Corporate Governance, Capital Structure Choice and Equity Prices

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Jobmarket paper

This paper studies the relationship between companies' choice of capital structure and their stock market returns from a corporate governance perspective. A portfolio buying low-levered, zero payout stocks and selling high-levered, zero payout stocks earned abnormal returns of 8.5% per year from Feb. 1964 to Jan. 2004 after controlling for the three Fama-French factors and momentum. Similar results arise for other portfolios with exposure to non-tight capital structures. Such structures are optimal for companies with high growth options and therefore high sensitivity to aggregate risk associated with correlation in the arrival of investment opportunities across companies. Consistent with this view, companies with less tight capital structures have higher rates of sales growth and returns which are positively correlated with the aggregate level of investment opportunities in the economy.

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1 Introduction

What is the relationship between companies' *choice* of capital structure and their equity prices? To study this question empirically, I sort companies into five groups with increasingly higher levels of total payout to asset ratios[2] and five groups with increasingly higher levels of leverage. These independent sorts create a grid, where each company falls into one of 25 categories according to its leverage and payout. I treat each category as a portfolio and evaluate its return relative to the Fama and French (1993) three factor model augmented by the momentum factor.

The main result is that a zero investment portfolio buying companies with low leverage and zero total payout and selling companies with high leverage and zero total payout earned an abnormal return of 8.5% per year from February 1964 to January 2004. Moving to groups of companies with higher total payout to asset ratios, the abnormal return from buying low-levered companies and selling high-levered ones gradually disappears. Similar results arise for other measures of payout and debt.

The theoretical motivation for this study comes from the corporate finance literature, which views capital structure as a governance mechanism chosen to mitigate the agency problem that arises, when shareholders hand over control of their company to a manager. This literature predicts that companies with lower growth options will choose tighter capital structures: that is, structures which limit the manager's discretion over funds and thereby leave him with less room for manoeuvre.

I add the idea that the arrival of investment opportunities is correlated across companies. Under this assumption, good news about arrival of an investment opportunity to one company is likely to mean that investment opportunities have arrived to other companies as well. The sum of these opportunities will lead to long-term growth of the economy. Sensitivity to arrival of investment opportunities therefore equals sensitivity to an aggregate source of risk, which I will call investment opportunity risk in the analysis that follows. Companies that optimally choose less tight capital structures have higher growth options and are therefore more sensitive to this risk factor. As a consequence, they should earn higher returns.

The corporate finance literature identifies leverage as a key variable in tightening capital structure. Higher leverage increases the part of earnings which the manager has to use for interest payments, it makes it harder to borrow more by using up borrowing capacity and it tightens the link between

[2] Total payout is defined as dividend payments until 1982 and as the sum of dividend payments and repurchases from 1983 onwards. To calculate the total payout to asset ratio I divide this number with book value of assets.

current bad investments and future bankruptcy.

The effect of payout is twofold. On one hand, higher payout leaves the manager with less discretion because part of earnings are paid out to shareholders. This tightening effect is especially important, when leverage is low and the manager therefore faces few other constraints. On the other hand, in the cross section, the observation that a company pays dividends is a signal of financial strength. In the future, the company can borrow against that stream of payments or reduce it to avoid bankruptcy. This buffer effect is especially important when leverage is high. It increases the manager's room for future renegotiation by creating a buffer consisting of soft renegotiable constraints from shareholders between the manager and the hard constraints from debt markets.

The main result is consistent with this view. When total payout is low, the capital structure of companies with high leverage is much tighter than the capital structure of those with low leverage. There is therefore a large difference in abnormal returns. As payout increases the tightening effect of payout is more important for low-levered than for high-levered companies, whereas the buffer effect is more important for high-levered than for low-levered companies. The result is that the difference in tightness of capital structure between low-levered and high-levered companies becomes smaller as payout increases, and that the abnormal return difference between these two groups of companies therefore shrinks.

In support of this interpretation, I find that the rate of sales growth is higher for low-levered than for high-levered companies and that the difference shrinks as payout increases. This is consistent with low-levered companies having higher growth options than high-levered companies and that the difference is more pronounced, when payout is low.

Comparing the contemporaneous correlation between the return on a factor portfolio designed to capture investment opportunity risk and the return on each of the 25 portfolios formed on capital structure, I find that the correlation is higher for those of the 25 portfolios representing less tight capital structures. The performance of the factor portfolio is, in turn, positively correlated with growth in both consumption and GDP per capita.

Gompers, Ishii and Metrick (2003) use a portfolio methodology to investigate the relationship between shareholder rights and equity prices. Since the theoretical framework that I use views capital structure choice as a governance mechanism, it is interesting to see if the relationship between capital structure choice and equity prices is robust to variations in shareholder rights. This turns out to be the case.

Further robustness checks show that the abnormal returns from buying low-levered and selling high-levered zero payout stocks exist for both small, medium and large companies. The effect is stronger for companies with higher market-to-book ratios and in the high-tech and manufacturing industries. The abnormal returns cannot be explained by inclusion of the liquidity factor from Pástor and Stambaugh (2003) and the aggregate volatility risk factor from Ang et. al (2006) in the pricing model. Finally, the abnormal returns are better explained as compensation for exposure to the factor portfolio capturing investment opportunity risk than as compensation for characteristics in the sense of Daniel and Titman (1997).

The rest of the paper proceeds as follows. Section 2 gives the theoretical argument in more detail and discusses related literature, section 3 contains the main empirical analysis, section 4 provides robustness checks, section 5 results on the relationship with shareholder rights and section 6 concludes. The appendix contains a sketch of a theoretical model as well as some additional empirical results.

2 Theory and related literature

The idea that companies with better growth options should choose less tight capital structures is firmly rooted in corporate finance theory. Jensen (1986) is concerned that managers will waste free cash flow, defined as "cash flow in excess of that required to fund all projects that have positive net present values" on unprofitable investment projects or organizational inefficiencies. He recommends higher debt as a potential solution. Myers (1977), on the other hand, argues that high debt increases the risk of falling into the debt overhang problem. This problem manifests itself in companies that are unable to finance profitable investment opportunities since too large a fraction of the payoff would accrue to existing debt holders.

Hart and Moore (1995) develop a model that trades off these two concerns and predicts that companies with better future investment opportunities should choose lower debt levels. The prediction has empirical support from among others Smith and Watts (1992) and Rajan and Zingales (1995), whose studies show that companies with higher market-to-book ratios have lower leverage.

The theories focus on the capital structure choice of the individual firm. I add the idea that the arrival of investment opportunities is correlated across companies. There are at least three reasons for this to be the case.

One source of new investment opportunities is the development of new technologies. A technological breakthrough, such as the advent of the Internet, will enlarge the investment opportunity set of a significant fraction of companies in the economy at once. Another source of new investment opportunities is changes in the legal environment. If an embargo is lifted or the sale of genetically modified crops allowed, this generate opportunities for many companies simultaneously. Finally, if investors have time varying discount rates, a change in the discount rate can turn projects that were previously non-profitable into profitable projects. The more potential projects a company has, the more likely it is that some of its projects will be affected.

Once the arrival of investment opportunities is correlated across companies it constitutes an aggregate source of risk. From the arguments above, companies with higher growth options choose less tight capital structures and the choice of capital structure therefore empirically identifies companies that are more sensitive to investment opportunity risk. This argument is formalized in a very simple model in the appendix. The model is not meant to give a full picture of the economy but merely illustrates that the argument makes sense in a formal setting.

To map the theoretical motivation to the empirics, it is necessary to find empirical indicators of capital structure tightness. The theoretical literature mentioned above emphasizes leverage as a key variable. Another important paper supporting this interpretation is Zwiebel (1996). He suggests that managers can take on debt and pay out the proceeds as dividends in order to commit not to undertake unprofitable investments. This choice of capital structure works as a commitment device by tightening the link between current unprofitable investments and future managerial loss of control through bankruptcy. It will be used by managers, who prefer to limit their own future discretion, because the alternative would be to face immediate loss of control through intervention by shareholders.

The tightening effect of payout mentioned in the introduction has casual support from the repeated reports in the financial press of shareholders forcing managers to pay out dividends and/or repurchase shares, because they are concerned that managers have discretion over more resources than they will invest in the interest of shareholders. One recent example is the conflict between Carl Icahn and the management at Time Warner, which resulted in the company increasing the size of its repurchase program by 15 billion dollars (The Economist 2006). Zwiebels (1996) use of dividend payments provides a theoretical example of the tightening effect. Shareholders role in assuring that payout takes place is treated in Myers (2000).

The buffer effect of dividend payments has support in the literature on companies facing financial constraints. The two indexes of the likelihood of facing financial constraints used by Whited and Wu (2006) and Lamont, Polk and Saá-Requejo (2001), respectively, both associate dividend payments with lower likelihood of the firm being financially constrained.

Both indexes associate higher leverage with higher likelihood of facing financial constraints. Since a marginal change in the likelihood of facing financial constraints should matter more when these constraints are closer to being binding, this supports that the buffer effect of dividend payments is more important for high-levered companies than for low-levered companies, as suggested in the introduction.

By looking into the relationship between equity prices and variables motivated by corporate governance considerations, this paper falls into the tradition established by the seminal paper by Gompers, Ishii and Metrick (2003) mentioned in the introduction. Another recent paper in this tradition is Cremers, Nair and John (2006). They sort companies into portfolios according to their likelihood of being acquired in a takeover and find that companies with higher takeover risk earn higher returns.

In addition, there is a literature that relates financial constraints to stock market returns. Examples include the papers just mentioned by Whited and Wu (2006) and Lamont, Polk and Saá-Requejo (2001). Whited and Wu (2006) estimate a partial equilibrium investment model to construct an index of financial constraints. They use this index to form a factor, which earns a positive abnormal return relative to the Fama and French (1993) three factor model augmented with momentum. They argue that their measure of financial constraints is better than the Kaplan-Zingales index (Kaplan and Zingales (1997)) used by Lamont, Polk and Saá-Requejo (2001)[3] to form a financial constraints factor. Their factor earned significant negative abnormal returns.

This paper differs from results in the financial constraints literature in terms of the actual sorts performed as well as the motivation for the analysis and interpretation of the results. In the financial constraints view, companies differ in their likelihood of facing financial constraints: that is "frictions that prevent the firm from funding all desired investments" (Lamont, Polk and Saá-Requejo (2001). The perspective is that of a decision maker choosing investment policy to maximize profits under the

[3] The working paper version of Lamont, Polk and Saá-Requejo (2001) also made separate sorts of companies according to interest coverage ratios, net cash flow and dividend/earning ratios.

constraints that external funds are more costly than internal funds or in some cases even impossible to obtain due to some underlying agency problem. Since the investment decision maximizes profits, any constraints on the maximization problem lowers profits.

Financial constraints are more likely to be binding in economic downturns. Companies, which are sensitive to those constraints, are therefore likely to under-perform in periods of time, when marginal consumption is valued the most by risk averse investors. To compensate investors for this risk, companies that are likely to face financial constraints should earn higher returns.

The tight capital structure view, presented here, emphasizes that due to the separation of ownership and control, investment policy is chosen to maximize the managers utility rather than profits. In this view, managers face constraints from financial markets because shareholders have insisted on a highly levered capital structure in order to place hard constraints on managerial discretion. The availability of this choice is beneficial to shareholders, as it enlarges the set of governance mechanisms they can choose between in order to align the manager's interests with their own. In this view, managers can face constraints both from shareholders demanding payout and from financial markets demanding repayment of debt and/or being unwilling to increase lending to the company. Capital structure is optimally chosen to be tighter for companies with fewer growth options and therefore lower exposure to investment opportunity risk. These companies should as a consequence earn lower returns.

The two views also differ on the role of dividends. The financial constraints view emphasizes only the buffer effect. If investments are chosen optimally there is no reason to pay dividends to limit the manager's discretion over funds and the tightening effect is therefore unimportant. The tight capital structure view considers both the buffer and the tightening effect of dividends and suggests that the net effect should vary with the level of leverage.

I believe that the financial constraint view is important, but the fact that the capital structure portfolios which earn high abnormal returns in this study are those, which are the least likely to face financial constraints, suggests that it is not the full story.

3 Empirical Analysis

3.1 Data

I draw the share price data and returns from CRSP, accounting data from Compustat and the factor returns for the four factor model from Kenneth R. French's website. The governance index G is from Andrew Metrick's website and is discussed in detail in Gompers, Ishii and Metrick (2003). In short, it is a variable ranging from 0 to 24, which counts whether the balance of power in the company is tilted towards management or shareholders according to 24 different criteria. Higher values of the index correspond to less powerful shareholders. The $FVIX$ factor is a portfolio formed to capture aggregate volatility risk and is described in detail in Ang et. al. (2006). LIQ^V (drawn from Wharton Research Data Services) is a portfolio designed to capture liquidity risk. It is described in detail in Pástor and Stambaugh (2003)[4]. The GDP, consumption and aggregate investment data are from the Bureau of Economic Analysis. The labour productivity index is from the Bureau of Labour Statistics.

In order to get an aggregate measure of investment opportunities, INV, I each year calculate the value weighted average market-to-book ratio across all companies, for which data are available in Compustat[5]. In order to avoid that the measure is driven by outliers, I winsorize the market-to-book ratios at the 1% and 99% percentiles of their univariate distribution.

To measure repurchases I use the change in treasury stock, except for companies which use the retirement method in their accounting for repurchases. For these companies, repurchases are defined as the difference between purchases and sales of stock, when this is positive, and zero otherwise. This measure was developed by Fama and French (2001). It is designed to exclude the substantial amount of repurchased stock that does not qualify as non-cash dividends, since it subsequently is reissued to either employee stock ownership plans, executive stock options or acquired firms in mergers. Further details are given in the appendix.

[4] I thank Andrew Ang, Robert J. Hodrick, Yuhang Xing and Xiaoyan Zhang for giving me access to their data on the $FVIX$ factor returns. I thank Kenneth R. French, Eugene F. Fama, Andrew Metrick, Paul Gompers, Joy Ishii, Lubos Pástor and Robert F. Stambaugh for making their data available through either their websites or Wharton Research Data Services.

[5] The weights are calculated using market value of outstanding equity (from CRSP) at the beginning of the Compustat year.

3.2 Abnormal returns

In each calendar year s, I sort companies based on accounting information from Compustat year s-2. The two year gap is chosen to ensure that there is no look-ahead bias. A variable is labeled year s in Compustat, if the financial statement it is based upon was published some time between the 1^{st} of June of year s and the 31^{st} of May of year s+1. Therefore, a lead of just one year is not enough to avoid potential look-ahead bias.

As I only have data on repurchases from 1983, I define total payout, PO_{s-2}, as dividend payments, D_{s-2}, until 1982, and as the sum of dividend payments and repurchases from 1983 onwards. The exclusion of repurchases until 1983 is a limited problem, since as a form of payout "share repurchases were relatively unimportant until the mid-1980's" (Allen and Michaely (2003)). I sort companies into two groups. Those with strictly positive total payout and those with either zero or strictly negative total payout. For simplicity, I refer to companies in the latter group as zero total payout companies in what follows. It is possible to have negative total payout in a given year, as my measure of repurchases can be negative. I then divide total payout by book value of assets, A_{s-2}, and sort the companies with strictly positive total payout into quartiles according to their $\frac{PO_{s-2}}{A_{s-2}}$ ratio.

I define leverage, $\frac{L_{s-2}}{A_{s-2}}$, as the ratio of liabilities, L_{s-2}, to book value of assets and make an independent sort of companies into quintiles according to leverage. The result is that each stock belongs to one of 25 (5x5) portfolios with different leverage and payout characteristics.

For each portfolio, i, I then calculate the value weighted return with monthly rebalancing over year s and compile the returns over years to construct a time-series of monthly returns. Unless otherwise noted, the series run from February 1964 to January 2004. Table 1 gives the average excess-return over the risk free rate and their standard errors for each of the 25 portfolios over this time period. In addition, the rightmost column gives the return on the 5 portfolios, which for each payout category buys the low-levered and sells the high-levered stocks.

Even though the overall sample is large, some portfolios contain only very few stocks in certain months, because the sorts according to leverage and total payout are done independently. The return on these portfolios should be interpreted with caution. Throughout the paper, I therefore mark portfolio returns based on portfolios, which for any given month contain less than 15, 10 or 5 stocks, with a "!", "!!" or "!!!" mark, respectively. Portfolios which have months with missing data due to zero stocks are marked with "!!!!".

Table 1. Excess-returns from sorts on leverage and total payout
The table shows average monthly excess-returns measured in % per month and their Fama-Macbeth standard errors in parenthesis for 25 portfolios formed on the ratio of total payout to assets and leverage. The rightmost column shows for each payout category the average monthly return difference between the portfolio of stocks with the lowest and highest leverage as well as it's Fama-Macbeth standard error. The sample period is Feb. 1964 to Jan. 2004. Portfolios, which for any month in the sample period contain less than 15, 10 or 5 stocks are marked with "!!!", "!!" or "!", respectively.

	$\frac{L_{s-2}}{A_{s-2}} low$	$\frac{L_{s-2}}{A_{s-2}}$ 2	$\frac{L_{s-2}}{A_{s-2}}$ 3	$\frac{L_{s-2}}{A_{s-2}}$ 4	$\frac{L_{s-2}}{A_{s-2}} high$	$\frac{L_{s-2}}{A_{s-2}} low - \frac{L_{s-2}}{A_{s-2}} high$
$\frac{PO_{s-2}}{A_{s-2}} low$	.742 (.375)	.598 (.358)	.683 (.345)	.416 (.329)	.569 (.328)	.173 (.211)
$\frac{PO_{s-2}}{A_{s-2}}$ 2	.671 (.330)!!	.530 (.323)	.469 (.291)	.588 (.269)	.709 (.263)	$-.038$ (.261)!!
$\frac{PO_{s-2}}{A_{s-2}}$ 3	.806 (.335)	.422 (.292)	.633 (.247)	.539 (.233)	.567 (.241)	.239 (.268)
$\frac{PO_{s-2}}{A_{s-2}}$ 4	.436 (.255)	.499 (.237)	.356 (.198)	.489 (.185)	.392 (.226)	.043 (.208)
$\frac{PO_{s-2}}{A_{s-2}} high$	.310 (.207)	.461 (.200)	.506 (.192)	.511 (.216)!!!	.658 (.267)!!!	$-.348$ (.226)!!!

The differences in raw returns are relatively small and statistically insignificant. This picture changes once the returns are adjusted for exposure to other risk factors through estimation of the following four factor asset pricing model:

$$RET_{i,t} - RF_t = \alpha_i + \beta_{i,1} RMRF_t + \beta_{i,2} SMB_t + \beta_{i,3} HML_t + \beta_{i,4} UMD_t + \zeta_{i,t} \quad (1)$$

This is the three factor model of Fama and French (1993) augmented with the momentum-factor, UMD_t. $RET_{i,t}$ is the return of portfolio i during month t and RF_t is the risk free rate during month t. So, $RET_{i,t} - RF_t$ is the return of a zero-investment portfolio, which is long in portfolio i and short in the risk free asset. $RMRF_t$, SMB_t (small minus big) and HML_t (high minus low) are month t returns on zero investment portfolios, which capture market risk, size and book-to-market effects, respectively. $\zeta_{i,t}$ is an error term, and α_i is the abnormal return of portfolio i beyond what can be explained by the four factors.

The intercepts and their robust t-statistics from estimation of equation (1) for each of the 25 portfolios are given in Table 2. The table also contains the abnormal returns and their robust t-statistics for the 5 portfolios, which for each total payout category buys the low-levered and sells the high-levered stocks.

Table 2. Abnormal returns from sorts on leverage and total payout
The table shows estimated $\alpha' s$ measured in % per month and their robust t-statistics in parenthesis from regression equation (1) for 25 portfolios formed on the ratio of total payout to assets and leverage. The rightmost column shows for each payout category the abnormal return from buying the portfolio with the lowest leverage and selling the portfolio with the highest leverage. Portfolios, which for any month in the sample period contain less than 15, 10 or 5 stocks are marked with "!!!", "!!" or "!", respectively. The sample period is Feb. 1964 to Jan. 2004.

	$\frac{L_{s-2}}{A_{s-2}} low$	$\frac{L_{s-2}}{A_{s-2}}$ 2	$\frac{L_{s-2}}{A_{s-2}}$ 3	$\frac{L_{s-2}}{A_{s-2}}$ 4	$\frac{L_{s-2}}{A_{s-2}} high$	$\frac{L_{s-2}}{A_{s-2}} low - \frac{L_{s-2}}{A_{s-2}} high$
$\frac{PO_{s-2}}{A_{s-2}} low$	.340 (2.1)	.008 (.1)	−.110 (−.8)	−.323 (−2.2)	−.339 (−2.3)	.679 (3.4)
$\frac{PO_{s-2}}{A_{s-2}}$ 2	.215 (1.0)!!	.041 (.2)	.010 (.1)	−.135 (−1.0)	.061 (.4)	.154 (.6)!!
$\frac{PO_{s-2}}{A_{s-2}}$ 3	.652 (2.9)	.064 (.5)	.127 (1.2)	−.099 (−1.1)	−.007 (−.1)	.659 (2.7)
$\frac{PO_{s-2}}{A_{s-2}}$ 4	.046 (.3)	−.010 (−.1)	−.064 (−.8)	−.004 (−.0)	−.055 (−.4)	.101 (.5)
$\frac{PO_{s-2}}{A_{s-2}} high$	−.058 (−.6)	.103 (1.3)	.097 (1.0)	.019 (.1)!!!	−.048 (−.3)!!!	−.010 (−.0)!!!

For the companies with zero total payout, the abnormal returns decline monotonically as leverage increases. The portfolio, which buys the low-levered zero total payout stocks and sells the high-levered zero total payout stocks, earns an abnormal return of 68 basis points per month. This is equivalent to an accumulated abnormal return of 8.5% per year. As total payout increases, the abnormal return from buying low-levered and selling high-levered stocks decreases. The decrease is statistically significant[6] and arises both from low-levered stocks doing poorer and high-levered stocks doing better as total payout increases.

None of these movements are monotone, but the deviations from monotonicity are not statistically significant. For example, a portfolio, which in the difference column of Table 2 buys the third portfolio from the top and sells the second, earns an abnormal return of (65.9-15.4)=50.5 basis points per month. The t-statistic of this difference is only 1.6, however. The lack of significance and the fact that other sorts on capital structure variables presented in the section with robustness checks give a more monotone picture of decline, makes me believe that the deviations from monotonicity could well be due to chance.

The theoretical motivation suggests that companies with less tight capital structures earn higher returns as compensation for higher exposure to investment opportunity risk. If loadings on the four factors from regression equation (1) vary systematically across capital structure portfolios, it is not

[6] A portfolio, which in the difference column of Table 2 buys the portfolio for the lowest total payout level and sells the portfolio for the highest total payout level, earns an abnormal return of (67.9-(-1.0))=68.9 basis points per month with a robust t-statistic of 2.4.

immediate that the abnormal returns from Table 2 give an accurate picture of the exposure of the portfolios to investment opportunity risk. A perfect pricing model, for example, would account fully for investment opportunity risk through variations in factor loadings and no abnormal returns would be left.

To address this concern, Table A2 through A4 in the appendix show the factor loadings of the 25 portfolios on the $RMRF_t$, SMB_t, and UMD_t factors, respectively. The tables show that the loadings on UMD_t are generally insignificant. The loadings on both $RMRF_t$ and SMB_t are decreasing as payout increases, but show relatively little systematic variation with leverage. Both of these portfolios can reasonably be thought to capture part of investment opportunity risk.

$RMRF_t$ captures fluctuations in the market, and since an inflow of investment opportunities leads to economic growth, part of it could be captured by this factor. SMB_t buys small firms and sells large firms. Small firms are generally thought to have higher growth options than large firms, so also part of the return on this factor could be compensation for investment opportunity risk. To show the importance of these three factors for the pricing of portfolios, Table 3 shows abnormal returns, when the factors are excluded from the pricing model.

Table 3. Abnormal returns when HML_t is the only factor
The table shows estimated $\alpha's$ measured in % per month and their robust t-statistics in parenthesis from regression equation (1) with $\beta_{i,1}, \beta_{i,2}$ and $\beta_{i,4}$ set equal to zero for 25 portfolios formed on the ratio of total payout to assets and leverage. Portfolios, which for any month in the sample period contain less than 15, 10 or 5 stocks are marked with "!!!", "!!" or "!", respectively. The sample period is Feb. 1964 to Jan. 2004.

	$\frac{L_{s-2}}{A_{s-2}} low$	$\frac{L_{s-2}}{A_{s-2}}$ 2	$\frac{L_{s-2}}{A_{s-2}}$ 3	$\frac{L_{s-2}}{A_{s-2}}$ 4	$\frac{L_{s-2}}{A_{s-2}} high$
$\frac{PO_{s-2}}{A_{s-2}} low$	1.419 (4.8)	1.168 (3.9)	1.165 (3.9)	.834 (2.8)	.952 (3.2)
$\frac{PO_{s-2}}{A_{s-2}}$ 2	1.066 (3.6)!!	.920 (3.1)	.812 (3.1)	.805 (3.2)	.854 (3.3)
$\frac{PO_{s-2}}{A_{s-2}}$ 3	1.281 (4.4)	.859 (3.5)	.913 (4.0)	.717 (3.2)	.717 (3.0)
$\frac{PO_{s-2}}{A_{s-2}}$ 4	.783 (3.5)	.786 (3.6)	.551 (3.0)	.568 (3.1)	.523 (2.4)
$\frac{PO_{s-2}}{A_{s-2}} high$	.597 (3.3)	.746 (4.3)	.633 (3.3)	.622 (3.0)!!!	.702 (2.7)!!!

A comparison of the abnormal returns in Table 3 with those in Table 2 shows that the pattern in the leverage dimension is unchanged, whereas the pattern in the payout dimension is different. Abnormal returns for the high payout stocks have been shifted down relative to those of low payout stocks. This was to be expected, as Table A2 through A4 showed that high payout stocks have lower sensitivity to the $RMRF_t$ and SMB_t factors than low payout stocks.

Ignore HML_t for a moment. Then, if $RMRF_t$ and SMB_t have nothing to do with investment opportunity risk, the abnormal returns in Table 2 give a correct picture of exposure to investment opportunity risk for the portfolios formed on capital structure. If, on the other hand, $RMRF_t$ and SMB_t only represent investment opportunity risk, the correct picture is given by Table 3.

In either case, the two predictions from theory are born out by the data. First, low-levered stocks earn higher returns than high levered stocks due to higher exposure to investment opportunity risk. Second, this difference shrinks as payout increases, because the tightening effect of payout is more important for low-levered stocks, whereas the buffer effect is more important for high-levered stocks.

The only difference between the two tables is that Table 2 suggests that the buffer effect of payout is strong enough to dominate the tightening effect for high-levered stocks, so that for these stocks, capital structure tightness falls and abnormal returns increase with payout. Table 3 on the other hand suggests that the tightening effect still dominates the buffer effect for the highest level of payout. Whether the buffer effect dominates the tightening effect for high-levered stocks or not is an interesting question. The theory generates no predictions about this, however, and is therefore consistent with both scenarios.

Now consider HML_t. Table 4 shows the factor loadings of the capital structure portfolios on HML_t, when it is used as the only factor.

Table 4. Loadings on HML_t, when it is the only factor

The table shows estimated factor loadings on the HML_t factor with robust t-statistics in parentheses for 25 portfolios formed on the ratio of total payout to assets and leverage, when $\beta_{i,1}, \beta_{i,2}$ and $\beta_{i,4}$ are set equal to zero in the four factor model from regression equation (1). Portfolios, which for any month in the sample period contain less than 15, 10 or 5 stocks are marked with "!!!", "!!" or "!", respectively. The sample period is Feb. 1964 to Jan. 2004.

	$\frac{L_{s-2}}{A_{s-2}}low$	$\frac{L_{s-2}}{A_{s-2}}$ 2	$\frac{L_{s-2}}{A_{s-2}}$ 3	$\frac{L_{s-2}}{A_{s-2}}$ 4	$\frac{L_{s-2}}{A_{s-2}}high$
$\frac{PO_{s-2}}{A_{s-2}}low$	-1.597	-1.346	-1.137	$-.985$	$-.902$
	(-12.7)	(-11.0)	(-8.5)	(-8.0)	(-7.8)
$\frac{PO_{s-2}}{A_{s-2}}$ 2	$-.932$	$-.920$	$-.808$	$-.510$	$-.343$
	(-7.1)!!	(-7.3)	(-6.8)	(-4.5)	(-2.8)
$\frac{PO_{s-2}}{A_{s-2}}$ 3	-1.119	-1.029	$-.660$	$-.421$	$-.352$
	(-9.1)	(-8.7)	(-6.4)	(-4.4)	(-3.1)
$\frac{PO_{s-2}}{A_{s-2}}$ 4	$-.818$	$-.677$	$-.460$	$-.188$	$-.307$
	(-9.4)	(-7.6)	(-6.3)	(-2.2)	(-3.3)
$\frac{PO_{s-2}}{A_{s-2}}high$	$-.676$	$-.674$	$-.297$	$-.264$	$-.103$
	(-8.3)	(-8.9)	(-3.2)	(-2.9)!!!	(-1.0)!!!

The table shows that low-levered stocks have lower loadings on the HML_t factor than high-levered stocks, and that low payout stocks have lower loadings than high-payout stocks. Furthermore, the difference in loading on the HML_t factor between low-levered and high-levered stocks is higher, when payout is low than when it is high. Similarly, the difference in loading on the HML_t factor between zero total payout and high total payout companies is larger for low-leverage companies than for high levered companies.

In other words, the portfolios which load the least on HML_t are those which the theory predicts should have the highest exposure to investment opportunity risk. There is therefore only two ways in which HML_t can disturb the mapping from exposure of the capital structure portfolios to investment opportunity risk into abnormal returns in Table 3. The first is, if HML_t is not a true factor, such that it is possible to find portfolios with negative exposure to HML_t but unaffected returns. When HML_t is included in the pricing model, the estimated intercept of such portfolios would be positive in order to correct for the false prediction that the portfolios should earn low returns due to negative exposure to HML_t. This story would create a pattern of abnormal returns as in Table 3 from the loadings on HML_t in Table 4 without any investment opportunity risk. The second way is, if HML_t represents positive investment opportunity risk.

The first case would be troubling given the status of HML_t in the literature. The second is hard to believe given that HML_t is a factor that buys companies with low market-to-book ratios and sells companies with high market-to-book ratios. Market-to-book ratios are widely used as a measure of investment opportunities, so if anything one would expect HML_t to represent negative exposure to investment opportunity risk.

Why then, is HML_t so important for the pattern in abnormal returns? The last alternative is that the portfolios, which have high exposure to investment opportunity risk, provide a hedge against the risk represented by HML_t. When neither HML_t nor investment opportunity risk is included in the pricing model, the compensation for exposure to these two risk factors approximately cancel each other out. Once HML_t is included in the pricing model, the lack of compensation for exposure to investment opportunity risk becomes clear in the pattern of abnormal returns. Fama and French (1993) suggested that HML_t represents distress risk. It makes sense that companies with tight capital structures, while being less exposed to investment opportunity risk, are more exposed to the risk of falling into financial distress. This would lead to some degree of cancellation.

It would be suspicious, if there was always approximate cancellation. One of the robustness checks below sorts companies simultaneously on market-to-book ratios, leverage and total payout to asset ratios. This sort limits the variation in market-to-book ratios across companies within each market-to-book ratio category and should thereby limit the cancellation problem. In that sort, there are abnormal returns from buying low-levered and selling high-levered zero total payout stocks in terms of both raw returns, returns relative to the CAPM model and returns relative to the full four factor model from regression equation (1). This shows that the cancellation argument is not necessary to demonstrate abnormal returns from portfolios formed on capital structure choice.

3.3 Contemporaneous factor exposure

So far, I have assumed that the abnormal returns were compensation for factor exposure. For this assumption to be reasonable, it is necessary that the portfolio returns are contemporaneously correlated with the returns on a portfolio, which represents the underlying investment opportunity risk factor.

To represent this factor, I choose a zero investment portfolio labeled $LLMHL_t$ (that is, low leverage minus high leverage). It buys an equal weighted average of the 3 portfolios in Table 2 with leverage in the lowest leverage quintile and total payout in one of the 3 lowest payout quintiles. It sells an equal weighted average of the 6 portfolios in Table 2 with leverage in one of the two highest leverage quintiles and total payout in one of the 3 lowest payout quintiles.

$LLMHL_t$ is chosen to capture the idea that low-levered companies are more exposed to investment opportunity risk than high-levered companies and that this difference is more pronounced for companies with low levels of total payout. The portfolio includes more capital structure groups in the short side than in the long side, because there are statistically significant abnormal returns for portfolios in the second highest leverage quintile in Table 2 but not in the second lowest. In this way, the portfolio includes all the statistically significant abnormal returns available from the sort on total payout and leverage.

I use the $LLMHL_t$ portfolio throughout the paper to capture the investment opportunity risk factor. The only exception is Table 5 below, where I show that the portfolios, which have high abnormal returns in Table 2, also have returns with high contemporaneous correlation with the investment opportunity risk factor. To show this, the immediate intuition would be to include the return on the $LLMHL_t$ portfolio on the right hand side of equation (1) to obtain the following pricing model:

$$RET_{i,t} - RF_t = \alpha_i + \beta_{i,1} RMRF_t + \beta_{i,2} SMB_t + \beta_{i,3} HML_t + \beta_{i,4} UMD_t + \beta_{i,5} LLMHL_t + \zeta_{i,t} \quad (2)$$

The problem with this approach is that it uses the left hand side portfolios to construct the right hand side factor. To avoid this problem, I, for the estimation of Table 5, first split the companies into two groups using a random number generator. I then sort the companies in the first group according to leverage and total payout and form the $LLMHL_t$ factor for the right hand side of (2) from that sort following the same procedure, as I used on the entire sample above. I finally sort companies in the second group into portfolios according to leverage and total payout and use the return on these portfolios on the left hand-side of (2). The result is given in Table 5.

Table 5. Loadings on the $LLMHL_t$ factor formed on half of the sample
The table shows estimates of β_5 with robust t-statistics in parenthesis from regression equation (2) for 25 portfolios formed on the ratio of total payout to assets and leverage. The firms in the sample are randomly split into two groups. The first group is used to form the $LLMHL_t$ factor and the second half is used to form the 25 portfolios. This is the only place in the paper where the $LLMHL_t$ factor is not calculated using the entire sample. Portfolios, which for any month in the sample period contain less than 15, 10 or 5 stocks are marked with "!!!", "!!" or "!", respectively. Portfolios which contain zero stocks in any month during the sample period is marker with "!!!!". The sample period is Feb. 1964 to Jan. 2004.

	$\frac{L_{s-2}}{A_{s-2}} low$	$\frac{L_{s-2}}{A_{s-2}}$ 2	$\frac{L_{s-2}}{A_{s-2}}$ 3	$\frac{L_{s-2}}{A_{s-2}}$ 4	$\frac{L_{s-2}}{A_{s-2}} high$
$\frac{PO_{s-2}}{A_{s-2}} low$	.290 (5.4)	.108 (2.3)!	.053 (1.1)	.069 (1.4)	−.051 (−1.0)
$\frac{PO_{s-2}}{A_{s-2}}$ 2	−.028 (−.3)!!!	.211 (2.9)!!	.013 (.3)!	−.042 (−.9)	−.212 (−6.4)
$\frac{PO_{s-2}}{A_{s-2}}$ 3	.201 (3.4)!!	.286 (4.1)	−.039 (−.8)	−.033 (−1.0)	−.171 (−4.5)
$\frac{PO_{s-2}}{A_{s-2}}$ 4	.169 (3.0)	.021 (.6)	.077 (2.5)	−.080 (−2.2)	−.021 (−.4)!!
$\frac{PO_{s-2}}{A_{s-2}} high$	.028 (.7)	.061 (2.0)	−.114 (−3.4)!	−.026 (−.6)!!!	−.217 (−3.2)!!!!

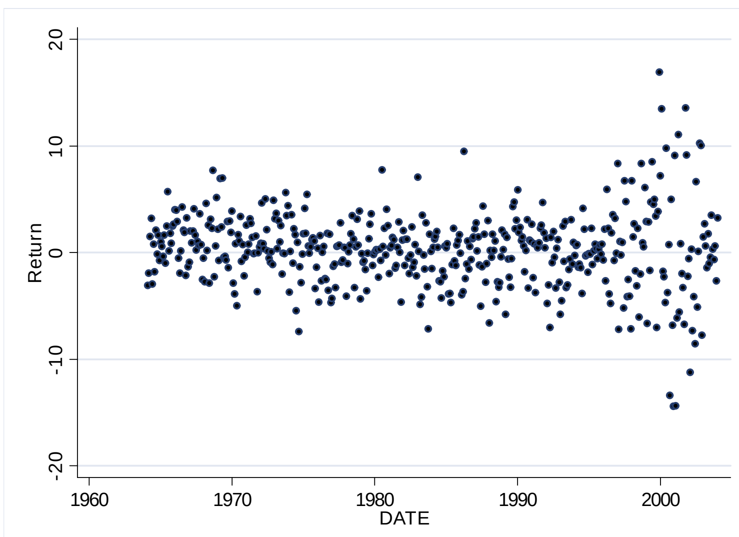
The overall pattern in Table 5 is that factor exposure, measured as the estimate of β_5 in (2), is reduced when leverage is increased as expected from theory. It can be seen that the absolute values of coefficient estimates tend to be higher when total payout is low than when it is high, consistent with the idea that factor exposure varies more with leverage, when total payout is low.

The one big exception from the overall pattern is the negative coefficient estimate for the portfolio with lowest leverage and second lowest level of payout. Due to the sample split, this portfolio contains as little as 1 stock in certain months and less than 5 stocks in 10% of the months. The point estimate is therefore relatively unreliable.

3.4 Exploration of the LLMHL factor

Having established that the portfolio returns are systematically related with the return on the $LLMHL_t$ factor, this section explores the properties of the factor. First, I plot the monthly returns on the factor in Figure 1.

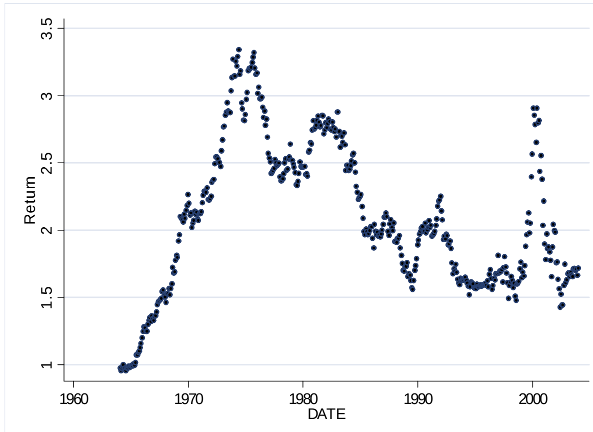
Figure 1. Monthly returns on the LLMHL$_t$ factor
The figure shows the monthly return in percent on the $LLMHL_t$ factor over the Feb. 1964 to Jan. 2004 period.



The volatility of returns seems to be fairly stable over time with the exception that it increases at the peak of the stock market bubble around year 2000. After the bubble, volatility drops back to the level before the bubble. There are no big outliers with the potential to drive results.

To give an idea about the cumulative effect of these returns, Figure 2 below shows the cumulative return on the $LLMHL_t$ factor over the sample period.

Figure 2. Cumulative returns on the LLMHL$_t$ factor
The figure shows the cumulative return on the $LLMHL_t$ factor over the Feb. 1964 to Jan. 2004 period.



The $LLMHL_t$ factor performs well until the end of June 1974. It never recovers to the level recorded at that month, but has another spike around the stock market bubble around year 2000.

This description does not do full justice to the $LLMHL_t$ factor, as it does not take into account that the factor provides a hedge against other priced sources of risk. To give an idea about this hedging effect, I have estimated the four factor model in regression equation (1) with the return on the $LLMHL_t$ factor on the left hand-side. The result is given in Table 6.

Table 6. The pricing of the LLMHL$_t$ factor by the four factor model in equation (1)
The table shows the estimated coefficients with robust t-statistics from an estimation of the four factor model given in equation (1) with the $LLMHL_t$ portfolio on the left hand-side. The sample period is Feb. 1964 to Jan. 2004.

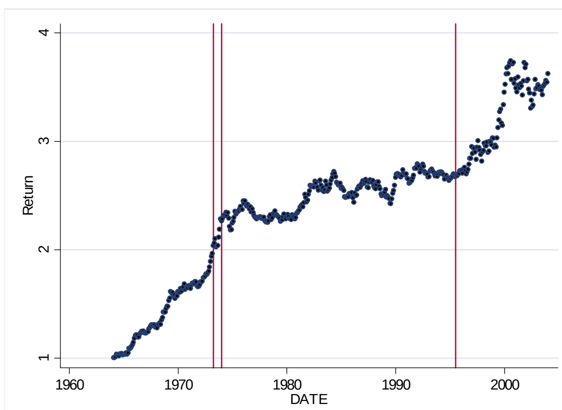
	Int	$RMRF_t$	SMB_t	HML_t	UMD_t	R^2
$LLMHL_t$	.543	−.074	.109	−.659	−.099	0.3064
	(3.8)	(−1.9)	(2.0)	(−9.5)	(−2.06)	

Table 6 shows that the abnormal return on the $LLMHL_t$ factor is 54 basis points per month, and that the factor provides a good hedge against the HML_t factor and some hedging against both the $RMRF_t$ factor and the UMD_t factor. The low R^2 indicates that a significant part of the variation in the $LLMHL_t$ factor cannot be explained by exposure to the four factors from the four factor model in regression equation (1).

To get an idea about the properties of this part of the $LLMHL_t$ factor, I have formed a portfolio which buys the $LLMHL_t$ portfolio, buys .074 units of the $RMRF_t$ factor, sells .109 units of the SMB_t factor, buys .659 units of the HML_t and buys. .099 units of the UMD_t factor. I have then scaled down the return on this portfolio in order for the total investment to correspond to the standard case of a 1$ long and a 1$ short position.

The result is a portfolio, which I will call the compensated $LLMHL_t$ portfolio. It's return is a scaled version of the sum of the intercept and the residual of the regression estimated in Table 6. It has therefore no estimated exposure to any of the four factors from the four factor model. It's cumulative return is given in Figure 3.

Figure 3. Cumulative returns on the compensated LLMHL$_t$ portfolio
The figure shows the cumulative return on the compensated $LLMHL_t$ portfolio over the Feb. 1964 to Jan. 2004 period. Vertical lines are at end of March and December 1973 and at the end of June 1995.



The first vertical line on the figure is at the end of March 1973. That is the date where US labour productivity starts to fall marking the beginning of a long period with lower productivity growth (see Figure 4 below). The second line is at the end of December 1973 and marks a shift toward lower returns on the compensated $LLMHL_t$ portfolio. It might appear that this break should be placed a little later, but if you magnify the graph, it shows a small dip in January 1974 and returns, which are generally lower after December 1973 than before. Finally, the last vertical line is at the end of June 1995 and marks the beginning of a second period of high labour productivity growth in the US (see Figure 4 below).

The graph suggests a link between long run productivity growth and long run performance of the compensated $LLMHL_t$ portfolio. This relationship supports the theoretical interpretation of the abnormal return results.

One of the suggested drivers of the correlation in the arrival of investment opportunities is technological innovation. In periods of time, where such innovations are frequent, labour productivity should improve due to improved technology, and new investment opportunities should appear. The exact timing of these effects are hard, as markets are forward-looking and it could either be that new investments increase labour productivity or that increases in labour productivity generate new investment opportunities. Over longer time horizons there should be a relationship however, and that is what is seen in Figure 3.

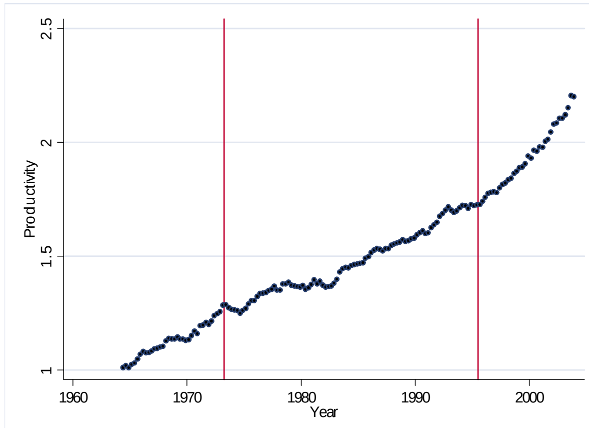
The slight divergence in timing between the slowdown in productivity growth and the slowdown in returns on the compensated $LLMHL_t$ portfolio, could be due either to the mentioned timing difficulties or the shock to costs, which firms faced during the first oil-crisis in the fall of 1973.

This shock to costs is likely to have affected companies with tighter capital structures more adversely than companies with loose capital structures, since the latter are more robust towards short term shocks to earnings. The good performance of the compensated $LLMHL_t$ portfolio in the fall of 1973 could be due to this robustness of companies with loose capital structures rather than good news about investment opportunities.

To give an idea about the changes in labour productivity growth, Figure 4 shows the cumulative growth in output per hour of all persons working in the US nonfarm business sector[7].

[7] The data for this time series is the PRS85006092 series from the Bureau of Labour Statistics.

Figure 4. Cumulative labour productivity growth.
The figure shows the cumulative growth in US labour productivity in the nonfarm business sector over the Apr. 1964 to Dec. 2003 sample period. Productivity at the start of April 1964 is normalized to 1. Vertical lines are at end of March 1973 and at the end of June 1995. Source: Bureau of Labour Statistics.



The figure shows relatively high labour productivity growth until the first vertical line at the end of March 1973. Then follows a period with lower average productivity growth until the end of June 1995, after which labour productivity growth picks up again. The changes are not as clear as those on Figure 3, but they still stand out, as a constant labour productivity growth throughout the period would have delivered exponential growth in the graph.

The comparison of Figure 3 and 4 links the return on the component of the $LLMHL_t$ portfolio which is not due to correlation with other factors to long term changes in productivity growth. For more formal testing of a relationship between the performance of the $LLMHL_t$ portfolio and macroeconomic variables, I include a number of macroeconomic factors on the right hand-side of the 4 factor model from equation (1) and put the $LLMHL_t$ portfolio on the left hand side. That is, I estimate:

$$LLMHL_{3t} = \gamma + \delta_1 RMRF_{3t} + \delta_2 SMB_{3t} + \delta_3 HML_{3t} + \delta_4 UMD_{3t} + \delta_5 Macro_{3t} + \nu_{3t} \qquad (3)$$

The results are given in Table 7, and for each column I have used a different variable for $Macro_{3t}$. The "3t" subscript denotes that the return data have been accumulated over quarters in order to match the quarterly frequency of the macro variables.

Table 7. Sensitivity to macro factors

Each column in the table shows coefficient estimates and their robust t-statistics from estimation of equation (3) with a different macro factor. Units are in % per quarter. The sample period is Apr. 1964 to Dec. 2003 and the data are quarterly.

	$LLMHL_{3t}$	$LLMHL_{3t}$	$LLMHL_{3t}$	$LLMHL_{3t}$
Int	1.071	1.067	1.041	.856
	(2.0)	(1.8)	(2.1)	(1.5)
$RMRF_{3t}$	−.083	−.080	−.098	−.083
	(−1.3)	(−1.3)	(−1.6)	(−1.3)
SMB_{3t}	.070	.096	.069	.076
	(0.7)	(1.0)	(0.7)	(0.7)
HML_{3t}	−.578	−.585	−.601	−.580
	(−6.2)	(−6.3)	(−6.5)	(−6.4)
UMD_{3t}	−.041	−.044	−.050	−.049
	(−0.4)	(−0.5)	(−0.5)	(−0.5)
$Pgrowth_{3t}$	.770			
	(1.5)			
$Igrowth_{3t}$		.315		
		(1.6)		
$Cgrowth_{3t}$			1.181	
			(2.1)	
$GDPgrowth_{3t}$				1.160
				(2.5)
R^2	0.279	0.283	0.286	0.295

$Pgrowth_{3t}$ is the quarterly growth in labour productivity and has already been motivated in the discussion of Figure 3 above.

$Igrowth_{3t}$ is the quarterly real growth of aggregate private fixed nonresidential investment. The idea is that increases in aggregate investment should be correlated with news about increases in the aggregate level of investment opportunities in the economy. Since companies with non-tight capital structures should perform well, when investment opportunities arise, the return on the $LLMHL_{3t}$ factor should be positively correlated with $Igrowth_{3t}$.

$GDPgrowth_{3t}$ is the quarterly real growth in GDP per capita. The theoretical motivation suggests that the $LLMHL_{3t}$ factor earns high returns, because it is sensitive to fluctuations in the aggregate level of investment opportunities. This sensitivity matters, because better investment opportunities lead to long term growth in output, and therefore higher sensitivity to investment opportunity risk means higher sensitivity to the general performance of the economy. From theory we should therefore expect a positive correlation between the $LLMHL_{3t}$ factor and $GDPgrowth_{3t}$.

$Cgrowth_{3t}$ is the quarterly real growth in personal consumption of nondurable goods per capita. The sketch of a theoretical model given in the appendix is rooted in the consumption based approach to asset pricing. In this view assets should earn high returns if they are negatively correlated with changes in marginal utility from consumption. From the model we should therefore expect a positive correlation between the $LLMHL_{3t}$ factor and $Cgrowth_{3t}$.

As expected from theory, the coefficients on all 4 macro-variables are positive. They are statistically significant for $Cgrowth_{3t}$ and $GDPgrowth_{3t}$, but not for $Pgrowth_{3t}$ and $Igrowth_{3t}$. In terms of economic significance, a one standard deviation increase in $Pgrowth_{3t}$, $Igrowth_{3t}$, $Cgrowth_{3t}$, and $GDPgrowth_{3t}$ are associated with 10%, 12%, 13% and 16% of a standard deviation increase in the $LLMHL_{3t}$ factor, respectively.

The theory section suggests that shareholders in the choice of capital structure trade off the risk of managerial empire building with the costs imposed by a tight capital structure when good investment opportunities arise. In this world, not all investments are good, but only investments undertaken, when there are good opportunities available.

The motivation for inclusion of investment growth in the regressions above is that investments are good on average, because shareholders have the possibility to limit poor investment through the choice of capital structure. The theory suggests that predictive power can be increased by taking aggregate investment opportunities into account as well.

To bring this idea into the empirical framework I calculate the value-weighted average of market-to-book ratios of all companies in Compustat, INV_s, as detailed in the data section. The motivation is that market-to-book ratios are a commonly used proxy for investment opportunities at the company level.

INV_s is based on yearly data, and I interact it with the growth in aggregate investments[8]. The idea is that high investment growth, when investment opportunities are high, is better than high investment growth, when investment opportunities are low. The results are given in Table 8 for the use of this interaction variable in the pricing equation (3):

[8] $Igrowth_{3t}$ of the second quarter of calendar year q is interacted with INV_s based on Compustat data from the Compustat year running from Jun. of calendar year q-1 to May of calendar year q, since that Compustat year has the highest degree of overlap with the second quarter.

Table 8. Sensitivity to investment opportunities

Each column in the table shows coefficient estimates and their robust t-statistics from estimation of equation (3) with various combinations of macro factors. t-statistics are calculated using standard errors clustered according to the Compustat year to take into account that the observations on INV_s are yearly. Units are % per quarter. The sample period is Apr. 1964 to Dec. 2003, and the data are quarterly.

	$LLMHL_{3t}$	$LLMHL_{3t}$	$LLMHL_{3t}$	$LLMHL_{3t}$
Int	−1.606	.784	−.189	−4.963
	(−0.8)	(1.4)	(−0.2)	(−2.3)
$RMRF_{3t}$	−.079	−.084	−.099	−.087
	(−1.4)	(−1.4)	(−1.9)	(−1.1)
SMB_{3t}	.082	.113	.127	.066
	(0.8)	(1.1)	(1.4)	(0.9)
HML_{3t}	−.591	−.580	−.579	−.341
	(−4.3)	(−4.6)	(−4.4)	(−3.4)
UMD_{3t}	−.057	−.046	−.059	.087
	(−0.4)	(−0.4)	(−0.5)	(0.8)
INV_s	1.561		.568	3.173
	(1.4)		(1.0)	(2.5)
$Igrowth_{3t}$			−1.267	−.781
			(−3.2)	(−1.1)
$INV_s * Igrowth_{3t}$		.258	.817	.457
		(2.7)	(4.3)	(1.1)
R^2	0.295	0.308	0.345	0.243

The first column of Table 8 shows that aggregate investment opportunities are positively correlated with returns on the $LLMHL_{3t}$ factor. But, the relation is not statistically significant. The second column shows that the interaction between INV_s and $Igrowth_{3t}$ is statistically significant and positive, when it enters the equation (3) alone.

In the third column all three variables enter together. It suggests that the $LLMHL_{3t}$ factor performs well, when aggregate investment grows in an environment with good investment opportunities, but poorly, when aggregate investment grows in an environment with poor investment opportunities. This is very much in line with the theoretical motivation. The relative magnitude of the coefficients on $Igrowth_{3t}$ and $INV_s * Igrowth_{3t}$ suggests that the marginal effect of an increase in $Igrowth_{3t}$ on $LLMHL_{3t}$ becomes positive, when INV_s reaches the 31^{st} percentile of its historical distribution.

The theory stresses investment opportunities, and you could therefore argue that this variable should be more important than investment growth. One problem here is that INV_s is only a proxy, which will be particularly out of line with investment opportunities in bubble periods. When INV_s is a poor measure of investment opportunities, there could well be more information in looking at $INV_s * Igrowth_{3t}$, which captures periods of time, when high values of the investment opportunity measure are associated with actual investment. This interpretation is supported by the fourth column.

Here, I exclude the bubble years from 1997 onwards, where INV_s is likely to be particularly noisy. I find that though the sign of all coefficients on the macro factors remain the same, the relative importance, as well as statistical significance, moves towards INV_s.

3.5 Further links to investment opportunities

3.5.1 Sales growth

The theoretical framework claims that companies with better growth options choose less tight capital structures. The empirical evidence cited in the theory section supports this idea. In order to check that it also holds under the current portfolio approach, I have in Table 9 reported averages across years together with their Fama-Macbeth standard errors of the value-weighted average sales growth across companies within each of the 25 capital structure portfolios.

The rightmost column of the table shows for each payout category, the difference in average sales growth between the portfolio of high-levered and the portfolio of low-levered companies and its t-statistic, calculated using Fama-Macbeth standard errors. Since sales growth is very volatile, I have for each year winsorized the growth rates at the 1% and 99% level of the empirical distribution across all companies.

Table 9. Value-weighted average sales growth
The table shows the average yearly sales growth across years and its Fama-Macbeth standard error for 25 portfolios formed on the ratio of total payout to assets and leverage. Each year s, the portfolios are formed using Compustat data from year s-1. The sales growth for each portfolio in year s is calculated as a value-weighted average of the sales growth from year s-1 to year s of all companies in the portfolio. Companies with negative sales in year s-1 are excluded, but all other companies in Compustat with the necessary data are used. Sales growth at the company level is winsorized at the 1% and 99% percentile of the distribution of sales growth across all companies in a given year before calculation of the value-weighted averages. The rightmost column contains the difference between the average sales growth of the portfolio with the lowest and highest leverage levels for each payout category and it's t-statistic calculated using Fama-Macbeth standard errors. The sample period is Jun. 1963 to May. 2004.

	$\frac{L_{s-2}}{A_{s-2}} low$	$\frac{L_{s-2}}{A_{s-2}}$ 2	$\frac{L_{s-2}}{A_{s-2}}$ 3	$\frac{L_{s-2}}{A_{s-2}}$ 4	$\frac{L_{s-2}}{A_{s-2}} high$	$\frac{L_{s-2}}{A_{s-2}} low - \frac{L_{s-2}}{A_{s-2}} high$
$\frac{PO_{s-2}}{A_{s-2}} low$	.429 (.035)	.324 (.024)	.278 (.018)	.273 (.023)	.300 (.034)	.130 (5.0)
$\frac{PO_{s-2}}{A_{s-2}}$ 2	.293 (.034)	.232 (.026)	.199 (.019)	.167 (.010)	.163 (.016)	.130 (3.7)
$\frac{PO_{s-2}}{A_{s-2}}$ 3	.173 (.018)	.155 (.013)	.139 (.008)	.123 (.009)	.129 (.016)	.044 (2.1)
$\frac{PO_{s-2}}{A_{s-2}}$ 4	.150 (.011)	.121 (.010)	.107 (.009)	.105 (.011)	.128 (.015)	.022 (1.3)
$\frac{PO_{s-2}}{A_{s-2}} high$	.136 (.011)	.119 (.009)	.097 (.009)	.095 (.010)	.121 (.026)	.015 (0.6)

Table 9 shows that the average sales growth rate is higher for companies with low leverage than for companies with high leverage. The difference is large and statistically significant when payout is low. It becomes smaller and statistically insignificant as payout increases. This is consistent with the idea that low-levered companies have higher growth options than high-levered companies and that this is more pronounced for companies with low payout.

3.5.2 Sort on market-to-book ratios

In reality there are many other motivations for the choice of capital structure than the considerations stressed in the theory section. If the abnormal returns from buying low-levered and selling high-levered stocks are linked to investment opportunity risk, these returns should be higher in situations, where the signal-to-noise ratio of capital structure choice is higher. That is: situations where differences in investment opportunities should be relatively more important for capital structure choice than other considerations.

One such situation is companies with high market-to-book ratios. A high market-to-book ratio can either arise because a company has good future investment opportunities or because current assets are highly profitable. In the first scenario, a non-tight capital structure is beneficial, as it allows managers to take advantage of future opportunities. The second scenario is the stereotype of the free cash flow problem. A manager is sitting on highly profitable assets with only few good investment opportunities. In this case, a tight capital structure is imperative.

In other words, we know ex ante that within the high market-to-book ratio class of companies, there is substantial variation among companies in the forces emphasized by theory. Therefore, the signal-to-noise ratio of capital structure should be higher within this group.

To investigate this idea, I sort companies simultaneously and independently according to the ratio of their market value, V_{s-2}, to book value of assets, A_{s-2}, the ratio of total payout to book value of asset and leverage. In order to maintain a reasonable number of firms in each portfolio, I only sort companies into 3 groups along each dimension rather than the usual 5. As before the lowest total payout group consists of companies with zero or negative total payout. The result is given in Table 10.

Table 10. Abnormal returns for different levels of investment opportunities.
The table shows estimated $\alpha's$ measured in % per month and their robust t-statistics in parenthesis from regression equation (1) for 27 portfolios formed on the ratio of total payout to assets, leverage and the market-to-book ratio. Portfolios, which for any month in the sample period contain less than 15, 10 or 5 stocks are marked with "!!!", "!!" or "!", respectively. The sample period is Feb. 1964 to Jan. 2004.

	$\frac{V_{s-2}}{A_{s-2}}low$			$\frac{V_{s-2}}{A_{s-2}}mid$			$\frac{V_{s-2}}{A_{s-2}}high$		
	$\frac{L_{s-2}}{A_{s-2}}l$	$\frac{L_{s-2}}{A_{s-2}}m$	$\frac{L_{s-2}}{A_{s-2}}h$	$\frac{L_{s-2}}{A_{s-2}}l$	$\frac{L_{s-2}}{A_{s-2}}m$	$\frac{L_{s-2}}{A_{s-2}}h$	$\frac{L_{s-2}}{A_{s-2}}l$	$\frac{L_{s-2}}{A_{s-2}}m$	$\frac{L_{s-2}}{A_{s-2}}h$
$\frac{PO_{s-2}}{A_{s-2}}l$	−.025	.016	.051	.005	−.205	−.366	.322	−.150	−.647
	(−.1)!!	(.1)	(.3)	(.0)!!	(−1.1)!!	(−2.5)	(2.0)!	(−1.0)!	(−3.6)
$\frac{PO_{s-2}}{A_{s-2}}m$	.038	−.115	.027	.097	−.113	−.077	.529	.202	−.022
	(.2)	(−1.2)	(.2)	(.5)!!!	(−1.0)	(−.7)	(2.8)!!!	(1.6)!!	(−.1)
$\frac{PO_{s-2}}{A_{s-2}}h$	.009	−.055	−.101	−.035	.025	.013	.005	.090	.102
	(.1)	(−.6)!	(−.8)!!!!	(−.3)	(.3)	(.1)	(.1)	(1.0)	(.7)!!

As expected, the strategy of buying low-levered and selling high-levered zero total payout stocks earns much higher returns in the group of high market-to-book ratio companies (97 basis points per month or 12.3% per year) than in the group of low market-to-book ratio companies (minus 8 basis points per month).

3.6 Industry effects

The theory section argues that a core reason for the arrival of investment opportunities to be correlated across companies is technological innovation. The signal-to-noise argument from the previous section therefore suggests that a portfolio buying low-levered and selling high-levered zero total payout stocks should earn higher returns in industries, where technological innovation is more important for long term growth. Candidates are the high-tech and manufacturing sectors.

To test this idea, I have sorted companies into 5 industries according to the classification made by Fama and French (see Fama and French (1997) and Kenneth R. French's website). The industries are Consumer, Manufacturing, HighTech, Health and Other[9].

To classify companies into industry groups I use historical SIC-codes from Compustat when available and SIC codes from CRSP, when this is not the case. To keep a reasonable number of firms in each capital structure category, I have only sorted companies into whether they have strictly positive payout or not, and whether their leverage is above or below the median.

[9] Consumer includes "Consumer Durables, NonDurables, Wholesale, Retail, and Some Services (Laundries, Repair Shops)". Manufacturing includes "Manufacturing, Energy, and Utilities". HighTech includes "Business Equipment, Telephone and Television Transmission". Health includes "Healthcare, Medical Equipment, and Drugs" and Other includes "Mines, Constr, BldMt, Trans, Hotels, Bus Serv, Entertainment, Finance". For further detail see Kenneth R. Frenchs website at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/.

The abnormal returns of the resulting portfolios relative to the four factor model from regression equation (1) and their robust t-statistics are given in Table 11. The "Dif" column gives for each industry the abnormal return for a zero investment portfolio buying low-levered and selling high-levered zero total payout stocks.

Table 11. Abnormal returns for different industries

The table shows estimated $\alpha's$ measured in % per month and their robust t-statistics in parenthesis from regression equation (1) for 20 portfolios formed on the ratio of total payout to assets, leverage and industry classification (see Fama and French (1997) and Kenneth R. French's website). Portfolios, which for any month in the sample period contain less than 15, 10 or 5 stocks are marked with "!!!", "!!" or "!", respectively. Portfolios which contain zero stocks in any month during the sample period are marked with "!!!!". The sample period is Feb. 1964 to Jan. 2004.

	$\frac{D_{s-2}}{A_{s-2}}l, \frac{L_{s-2}}{A_{s-2}}l$	$\frac{D_{s-2}}{A_{s-2}}l, \frac{L_{s-2}}{A_{s-2}}h$	$\frac{D_{s-2}}{A_{s-2}}h, \frac{L_{s-2}}{A_{s-2}}l$	$\frac{D_{s-2}}{A_{s-2}}h, \frac{L_{s-2}}{A_{s-2}}h$	Dif
Consumer	−.418 (−2.3)	−.030 (−.2)	.051 (.5)	.085 (.8)	−.388 (−1.9)
Manufacturing	−.180 (−1.0)	−.537 (−3.3)	−.127 (−1.3)	−.084 (−1.1)	.357 (1.8)
HighTech	.485 (2.3)	.108 (.4)	.312 (1.9)	.204 (1.3)	.377 (1.6)
Health	.320 (1.0)!!!	−.736 (−1.9)!!!!	.437 (2.6)	.488 (2.0)!!!	1.030 (2.3)!!!!
Other	−.332 (−1.6)!!	−.533 (−3.4)	−.122 (−1.2)	−.021 (−.2)	.202 (.9)!!

The "Dif" column shows that only the abnormal return from buying low-levered and selling high-levered zero total payout stocks in the health sector is statistically significant. That estimate relies on a portfolio, which in certain months contain no stocks. If I restrict the sample period, to the period for which the long and the short side of the "Dif" portfolio for the health sector contains at least 15 stocks each month (February 1974 to January 2004), the point estimate drops to 0.52 percent per month, with a t-statistic of 1.6.

The difference between the performance of the "Dif" portfolio for the Consumer sector and both the Manufacturing sector and the HighTech sector is statistically significant[10], however. These differences are what were expected to be significant from theory.

The negative abnormal return of the "Dif" portfolio for the consumer sector is statistically insignificant but still large. One possible explanation is that the investment opportunity considerations

[10] The portfolio which buys the "Dif" portfolio for the manufacturing sector and sells the "Dif" portfolio for the consumption sector earns an abnormal return relative to the four factor model of 75 basis points per month with a t-statistic of 2.7. For the portfolio which buys the "Dif" portfolio for the HighTech sector and sells the "Dif" portfolio for the consumption sector the abnormal return is 77 basis points per month with a t-statistic of 2.5.

stressed in this paper are so unimportant for this sector that other considerations are dominating the relationship between abnormal returns and capital structure choice. The capital constraint view mentioned in the theory section is an example of a theory, which suggests that high-levered companies should earn higher returns.

4 Robustness checks

4.1 Sorts on alternative measures of tight capital structure

There is no unique way to measure the tightness of capital structure. This section therefore explores the robustness of the abnormal return results to variation in the capital structure variables.

One concern is that the effect of dividend payments and repurchases on capital structure tightness could be different, since dividend payments are a more permanent commitment to pay out than repurchases. I prefer the total payout measure used above, as repurchases especially in recent years have constituted a significant part of payout. But, Table 12 shows that the main results are robust to exclusion of repurchases. It uses the ratio of dividend payments to book value of assets, $\frac{D_{s-2}}{A_{s-2}}$, as the measure of payout, and the resulting return pattern is quite close to what I found earlier using total payout.

Table 12. Abnormal returns from sorts on leverage and dividend payments
The table shows estimated $\alpha's$ measured in % per month and their robust t-statistics in parenthesis from regression equation (1) for 25 portfolios formed on the ratio of dividend payments to assets and leverage. Portfolios, which for any month in the sample period contain less than 15, 10 or 5 stocks are marked with "!!!", "!!" or "!", respectively. The sample period is Feb. 1964 to Jan. 2004.

	$\frac{L_{s-2}}{A_{s-2}}low$	$\frac{L_{s-2}}{A_{s-2}}$ 2	$\frac{L_{s-2}}{A_{s-2}}$ 3	$\frac{L_{s-2}}{A_{s-2}}$ 4	$\frac{L_{s-2}}{A_{s-2}}high$	$\frac{L_{s-2}}{A_{s-2}}low - \frac{L_{s-2}}{A_{s-2}}high$
$\frac{D_{s-2}}{A_{s-2}}low$	.285 (1.8)	.051 (.4)	−.111 (−.8)	−.272 (−1.9)	−.348 (−2.3)	.633 (3.2)
$\frac{D_{s-2}}{A_{s-2}}$ 2	.148 (.5)!!!	−.027 (−.2)!	−.055 (−.3)	−.192 (−1.4)	.054 (.4)	.094 (.3)!!!
$\frac{D_{s-2}}{A_{s-2}}$ 3	.646 (2.9)!	.091 (.6)	.129 (1.3)	−.003 (−.0)	.005 (.0)	.640 (2.6)!
$\frac{D_{s-2}}{A_{s-2}}$ 4	.112 (.7)	−.011 (−.1)	−.009 (−.1)	−.003 (−.0)	.005 (.0)	.108 (.5)
$\frac{D_{s-2}}{A_{s-2}}high$	−.074 (−.7)	.018 (.2)	.071 (.7)	−.008 (−.1)!!!	−.111 (−.6)!!!	.037 (.2)!!!

The tight capital structure view is concerned with the manager's room for manoeuvre. The capital structure variables used so far have the advantage that they focus on long term constraints and therefore should be less noisy measures of the desired tightness of capital structure. This should give higher predictive power as well as lower portfolio turnover making transaction costs a less plausible justification for the abnormal returns. The variables have the disadvantage however that they do not take into account the current income situation of the company. Table 13 and 14 attempt to address this concern.

In Table 13 I use the ratio of current assets, C_{s-2}, to liabilities, L_{s-2}, as a measure of debt constraints. Current assets is defined in Compustat as "cash, and other assets, which in the next 12 months, expect to be realized in cash or used in the production of revenue." This measure therefore captures the relationship between the accumulated funds over which the manager currently has discretion and his obligations to repay debt.

In Table 14 the focus is completely on the company's current situation rather than the long term. Here I look at the part of earnings, which are either used to repay debt or paid out in terms of dividends and/or share repurchases. I sort companies according to their interest coverage, $Icov_{s-2}$, defined as the ratio of earnings before interest and taxes divided by interest expense, and the ratio of total payout to earnings after interest payments and taxes, EaI_{s-2}. The idea here is to capture the part of current income used to meet current hard obligations in terms of interest payments and current soft obligations in terms of payout to shareholders.

Table 13. Abnormal returns from sorts on $\frac{C_{s-2}}{L_{s-2}}$ and total payout

The table shows estimated $\alpha's$ measured in % per month and their robust t-statistics in parenthesis from regression equation (1) for 25 portfolios formed on the ratio of total payout to assets and the ratio of short term assets to liabilities. Portfolios, which for any month in the sample period contain less than 15, 10 or 5 stocks are marked with "!!!", "!!" or "!", respectively. The sample period is Feb. 1964 to Jan. 2004.

	$\frac{C_{s-2}}{L_{s-2}} low$	$\frac{C_{s-2}}{L_{s-2}}$ 2	$\frac{C_{s-2}}{L_{s-2}}$ 3	$\frac{C_{s-2}}{L_{s-2}}$ 4	$\frac{C_{s-2}}{L_{s-2}} high$	$\frac{C_{s-2}}{L_{s-2}} high - \frac{C_{s-2}}{L_{s-2}} low$
$\frac{PO_{s-2}}{A_{s-2}} low$	−.346 (−2.4)	−.402 (−2.5)	−.138 (−.9)	.213 (1.3)	.447 (2.3)	.792 (3.4)
$\frac{PO_{s-2}}{A_{s-2}}$ 2	−.175 (−1.2)	.034 (.2)	.198 (1.1)	.323 (1.7)	.356 (1.4)!!	.531 (1.6)!!
$\frac{PO_{s-2}}{A_{s-2}}$ 3	−.270 (−2.4)	.087 (.8)	.201 (1.7)	.599 (2.8)	.114 (.6)	.384 (1.8)
$\frac{PO_{s-2}}{A_{s-2}}$ 4	−.142 (−1.5)	.091 (.8)	.002 (.0)	.175 (1.5)	.319 (1.8)	.461 (2.3)
$\frac{PO_{s-2}}{A_{s-2}} high$	−.082 (−.8)!!	.083 (.8)	.157 (1.3)	.090 (.8)	.105 (.8)	.187 (1.1)!!

Table 14. Sorts on interest coverage and the payout-earning ratio
The table shows estimated $\alpha's$ measured in % per month and their robust t-statistics in parenthesis from regression equation (1) for 25 portfolios formed on the ratio of total payout to earnings after interest and taxes and the interest coverage ratio. The sample excludes companies for which these ratios are strictly negative[11]. Portfolios, which for any month in the sample period contain less than 15, 10 or 5 stocks are marked with "!!!", "!!" or "!", respectively. The sample period is Feb. 1964 to Jan. 2004.

	$Icov_{s-2}$ *low*	$Icov_{s-2}$ 2	$Icov_{s-2}$ 3	$Icov_{s-2}$ 4	$Icov_{s-2}$ *high*	*high* − *low*
$\frac{PO_{s-2}}{EaI_{s-2}}low$	−.289	−.551	−.249	−.028	.371	.659
	(−2.0)	(−3.8)	(−1.4)	(−.2)	(2.2)!	(3.4)!
$\frac{PO_{s-2}}{EaI_{s-2}}$ 2	.189	−.269	−.103	.188	.424	.235
	(.9)	(−1.9)	(−.8)	(1.5)	(3.3)	(1.0)
$\frac{PO_{s-2}}{EaI_{s-2}}$ 3	.022	−.163	.055	.087	.138	.115
	(.1)!	(−1.3)	(.5)	(1.1)	(1.1)	(.5)!
$\frac{PO_{s-2}}{EaI_{s-2}}$ 4	.216	−.066	.005	.014	.190	−.026
	(1.4)!	(−.6)	(.1)	(.2)	(1.3)	(−.1)!
$\frac{PO_{s-2}}{EaI_{s-2}}high$	−.097	−.149	.065	−.273	.031	.128
	(−.8)	(−1.3)	(.5)	(−1.8)!!	(.2)!!!	(.5)!!!

Since higher values of $Icov_{s-2}$ and $\frac{C_{s-2}}{L_{s-2}}$ correspond to less tight capital structures, the results in Table 13 and 14 are overall consistent with the results from the main analysis. In both sorts, the decline in abnormal return as payout increases from buying companies with low constraints from debt and selling companies with high constraints from debt is more monotone than what we saw in the main analysis. This strengthens the interpretation that the deviations from monotonicity in the main analysis are due to chance.

4.2 Constraints from financial markets

The logic of using leverage as a measure of constraints on the manager's financial discretion is partly motivated by the idea that higher leverage is a commitment to higher interest payments, and partly by the idea that it uses up borrowing capacity. The latter part of the argument could be wrong, if the choice of leverage is driven mainly by the ability to borrow.

I doubt this interpretation for two reasons. First, the companies in the sample are listed companies and therefore companies with reasonable access to external finance. Second, the sort on interest coverage above gave similar results as the main analysis, and it is hard to argue that companies with lower interest coverage have higher ability to borrow.

[11] The problem is that the ratios are hard to interpret when earnings are negative. With negative earnings, a decrease in dividends or a decrease in earnings both increase the $\frac{PO_{s-2}}{EaI_{s-2}}$ ratio, but have opposite implications for the tightness of capital structure.

As a final test, I have calculated the average across years of the fraction of companies, which for each capital structure category falls into the top decile of the empirical distribution across companies of the Kaplan and Zingales (1997) index of financial constraints. If low-levered companies have low leverage due to lack of ability to borrow, they should also be more likely to face financial constraints. The exact calculation of the index follows Lamont, Polk and Saá-Requejo (2001) and is given in the appendix.

Table 15. Fractions of companies in the highest decile of the Kaplan-Zingales index
The table shows the average fraction across the years 1963-2004 of companies in each of 25 portfolios falling into the top-decile of the distribution of the Kaplan-Zingales index across all firms in that year. Portfolios are formed using Compustat data from year s-1 on leverage and the total payout to asset ratio, and the Kaplan-Zingales index is calculated using data from year s. Only companies for which the necessary data are available to calculate the index are used to calculate the fractions.

	$\frac{L_{s-2}}{A_{s-2}} low$	$\frac{L_{s-2}}{A_{s-2}}$ 2	$\frac{L_{s-2}}{A_{s-2}}$ 3	$\frac{L_{s-2}}{A_{s-2}}$ 4	$\frac{L_{s-2}}{A_{s-2}} high$
$\frac{PO_{s-2}}{A_{s-2}} low$	.087	.082	.104	.209	.465
$\frac{PO_{s-2}}{A_{s-2}}$ 2	.033	.022	.034	.093	.266
$\frac{PO_{s-2}}{A_{s-2}}$ 3	.012	.008	.009	.030	.177
$\frac{PO_{s-2}}{A_{s-2}}$ 4	.008	.005	.005	.014	.184
$\frac{PO_{s-2}}{A_{s-2}} high$	.005	.008	.010	.040	.209

Table 15 shows that the portfolio with the highest concentration of firms, which are likely to be financially constrained, is the high leverage, zero total payout portfolio. Consistent with the buffer effect of dividend payments, the likelihood of being financially constrained falls with payout.

These relationships are somewhat mechanical in that leverage enters positively and dividend payments negatively in the calculation of the index, but still interesting. Theoretically, everything else equal, higher leverage and lower ability to pay out increases the risk of facing financial constraints.

The numbers in Table 15 shows that in the cross section, variation in other factors in the index are not strong enough to overcome the everything else equal effect of leverage and dividend payments. The table also shows the increase in importance of the buffer effect of dividend payments as leverage increases. For low-levered companies, moving from low payout to high payout lowers the reported fraction with 8.2%, whereas the same move for high-levered stocks reduces the fraction with 25.6%.

4.3 Is the result a small firm effect?

It is well known that the Fama-French three factor model has problems pricing small companies, and it is therefore interesting to see if the results in the main analysis are a small-firm effect. To that end, I have in Table 16 sorted companies simultaneously on total payout, leverage and book value of assets, A_{s-2}. In order to maintain a reasonable number of companies in each portfolio, I have again sorted companies into only three groups along each dimension.

Table 16. Abnormal returns for different company sizes
The table shows estimated $\alpha's$ measured in % per month and their robust t-statistics in parenthesis from regression equation (1) for 27 portfolios formed on the ratio of total payout to assets, leverage and size. Portfolios, which for any month in the sample period contain less than 15, 10 or 5 stocks are marked with "!!!", "!!" or "!", respectively. The sample period is Feb. 1964 to Jan. 2004.

	A_{s-2} *low*			A_{s-2} *mid*			A_{s-2} *high*		
	$\frac{L_{s-2}}{A_{s-2}}l$	$\frac{L_{s-2}}{A_{s-2}}m$	$\frac{L_{s-2}}{A_{s-2}}h$	$\frac{L_{s-2}}{A_{s-2}}l$	$\frac{L_{s-2}}{A_{s-2}}m$	$\frac{L_{s-2}}{A_{s-2}}h$	$\frac{L_{s-2}}{A_{s-2}}l$	$\frac{L_{s-2}}{A_{s-2}}m$	$\frac{L_{s-2}}{A_{s-2}}h$
$\frac{PO_{s-2}}{A_{s-2}}l$	−.166 (−1.2)	−.387 (−2.6)	−.607 (−3.7)	.194 (1.1)!!	−.314 (−2.6)	−.309 (−2.4)	.468 (2.0)!!!	−.044 (−.2)!!!	−.299 (−1.9)!
$\frac{PO_{s-2}}{A_{s-2}}m$	.001 (.0)	−.253 (−1.3)	−.470 (−1.9)	.154 (1.2)	−.036 (−.4)	−.085 (−.7)	.415 (2.4)	.023 (.3)	−.017 (−.2)
$\frac{PO_{s-2}}{A_{s-2}}h$	.084 (.6)	.082 (.4)!	−.295 (−1.2)!!!	.008 (.1)	.091 (1.1)	−.061 (−.5)!	−.024 (−.3)	.036 (.7)	.020 (.3)

The table shows that the abnormal return from buying low-levered and selling high-levered, zero total payout stocks is large for all size classes. It increases somewhat with company size, but since the result for large companies build on a portfolio with relatively few stocks in certain months, it is hard to say, whether this is due to chance or not. In any event, the abnormal return is not a small-firm effect.

4.4 Other factors

Recent literature has found other ways of sorting assets, which generate abnormal returns relative to the four factor pricing model from regression equation (1). It is of interest to check, if the factors driving these abnormal returns can explain the abnormal returns for companies sorted on capital structure choice.

Pástor and Stambaugh (2003) found that stocks with high sensitivity to aggregate liquidity fluctuations outperformed those with low sensitivity with 7.5% per year. Their LIQ^V portfolio buys stocks that are highly sensitive to aggregate liquidity fluctuations and sells stocks, with little sensitivity.

Ang. et. al (2006) showed that companies with low sensitivity to aggregate volatility outperform those with high sensitivity and formed the $FVIX$ portfolio to capture that risk factor.

To take account of these factors I estimate the following extended pricing model:

$$RET_{i,t} - RF_t = \alpha_i + \beta_{i,1} RMRF_t + \beta_{i,2} SMB_t + \beta_{i,3} HML_t + \beta_{i,4} UMD_t + \beta_{i,5} FVIX_t + \beta_{i,6} LIQ_t^V + \zeta_{i,t} \quad (4)$$

for the portfolios sorted on total payout to asset ratios and leverage. The results are given in Table 17.

Table 17. Abnormal returns from augmented pricing model
The table shows estimated $\alpha's$ measured in % per month and their robust t-statistics in parenthesis from regression equation (4) for 25 portfolios formed on the ratio of total payout to assets and leverage. No portfolios contain less than 15 stocks in any month. The sample period is Feb. 1986 to Dec. 2000.

	$\frac{L_{s-2}}{A_{s-2}} low$	$\frac{L_{s-2}}{A_{s-2}}$ 2	$\frac{L_{s-2}}{A_{s-2}}$ 3	$\frac{L_{s-2}}{A_{s-2}}$ 4	$\frac{L_{s-2}}{A_{s-2}} high$
$\frac{PO_{s-2}}{A_{s-2}} low$	.470 (1.8)	.261 (1.2)	.399 (2.3)	−.419 (−2.3)	−.357 (−1.4)
$\frac{PO_{s-2}}{A_{s-2}}$ 2	−.031 (−.1)	.281 (1.0)	.185 (.7)	.165 (.8)	.027 (.1)
$\frac{PO_{s-2}}{A_{s-2}}$ 3	.903 (2.4)	.157 (.6)	.252 (1.4)	−.027 (−.2)	−.264 (−1.5)
$\frac{PO_{s-2}}{A_{s-2}}$ 4	.271 (1.1)	−.040 (−.2)	.052 (.4)	−.051 (−.3)	−.111 (−.6)
$\frac{PO_{s-2}}{A_{s-2}} high$	−.296 (−2.0)	.285 (2.2)	.259 (2.2)	.184 (1.0)	.386 (1.5)

Since the $FVIX_t$ factor is only available for a shorter period, the results in Table 17 build upon returns from February 1986 to December 2000. The table shows that the abnormal returns from buying low-levered and selling high-levered zero total payout stocks persist when the new factors are included.

The overall pattern of abnormal returns is less in line with theory than the results in the main analysis. This is due to changes in the sample period rather than inclusion of the extra factors, however. Estimation of (1) for the same time period gives results very close to those presented in Table 17. It is not surprising that a sample dominated by the bubble period of the 1990's is less closely related to the theoretical model, than the longer term averages from previous tables.

4.5 Factor risk vs. characteristics

Daniel and Titman (1997) argue that the higher expected returns of companies with low market-to-book ratios and stocks of small companies are due to characteristics of these companies rather than covariation in their returns with portfolios representing non-diversifiable factor risk[12]. This leads to the concern that abnormal returns in the main analysis could be due to characteristics rather than factor risk as well.

In spirit of the approach taken by Daniel and Titman (1997), I therefore, for each year s in Compustat make independent sorts of companies on leverage and total payout to form a total of 25 capital structure categories in the same way, as I made monthly sorts in the main analysis. I then for each stock estimate the Fama and French (1993) three factor model augmented with UMD_t and $LLMHL_t$ over a 36 month window ending at the end of May in year s+1. That is: I estimate regression equation (2) above with $RET_{i,t}$ now being the monthly return on an individual stock rather than a portfolio.

Within each capital structure category, I then sort stocks into three groups according to their coefficient from these regressions on the $LLMHL_t$ factor. The result is a total of 75 portfolios. I calculate monthly value-weighted returns for each portfolio beginning at the end of May of year s+1 and ending at the end of May of year s+2. These monthly portfolio returns are then compiled over years, to construct time-series of monthly returns for each of the 75 portfolios.

Finally, I form the characteristics neutral portfolio, which for 24 of the 25 capital structure categories with equal weight buys the portfolio with the highest coefficients on the $LLMHL_t$ factor and sells the portfolio with the lowest coefficients on the $LLMHL_t$ factor. I exclude the capital structure group with the highest payout and leverage level, as this group for some months has zero stocks in some of the coefficient groups[13].

The idea is that the characteristics neutral portfolio buys and sells stocks within each capital structure category in equal proportions and therefore should have only little exposure to capital structure characteristics. At the same time, it for each capital structure category buys stocks with relatively high

[12] A response by Davis, Fama and French (2000) argue that this result is specific for the sample period considered by Daniel and Titman (1997).

[13] This footnote provides a little more detail on the methodology. To be considered for the portfolios running from June of year s+1, each stock must have an uninterrupted series of 36 monthly returns ending at the end of May in year s+1. For consistency, 36 months of returndata are also required to be considered for the year starting in June 1966, but due to limited availability of the $LLMHL_t$ factor, only 28 months of data are used for the individual stock regressions ending in that year. Had I included the 25^{th} capital structure category in months, where it was available, results would have favoured a factor risk interpretation even more.

historical exposure to the $LLMHL_t$ factor and sells stocks with relatively low historical exposure to the $LLMHL_t$ factor. This gives the characteristics neutral portfolio positive historical, and therefore hopefully also contemporaneous, exposure to the $LLMHL_t$ factor.

If the abnormal returns represent non-diversifiable factor risk rather than firm characteristics, the characteristics neutral portfolio should earn positive abnormal returns when the $LLMHL_t$ factor is excluded from the pricing model, and zero abnormal returns when the $LLMHL_t$ factor is included.

If, on the other hand, the characteristics rather than factor exposure drive the abnormal returns, the characteristics neutral portfolio should earn zero abnormal returns when the $LLMHL_t$ factor is excluded from the pricing model and negative abnormal returns, when the $LLMHL_t$ factor is included. The reason is that the portfolio has only little exposure to characteristics and therefore should not earn abnormal returns under this interpretation. When the $LLMHL_t$ factor is included, the exposure to the factor makes the pricing model predict that the portfolio should have a higher return. Since factor exposure does not matter for pricing under the characteristics interpretation, this predicted higher return from the factors gives rise to a compensating negative estimate of the intercept.

Table 18. Factor Risk vs. Characteristics
The table shows coefficient estimates and their robust t-statistics in parenthesis from regression equations (1) and (2) for the characteristics neutral portfolio. The sample period is Jun.. 1966 to Jan. 2004.

	$LLMHL_t$ *excluded*	$LLMHL_t$ *included*
Int	.141	.029
	(1.5)	(0.3)
$RMRF_t$	.035	.053
	(1.2)	(1.89)
SMB_t	$-.040$	$-.059$
	(-1.1)	(-1.7)
HML_t	$-.145$	$-.002$
	(-3.2)	(-0.0)
UMD_t	$-.048$	$-.024$
	(-1.7)	(-0.9)
$LLMHL_t$		.208
		(6.1)
R^2	.069	.164

Table 18 provides regression results for regression equation (1) and (2) with $RET_{i,t}$ being the return on the characteristics neutral portfolio. The point estimates are supportive of a non-diversifiable factor risk explanation rather than a characteristics based explanation, but are not statistically significant. There are positive abnormal returns of 1.7% per year when the $LLMHL_t$ factor is excluded and close to zero abnormal returns when the $LLMHL_t$ factor is included.

The highly statistically significant coefficient on the $LLMHL_t$ factor shows that the sorting on historic $LLMHL_t$ factor loadings has been successful at obtaining a portfolio, which loads contemporaneously on the $LLMHL_t$ factor.

4.6 Dependency of results upon the HML_t factor

The main analysis showed that the inclusion of the HML_t factor in the pricing model is crucial for the base line result. I argued that the most likely explanation for this dependence was that exposure to investment opportunity risk cancelled out with exposure to HML_t factor risk. If this cancellation was always close to perfect it would be a little unsettling. Especially given that we do not have a clear knowledge of what the HML_t factor is, since market-to-book ratios have been used as proxies for both investment opportunities, distress risk and efficiency of managements use of corporate assets (Schwert (2003)).

To show that the cancellation argument is not necessary to find abnormal returns related to capital structure choice, Table 19 below shows the abnormal returns from the sort on market-to-book ratios, leverage and total payout to asset ratio from Table 10 above, when the resulting portfolios are priced by the CAPM model rather than the four factor model from regression equation (1).

The idea behind the sort is that by sorting on market-to-book ratios, the variation in exposure to the HML_t factor across companies within each market-to-book ratio category is limited.

Table 19. Abnormal returns relative to the CAPM-model
The table shows estimated intercepts measured in % per month and their robust t-statistics in parenthesis from the CAPM model for 27 portfolios formed on the ratio of total payout to assets, leverage and the market-to-book ratio. Portfolios, which for any month in the sample period contain less than 15, 10 or 5 stocks are marked with "!!!", "!!" or "!", respectively. The sample period is Feb. 1964 to Jan. 2004.

	$\frac{V_{s-2}}{A_{s-2}}low$			$\frac{V_{s-2}}{A_{s-2}}mid$			$\frac{V_{s-2}}{A_{s-2}}high$		
	$\frac{L_{s-2}}{A_{s-2}}l$	$\frac{L_{s-2}}{A_{s-2}}m$	$\frac{L_{s-2}}{A_{s-2}}h$	$\frac{L_{s-2}}{A_{s-2}}l$	$\frac{L_{s-2}}{A_{s-2}}m$	$\frac{L_{s-2}}{A_{s-2}}h$	$\frac{L_{s-2}}{A_{s-2}}l$	$\frac{L_{s-2}}{A_{s-2}}m$	$\frac{L_{s-2}}{A_{s-2}}h$
$\frac{PO_{s-2}}{A_{s-2}}l$	.305 (1.4)!!	.496 (2.6)	.529 (2.8)	.080 (.4)!!	.021 (.1)!!	−.018 (−.1)	−.011 (−.1)!	−.259 (−1.4)!	−.666 (−3.4)
$\frac{PO_{s-2}}{A_{s-2}}m$	.340 (1.8)	.187 (1.6)	.427 (3.3)	.291 (1.6)!!!	.093 (.8)	.060 (.6)	.082 (.4)!!!	−.045 (−.4)!!	−.177 (−1.0)
$\frac{PO_{s-2}}{A_{s-2}}h$	.372 (2.5)	.308 (2.6)!	.201 (1.3)!!!!	.127 (1.1)	.178 (1.9)	.154 (1.4)	−.134 (−1.5)	−.017 (−.2)	.071 (.6)!!

We see that there are still statistically significant abnormal returns of 66 basis points per month from buying low-levered and selling high-levered zero total payout companies within the highest market-to-book ratio category. Unreported results show that the difference in raw returns is statistically significant 68 basis points per month[14]. This demonstrates that the cancellation argument is not necessary to show abnormal returns from sorts motivated by capital structure choice.

5 Governance and capital structure

This paper stresses the role of capital structure as a governance mechanism chosen to mitigate the managerial agency problem. Another way for shareholders to control the manager is through direct intervention. It is therefore of interest to see how the abnormal returns from buying low-levered and selling high-levered stocks vary with shareholders ability to intervene[15].

As a measure of this ability I use the governance index, G, developed by Gompers, Ishii and Metrick (2003). The index counts such things as whether there is a poison pill in place and whether the company has a staggered board. Higher values of the index correspond to less powerful shareholders.

The index is only available from September 1990 onwards, and therefore the sample period in this section is from that month until January 2004. The index is updated at infrequent intervals, as new reports from the Investor Responsibility Research Center with the underlying data are published. Following Gompers, Ishii and Metrick (2003) I use the most recent historical value of G in months, where no update is available. This avoids any look ahead bias and introduces only limited noise, as the measure is stable over time. I also follow Gompers, Ishii and Metrick (2003) and exclude dual class stocks to increase comparability with their results.

To look at the interaction between shareholder rights and capital structure choice I sort companies according to shareholder rights and capital structure choice simultaneously and independently. To maintain a reasonable number of companies in each portfolio, I only divide companies according to whether they have strictly positive total payout or not, and whether their leverage is above or below the median.

Table 20 provides results for the sample period considered by Gompers, Ishii and Metrick (2003) and Table 21 provides results for the longer September 1990 to January 2004 period. This matters as Core et. al. (2006) has shown that the abnormal returns from buying companies with strong shareholders

[14] The t-statistic for the intercept in the CAPM model of the portfolio buying zero total payout, low-levered, high market-to-book ratio stocks and selling zero total payout, high-levered, high market-to-book ratio stocks is 3.0. The t-statistic for the raw return of this portfolio is 3.14.

[15] I am thankful to Paul Gompers for suggesting me to look into this relationship.

and selling companies with weak shareholders decline significantly over the longer sample period. The "Dif" column in each table denotes abnormal returns from the zero investment portfolio, which buys low-levered stocks with zero total payout and sells high-levered stocks with zero total payout.

Table 20. Sort on shareholder rights, leverage and total payout. Sep. 1990 to Dec. 1999
The table shows estimated $\alpha's$ measured in % per month and their robust t-statistics in parenthesis from regression equation (1) for 12 portfolios formed on the ratio of total payout to assets, leverage, and the G-index. No portfolio contains less than 15 stocks in any month. The sample period is Sep. 1990 to Dec. 1999 and dual class stocks are excluded.

	$\frac{PO_t}{A_t} low, \frac{L_t}{A_t} low$	$\frac{PO_t}{A_t} low, \frac{L_t}{A_t} high$	$\frac{PO_t}{A_t} high, \frac{L_t}{A_t} low$	$\frac{PO_t}{A_t} high, \frac{L_t}{A_t} high$	Dif
$G \leq 7$	.883	−.156	.309	.094	1.040
	(2.8)	(−.5)	(1.6)	(.6)	(2.5)
$8 \leq G \leq 10$	1.166	.500	.185	−.205	.665
	(2.7)	(1.3)	(1.7)	(−1.9)	(1.2)
$11 \leq G$	.016	−.977	.124	−.067	.993
	(.0)!	(−3.0)	(.7)	(−.5)	(1.6)

Table 21. Sort on shareholder rights, leverage and total payout. Sep. 1990 to Jan. 2004
The table shows estimated $\alpha's$ measured in % per month and their robust t-statistics in parenthesis from regression equation (1) for 12 portfolios formed on the ratio of total payout to assets, leverage, and the G-index. No portfolios contains less than 15 stocks in any month. The sample period is Sep. 1990 to Jan. 2004 and dual class stocks are excluded.

	$\frac{PO_t}{A_t} low, \frac{L_t}{A_t} low$	$\frac{PO_t}{A_t} low, \frac{L_t}{A_t} high$	$\frac{PO_t}{A_t} high, \frac{L_t}{A_t} low$	$\frac{PO_t}{A_t} high, \frac{L_t}{A_t} high$	Dif
$G \leq 7$	.689	−.425	.243	.300	1.114
	(2.0)	(−1.4)	(1.3)	(1.9)	(3.0)
$8 \leq G \leq 10$	1.081	.124	−.028	−.040	.957
	(3.5)	(.3)	(−.2)	(−.3)	(2.0)
$11 \leq G$	.510	−.657	.332	−.011	1.167
	(1.0)!	(−1.7)	(1.7)	(−.1)	(2.3)

Table 20 and 21 show that for both sample periods, the abnormal return from buying low-levered zero total payout stocks and selling high-levered ones is robust to variations in shareholder rights. The stability in abnormal returns from this strategy masks that the abnormal return on both the long and the short side of the portfolio varies with shareholder rights.

In the shareholder rights dimension, it is seen that the abnormal return from buying companies with strong shareholders ($G \leq 7$) and selling those with weak shareholders ($G \geq 11$) varies widely across capital structure categories.

In the shorter sample considered in Table 21 this strategy delivers large abnormal returns in both of the zero total payout categories, and relatively small abnormal returns in both of the strictly positive total payout categories. In the longer sample considered in Table 22 this picture turns around. The abnormal return from buying companies with strong shareholders and selling those with weak ones is now generally low, consistent with the result by Core et. al. (2006). Across capital structure categories it is largest for the group of companies with high leverage and high total payout.

Overall there seems to be no systematic interaction effect between shareholder rights and capital structure in terms of their influence on returns. In the absence of such systematic interaction effects the question becomes, whether the abnormal returns related to shareholder rights and capital structure, respectively, are robust to variations in the other variable. Here, the abnormal return from buying low-levered and selling high-levered companies seems to more robust to variations in shareholder rights, than the abnormal return from buying companies with strong shareholders and selling those with weak ones is to variations in capital structure.

Nielsen (2005) showed that companies with weaker shareholders are more highly levered, more likely to pay dividends, and conditional upon paying, pay higher dividends. Since companies with zero total payout and low leverage in general earn higher returns, it is worth to investigate to which extend the abnormal returns found by Gompers, Ishii and Metrick (2003) from buying "Democrats" (defined as companies with $G \leq 5$) and selling "Dictators" (defined as companies with $G \geq 14$) can be explained by differences in capital structure between these two groups.

To investigate this, Table 22 reports the average across months from Sep. 1990 to Dec. 1999 of the fraction of total market value of the Democracy and Dictatorship portfolios, which falls in each of the four capital structure categories considered above.

Table 22. Capital structure composition

The table shows the average fraction of total company value that falls into each of 4 capital structure categories for companies with $G \leq 5$ and $14 \leq G$ respectively. The sample period is Sep. 1990 to Dec. 1999 and the sample excludes dual class companies.

	$\frac{D_t}{A_t} low, \frac{L_t}{A_t} low$	$\frac{D_t}{A_t} low, \frac{L_t}{A_t} high$	$\frac{D_t}{A_t} high, \frac{L_t}{A_t} low$	$\frac{D_t}{A_t} high, \frac{L_t}{A_t} high$
$G \leq 5$	.119	.038	.403	.440
$14 \leq G$	.014	.033	.371	.581

The table shows that the democracy portfolio compared to the dictatorship portfolio has significantly higher weight on the low leverage, zero total payout portfolio and significantly lower weight on the high leverage, high total payout portfolio.

To get an idea about how much this matters for returns, I have taken a simple average across governance groups of the abnormal returns for each category of capital structure as reported in Table

20 and calculated the difference in abnormal expected returns between democrats and dictators, which arise, if you multiply those returns with the weights from Table 22.

The difference is 8.6 basis points per month or 17% of the abnormal return, which existed relative to the four factor model (1) from buying the democracy portfolio and selling the dictatorship portfolio during the original Gompers, Ishii and Metrick (2003) sample period[16].

6 Conclusion

This paper has shown that companies with less tight capital structures earn higher abnormal returns relative to the four factor model from regression equation (1). I interpret this as compensation to investors for exposure to the aggregate investment opportunity risk, which arises when the arrival of investment opportunities is correlated across companies. The empirical evidence is consistent with this interpretation.

In future research, it would be of interest to develop a more formal theoretical model as a way to look into the interaction between the factors of the four factor model and investment opportunity risk. The appendix provides a small first step by formalizing the existence of investment opportunity risk in a one factor model.

7 Appendix

7.1 A theoretical model

The model presented here is only meant to illustrate that the theoretical considerations in the theory section makes sense in a technical setting. It is a one factor model, rather than the five factor model, which would be necessary to create a tight link to the empirics. None the less, it serves as a stripped down illustration of a basic mechanism, which it would be of interest to incorporate into more realistic models.

The model is a general equilibrium, infinite horizon model with heterogeneous firms. There are two sectors in the economy. These sectors each have a representative company labelled A and B

[16] The abnormal return of the democracy minus dictatorship portfolio is 50 basis points per month relative to the four factor model in regression equation (1). The divergence from the 71 basis points per month found by Gompers, Ishii and Metrick (2003) is due to (1) using the UMD_t momentum factor instead of the Carhart (1997) momentum factor.

respectively. The companies are representative in the sense that they do not take their price impact into account in making investment and capital structure decisions. Each company consists of an existing project that pays Z units of the consumption good with certainty each period. For company A, a profitable investment opportunity arises between each period t and t+1 (that is $OP^A_{t+1} = 1$) with probability q_h, whereas it only arises (that is $OP^B_{t+1} = 1$) with probability q_l for company B. $q_l < q_h$. The investment opportunities are correlated in that $OP^B_{t+1} = 1 \Rightarrow OP^A_{t+1} = 1$.

For both companies, the profitable investment opportunity requires an investment of $I \leq Z$ units of the consumption good between period t and t+1 and pays off M units of the consumption good in period t+1 with certainty. This is the only return from the investment opportunity. If no profitable investment opportunity arises for a company (that is $OP^A_{t+1} = 0$ and/or $OP^B_{t+1} = 0$), the company always has a non-profitable investment opportunity available, which requires an investment of I units of the consumption good between period t and t+1 but never pays anything.

The manager of each company is an empire builder, who will invest whether a profitable investment opportunity is available or not. The manager is controlled by a board, which each period decides on the financial policy in order to maximize shareholder value. If the policy $T^A_t = 0$, the capital structure in company A is tight, and the manager has to pay out the entire cash flow in period t. The manager has no access to outside funds and therefore can not invest between period t and t+1 when $T^A_t = 0$. If the policy $T^A_t = 1$, the capital structure is slack, and the manager is only forced to pay out the part of the cash flow in excess of I. That is, the manager is free to invest between period t and t+1. The variable T^B_t is defined similarly for company B.

I will assume that the optimal financial policies are $T^A_s = 1$ and $T^B_s = 0$ for all $s \geq t$ and then verify that this is true under appropriate assumptions on I and M. Under this assumption, the payout D^A_{t+1} and D^B_{t+1} by company A and B respectively in period t+1 as a function of the availability of investment opportunities between period t and t+1 is given in Table A1.

Table A1. Payout

	$OP^A_{t+1} = 0$	$OP^A_{t+1} = 1$
D^A_{t+1}	$Z - I$	$Z - I + M$
D^B_{t+1}	Z	Z

In accordance with the intuition in the main text, the companies which choose a non-tight capital structure are those that are more likely to have a profitable investment opportunity available. They are also the companies, which through investment generate growth in the economy and therefore are successful (that is $D^A_{t+1} = Z - I + M$) exactly when the economy as such is successful (that is $D^A_{t+1} + D^B_{t+1} = 2Z - I + M$). They therefore have to deliver higher expected returns to be held in equilibrium.

It can be argued that the cash flows in the model economy look more like cyclical fluctuations than growth. An alternative specification that looks more like growth would be to let the good investment project be an annuity with a constant payout throughout the future. This specification would make company A outgrow company B. To get a stable model, it would therefore be necessary to have time changing probabilities of good investment opportunities being available for a given sector. This is not an unreasonable assumption, but would complicate the analysis substantially without changing the basic idea. Namely that the companies, which deliver growth through investment, will be successful, when the economy in general is successful.

I assume that the timing each period t is such that first the board decides upon the period t capital structure. Then the company pays period t dividends according to the policy. Finally, the consumer decides on period t consumption and asset holdings from period t to t+1.

Let a_t denote the fraction of company A held by the representative consumer from period t to t+1. Let W_t denote his wealth after dividend payments but before consumption in period t. Finally, let P^A_t, D^A_{t+1}, P^B_t and D^B_{t+1} denote the exdividend price of company A in period t, the dividend paid by company A in period t+1, the exdividend price of company B in period t and the dividend paid by company B in period t+1, respectively. The representative consumer then takes the financial policy of the company as given and solves the problem:

$$\underset{\{C_t, a_t\}}{Max}\, E_t \sum_{s=t}^{\infty} \beta^{s-t} \log C_s \tag{5}$$

Subject to:

$$W_{t+1} = W_t + (P^A_{t+1} + D^A_{t+1} - P^A_t)a_t + (P^B_{t+1} + D^B_{t+1} - P^B_t)(\frac{W_t - C_t - P^A_t a_t}{P^B_t}) - C_t \tag{6}$$

7.1.1 Equilibrium asset prices and expected returns

This section solves the model. I find equilibrium asset prices under the conjectured capital structure. I then show that the conjectured capital structure is optimal, and finally compare expected returns of the two companies. All proofs are given in the proof section of the appendix.

Lemma 1

Under the transversality conditions $\lim_{s\to\infty} E_t\beta^s \frac{C_t}{C_{t+s}} P^A_{t+s} = 0$ and $\lim_{s\to\infty} E_t\beta^s \frac{C_t}{C_{t+s}} P^B_{t+s} = 0$ equilibrium asset prices are given by:

$$P_t^A = E_t \sum_{s=1}^{\infty} \beta^s \frac{C_t}{C_{t+s}} D^A_{t+s} = \Gamma C_t \frac{\beta}{1-\beta}$$

and

$$P_t^B = E_t \sum_{s=1}^{\infty} \beta^s \frac{C_t}{C_{t+s}} D^B_{t+s} = (1-\Gamma) C_t \frac{\beta}{1-\beta}$$

where $\Gamma \equiv \gamma_G q_h + \gamma_B(1-q_h)$ and $\gamma_G \equiv \frac{Z-I+M}{2Z-I+M}$ and $\gamma_B \equiv \frac{Z-I}{2Z-I}$.

The first equality in each asset pricing equation is standard material. The second equality uses the constraint that in equilibrium aggregate consumption has to equal aggregate payout. Γ is the expected fraction of total output supplied by company A in any future period.

Lemma 2

There exist an equilibrium in which the conjectured capital structure for the two companies (that is $T_t^A = 1\ \forall t$ and $T_t^B = 0\ \forall t$) is optimal if

$$\frac{I}{q_l\beta} > M \geq \frac{I\,(2Z-I)}{(q_h\beta\,(2Z-I)-I)} \quad and \quad \beta > \frac{I}{q_h\,(2Z-I)} \tag{7}$$

Furthermore, for any choice of the other parameters of the model, there always exist values of I and M satisfying these restrictions.

The constraints are highly intuitive. Company A is more likely to have a good investment opportunity available than company B, and therefore, there will be a wedge between the payoff of the good investment opportunity that will keep B from having a non-tight capital structure and the payoff that will make A willing to have one. For this argument to work, the representative agent has to care sufficiently about the future, which gives rise to the second part of the condition in equation (7).

Theorem 1

The expected return of the non-tight capital structure company A is higher than that of the tight capital structure company B.

Theorem 1 states that company A has a higher expected return than company B. The proof relies on the fact that $\Gamma < \frac{E_t[D^A_{t+1}]}{E_t[C_{t+1}]}$. That is, the expected fraction of consumption in any period due to dividends from company A is lower than expected dividends from company A divided by expected consumption. This is just another way to say that company A pays the majority of its dividends in periods, where the economy is doing well, as described by Table A1.

Theorem 1 implies that companies with a non-tight capital structure should have higher abnormal returns in a pricing model that does not account for investment opportunity risk, or a higher beta on the investment opportunity risk factor in a pricing model, which does account for this risk.

The empirical results in the main analysis suggest that at least unconditionally the four factor model from regression equation (1) does not fully account for the exposure of companies to investment opportunity risk.

7.2 Proofs

7.2.1 Proof of Lemma 1

Let $V_t(W_t)$ denote the valuefunction of the consumers problem at time t as a function of W_t conditional upon the information available at time t. Then the consumers problem can be rewritten as:

$$\underset{C_t,a_t}{Max} \log C_t + \beta E_t V_{t+1}(W_t + (P^A_{t+1} + D^A_{t+1} - P^A_t)a_t + (P^B_{t+1} + D^B_{t+1} - P^B_t)(\tfrac{W_t - C_t - P^A_t a_t}{P^B_t}) - C_t)$$

The first order conditions for this problem are:

$$\frac{1}{C_t} - \beta E_t V'_{t+1}(W_{t+1})(\frac{P^B_{t+1} + D^B_{t+1} - P^B_t}{P^B_t} + 1) = 0 \tag{8}$$

$$\beta E_t V'_{t+1}(W_{t+1})[(P^A_{t+1}+D^A_{t+1}-P^A_t)-(P^B_{t+1}+D^B_{t+1}-P^B_t)\frac{P^A_t}{P^B_t}]=0 \tag{9}$$

From the envelope theorem $V'_{t+1}(W_{t+1})=\frac{1}{C_{t+1}}$, so (8) and (9) imply that:

$P^B_t=\beta E_t\frac{C_t}{C_{t+1}}(P^B_{t+1}+D^B_{t+1})$ and $P^A_t=\beta E_t\frac{C_t}{C_{t+1}}[(P^A_{t+1}+D^A_{t+1})]$

Imposing the transversality conditions $\lim_{s\to\infty}E_t\beta^s\frac{C_t}{C_{t+s}}P^A_{t+s}=0$ and $\lim_{s\to\infty}E_t\beta^s\frac{C_t}{C_{t+s}}P^B_{t+s}=0$ together with repeated substitution of prices for future periods gives the conditions:

$P^A_t=E_t\sum_{s=1}^{\infty}\beta^s\frac{C_t}{C_{t+s}}D^A_{t+s}$ and $P^B_t=E_t\sum_{s=1}^{\infty}\beta^s\frac{C_t}{C_{t+s}}D^B_{t+s}$

Since in equilibrium $C_t=D^A_t+D^B_t$ for all t, it is possible to calculate explicit prices for the two securities. Define $\gamma_G=\frac{Z-I+M}{2Z-I+M}$, $\gamma_B=\frac{Z-I}{2Z-I}$ and $\Gamma=\gamma_G q_h+\gamma_B(1-q_h)$. Then:

$$P^A_t=E_t\sum_{s=1}^{\infty}\beta^s\frac{C_t}{C_{t+s}}D^A_{t+s}=\sum_{s=1}^{\infty}C_t\beta^s E_t\frac{D^A_{t+s}}{C_{t+s}}=\sum_{s=1}^{\infty}C_t\beta^s\Gamma=\Gamma C_t\frac{\beta}{1-\beta}$$

$$P^B_t=E_t\sum_{s=1}^{\infty}\beta^s\frac{C_t}{C_{t+s}}D^B_{t+s}=\sum_{s=1}^{\infty}C_t\beta^s E_t\frac{D^B_{t+s}}{C_{t+s}}=\sum_{s=1}^{\infty}C_t\beta^s(1-\Gamma)=(1-\Gamma)C_t\frac{\beta}{1-\beta}$$

QED.

7.2.2 Proof of Lemma 2

Since all companies act as price takers and each future period is identical in expectation, company A will always have a non-tight capital structure if and only if it is willing to have a non-tight capital structure when current resources are the most valuable. That is, when current consumption is $2Z-I$. Due to the price taker assumption company A does not take its impact on equilibrium consumption into account, so the condition for maintaining a non-tight capital structure for one period becomes:

$q_h\beta\frac{2Z-I}{2Z-I+M}M\geq I$

$\Updownarrow$

$(q_h\beta(2Z-I)-I)M\geq I(2Z-I)$

$\Updownarrow$

$M \geq \frac{I(2Z-I)}{(q_h\beta(2Z-I)-I)}$ and $(q_h\beta\,(2Z-I)-I)>0$

$\Updownarrow$

$M \geq \frac{I(2Z-I)}{(q_h\beta(2Z-I)-I)}$ and $\beta > \frac{I}{q_h(2Z-I)}$

Similarly, company B will maintain a tight capital structure each period if and only if it is willing to do so when current period investment funds are as cheap as possible. That is, we must have that:

$q_l\beta\frac{2Z-I+M}{2Z-I+M}M < I$

$\Updownarrow$

$M < \frac{I}{q_l\beta}$

It will be possible to pick M to satisfy both of these sets of inequalities simultaneously if:

$\frac{I}{q_l\beta} > \frac{I(2Z-I)}{(q_h\beta(2Z-I)-I)}$ and $\beta > \frac{I}{q_h(2Z-I)}$

$\Updownarrow$

$(q_h - q_l) > \frac{I}{\beta(2Z-I)}$ and $\beta > \frac{I}{q_h(2Z-I)}$

Since $q_h > q_l$ and $\beta > 0$, both of these inequalities will be satisfied simultaneously for I sufficiently close to zero. QED.

7.2.3 Proof of Theorem 1

The expected returns for the 2 companies are given by:

$\frac{E_t(P^A_{t+1}+D^A_{t+1})}{P^A_t} - 1 = \frac{\Gamma\frac{\beta}{1-\beta}E_t[C_{t+1}]+E_t[D^A_{t+1}]}{P^A_t} - 1$ and $\frac{E_t(P^B_{t+1}+D^B_{t+1})}{P^B_t} - 1 = \frac{(1-\Gamma)\frac{\beta}{1-\beta}E_t[C_{t+1}]+E_t[D^B_{t+1}]}{P^B_t} - 1$

Expected returns for A are therefore larger than for B if and only if

$\frac{(1-\Gamma)\frac{\beta}{1-\beta}E_t[C_{t+1}]+E_t[D^B_{t+1}]}{P^B_t} - 1 < \frac{\Gamma\frac{\beta}{1-\beta}E_t[C_{t+1}]+E_t[D^A_{t+1}]}{P^A_t} - 1$

$\Updownarrow$

$\Gamma < \frac{E_t[D^A_{t+1}]}{E_t[C_{t+1}]}$

$\Updownarrow$

$\frac{Z-I}{2Z-I} < \frac{Z-I+M}{2Z-I+M}$

Which is always true in the model. QED.

7.3 Factor loadings

This subsection gives the loadings of the 25 portfolios sorted on total payout to asset ratios and leverage from Table 2 on the $RMRF_t$, SMB_t and UMD_t factors from regression equation (1).

Table A2. Loadings on the $RMRF_t$ factor
The table shows the coefficient estimates of $\beta_{i,1}$ and its robust t-statistics in parenthesis from regression equation (1) for 25 portfolios formed on the ratio of total payout to assets and leverage. Portfolios, which for any month in the sample period contain less than 15, 10 or 5 stocks are marked with "!!!", "!!" or "!", respectively. The sample period is Feb. 1964 to Jan. 2004.

	$\frac{L_{s-2}}{A_{s-2}} low$	$\frac{L_{s-2}}{A_{s-2}}$ 2	$\frac{L_{s-2}}{A_{s-2}}$ 3	$\frac{L_{s-2}}{A_{s-2}}$ 4	$\frac{L_{s-2}}{A_{s-2}} high$
$\frac{PO_{s-2}}{A_{s-2}} low$	1.244 (27.0)	1.270 (34.4)	1.264 (28.3)	1.246 (25.8)	1.281 (34.3)
$\frac{PO_{s-2}}{A_{s-2}}$ 2	1.075 (17.0)!!	1.274 (26.6)	1.141 (28.7)	1.145 (29.5)	1.207 (30.2)
$\frac{PO_{s-2}}{A_{s-2}}$ 3	1.023 (15.5)	1.100 (30.5)	1.089 (39.0)	1.102 (44.9)	1.147 (39.9)
$\frac{PO_{s-2}}{A_{s-2}}$ 4	.958 (23.9)	1.056 (35.0)	.921 (40.3)	.888 (37.1)	.993 (28.3)
$\frac{PO_{s-2}}{A_{s-2}} high$	.859 (31.5)	.867 (38.3)	.905 (33.3)	.921 (26.2)!!!	.997 (18.4)!!!

Table A3. Loadings on the SMB_t factor
The table shows the coefficient estimates of $\beta_{i,2}$ and its robust t-statistics in parenthesis from regression equation (1) for 25 portfolios formed on the ratio of total payout to assets and leverage. Portfolios, which for any month in the sample period contain less than 15, 10 or 5 stocks are marked with "!!!", "!!" or "!", respectively. The sample period is Feb. 1964 to Jan. 2004.

	$\frac{L_{s-2}}{A_{s-2}} low$	$\frac{L_{s-2}}{A_{s-2}}$ 2	$\frac{L_{s-2}}{A_{s-2}}$ 3	$\frac{L_{s-2}}{A_{s-2}}$ 4	$\frac{L_{s-2}}{A_{s-2}} high$
$\frac{PO_{s-2}}{A_{s-2}} low$	.537 (7.7)	.688 (13.3)	.763 (10.3)	.641 (7.5)	.680 (11.5)
$\frac{PO_{s-2}}{A_{s-2}}$ 2	.338 (3.4)!!	.250 (3.9)	.351 (4.6)	.306 (4.0)	−.066 (−1.1)
$\frac{PO_{s-2}}{A_{s-2}}$ 3	.182 (2.1)	.187 (2.9)	.043 (.9)	.062 (1.8)	−.163 (−3.8)
$\frac{PO_{s-2}}{A_{s-2}}$ 4	.177 (3.1)	−.029 (−.7)	−.047 (−1.4)	−.118 (−3.4)	−.170 (−3.7)
$\frac{PO_{s-2}}{A_{s-2}} high$	.067 (2.1)	−.050 (−1.2)	−.207 (−4.9)	−.190 (−3.7)!!!	.185 (2.6)!!!

Table A4. Loadings on the UMD_t factor
The table shows the coefficient estimates of $\beta_{i,4}$ and its robust t-statistics in parenthesis from regression equation (1) for 25 portfolios formed on the ratio of total payout to assets and leverage. Portfolios, which for any month in the sample period contain less than 15, 10 or 5 stocks are marked with "!!!", "!!" or "!", respectively. The sample period is Feb. 1964 to Jan. 2004.

	$\frac{L_{s-2}}{A_{s-2}}low$	$\frac{L_{s-2}}{A_{s-2}}$ 2	$\frac{L_{s-2}}{A_{s-2}}$ 3	$\frac{L_{s-2}}{A_{s-2}}$ 4	$\frac{L_{s-2}}{A_{s-2}}high$
$\frac{PO_{s-2}}{A_{s-2}}low$	$-.035$ $(-.8)$	$-.035$ $(-.8)$	$.059$ (1.3)	$-.001$ $(-.0)$	$.098$ (2.5)
$\frac{PO_{s-2}}{A_{s-2}}$ 2	$-.063$ (-1.0)!!	$-.144$ (-3.1)	$-.171$ (-3.7)	$-.007$ $(-.14)$	$-.045$ (-1.0)
$\frac{PO_{s-2}}{A_{s-2}}$ 3	$-.191$ (-2.8)	$-.073$ (-1.4)	$-.010$ $(-.3)$	$.002$ $(.1)$	$-.031$ (-1.0)
$\frac{PO_{s-2}}{A_{s-2}}$ 4	$-.023$ $(-.5)$	$.056$ (1.6)	$-.026$ (-1.1)	$-.014$ $(-.6)$	$-.066$ (-1.7)
$\frac{PO_{s-2}}{A_{s-2}}high$	$.014$ $(.5)$	$.047$ (1.5)	$-.028$ $(-.7)$	$.025$ $(.8)$!!!	$-.043$ $(-.8)$!!!

7.4 DERIVED VARIABLES

Numbers in parenthesis correspond to Compustat data item numbers.

L_s = "Liabilities-Total" (181).

A_s = "Assets-Total" (6).

D_s = "Dividends-Common" (21).

C_s = "Current Assets" (4).

Preferred Stock = "Preferred Stock-liquidating Value" (10) if available, else "Preferred Stock-Redemption Value" (56) if available, else "Preferred Stock Carrying Value" (130).

Market Equity (ME_s) = "Price-Fiscal Year-Close" (199) * "Common Shares Outstanding" (25).

Market value of firm (V_s) = L_s- "Deferred Tax and Investment Tax Credit" (35) if available − Preferred Stock + ME_s.

Book Equity (BE_s) = $A_s - L_s$ + "Deferred Tax and Investment Tax Credit" (35) if available − Preferred Stock.

Earnings before interest (E_s) = "Income Before Extraordinary Items" (18) + "Interest Expense" (15).

Earnings before interest and taxes (ET_s) = E_s+ "Income Taxes-Total" (16).

G = governance index from Gompers, Ishii and Metrick (2003).

$Intcov_s = ET_s/"InterestExpense"(15)$.

Re$purchases_s$ = "Treasury Stock (Dollar Amt), Common" $(226)_s$ − "Treasury Stock (Dollar Amt), Common" $(226)_{s-1}$ if firm does not use the retirement method to account for repurchases.

$\mathrm{Re}\,purchases_s$ = Max{0,"Purchase of Common and Preferred Stock" (115) − "Sale of Common and Pref. Stock" (108)} if firm uses the retirement method to account for repurchases.

EaI_s ="Income Before Extraordinary Items" (18).

$Kaplan{-}Zingales_s = -1.001909\frac{I18+I14}{I8} + .2826389\frac{I6+CR-I60-I74}{I6} + 3.139193\frac{I9+I34}{I9+I34+I216} - 39.3678\frac{I21+I19}{I8} - 1.314759\frac{I1}{I8}$.

where I in the formula is shorthand for Compustat data item number.

$CR = CRSP\ December\ Market\ Equity.$

$Sales\ Growth_s = \left[\text{"Sales"}(12)_s - \text{"Sales"}(12)_{s-1}\right] / \text{"Sales"}(12)_{s-1}$

Following Fama and French (2001), a firm is defined to use the retirement method for repurchases in all years, when Compustat annual footnote 45 is equal to TR, as well as all contiguous years, where "Treasury Stock (Dollar Amt), Common" (226) is zero or missing. See Fama and French (2001) for further discussion of these criteria.

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