	**dV_t/A_t**	
Mean	**0.17**	**16.67**	**5.93**	**-0.18**	**Dividends**
t(mean)	**6.10**	**7.87**	**3.19**	**-1.85**	
	Int	**D_t/A_t**	**$d(D_t/A_t)$**	**dV_t/A_t**	
Mean	**0.17**	**17.35**	**6.11**	**-0.16**	**Dividend Policy**
t(mean)	**5.71**	**7.86**	**4.03**	**-1.69**	

Table 3b – Average coefficients and their t-statistics from simple biannual change regressions to explain (V_t-A_t) and $d(V_t-A_t)/A_t$

Biannual Change Regressions	Dependent is (Vt-At)/At=[(Vt+2-At+2)-(Vt-At)]/At			
	Int	dA_t/A_t	dA_{t+2}/A_t	dV_{t+2}/A_t
Investment	0.02	0.16	0.35	-0.28
	0.48	1.64	2.80	-2.71
	Int	dE_t/A_t	dE_{t+2}/A_t	dV_{t+2}/A_t
EBI	0.09	1.35	1.63	-0.14
	2.10	2.05	1.56	-2.17
	Int	dET_t/A_t	dET_{t+2}/A_t	dV_{t+2}/A_t
EBIT	0.08	1.40	1.47	-0.15
	1.98	2.50	1.62	-2.39
	Int	dI_t/A_t	dI_{t+2}/A_t	dV_{t+2}/A_t
Leverage	0.08	3.32	3.21	-0.13
	1.82	2.17	2.71	-2.51
	Int	$d(I_t/A_t)$	$d(I_{t+2}/A_{t+2})$	dV_{t+2}/A_t
Leverage Policy	0.09	-0.51	-0.32	-0.09
	2.07	-0.53	-0.66	-1.91
	Int	dD_t/A_t	dD_{t+2}/A_t	dV_{t+2}/A_t
Dividends	0.08	5.83	3.55	-0.09
	1.79	4.35	3.15	-2.45
	Int	$d(D_t/A_t)$	$d(D_{t+2}/A_{t+2})$	dV_{t+2}/A_t
Dividend Policy	0.10	4.02	0.43	-0.08
	2.29	6.46	0.92	-1.95

Table 4a – Average coefficients and their t-statistics from estimates of the full regressions (1) and (2)

Dependent Variable Is $(V_t-A_t)/A_t$

	Int	**E_t/A_t**	**dE_t/A_t**	**dA_t/A_t**	**dV_t/A_t**	**I_t/A_t**	**$d(I_t/A_t)$**	**D_t/A_t**	**$d(D_t/A_t)$**
Mean	0.17	0.40	0.01	0.38	-0.33	-2.16	-1.36	14.70	4,80
t(Mean)	3.68	1.20	0.03	2.49	-2.45	-1.87	-1,09	7,93	3.76
Mean	*0.09*	*0.48*	*0.21*	*0.79*	*-0.25*	*-3.84*	*-1.19*	*10.53*	*2.78*
t(Mean)	*0.87*	*0.36*	*0.43*	*5.06*	*-2.43*	*-2.33*	*-1.13*	*7.81*	*1.97*

	Int	**ET_t/A_t**	**dET_t/A_t**	**dA_t/A_t**	**dV_t/A_t**	**I_t/A_t**	**$d(I_t/A_t)$**	**D_t/A_t**	**$d(D_t/A_t)$**
Mean	0.12	1.44	0.41	0.42	-0.34	-2,32	-0,86	12.57	4.64
t(Mean)	2.83	6.33	1.91	2.47	-2.54	-2,12	-0,82	7.09	3.32
Mean	*0.04*	*0.80*	*0.49*	*-0.26*	*0.75*	*-2.78*	*0.14*	*8.34*	*1.51*
t(Mean)	*0.33*	*0.89*	*1.38*	*-2.53*	*4.93*	*-2.25*	*0.13*	*5.48*	*1.05*

	Int	**E_t/A_t**	**dE_t/A_t**	**dA_t/A_t**	**dV_t/A_t**	**I_t/A_t**	**dI_t/A_t**	**D_t/A_t**	**dD_t/A_t**
Mean	0.18	0.42	0.03	0.43	-0.33	-2.23	-1.44	14.60	5.16
t(Mean)	3.85	1.22	0.11	2.78	-2.46	-2.06	-1.25	7.91	4.52
Mean	*0.09*	*0.02*	*-0.15*	*1.00*	*-0.26*	*-3.28*	*-6.40*	*10.43*	*6.82*
t(Mean)	*0.97*	*0.02*	*-0.34*	*5.44*	*-2.57*	*-2.15*	*-3.74*	*8.64*	*7.15*

	Int	**ET_t/A_t**	**dET_t/A_t**	**dA_t/A_t**	**dV_t/A_t**	**I_t/A_t**	**dI_t/A_t**	**D_t/A_t**	**dD_t/A_t**
Mean	0.13	1.38	0.34	0.38	-0.53	-2.52	-1.23	12.04	3.68
t(Mean)	2.91	5.23	1.58	2.47	-2.22	-1.15	-1.15	7.01	2.78
Mean	*0.05*	*0.50*	*0.20*	*0.93*	*-0.27*	*-2.68*	*-5.24*	*8.59*	*5.42*
t(Mean)	*0.50*	*0.60*	*0.61*	*5.22*	*-2.63*	*-2.25*	*-3.51*	*6.57*	*7.15*

The regressions are run for each year t using all German firms with data available for the year on all variables in the level regressions. The table shows means (across years) of the regression intercepts (Int) and slopes, and t-statistics for the means (means divided by their standard errors times the square root of the number of observations/years T-1). The time period for the level regressions is t=1967-84, N=18. Regression results from *Fama/French* (1996) of their sample of US companies over the same time period are provided below the German results for comparisons *(in italics)*.

Table 4b– Average coefficients and their t-statistics from estimates of the full regressions (3) and (4)

Dependent Variable Is $d(V_t-A_t)/A_t=[(V_{t+2}-A_{t+2})-(V_t-A_t)]/A_t$

	Int	**dE_t/A_t**	**dE_{t+2}/A_t**	**dA_t/A_t**	**dA_{t+2}/A_t**	**dV_{t+2}/A_t**	**$d(I_t/A_t)$**	**$d(I_{t+2}/A_{t+2})$**	**$d(D_t/A_t)$**	**$d(D_{t+2}/A_{t+2})$**
Mean	0.02	0.22	0.16	0.15	0.37	-0.29	-0.39	0.14	3.99	0.46
t(Mean)	0.56	0.63	0.84	1.79	3.20	-2.80	-1.28	0.49	5.99	0.78
Mean	*-0.20*	*3.15*	*0.60*	*1.07*	*0.38*	*-0.16*	*-2.42*	*-0.70*	*4.05*	*1.48*
t(Mean)	*-4.07*	*2.75*	*2.06*	*7.83*	*3.93*	*-2.21*	*-1.75*	*-0.66*	*2.15*	*0.54*
	Int	**DET_t/A_t**	**dET_{t+2}/A_t**	**dA_t/A_t**	**dA_{t+2}/A_t**	**dV_{t+2}/A_t**	**$d(I_t/A_t)$**	**$d(I_{t+2}/A_{t+2})$**	**$d(D_t/A_t)$**	**$d(D_{t+2}/A_{t+2})$**
Mean	0.02	0.56	0.22	0.05	0.37	-0.29	-0.35	0.14	3.24	0.42
t(Mean)	0.61	1.84	1.39	0.45	3.15	-2.84	-1.14	0.47	4.24	0.67
Mean	*-0.21*	*2.44*	*0.49*	*1.05*	*0.35*	*-0.17*	*-0.90*	*0.13*	*3.49*	*1.00*
t(Mean)	*-3.98*	*3.41*	*2.55*	*7.79*	*3.76*	*-2.29*	*-0.67*	*0.12*	*1.78*	*0.35*
	Int	**dE_t/A_t**	**dE_{t+2}/A_t**	**dA_t/A_t**	**dA_{t+2}/A_t**	**dV_{t+2}/A_t**	**dI_t/A_t**	**dI_{t+2}/A_t**	**dD_t/A_t**	**dD_{t+2}/A_t**
Mean	0.01	-0.08	-0.20	0.09	0.34	-0.29	0.63	0.66	4.79	2.51
t(Mean)	0.43	-0.18	-1.16	1.29	3.04	-2.75	1.21	0.96	4.75	3.15
Mean	*-0.23*	*2.92*	*0.47*	*0.23*	*0.43*	*-0.17*	*-4.72*	*-1.34*	*4.53*	*5.16*
t(Mean)	*-5.67*	*2.64*	*1.60*	*1.32*	*3.58*	*-2.32*	*-3.62*	*-1.26*	*2.70*	*2.57*
	Int	**dET_t/A_t**	**dET_{t+2}/A_t**	**dA_t/A_t**	**dA_{t+2}/A_t**	**dV_{t+2}/A_t**	**dI_t/A_t**	**dI_{t+2}/A_t**	**dD_t/A_t**	**dD_{t+2}/A_t**
Mean	0.02	0.30	-0.13	0.09	0.33	-0.29	0.50	0.69	4.15	2.74
t(Mean)	0.52	0.81	-0.85	1.09	3.00	-2.76	0.92	1.04	3.91	3.10
Mean	*-0.23*	*2.26*	*0.39*	*0.18*	*0.39*	*-0.17*	*-3.31*	*-0.56*	*3.65*	*4.38*
t(Mean)	*-5.32*	*3.16*	*2.06*	*0.98*	*3.29*	*-2.34*	*-2.49*	*-0.47*	*2.29*	*2.27*

The regressions are run for each year t using all German firms with data available for the year on all variables in the level regressions. The table shows means (across years) of the regression intercepts (Int) and slopes, and t-statistics for the means (means divided by their standard errors times the square root of the number of observations/years T-1). The time period for the level regressions is t=1967-84, N=18. Regression results from *Fama/French* (1996) of their sample of US companies over the same time period are provided below the German results for comparisons *(in italics)*.

Table 5 – Time-series means of ratios of aggregate (V_t-A_t) to aggregate A_t and means of (V_t-A_t) and $d(V_t-A_t)/A_t$.

The variables are defined in table 1. The All group includes all German firms in the sample. The formation of the groups on size [big (B) or small (S)] and book-to-market equity [bottom 50% (L), and top 50% (H)] is described in table 2. The table shows means (across years) of the ratios of aggregate (V_t-A_t) to aggregate A_t, for the firms in a group to their aggregate A_t. The table also shows means (across firms and then years) of the ratios $(V_t-A_t)/A_t$ and $d(V_t-A_t)/A_t = [(V_{t+2}-A_{t+2})-(V_t-A_t)]/A_t$ for individual firms.

	All	S/L	S/H	B/L	B/H	USA
Time-series means of ratios of aggregate (V_t-A_t) to aggregate A_t						
1967-84	0.256	0.419	0.068	0,636	0.106	
1985-91	0.140	0.521	0.011	0.507	0.057	
1991	0.144	0.496	0.036	0.516	0.090	0.212
Means of $(V_t-A_t)/A_t$						
1967-84	0.460	0.846	0.142	0.747	0.110	0.501
1985-91	0.451	0.742	0.095	0.942	0.077	0.834
1991	0.442	0.634	0.089	0.924	0.125	1.010
Means of $d(V_t-A_t)/A_t$						
1967-84	0.109					
1985-89	0.084					

Table 6 – LTS (*least trimmed squares*) regressions to explain (V_t-A_t) and $d(V_t-A_t)/A_t$

The LTS regressions use a trimming proportion of 50%, returning a regression estimate that minimizes the sum of the smallest half of the squared residuals, in order to reject outliers and to get a very resistant regression. The results shown here will not be exactly reproducible, because the LTS method approximates the true solution based on a random algorithm, hence different answers will result each time the same regression is run. The table shows means (across years) of the regression intercepts (Int) and slopes, and t-statistics for the means (means divided by their standard errors times the square root of the number of observations/years). The time period for the regressions is t=1967-84, T=18.

Dependent is (Vt-At)/At			... **is d(Vt-At)/At=[(Vt+2-At+2)-(Vt-At)]/At**				
	Int	**dAt/At**	**dVt/At**	**Int**	**dAt/At**	**dA_{t+2}/At**	**dV_{t+2}/A_t**
Mean	0.08	0.38	-0.30	0.01	0.08	0.14	-0.09
t(mean)	13.82	3.16	-2.50	0.71	2.17	2.45	-2.10
	Int	**E_t/A_t**	**dE_t/A_t**	**dV_t/A_t**	**Int**	**dE_t/A_t**	**dE_{t+2}/A_t**	**dV_{t+2}/A_t**
Mean	0.03	2.10	0.75	0.03	0.01	0.60	0.33	-0.02
t(mean)	1.95	4.53	3.11	1.08	0.90	2.77	1.37	-0.98
	Int	**ET_t/A_t**	**dET_t/A_t**	**dV_t/A_t**	**Int**	**dET_t/A_t**	**dET_{t+2}/A_t**	**dV_{t+2}/A_t**
Mean	-0.01	2.06	0.49	-0.03	0.02	0.45	0.16	-0.03
t(mean)	-0.49	6.80	4.04	-1.25	0.95	2.44	1.47	-1.81
	Int	**I_t/A_t**	**dI_t/A_t**	**dV_t/A_t**	**Int**	**dI_t/A_t**	**dI_{t+2}/A_t**	**dV_{t+2}/A_t**
Mean	0.14	-1.63	-0.56	0.03	0.01	-0.92	0.33	0.01
t(mean)	10.36	-5.77	-0.67	0.98	0.61	-2.38	1.07	0.76
	Int	**I_t/A_t**	**$d(I_t/A_t)$**	**dV_t/A_t**	**Int**	**$d(I_t/A_t)$**	**$d(I_{t+2}/A_{t+2})$**	**dV_{t+2}/A_t**
Mean	0.15	-1.94	-0.53	0.03	0.02	0.22	0.10	0.00
t(mean)	47,15	-22.88	-4.81	8,39	1.00	0.60	0.35	-0.25
	Int	**D_t/A_t**	**dD_t/A_t**	**dV_t/A_t**	**Int**	**dD_t/A_t**	**dD_{t+2}/A_t**	**dV_{t+2}/A_t**
Mean	0.02	10.19	1.33	-0.03	0.01	5.02	0.80	-0.03
t(mean)	1.50	13.56	2.87	-0.81	0.46	3.85	1.51	-1.51
	Int	**D_t/A_t**	**$d(D_t/A_t)$**	**dV_t/A_t**	**Int**	**$d(D_t/A_t)$**	**$d(D_{t+2}/A_{t+2})$**	**dV_{t+2}/A_t**
Mean	0.01	10.44	2.51	-0.00	0.02	4.65	-0.19	-0.02
t(mean)	1.11	12.23	2.88	-0.02	1.12	3.91	-0.33	-1.26

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