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# Does systematic distress risk drive the investment growth anomaly?

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ABSTRACT

Expanding on rational Q theory, this study demonstrates that less exposure to systematic distress risk partially explains the phenomenon of investment growth anomalies, wherein equities of firms with greater growth in capital investment display lower stock returns. Using the default yield spread between BAA- and AAA-rated corporate bonds as a proxy for a systematic distress risk factor driving the pricing kernel, I show that firms with high (low) capital investment have lower (higher) exposure to systematic distress risk and thus lower (higher) expected returns. Depending on model settings, the factor used here to measure systematic distress risk explains 30–40% of the investment growth effect. Overall, I conservatively conclude that a moderate part of investment growth anomaly can be viewed as compensation for systematic distress risk, even though many studies explain it as a result of behavioral mispricing.



> Firms that increase their level of capital investment the most tend to achieve lower stock returns for five subsequent years . . .. Our evidence is consistent with the hypothesis that investors tend to underestimate the importance of the unfavorable information about managerial intentions . . .. However, it is possible that the excess return associated with abnormal investment expenditures is in fact related to risk factors that are unrelated to the factors we consider.
>
> Titman, Wei, and Xie (2004), JFQA, Vol. 39, P.699.

## 1. Introduction

Titman, Wei, and Xie (2004) showed that firms with highly abnormal capital investments (ACI) earn significantly lower benchmark-adjusted returns—the so-called investment growth anomaly[1]. Existing literature offers two competing explanations for this anomaly: behavioral mispricing and rational Q theory. Consistent with Jensen's (1986) agency hypothesis, Titman et al. (2004) offered a mispricing-based explanation: investors underreact to managerial empire building through increased investment expenditures. Cooper et al. (2008) documented a significantly negative association between firms' asset growth and subsequent stock returns and found that investors overreact to past operating performance of firms with high asset growth. This finding coincides with the assertion that an asset's growth effect is most consistent with a mispricing hypothesis. Using a stock's price proximity to its 52-week high price as a measure of mispricing, George et al. (2014) interpreted their findings as corrections of mispricing, noting that stock returns on firms with high capital investment are not low when samples exclude stocks with prices farthest from their 52-week high prices.

The rational Q theory explains the negative investment–return relation by suggesting that firms tend to invest more when the cost of capital (expected return) is lower, which induces a higher net present value of new investments (e.g., Cochrane, 1991; Zhang, 2005; Xing, 2008; Li, Livdan, & Zhang, 2009; Liu, Whited, & Zhang, 2009; Li & Zhang, 2010; Chen, Novy-Marx, & Zhang, 2011; Cooper & Priestley, 2011; Lam & Wei, 2011). Theoretical models in Berk,

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[1] The investment growth anomaly has been extended in different contexts by later literature, e.g., Anderson and Garcia-Feijoo (2006), Fama and French (2006), Cooper, Gulen, and Schill (2008), Lyandres, Sum, and Zhang (2008), Xing (2008), Polk and Sapienza (2009), Li and Zhang (2010), Titman, Wei, and Xie (2011), Lam and Wei (2011), Lipson, Mortal, and Schill (2012), Stambaugh, Yu, and Yuan (2012), Watanabe, Xu, Yao, and Yu (2013), and George, Hwang, and Li (2014).

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Green, and Naik (1999) and Carlson, Fisher, and Giammarino (2006) similarly interpreted capital investment decisions as the exercise of risky firm growth options into less-risky assets instead. As firms undertake investment projects, the importance of growth options relative to existing assets declines, reducing the exposure to systematic risk and prompting lower average subsequent returns. Anderson and Garcia-Feijoo (2006) supported this theoretical predication with empirical evidence. Cooper and Priestley (2011) showed that low-investment firms tend to have higher loadings with respect to the Chen, Roll, and Ross (1986) factors than do high-investment firms and concluded that risk plays an important role in explaining the investment–return relation.

Expanding upon Q theory, which emphasizes risk differentials between high-ACI and low-ACI firms arising from differing sensitivities to underlying risk factors important for asset pricing, this paper focuses on the *systematic distress risk* dimension to explain the investment growth effect. This paper's main aim is to test the extent to which systematic distress risk drives the ACI return spread. The central hypothesis builds on rational Q theory: firms with high ACI face lower distress costs and therefore reduced exposure to systematic risk factors that entail distress costs. Accordingly, these firms have lower expected returns relative to firms with low ACI.

Q theory literature suggests that marginal Q represents the net present value of future cash flows generated from investing one additional unit of capital and reflects a firm's future profitability. A higher Q value indicates stronger future profitability, which results in a lower distress cost. Consequently, Q theory both predicts a positive investment–Q relation and implies that distress costs should be lower (higher) among firms with higher (lower) ACI. Consistent with this argument, my preliminary results indicate that high-ACI firms exhibit characteristics traditionally associated with lower distress costs: larger size, stronger earnings, lower financial leverage (Penman, Richardson, & Tuna, 2007), lower Ohlson's (1980) O-score, and a lower default likelihood (Vassalou & Xing, 2004), compared with low-ACI firms.

Because distress costs depress asset payoffs in low states and the occurrence of low states is at least partly systematic, these costs would enhance exposure to systematic risk (George & Hwang, 2010). That in turn implies that loadings for a systematic distress risk factor should be low (high) among firms with low (high) distress costs. Therefore, my finding that firms with high ACI tend to have lower distress costs is crucial because it suggests that exposure to systematic distress risk may explain the investment growth effect that is anomalous in the standard Fama–French four-factor model.

A systematic distress risk explanation of the investment growth anomaly must meet four tests: (i) identify a plausible distress risk factor driving the pricing kernel, (ii) show that exposure to this risk factor is priced, (iii) show that the risk factor loadings of high-ACI firms significantly differ from those of low-ACI firms, and (iv) show that spreads in loadings are large enough to explain return spreads between high-ACI and low-ACI firms. I offer evidence consistent with all four requirements.

First, I identify the investment growth anomaly in a sample spanning January 1969–December 2010 using 25 ACI portfolios as the basic set of test assets and find that high-ACI firms exhibit significantly lower expected returns than low-ACI firms. The average equally-weighted (value-weighted) return spread between high-ACI firms and low-ACI firms is significantly negative at −0.800% (−0.582%) per month. Consistent with Titman et al. (2004), Anderson and Garcia-Feijoo (2006), Xing (2008), and Cooper and Priestley (2011), the findings confirm that zero-investment portfolios from long high-ACI firms and short low-ACI firms yield statistically and economically negative abnormal returns.

Second, using default yield spread (DEF, defined as monthly yield spread between BAA- and AAA-rated corporate bonds) as a measure of systematic distress risk factor[2], I show that high-ACI firms have substantially lower loadings with respect to a systematic distress risk factor than do low-ACI firms. The difference in DEF loading between high-ACI firms and low-ACI firms is significantly negative at −0.804.

Third, I present a significantly positive risk premium (the price of risk) for DEF at 0.327% per month for 25 ACI portfolios based on the two-stage Fama and MacBeth (1973) cross-sectional regressions (2SCRS), following the approach in Chen et al. (1986), Griffin, Ji, and Martin (2003), Sadka (2006) and Chen and Petkova (2012). This finding that DEF commands a positive price for risk in the cross-section of portfolios sorted by ACI is supported by Bali (2008), Bali and Engle (2010) and Bali, Brown, and Caglayan (2011), who suggested that because default premiums tend to be high in recessions, stocks (e.g., hedge funds) with higher (lower) exposure to a default premium are expected to have higher (lower) returns.

Finally, and most importantly, combined with a positive price of risk for DEF, I show that the difference in DEF loadings between high-ACI firms and low-ACI firms explains 30–40% of the cross-sectional variation of expected ACI portfolio returns, which conservatively suggests that systematic distress risk partially explains the investment growth anomaly.

As suggested by Pastor and Stambaugh (2003) and Chen and Petkova (2012), when all the risk factors in an asset-pricing model are tradable factors, the intercepts in the time-series regression can be interpreted as the risk-adjusted alphas. Motivated by this suggestion, I further employ Vassalou and Xing's (2004) firm-level default likelihood indictors (DLI) to construct a high-minus-low DLI portfolio as a tradable mimicking factor for distress risk, $DLI^m$. And then I estimate the $DLI^m$-augmented Fama–French four-factor model with the ACI return spread as a dependent variable to investigate the extent to which the ACI's alpha is reduced by $DLI^m$ [3]. This test generates a direct estimate of the alphas and provides more intuitive evidence of the incremental contribution of systematic distress risk to the ACI return spread. The empirical results of this test indicate that about 30–40% of the ACI's alpha is explained by a tradable $DLI^m$-mimicking factor and thus explore the robustness of the findings mentioned above.

Although my overall evidence is tantalizing, it should be concluded with caution because systematic distress risk is shown to only account for 30–40% of the investment growth anomaly. Nevertheless, this study's importance arises from providing a possible distress-risk interpretation behind the cross-sectional pricing of investment growth. Several papers have documented the rational pricing explanation based on Q theory, wherein the investment growth effect relates to the time-varying risk caused by changes in the mix of assets in place and growth options (e.g., McDonald & Siegel, 1986; Majd & Pindyck, 1987; Berk et al., 1999; Gomes, Kogan, & Zhang, 2003; Zhang, 2005; Carlson et al., 2006; Cooper, 2006; Anderson & Garcia-Feijoo, 2006; Li et al., 2009; Liu et al., 2009). Focusing on the distress risk dimension, this paper adds to this literature by suggesting that a moderate part of investment growth anomaly can be viewed as compensation for systematic distress risk[4].

[2] Previous literature examining the effect of distress risk on equities focuses on the default yield spread to explain returns (e.g., Fama & Schwert, 1977; Keim & Stambaugh, 1986; Campbell, 1987; Fama & French, 1989). Further, Chen et al. (1986), Fama and French (1996), Jagannathan and Wang (1996) and Hahn and Lee (2001) consider variations of the default yield spread in asset-pricing tests. Motivated by these studies, I use the default yield spread to capture systematic distress risk.

[3] I wish to thank an anonymous referee for this constructive suggestion.

[4] Two recent papers that investigate the relationship between investment growth anomaly and default spreads are related to my work. Cooper and Priestley (2011) showed that the loadings (systematic risks) on Chen et al.'s (1986) factors (growth rate of industrial production, unexpected inflation, change in expected inflation,