The Impact of Growth Options and Distress Risk on Stock Returns via Idiosyncratic Skewness

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Abstract

We examine the combined impact of growth options and distress on expected idiosyncratic skewness and whether the negative return on skewness is driven by growth options and distress risk. We show that growth and reorganization options lead to more convex value and increased skewness for active levered equity returns. We find empirically that the negative relation between growth options or distress risk and stock returns can be attributed to the more skewed distribution for growth and distressed firms. Our study offers deeper rationale behind these twin "puzzling" phenomena suggesting that growth and distress justify lower, rather than higher, expected returns.

Keywords: growth options, distress risk, skewness, cross-sectional returns

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The Impact of Growth Options and Distress Risk on Stock Returns via Idiosyncratic Skewness

In this paper we examine the combined impact of growth options and distress risk on expected idiosyncratic skewness and whether the negative return premium observed on positively skewed stocks is driven by growth options and distress risk. We argue that growth options and downsizing/reorganization options lead to more convex value payoffs and increased skewness for active levered equity returns. We show empirically that the negative relation between growth options or distress risk and stock returns found in prior studies can be attributed to the more positively skewed return distribution for growth-oriented and distressed firms.

It is nowadays well documented that conditional skewness can help explain the cross-sectional variation of stock returns (e.g., Harvey and Siddique (2000), Boyer et al (2010)). It is also evident now that growth options (Anderson and Garcia-Feijoo (2006), Cao et al. (2008), Trigeorgis and Lambertides (2013)) as well as distress risk (e.g., Dichev (1998), Garlappi and Yan (2011), Chava and Purnanandam (2010)) might help explain returns. Most of these papers have shown a negative relation between growth options or distress risk with stock returns, both representing unresolved "puzzles" in the asset pricing literature.

Prior studies focused in explaining these bilateral relations as stand alone, distinct phenomena. Cooper et al. (2008) attribute the negative growth-returns relation to mispricing. Anderson and Garcia-Feijoo (2006) suggest that the return predictability associated with growth opportunities is responsible for the explanatory power of the size and book-to-market factors in cross-sectional stock returns (Fama and French (1992), (1993)). Trigeorgis and Lambertides (2013) suggest that investors may rationally accept a lower required or average return from growth stocks in exchange for the growth option value and the favorably (positively) skewed risk-return profile they offer investors through active management. Grullon et al. (2012) find a stronger volatility-return relation for firms with growth options and that the sensitivity of firm value to changes in volatility declines after firms exercise their real options.

Analogously, most recent studies document an overall negative relation between default risk and subsequent returns. Several explanations have been offered for this apparent anomaly. The first explanation focuses on *mismeasurement of returns*, suggesting there is a measurement error in the returns horizon for the analysis of bankruptcy-filing or financially distressed stocks (Chava and Purnanandam (2010), Vassalou and Xing (2004)). The second explanation (Dichev (1998), Griffin and Lemmon (2002)) centers on *mispricing*, attributing the anomaly to investors' inability to price distressed firms close to the event of default (mispricing effect or post-downgrade negative drift). A third key explanation, *renegotiation*, attributes the negative relation to high shareholder renegotiation advantage that enables extracting more benefits from renegotiation near the event of default (Garlappi et al. (2008), Garlappi and Yan (2011)). In this paper, we extend this line of reasoning suggesting that shareholders´ default option and/or reduction of fixed operating costs from reorganization (e.g., via lower renegotiated coupon payments) may help increase skewness thereby leading to lower returns.

Following a separate path, a number of studies have recently examined the role of skewness in stock returns, finding a negative return premium. As Harvey and Siddique (2000) and Charitou et al. (2013) argue, certain investors might prefer portfolios that are right-skewed and, as a result, stocks with higher skewness are more desirable and should have lower expected returns. This negative return premium associated with enhanced skewness is confirmed in other studies (Smith (2007), Yang et al. (2010)). Conrad et al. (2013) find a negative premium for risk-neutral co-skewness measures. Kumar (2009) suggests individual investors prefer stocks with lottery features, where lottery stocks are identified as having high idiosyncratic volatility and skewness. Boyer et al. (2010) find that expected idiosyncratic skewness is an important priced factor commanding a negative return premium. Campbell et al. (2008) similarly suggest that distressed stocks have characteristics that appeal to certain investors, such as increased opportunities to extract private benefits of control or higher skewness of returns and that distressed stocks offer positively skewed returns.

Although these various separate literatures are rich and extensive, the inter-linkage between growth options, distress risk and idiosyncratic skewness and their combined impact on stock returns remains unexplored. The aim of this study is to help fill this gap, namely to examine the combined impact of growth options and the distress/reorganization option on stock returns through influencing expected idiosyncratic skewness and test whether the negative return premium of positively skewed stocks is driven by the growth options and/or distress risk embedded in these stocks.

Building on a theoretical model with growth and default/reorganization options (developed in the next section), we suggest that the negative relation between growth options or default risk and stock returns (found in prior studies) can be attributed to the more convex value function and resulting more positively skewed return distribution of growth-oriented and distressed firms. Rather than uncertainty being a penalty for which shareholders require a higher return, as one might expect for established value stocks, for growth or distress stocks higher uncertainty underlying their growth or default/reorganization options, combined with managerial, organizational and financial flexibility that result in more asymmetric returns, may be reflected positively ex ante in current prices and justify lower required or subsequent average returns. Active management in levered firms provides equity-holders with a set of call (expansion or growth) and put (default/reorganization) options that creates a more convex firm value payoff and leads to a more positively skewed return distribution. As a result, investors are willing to accept a lower average return from such growth or distressed stocks in exchange for the more favorable (positively skewed) risk-return profile.

To identify the first order condition in the association between growth options, distress risk, skewness and stock returns, we first isolate the part of idiosyncratic skewness generated by growth options and the default/reorganization option (distress risk). We refer to this as attributed or expected idiosyncratic skewness. To determine this, we first regress idiosyncratic skewness on growth options and distress risk measures, controlling for other relevant variables (including size, turnover, momentum, lag skewness and idiosyncratic volatility). We then examine the impact of this attributed or expected idiosyncratic skewness on stock returns in a Fama-MacBeth (1973) framework.

Our methodological design is as follows. In the first stage of our analysis we show that growth options and distress risk are positively related to expected idiosyncratic skewness. In the second part, expected idiosyncratic skewness specifically deriving from the real options (growth and default/reorganization) found in the first stage is shown to be negatively related to stock returns. Expected idiosyncratic skewness predicts contemporaneous and subsequent short-run returns (up to 6 months). These predictions correspond to an annualized return differential (hedge portfolio return) of about 9% between low and high idiosyncratic skewness quintile portfolios, and an average annualized Sharpe ratio close to 0.70, which is substantial (Lewellen, 2010). The negative return premium associated with idiosyncratic skewness is higher for stocks with higher growth options and higher distress risk.

The paper is organized as follows. Section I presents a theoretical model of an active levered firm with growth options on the upside and a reorganization/downsizing option on the downside, leading to a convex value payoff and positively skewed returns. Section II discusses the variables measurement, data and methodology used. Our empirical findings including various robustness tests are discussed in section III. The last section concludes.

I. Theoretical Model: Growth and Downsizing/Reorganization Options

In this section we discuss how growth options on the upside and downsizing/reorganization options in adverse scenarios lead to more convex value payoffs and increased skewness for an active levered firm (compared to a similar passive all-equity firm). We rely on a simple extension of the Kulatilaka and Perotti (1998) strategic growth model extended to accommodate downsizing or reorganization options on the downside. Consider a duopoly with two firms facing an inverse demand function of the form: $p(q,\theta) = \theta - q$, where $p(q,\theta)$ is the market price as a function of total industry supply (q) given a random demand shock θ.

Each firm in this duopoly faces total annual costs represented by a production cost function of the form: $TC = FC + VC$, where FC and VC are the annual fixed and variable cost components, respectively. FC reflects the minimum scale required for a set level of production as well as the annual cost to serve debt (e.g., coupon payments) if the firm is levered. Suppose the active firm has access to a strategic investment growth opportunity that will lower the future unit (variable) production costs (from C to c). Active management also allows for a more flexible structure on the downside that allows reducing fixed costs from F to f through downsizing/restructuring or reorganization and debt renegotiation. The expansion/growth and downsizing/reorganization opportunities are a function of future demand realization in non normal economic scenarios.

As illustrated in Figure 1, if future demand θ increases beyond an upper demand threshold, θ^{**}, the active firm with the strategic growth investment will exercise an expansion/growth option and lower future marginal production costs (from C to c). On the other extreme, in case of a severe negative shock in demand, below lower threshold θ^{*}, the active levered firm can exercise a put option to restructure operations or file for a Chapter 11 reorganization that enables downsizing the firm's scale and/or renegotiating debt terms and lowering fixed costs (potentially including lower coupon payments) from F to f. The active levered firm is able through a strategic growth investment or reorganization/renegotiation and restructuring to effectively change its operating scale and cost structure depending on the random demand realization θ, exercising growth or downsizing opportunities accordingly. Under high demand ($\theta > \theta^{**}$), to satisfy the increased level of production, the firm adopts a larger scale that involves higher fixed costs F ($F > f$). However, given the expanded scale arising from its strategic investment, the active firm faces lower marginal future production costs c ($c < C$). Thus, its costs are $F + cq$ when $\theta > \theta^{**}$. Conversely, if demand drops below critical level θ^{*}, the active levered firm can restructure and downsize or reorganize its debt terms to achieve lower fixed operating and financing costs f ($f < F$). In this extreme adverse scenario ($\theta < \theta^*$), the firm faces a higher marginal operating cost C. Its total costs will thus be $f + Cq$, for $\theta < \theta^*$. Figure 1 provides a graphical representation of the above reasoning. The value of the active levered firm (V') can thus be viewed as the value of a passive (all-equity) firm (V) in a normal demand range ($\theta^* < \theta < \theta^{**}$) plus the downsize/reorganization (put) option and the growth/expansion (call) option.

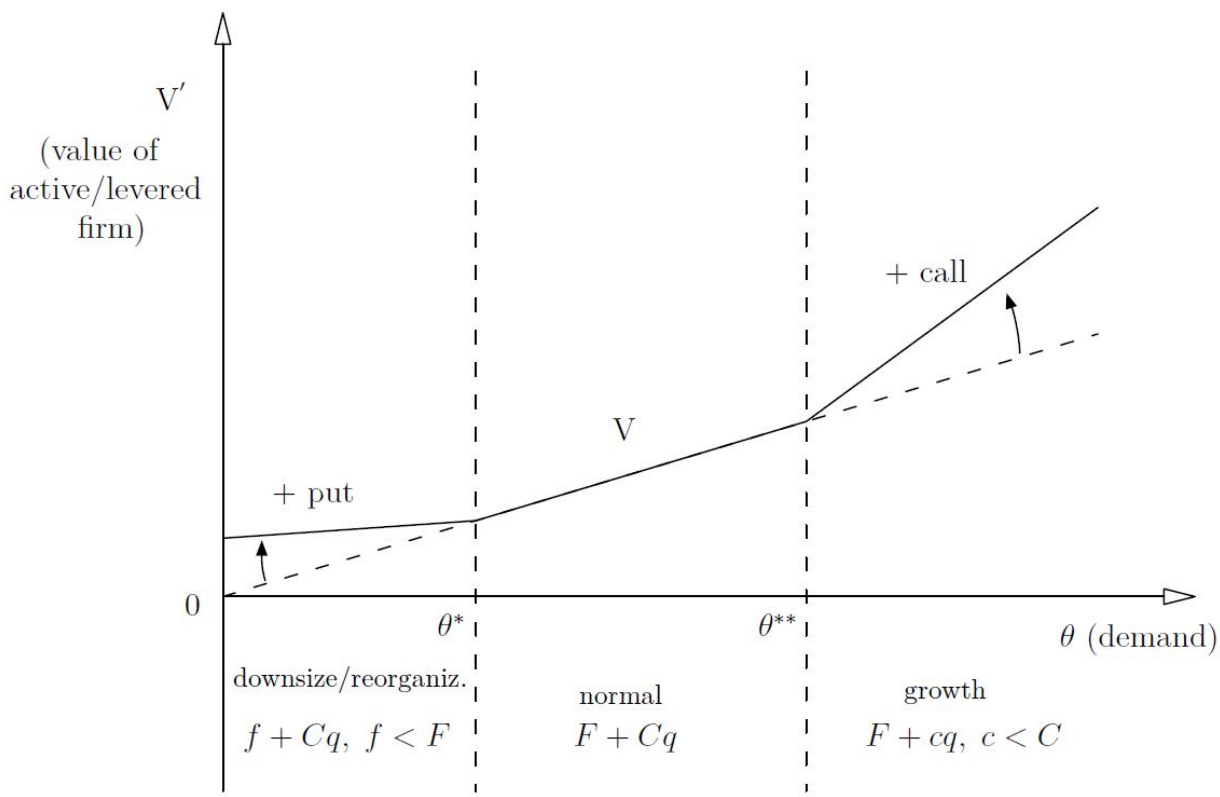

Figure 1: Graphical representation of the adaptive options of an active levered firm. At an extremely low level of demand ($\theta < \theta^*$) the firm can pursue a downsizing/reorganization (put) option reducing fixed costs to f ($f < F$). For intermediate (normal) level of demand $\theta^* < \theta < \theta^{**}$ neither the downsize/reorganize or the expansion option is exercised: the firm faces the same cost function as an identical passive all-equity firm without options. For high level of demand ($\theta > \theta^{**}$) the active firm will exercise an expansion/growth option exploiting economies of scale, so the firm is able to produce at a lower marginal cost c ($c < C$). The total cost of the passive firm under normal demand is $TC = F + Cq$. The expected total adaptive costs of an active levered firm are ($f + Cq$) with demand scalar or probability $\left(1 - \frac{\theta}{M}\right)$ in case of downsizing/reorganization and ($F + cq$) with probability $\left(\frac{\theta}{M}\right)$ under expansion/growth.

Under the assumption that random demand θ follows a uniform distribution with support $[0, M]$, as in Kulatilaka and Perotti (1998), the active levered firm with strategic growth and downsizing/reorganization options (of value V') faces an expected total annual production cost $TC' = \left(1 - \frac{\theta}{M}\right)(f + Cq) + (\frac{\theta}{M})(F + cq)$.

By contrast, a passive (all-equity) firm facing rigidities would face constant annual fixed and variable costs, F and C. Under the assumption of a steady-state operation with a constant discount rate (opportunity cost) $\delta = k - g$, where k is the total equilibrium return or cost of capital and g the expected growth rate, the *ex-post* cash flow (perpetuity) values of the two firms, the passive all-equity firm *V* and the active levered firm V', are as follows:

$$V = \begin{cases} -\dfrac{F}{\delta} & if \quad \theta < \theta^{**} \\ \dfrac{1}{\delta}\left[\dfrac{1}{9}\left(\theta - 2C + c\dfrac{\theta}{M} + C\left(1 - \dfrac{\theta}{M}\right)\right)^2 - F\right] & if \quad \theta \geq \theta^{**} \end{cases}$$

$$V' = \begin{cases} -\dfrac{1}{\delta}\left[F\dfrac{\theta}{M} + f\left(1 - \dfrac{\theta}{M}\right)\right] & if \quad \theta < \theta^{*} \\ \dfrac{1}{\delta}\left[\dfrac{1}{4}\left(\theta - c\dfrac{\theta}{M} - C\left(1 - \dfrac{\theta}{M}\right)\right)^2 - F\dfrac{\theta}{M} - f\left(1 - \dfrac{\theta}{M}\right)\right] & if \quad \theta^{*} < \theta \leq \theta^{**} \\ \dfrac{1}{\delta}\left[\dfrac{1}{9}\left(\theta - 2\left(c\dfrac{\theta}{M} + C\left(1 - \dfrac{\theta}{M}\right)\right) + C\right)^2 - F\dfrac{\theta}{M} - f\left(1 - \dfrac{\theta}{M}\right)\right] & if \quad \theta \geq \theta^{**} \end{cases}$$

where $\theta^{*} = C/(1 + 1/M(C - c))$ and $\theta^{**} = C/(1 - 1/M(C - c))$ are the Cournot entry thresholds for the active and passive firm, respectively. The higher level of operating and financial flexibility (through downsizing or via reorganization and debt renegotiation) of the active levered firm increases the convexity of its value payoff (*V´* is more convex than *V*) and thereby increases the skewness of its shareholder returns (e.g., see van Zwet, 1964; Xu, 2007). We put this theoretical prediction to empirical testing below.

II. Measurement, Data and Methodology

A. Growth Options

Growth options (*GO*) represent idiosyncratic, firm-specific future investment opportunities. Growth options enhance the upside potential of a firm, increasing the convexity of its pay-off and the skewness of its returns. *GO* here represents the % of a firm's value arising from future growth opportunities (PVGO/*V*). It can be inferred by subtracting from the current market value of the firm the perpetual discounted stream of firm operating cash flows under a no-growth policy (e.g., see Kester (1984), Cao et al. (2008)):

$$V_{i,t} = \frac{CF_{i,t}}{k_i} + GO_{i,t} \qquad \text{or} \qquad GO_{i,t} = V_{i,t} - \frac{CF_{i,t}}{k_i} \tag{1}$$

where $V_{i,t}$ is the market value of firm *i* at time t, $CF_{i,t}$ is the (perpetual) Operating Cash Flow of firm *i* at time t and k_i is firm *i*'s weighted average cost of capital (WACC). CF is measured as free cash flow under a no-further-growth policy where capital expenditure equals depreciation. We calculate CF as net cash flow from operating activities (Compustat item #308) plus interest and related expenses (#15) minus depreciation and amortization (#125).[1] To estimate the cost of equity in WACC we assume the *market model* setting beta equal to 1 for all firms and estimate the market risk premium as the average premium of the S&P500 index portfolio over the one-month T-bill rate over the previous 60-month period. This simple set up avoids reliance of our results on CAPM validity. We estimate the cost of debt to be four units below the corresponding cost of equity. Effective tax rates are obtained from income taxes (#370) divided by pretax income (#365). We use the industry average if not available.

B. Distress Risk (Default/Reorganization Option)

Skewness enhancement also results for levered firms with high distress risk facing potential default and reorganization. The negative overall relation between default risk and stock returns found in prior studies can be attributed to the more positively skewed distribution of levered equity returns of distressed firms that can reduce fixed operating and financial costs (e.g., coupon payments) by exercising their default/reorganization option via Chapter 11. Effectively, the default/reorganization option held by shareholders of distressed firms provides a more positively skewed return distribution that compensates for lower average returns.

The simplest way to proxy for this option in our empirical study is to use Merton's (1974) option pricing model (that views equity as an option on the firms´ assets with exercise price the value of debt) to compute a distress risk (*DR*) measure for individual firms. This measure is highly correlated with the probability of taking advantage of the

[1] For years prior to 1988, we follow Xie (2001) in estimating cash flow from operations as funds from operations (#110) – change in current assets (#4) + change in cash and cash equivalent (#1) + change in current liabilities (#5) – change in short-term debt (#34)].

default/reorganization option that positively skews levered equity returns. An advantage of using option models in calculating the distress risk is that they provide the necessary structure to infer default-related information from market prices. Option pricing models enable the construction of a measure of distress risk that contains forward-looking information (since market prices reflect investors' expectations about a firm's future performance). This is more appropriate for estimating the market´s assessment of the likelihood of a firm exercising its default/reorganization option in the future than historical estimates. Unlike accounting-based models, firm asset volatility is a key input in such option pricing models. In this paper, distress risk is calculated analogous to Bharath and Shumway (2008) as the probability of default at the debt's maturity. The face value of the debt is current liabilities (#45) plus half of the long-term debt (#51). The market value of the firm is the sum of the market value of equity and the book value of total liabilities. The total payout by the firm (including dividends and coupon payments to debt holders) is the sum of interest expense (#15) and cash dividends (#127). Following Bharath and Shumway (2008) the debt maturity is set at one year.

C. Expected Idiosyncratic Skewness

We calculate skewness based on daily returns of non-financial firms in the CRSP/COMPUSTAT merged file from January 1983 to December 2012. Idiosyncratic skewness is calculated each month as a scaled measure of the third central moment of the residual obtained by fitting the market model to the daily stock returns. We first fit the market model to the daily stock returns over a year from January to December by running:

$$Re_{i,t} = \alpha + \beta_{i,m}\left(R_{m,t} - R_{f,t}\right) + u_{i,t} \qquad (2)$$

where $Re_{i,t}$ is the daily excess return of stock i and $R_{m,t} - R_{f,t}$ is the daily market excess return at time t. The above equation is estimated using daily data from January to December of each year. We then calculate the daily idiosyncratic skewness (is) and idiosyncratic volatility (iv) in each month as follows:

$$is_{i,t} = \frac{E_t\left[\left(\hat{u}_{i,j} - E_t[\hat{u}_i]\right)^3\right]}{\left(\sqrt{E_t\left[\left(\hat{u}_{i,j} - E_t[\hat{u}_i]\right)^2\right]}\right)^3} \frac{\sqrt{N(N-1)}}{N-2} \tag{3a}$$

$$iv_{i,t} = \frac{\sqrt{E_t\left[\left(\hat{u}_{i,j} - E_t[\hat{u}_i]\right)^2\right]}}{\sqrt{N-1}} \sqrt{N} \tag{3b}$$

$E_t[.]$ above indicates the expectation at the beginning of month t over the period $[t, t + T]$ and N is the number of daily observations from the first available observation of month t to the last available daily observation at the end of the final month of the period analyzed (T). As a base case, we calculate daily idiosyncratic skewness over a period of T=6 months.[2] For our asset pricing tests we use a measure of expected idiosyncratic skewness over a horizon of T=6 months that is generated by our real option variables, namely GO and DR. We use this measure of *expected* idiosyncratic skewness (rather than realized skewness) in an effort to isolate the impact on skewness due to GO and DR. The estimation of expected skewness is feasible in that it only uses information available to investors at the time the expectation is built.

To guarantee the feasibility of the measure and isolate the impact of GO and DR drivers we first estimate the below cross-sectional regressions each month *t:*

[2] For robustness, we repeated the analysis using different horizons from 6 to 12 months. Results are similar. For shorter horizons (below 6 months), GO and DR lose importance once other control variables are added.

$is_t =$

$$\alpha + \beta_{GO}GO_{t-1} + \beta_{DR}DR_{t-1} + \beta_{is}is_{t-T} + \beta_{SIZE}SIZE_{t-1} + \beta_{MOM}MOM_{t-1} + \beta_{TURN}TURN_{t-1} + \beta_{iv}iv_{t-T} + \varepsilon_t \quad (4)$$

In Equation (4) above, is_t is an $\mathrm{M} \times 1$ vector (of M firms) cross-sectional idiosyncratic skewness in month t; GO_{t-1} and DR_{t-1} are $\mathrm{M} \times 1$ vectors of cross sectional growth option (GO) and distress risk (DR) proxies in month t-1. Growth option intensity (GO) is calculated as in Section II.A while distress risk (DR) is the negative value of the Merton distance to default (-$D2D$) adjusted using the actual drift μ rather than the risk-free interest rate r. Control variables include: i) lag idiosyncratic skewness is_{t-T} and lag idiosyncratic volatility iv_{t-T}; ii) $SIZE_{t-1}$, the logarithm of market value of equity (ME) observed at month t-1 where ME is calculated as the product of shares outstanding and the last available closing price; iii) MOM_{t-1} (momentum) is calculated as the cumulative monthly return of the previous 12 months; iv) $TURN_{t-1}$ (turnover) is calculated as the ratio of trading volume to total shares outstanding in month t-1. Equation (4) is cross-sectionally estimated for each month in the sample. Then we determine the expected idiosyncratic skewness specifically attributed to the real option variables above from month *t* to t+T as:

$$E_t[is_{t+T}] = \hat{\beta}_{GO}GO_t + \hat{\beta}_{DR}DR_t \quad (5)$$

The expected idiosyncratic skewness estimated using Equation (5) is meant to isolate the predicted skewness impact attributed to growth options (*GO*) and distress risk (*DR*) alone. Unlike Harvey and Siddique (2000) who focus on the pricing of co-skewness, we here focus on the impact of idiosyncratic skewness resulting from the GO and DR factors. The reason we focus on idiosyncratic skewness is related to the firm-specific nature of real options. Several prior papers have documented the pricing impact of idiosyncratic skewness (see Boyer et al. (2010), Kumar (2009)). Our focus differs from Boyer et al. (2010) in that we restrict our attention to "real options" generated expected idiosyncratic skewness. Compared to Kumar (2009), we provide a real options motivation of why investors should prefer stocks with skewed returns arising from growth and default/reorganization options.

To test the robustness of this approach in isolating the idiosyncratic skewness impact of these real options, we also calculate the real options driven expected skewness impact using a different procedure. In this variant, we first calculate the expected idiosyncratic skewness generated by the other control variables (model (1) in Table 3):

$$(a)\ E_t\left[is_{i,t+T}\right] = \hat{\alpha} + \hat{\beta}_{is} is_t + \hat{\beta}_{SIZE} SIZE_t + \hat{\beta}_{MOM} MOM_t + \hat{\beta}_{TURN} TURN_t + \hat{\beta}_{iv} iv_t \qquad (6)$$

We then calculate alternative expected skewness measures using three extended models that additionally include GO and/or DR:

$$(b)\ E_t\left[is_{i,t+T}\right] = \hat{\alpha} + \hat{\beta}_{GO} GO_t + \hat{\beta}_{is} is_t + \hat{\beta}_{SIZE} SIZE_t + \hat{\beta}_{MOM} MOM_t + \hat{\beta}_{TURN} TURN_t + \hat{\beta}_{iv} iv_t \qquad (7)$$

$$(c)\ E_t\left[is_{i,t+T}\right] = \hat{\alpha} + \hat{\beta}_{DR} DR_t + \hat{\beta}_{is} is_t + \hat{\beta}_{SIZE} SIZE_t + \hat{\beta}_{MOM} MOM_t + \hat{\beta}_{TURN} TURN_t + \hat{\beta}_{iv} iv_t \qquad (8)$$

$$(d)\ E_t\left[is_{i,t+T}\right] = \hat{\alpha} + \hat{\beta}_{GO} GO_t + \hat{\beta}_{DR} DR_t + \hat{\beta}_{is} is_t + \hat{\beta}_{SIZE} SIZE_t + \hat{\beta}_{MOM} MOM_t + \hat{\beta}_{TURN} TURN_t + + \hat{\beta}_{iv} iv_t \qquad (9)$$

The incremental real options driven expected idiosyncratic skewness, $\Delta E_t[is_{t+T}]$ (henceforth indicated with ESKEWDIFF) is obtained as pairwise differences between models (d)-(a), (c)-(a) and (b)-(a).

D. Returns Model Specification

We subsequently study the relation between expected idiosyncratic skewness ($E_t[is_{t+T}]$) specifically attributed to the growth and default/reorganization options and stock returns, after controlling for beta, size, book-to-market (B/M) and interaction terms, based on the following asset pricing model:

$$\text{Stock Returns} = f\,(\beta, \text{size, B/M; Capex, } E_t[is_{t+T}], \text{ interactions}) \quad (10)$$

Following Fama and French (1992), market or systematic risk (β) is estimated over the previous 36 months using the Sharpe-Lintner (CAPM) model: $E[R_{i,t}] = R_{f,t} + \beta_{i,t}(R_{m,t} - R_{f,t})$, where $R_{i,t}$ is the stock return of firm i in month t, $R_{m,t}$ is the market return in month t (a value-weighted portfolio of NYSE and AMEX stock returns), $R_{f,t}$ is the one-month U.S. T-bill rate in month t, and $\beta_{i,t}$ is the beta of firm *i* in month *t*. Size is alternatively measured as the log of the book value of the firms' total assets, the log of sales or as the market value of equity (ME), measured by log[fiscal year-end price per share (#199) * number of shares outstanding (#25)]. Results are similar so we report only the ME results. Book-to-market of equity (B/M) is measured as the book value of common equity (#60) divided by the fiscal year-end market value of equity (ME).[3] Capex is measured as the (three-year period) average capital expenditures CAPX (#128) at year end minus

[3] Leverage, measured in market value as the log of total liabilities LT (#81) divided by the fiscal year-end firm market value *V* (ME + LT), was also included for robustness as an additional control variable. Results are essentially the same (not reported).

the beginning-of-period CAPX, deflated by total assets AT (#6). Capex is included to control for past exercised growth options. Controlling for this helps isolate the impact that future un-exercised growth opportunities, reflected in the real-options-driven expected skewness, have on equity returns. Expected idiosyncratic skewness $E_t[is_{t+T}]$ is measured as in section II.C above.

E. Data and Methodology

Our sample consists of 17,530 U.S. listed firms during the 1983-2012 period with data available in the annual Compustat/CRSP Merged Database (excluding financial and utility firms with four-digit SIC codes between 6000 and 6999, and between 4900 and 4999). [4] [5] In implementing the model of Equation (10) we follow the regression procedure of Fama and MacBeth (1973). For each month, we cross-sectionally regress the subsequent realised stock returns on the explanatory variables described in the model of Equation (10) above.[6]

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[4] For robustness, we also tested our models for the extended period 1962-2010. The main results are similar. As expected, the effect of yet-unexercised growth options (GO) on subsequent stock returns is smaller than the corresponding coefficient found for the more recent period 1983-2010.

[5] There are several reasons why we focus on the post-1983 period. First, many growth stocks are traded on NASDAQ. Second, market volatility and growth option value have been higher since 1983. Xu and Malkiel (2003) argue that idiosyncratic risk has become more important over time as stocks listed on the NASDAQ increased in number and importance. The start of S&P 500 index futures trading in 1983 and related computerized program trading activities have increased market volatility and the value of growth options. Chan and Lakonishok (1993) report that beta was working fine until 1982, but stopped being significant subsequently. A potential growth options factor would be more significant in the presence of increased volatility and enhanced growth opportunities which have become more pronounced since 1983. Equally important is a dramatic increase in the number of stocks with negative book equity in the post-1983 period, as documented in Brown et al. (2008), Exhibit 1. An estimated 77% of these stocks trade on NASDAQ, many being small distressed stocks, with some simultaneously being growth stocks.

[6] To ensure that the accounting and option variables are known before the returns they are used to explain, we match the accounting data for fiscal year end in calendar year t - 1 (1983-2012) with the returns from July of year t to June of year t + 1. We use a firm's market equity at the end of December of year t – 1 to compute its book-to-market ratio for t – 1. To be included in the return tests for July of year t, a firm must have Compustat/CRSP data for December of year t – 1 and June of year t. It must also have monthly returns for at least 24 of the 36 months preceding July of year t in order to calculate the option-based variables (such as the firms' volatility, DR and

Table 1 Panel A reports summary statistics for all variables in our models. To simplify the presentation we use ESKEW and ESKEW12 to indicate the expected idiosyncratic skewness estimated over a horizon of 6 and 12 months, respectively. ESKEWDIFF indicates the difference in expected idiosyncratic skewness (d) – (a) based on Equations (9) and (6). Finally, RSKEW indicates the realized skewness of the past 1 month. If not specifically stated, we refer to the expected skewness over a base horizon of 6 months (ESKEW). To limit the influence of outliers, we removed the extreme 1% in both tails of the estimated expected skewness measure. As expected, market beta is close to one. Mean book-to-market (B/M) is 0.61, which is within the normal range found in other studies (e.g., Cooper et al. (2008), Anderson and Garcia-Feijoo (2006)). Capex/Sales is on average 0.3%, and it is highly volatile. The average monthly return (Return) is 1.32%. The time series averages of the cross sectional equally and value weighted expected skewness measures are -0.0022 and -0.0097, respectively. These cross-sectional averages are volatile, with standard deviations of 0.041 and 0.038, respectively. Including the constant term to these expectations leads to time series averages of 1.30 and 1.29 with standard deviations of 0.564 and 0.563 for the equally and value weighted cross-sectional averages, respectively.[7]

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skewness) and the firm's beta. Considering the sensitivity of our results to extreme observations, we perform the analysis winsorizing the top and bottom 1 percent of observations for each independent variable except size (setting them at the 1st and the 99th percentile, respectively). This procedure leads to 1,709,385 firm-month available observations to run the *GO* model of Equation (1). A significant number of observations is lost in the calculation of volatility and skewness since at least 24 available monthly returns are required. Other observations are lost in carrying out the Fama-MacBeth (1973) rolling procedure due to missing monthly returns. These lead to a final sample of 1,530,790 firm-month observations.

[7] The non real-options-driven skewness (without the constant term) generated by the control variables of Equation (6) alone have time-series averages of -0.865 and -1.222 with volatilities 0.542 and 0.669 for the cross-sectional equally weighted and value weighted averages, respectively. Inclusion of the constant term leads these averages of expected skewness to be positive (0.437 and 0.081) with volatilities 0.12 and 0.17 for the equally and value weighted cross sectional averages, respectively.

Panel B of Table 1 reports the correlation coefficients among these key variables. Expected skewness is negatively correlated with size, B/M, leverage and E(+)/P, as expected. It seems to have a low correlation with the other variables. The correlation coefficient among the three incremental expected skewness measures is close to 40%, while the correlation between these measures and realized skewness is very small. The above reaffirms that our expected skewness measure properly isolates the effects of growth options and distress risk and is different from realized skewness used in prior studies.

Our empirical investigation proceeds in two stages. In the first we examine the relationship of idiosyncratic skewness with growth options (GO) and distress risk (DR). In the second stage we provide asset pricing tests to identify the prediction ability of expected idiosyncratic skewness specifically arising from the growth and default/reorganization options.

III. Empirical Findings

A. Relation of Skewness with Growth Options (GO) and Default/Reorganization (DR)

In this section we examine the impact that the growth option (GO) and default/reorganization (DR) proxies have on realized idiosyncratic skewness. Table 2 panel A contains the average realized skewness calculated for each decile of GO and DR. In particular, each month we divide firms in 10 equally-spaced deciles built on GO and DR. We then calculate the average realized skewness over the subsequent 6 months in each decile. GO and DR are observed at the beginning of each period in which skewenss is calculated.

As can be seen in Table 2 panel A, higher levels of GO_{t-1} and DR_{t-1} separately are associated with higher average idiosyncratic skewness. The differences between the 10th (High) and 1st (Low) deciles show an average spread of 0.2504 for GO_{t-1} and 0.4014 for DR_{t-1}, respectively. These differences are statistically significant at 1%. These results confirm that higher values of GO and DR are associated with higher average skewness as hypothesized. The relation between GO and skewness appears curvilinear. A similar relation between average realized skewness and GO and DR is again observed using the two-way sorting procedure of Table 2 panel B. To further corroborate the impact of GO and DR on idiosyncratic skewness we perform a series of cross-sectional regressions using the set of control variables shown in Equation (4). The time-series averages and standard errors of the cross-sectional slopes are contained in Table 3. As can be observed, GO and DR are statistically significant positive drivers of idiosyncratic skewness after controlling for a number of covariates. Lagged idiosyncratic volatility and past skewness are also significant positive determinants. Size, momentum and turnover have a significant negative impact. For robustness, we also examine the impact that GO and DR have in explaining the residuals obtained by first regressing idiosyncratic skewness on a constant term, lagged idiosyncratic skewness and volatility, size, momentum and turnover. GO and DR remain positive and significant determinants of residual idiosyncratic skewness, after adjusting for other relevant determinants.

Table 4 contains averages along with statistical significance of differences of expected idiosyncratic skewness calculated following pairwise comparisons based on models (d) - (a) of equations (9) and (6), (c) – (a) of equations (8) and (6), and (b) – (a) of equations (7) and (6). EW-$E_t[is_{t+T}]$ indicates the time-series average of equally weighted (EW) cross-sectional expected skewness, while VW-$E_t[is_{t+T}]$ is the time-series average of value weighted (VW) cross-sectional expected skewness. As noted in Table 4, both GO and DR have a significant differential impact on the magnitude of expected idiosyncratic skewness in pairwise comparisons. All differences are significant at the 1% level, confirming that GO and DR are significant positive drivers of expected idiosyncratic skewness, alone and beyond other factors, as hypothesized in models (5) and (9). To ensure that GO and DR are not capturing the same phenomenon, we also test the significance of the difference between model (c) and (b) of equations (8) and (7). As noted in the last column of Table 4, GO and DR seem to capture different economic drivers.

B. Predicting Contemporaneous and Future Returns

If the skewness-related growth and default option explanations hold, the aforementioned option-driven expected idiosyncratic skewness measures should contain incremental explanatory power in explaining stock returns beyond standard factors. We thus use the expected idiosyncratic skewness measure derived in the previous stage isolating the part attributed purely to growth options (GO) and distress risk (DR). We then proceed to analyze the relation between real options-driven expected idiosyncratic skewness and equity returns, controlling for other standard factors.

As a benchmark, we first confirm the role of standard variables (e.g., beta, size, B/M) in a basic Fama-French type analysis (including Earnings-to-Price, E/P, and a distress dummy for negative earnings). Then we proceed with our extended analysis of the incremental role of expected idiosyncratic skewness (as determined by growth options and distress/reorganization discretion) in explaining subsequent equity returns. The use of B/M ratio rather than log of B/M (widely used in prior studies) is essential in this context to avoid excluding distressed firms (i.e., negative book equities) from the sample. To confirm consistency with prior studies as a base-line, the first model (coded LN in Table 5 Panel A) considers only positive book equity firms using log B/M instead.

As shown in Table 5 panel A, the results of model LN (of B/M) are largely consistent with Fama-French (1992) and prior studies that exclude negative book equity observations. Both size and book-to-market (B/M) appear significant in explaining subsequent returns. Consistent with the small firm effect, size has a negative effect on stock returns on average. As in Fama and French (1992), ln(B/M) is positively and significantly related with stock returns.[8] When negative book equity observations are kept in the sample (as in model 1), book-to-market (B/M) loses significance. Model 2 in Panel A of Table 5 confirms that *Capex* exhibits a significant *negative* relation with subsequent stock returns: a unit increase in *Capex* implies a lower average return by 2.4%.[9] The negative impact of growth in capital expenditures on stock returns is consistent with prior studies (e.g., Gomes et al. (2003), Titman et al. (2004), Anderson and Garcia-Feijoo (2006), Trigeorgis and Lambertides (2013)).

[8] Using log B/M as per standard Fama-French procedure automatically excludes observations with negative book value. Since the main objective of this study is to explore the impact of skewness generated jointly by distress risk and/or growth options it is not appropriate to exclude candidate firms with these characteristics. Therefore we further examine our hypothesis by using the simple B/M ratio. An alternative approach is the use of B/M(+) that equals B/M for positive B/M and zero otherwise, along with a negative B/M dummy that equals 1 for negative B/M and zero otherwise. This setting is meant to capture separately a double role of book to market, that of a growth and a distress role (Trigeorgis and Lambertides (2013)). In our study the negative earnings-to-price dummy, E/P(dum), takes the role of a distress variable.

[9] Capex is included to control for past exercised growth options. Controlling for this helps isolate the impact that future un-exercised growth opportunities, reflected in real-option-driven expected skewness, have on equity returns.

Model 3 in Panel A of Table 5 extends the Fama-French type analysis of model 1 by additionally considering the real options-driven expected idiosyncratic skewness variable (over 6 months), ESKEW, beyond the above Fama-French type variables. Model 3 confirms that our expected idiosyncratic skewness measure that is purely driven by growth options and distress risk is significant and *negative* in explaining subsequent stock returns, beyond all other variables: a 1% increase in expected idiosyncratic skewness arising from real options variables implies a lower average monthly return of 0.12%. This amounts to a 1.5% lower annualized return differential and a corresponding lower cost of capital for a given 1% increase in skewness. The negative impact of skewness on stock returns is consistent with evidence from other recent studies (e.g., Harvey and Siddique (2000), Smith (2007), Yang et al. (2010)).

In order to control for the possibility that our expected idiosyncratic skewness measure may capture other idiosyncratic characteristics already identified in prior studies, model 4 of Panel A extends model 3 by adding the lag of realized idiosyncratic skewness calculated over the last available month, RSKEW. The inclusion of past realized skewness helps to control for changes in investor expectations due to unexpected realization of skewness for other reasons. Although the added past realized skewness measure is also negative and significant, as found in prior studies (Harvey and Siddique (2000)) our expected idiosyncratic skewness coefficient is unaffected. Our expected idiosyncratic skewness measure deriving from real options has incremental explanatory power above and beyond other control variables and past realized skewness proxies. This may suggest that idiosyncratic and/or other skewness measures are not a sufficient proxy of expectations regarding future skewness. Our measure of expected idiosyncratic skewness (driven by growth options and distress risk) seems to capture different and complementary aspects. Realized past skewness focuses more on the near-term exercise (harvesting) of mature growth opportunities and default probabilities, while expected idiosyncratic skewness captures incremental value from creating new or sustaining existing growth option value and default/reorganization option protection over the longer term.

The significant *negative* impact of both realized and expected idiosyncratic skewness measures on stock returns is consistent with rational incorporation of growth and default/reorganization option value in current stock prices leading to lower subsequent average stock returns. The above is consistent with our hypothesis that investors may accept lower average returns in exchange for the positively skewed upside potential and downside default protection arising from corporate growth options and the shareholders´ implied default/reorganization option. These results additionally confirm that our expected skewness measure reflects the part specifically attributed to growth options and distress risk and that it differs from other skewness proxies used in prior studies (e.g., Boyer et al. (2010)). Our results are unaffected when a market-wide co-skewness measure is added (untabulated). These findings confirm that growth options and distress risk convey important information affecting investor expectations of future idiosyncratic skewness. This incremental information appears to be rationally priced according to a joint real options-skewness hypothesis.

Panel B of Table 5 shows robustness results to alternative expected skewness specifications. The first alternative skewness specification is using a 12-month length estimating window (ESKEW12). The second skewness specification involves the difference between the fitted values of models (d) and (a) based on equations (9) and (6) described in Section II.C above, ESKEWDIFF. The results are similar to those of our main analysis.

To shed further light on the effects of real options driven expected idiosyncratic skewness on stock returns, we next examine the effects of skewness that is not driven by growth options or distress risk, ESKEWREST. This non-real options part of expected skewness is obtained as the fitted value from all other explanatory variables except GO and DR as per Equation (6). Revised model (2´) in Panel C of Table 5 (based on adding ESKEWREST to previous model 2) confirms that there is a significant role for other skewness determinants. However, this alternative skewness determinant (ESKEWREST) becomes insignificant in model 4´ (effectively model 4 with ESKEWREST added) when our expected idiosyncratic skewness and past-skewness measures are included as well. Our real-options driven expected idiosyncratic skewness remains significant. These results corroborate our hypothesis and research design in isolating the effects of the growth and default/reorganization options from other factors.

To ascertain the economic significance of the expected idiosyncratic skewness deriving from real options, we report portfolio level returns (and differences among extreme portfolios) in Table 6. In constructing these portfolio returns we cross-sectionally sort each equity into five equal-sized groups based on expected idiosyncratic skewness. Panel A reports portfolio returns for expected idiosyncratic skewness estimated over 6 months (ESKEW). Panel B reports expected skewness estimated over 12 months (ESKEW12). Finally, panel C focuses on the differential in expected skewness over 6 months (ESKEWDIFF). We then compute the value weighted average return over the next 6 months (across the 360 months). We also report a portfolio hedge return as the difference in the average portfolio returns across the extreme quintiles (low minus high expected idiosyncractic skewness). Test statistics are reported based on time series variation in these portfolio hedge returns. This approach assumes monthly rebalancing and ignores the impact of transaction costs. Across the three alternative skewness measures, there is an economically significant predictive association between expected idiosyncratic skewness and average future returns. For example, the 0.75 monthly portfolio hedge differential between the low and high portfolios (quintiles) sorted on expected idiosyncratic skewness over the next 6 months (ESKEW) for explaining simultaneous returns (RET0) amounts to an annualized 9% return differential. This is both statistically and economically significant. The Fama-MacBeth (1973) test statistic of 3.10 for ESKEW for explaining contemporaneous returns (RET0) is equivalent to a monthly Sharpe ratio of 0.17 or 0.70 annualized (see Lewellen (2010) for a mapping of Fama-MacBeth test statistics to Sharpe ratios). Across all skewness measures, the monthly Sharpe ratio ranges from 0.16-0.19 for contemporaneous and first month returns, and declines to 0.06-0.14 by the sixth month. These are economically significant (Lewellen, 2010).

IV. Conclusion

This paper made several contributions by establishing necessary linkages at three levels. We have shown that: (i) both theoretically and empirically real growth and default/reorganization options are strong positive drivers of idiosyncratic skewness; (ii) the resulting real-options-induced expected idiosyncratic skewness commands a negative equity return premium; and (iii) a behaviorally rational transmission mechanism from real growth and distress/reorganization options to stock returns operates through observable idiosyncratic skewness.

Specifically we have examined the combined impact of growth options and distress risk on expected idiosyncratic skewness and whether the negative return premium observed on positively skewed stocks is driven by the growth options and distress risk embedded in these stocks. We have shown how growth options on the upside and downsizing/reorganization options in adverse scenarios lead to more convex firm value payoffs and increased skewness for active levered equity returns. The resulting enhanced skewness has important pricing implications for the relation between stock returns and growth options or distress risk factors. The negative relation between growth options or distress risk and stock returns found in prior studies can be attributed to the more positively skewed distribution of returns for growth-oriented and distressed firms. The existence of default/reorganization and growth options truncates the left tail of the return distribution while preserving the upside growth potential increasing the right tail. The combination of these two kinds of real options increases the idiosyncratic skewness of firm equity returns. We posit that investors are willing to accept lower average returns from growth or distressed stocks in exchange for the more favorable (positively skewed) risk-return profile.

Our empirical design proceeded in several stages. We first isolated the part of idiosyncratic skewness attributed to growth options and distress risk by regressing residual idiosyncratic skewness on growth options and distress risk measures, after controlling for other known related factors. Then we examined the impact of this attributed or expected idiosyncratic skewness on stock returns in a Fama-MacBeth (1973) framework. Consistent with our theoretical model and hypotheses, after confirming that growth options and distress risk are positively related to future idiosyncratic skewness, we showed that our attributed or expected skewness measure is negatively related to stock returns. Expected idiosyncratic skewness attributed to these real options predicts contemporaneous and subsequent average returns for the next 6 months. The economic significance of these results is noticeable. There is a 9% annualized portfolio hedge differential between the low and high portfolios (quintiles) sorted on expected idiosyncratic skewness over the next 6 months that is priced and explains contemporaneous returns. These predictions correspond to an annualized Sharpe ratio of 0.70.

We add to the thus far distinct empirical literatures on growth options (e.g., Anderson and Garcia-Feijoo (2006), Cao et al. (2008), Trigeorgis and Lambertides (2013)) and on distress risk (e.g., Dichev (1998), Griffin and Lemmon (2002), Garlappi et al. (2008), (2011), Chava and Purnanandam (2010)), both impacting negatively on stock returns, by showing that the channel through which these negative impacts are carried out is by shifting the shape of the return distribution as predicted by real options theory. Our findings reinforce and extend recent results by Boyer et al. (2010) and Conrad et al. (2013) providing further evidence that expected idiosyncratic skewness is priced and commands a negative return premium. Specifically we show that this effect is significantly driven by real options variables (related to growth options and default/reorganization) that impact on returns via the channel of skewness, i.e., we show that the part of expected idiosyncratic skewness that is generated by these real options variables commands an incremental negative return premium after controlling for other standard factors.

Recent literature on lottery behavior also documents that certain clienteles of investors have a preference for lottery type stocks and positive skewness (Bali et al. (2011), Kumar (2009)). Relative to this literature we add further theoretical, behavioral and statistical evidence that enhanced idiosyncratic skewness related to real options leads to a negative return premium. We contribute to this behavioral literature by demonstrating how real growth and reorganization options provide valuable flexibility for actively managed levered firms, which leads to a more convex value function and positively skewed equity returns. The resulting positively skewed returns deriving from real options resemble desirable lottery (and insurance) type features. Consistent with the above behavioral findings we posit that actively-managed levered firms with growth and/or reorganization/downsizing options enable investors to obtain equally desirable benefits within a rational equilibrium framework.

We believe that providing a theoretical basis for the inter-linkage between growth options, distress risk and idiosyncratic skewness and their combined impact on stock returns offers a deeper understanding of these twin "puzzling" phenomena that suggest that more risky growth and distress investment situations justify lower, rather than higher, expected returns. This also has profound implications for the true cost of capital related to growth and distress businesses and for conglomerate resource allocation. The resulting insights and implications should be of value to corporate managers, financial analysts and investors alike. Improvement in forecast (and discounting) accuracy may also help reduce information asymmetry in the marketplace. Practitioners may derive valuable insights regarding the economic determinants of firm performance, returns prediction and investing strategies.

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Table 1

Summary Statistics of Main Variables

This table reports summary statistics (Panel A) and correlations (Panel B) for the main variables included in the asset pricing model specified in Equation (10). Market Risk (β) is estimated over a three-year period using the Sharpe-Lintner CAPM model as in Fama and French (1992). Size is measured as the ln of the market value of equity (ME) (price per share x number of shares outstanding). Book-to-market (B/M) is measured as the book value of common equity divided by the market value of equity (ME). Capex is measured as the (three-year period) average growth in capital expenditures, deflated by total assets. ESKEW is expected skewness calculated based on Equation (4) with coefficients estimated based on Equation (4) over a horizon of 6 months. RSKEW is the realized idiosyncratic skewness of the past 1 month (based on Equation 3a). ESKEW12 and ESKEWDIFF are expected skewness calculated over a horizon of 12 months and the difference in expected skewness (d) – (a) of equations (9) and (6), respectively. Return is monthly returns.

Panel A. Summary Statistics

	Mean	Median	st. dev	min	max
Return	1.3247	0.1560	15.6787	-87.80	437.4
Beta (β)	1.0881	1.0849	0.8790	-6.659	11.37
Size	5.6045	5.5402	1.9768	-0.611	11.46
B/M	0.6146	0.5051	0.5135	-5.514	7.800
Capex	0.0034	0.0031	0.0308	-0.355	0.174
E(+)/P	2.6376	0.5210	8.1870	0.0000	208.4
E/P dum	0.2464	0.0000	0.4309	0.0000	1.000
ESKEW	-0.0022	-0.0032	0.0455	-0.4196	0.3672
ESKEW12	0.0122	0.0052	0.0606	-0.4866	0.5302
ESKEWDIFF	0.0007	0.0020	0.0281	-0.3191	0.2003
RSKEW	0.2405	0.2130	0.6594	-2.4099	2.4821

Panel B. Pearson Correlation Coefficients

	Return	Beta	Size	B/M	Capex	E(+)/P	E/P d	ESKEW	ESKEW12	ESKEWDIFF	RSKEW
Return	-										
Beta	0.002	-									
Size	-0.031	0.063	-								
B/M	0.026	-0.089	-0.356	-							
Capex	-0.009	-0.007	0.068	-0.086	-						
E(+)/P	-0.010	-0.022	0.437	-0.071	0.017	-					
E/P dum	0.022	0.181	-0.218	0.113	-0.113	-0.186	-				
ESKEW	0.009	0.006	-0.028	-0.012	0.013	-0.032	0.086	-			
ESKEW12	-0.006	0.041	-0.049	-0.031	-0.007	-0.052	0.130	0.476	-		
ESKEWDIFF	-0.020	0.038	0.055	0.008	-0.010	0.032	0.055	0.420	0.228	-	
RSKEW	0.005	0.029	-0.040	0.006	-0.004	-0.023	0.044	0.031	0.032	-0.006	-

Table 2

Average Idiosyncratic Skewness by Growth Option (GO) and Distress Risk (DR) Decile

This table contains the average idiosyncratic skewness over the subsequent 6 months (T = 6) for each decile sorted by GO_{t-1} and DR_{t-1} (Panel A). Panel B reports the average idiosyncratic skewness of each portfolio obtained by the intersection of 5 equally spaced quintiles calculated on GO_{t-1} and DR_{t-1}.

Panel A. Separate Skewness by *GO* and *DR*

GO_{t-1} decile	$Average\ is_{t+T}$
1 (Low)	0.586
2	0.426
3	0.350
4	0.313
5	0.299
6	0.294
7	0.352
8	0.451
9	0.588
10 (High)	0.837

DR_{t-1} decile	$Average\ is_{t+T}$
1 (Low)	0.350
2	0.361
3	0.369
4	0.355
5	0.377
6	0.417
7	0.448
8	0.486
9	0.583
10 (High)	0.751

Panel B. Average Idiosyncratic Skewness at Intersection of GO and DR *Quintiles*

		DR_{t-1}				
		1 (Low)	2	3	4	5 (High)
GO_{t-1}	1 (Low)	0.468	0.429	0.443	0.510	0.656
	2	0.309	0.243	0.297	0.379	0.543
	3	0.238	0.228	0.257	0.337	0.530
	4	0.317	0.326	0.338	0.411	0.601
	5 (High)	0.556	0.691	0.718	0.655	0.837

Table 3

Time-series Average Coefficients of Cross Sectional Month-by-month Regression Slopes

This table contains the averages of cross sectional month-by-month regression slopes calculated by regressing each month idiosyncratic skewness on GO, DR and the control variables contained in Equation (4). The dependent variable is realized idiosyncratic skewness estimated over a period of 6 months. The values in parenthesis are t-statistics. Standard errors are calculated from the time series slopes and the R-squared is the average coefficient of determination of the N=329 repeated cross sectional regressions. *, ** and *** indicate 10%, 5% and 1% significance level, respectively.

	(1)	(2)	(3)	(4)
Constant	1.3060^{***}	1.2873^{***}	1.3203^{***}	1.3023^{***}
	(41.34)	(41.16)	(41.97)	(41.85)
GO_{t-1}	-	0.0130^{***}	-	0.0129^{***}
	-	(5.897)	-	(5.870)
DR_{t-1}	-	-	0.0011^{***}	0.0011^{***}
	-	-	(9.245)	(9.419)
is_{t-T}	0.0349^{***}	0.0348^{***}	0.0349^{***}	0.0348^{***}
	(17.50)	(17.50)	(17.71)	(17.71)
$SIZE_{t-1}$	-0.0839^{***}	-0.0829^{***}	-0.0836^{***}	-0.0826^{***}
	-(35.85)	-(35.75)	-(35.73)	-(35.64)
MOM_{t-1}	-0.1134^{***}	-0.1112^{***}	-0.1132^{***}	-0.1110^{***}
	-(23.20)	-(23.25)	-(23.39)	-(23.44)
$TURN_{t-1}$	-0.0003^{***}	-0.0003^{***}	-0.0003^{***}	-0.0003^{***}
	-(11.84)	-(12.28)	-(12.60)	-(13.03)
iv_{t-T}	4.7384^{***}	4.6310^{***}	4.6624^{***}	4.5503^{***}
	(18.12)	(17.95)	(17.95)	(17.77)
N	329	329	329	329
R^2	0.0569	0.0581	0.0577	0.0589

Table 4

Time-series Averages of Cross Sectional Equally Weighted (EW) and Value Weighted (VW) Expected Skewness Differentials

This table contains equally weighted (EW) and value weighted (VW) averages of the differences, in absolute value, between expected idiosyncratic skewness in pairwise comparisons based on Equations (6)-(9). (d) – (a) refers to the absolute value of the difference between expected skewness calculated following Equations (9) and (6). (b) – (a) is the absolute value of the difference between expected skewness based on Equations (7) and (6). (c) – (a) is the absolute value of the difference between expected skewness based on Equations (8) and (6). Finally, (d) – (a) is the absolute value of the difference between expected skewness based on Equations (8) and (7). Expected skewness is calculated over a horizon of 6 months. *, ** and *** indicate 10%, 5% and 1% significance level, respectively.

	$((d)-(a))$	$((b)-(a))$	$((c)-(a))$	$((c)-(b))$
ESKEWDIFF (EW)	0.0133^{***}	0.0104^{***}	0.0116^{***}	0.0087^{***}
ESKEWDIFF (VW)	0.0375^{***}	0.0346^{***}	0.0376^{***}	0.0109^{***}

Table 5

Cross Sectional Regressions

Reported coefficients are the time-series averages of month-by-month regressions over 324 months (from July 1985 to June 2012). The t-statistic is the average slope divided by its time-series Newey-West (1987) standard errors. β is the firm's beta, B/M is book-to-market, where B is book value of equity and M the market value of equity. Size is the logarithm of the market value of equity. If earnings are positive, E(+)/P is the ratio of total earnings to price and E/P Dummy is 0. If earnings are negative, E(+)/P is 0 and E/P Dum is 1. Capex is measured as the (three-year period) average growth in capital expenditures, deflated by total assets. ESKEW is expected idiosyncratic skewness calculated as described by Equation (5) over a horizon of 6 months. RSKEW is lag realized skewness calculated over the past month. ESKEW12 and ESKEWDIFF are expected skewness over a horizon of 12 months and the difference in expected skewness (d) – (a) of equations (9) and (6), respectively. ESKEWREST is the expected skewness from non-real options variables. Panel A shows results for the main models. Panel B shows robustness regressions using alternative definitions of expected skewness, different horizons and approaches. Panel C reports results using the non-real options expected skewness measure. ***, **, * represent statistical significance at the 1%, 5%, and 10% level (respectively).

Panel A. Main Models

	Constant	β	Size	B/M	E(+)/P	E/P Dum	Capex	ESKEW	RSKEW
L									
	2.599	0.093	-0.245	0.207	0.058	0.342			
	(6.5)***	(0.77)	(-4.4)***	(2.1)**	(3.65)***	(2.05)**			
1	2.278	0.103	-0.239	0.110	0.046	0.350			
	(5.67)***	(0.75)	(-4.56)***	(0.83)	(4.28)***	(2.25)**			
2	2.278	0.100	-0.235	0.107	0.044	0.339	-2.589		
	(5.7)***	(0.73)	(-4.52)***	(0.82)	(4.19)***	(2.19)**	(-2.05)**		
3	2.719	0.164	-0.273	0.030	0.045	0.585	-2.518	-13.375	
	(6.8)***	(1.28)	(-5.44)***	(0.24)	(4.27)***	(4.14)***	(-1.99)**	(-2.58)***	
4	2.769	0.169	-0.276	0.026	0.045	0.592	-2.578	-13.354	-0.168
	(6.89)***	(1.31)	(-5.47)***	(0.21)	(4.32)***	(4.18)***	(-2.04)**	(-2.58)***	(-4.4)***

Panel B. Robustness Tests Using Alternative Expected Skewness Measures

	Constant	β	Size	B/M	E(+)/P	E/P Dum	Capex	ESKEW#	RSKEW
#12	2.604	0.205	-0.277	0.094	0.042	0.644	-2.660	-14.652	-0.163
	(6.45)***	(1.52)	(-5.34)***	(0.73)	(4.17)***	(4.39)***	(-2.08)**	(-3.65)***	(-4.07)***
#DIFF	1.868	0.124	-0.176	0.060	0.046	0.562	-2.298	-13.701	-0.184
	(4.6)***	(0.92)	(-3.37)***	(0.47)	(4.21)***	(3.64)***	(-1.75)*	(-2.98)***	(-4.73)***

Panel C. Non-real Option Skewness

	Constant	β	Size	B/M	E(+)/P	E/P Dum	Capex	ESKEW	RSKEW	ESKEWR
2'	2.845	0.081	-0.291	0.129	0.044	0.224	-2.600			-1.218
	(3.74)***	(0.6)	(-3.17)***	(0.98)	(3.27)***	(1.6)	(-1.96)*			(-2.16)*
4'	2.832	0.152	-0.274	0.059	0.044	0.486	-2.557	-16.463	-0.196	-0.815
	(3.58)***	(1.16)	(-2.9)***	(0.47)	(3.28)***	(3.72)***	(-1.95)*	(-3.58)***	(-4.54)***	(-1.4)

Table 6

Economic Significance of Impact of Expected Idiosyncratic Skewness on Portfolio Returns

For each sample month, stocks are sorted into five equal-sized groups based on the expected idiosyncratic skewness over a horizon of 6 (12) months ESKEW (ESKEW12), and on the difference in expected skewness (d) – (a) of equations (9) and (6), ESKEWDIFF. RET0 to RET6 are the (value weighted) average returns within each of the groups 0-6 months ahead. The hedge portfolio return is the difference between the average portfolio return across extreme quintiles (low minus high expected idiosyncratic skewness or portfolio 1 – 5). The Fama-MacBeth *t* statistic for hedge portfolio returns (1 – 5) is reported, along with the Sharpe ratio, calculated following Lewellen (2010).

Panel A. Portfolio Returns Using ESKEW - Expected Skewness (6 Months Ahead)

	RET0	RET1	RET2	RET3	RET4	RET5	RET6
1 (Low)	1.2984	1.3396	1.1422	1.1155	1.1808	1.1390	1.0736
2	1.0871	1.0373	1.0834	0.9955	1.0236	0.9742	0.8958
3	0.7765	0.8592	0.8444	0.8409	0.8455	0.8432	0.8625
4	0.5857	0.7035	0.7428	0.7284	0.8551	0.8498	0.7581
5 (High)	0.5527	0.6802	0.7324	0.6238	0.7796	0.7516	0.8129
Hedge (1-5)	0.7457	0.6594	0.4098	0.4918	0.4012	0.3874	0.2607
FM t-stat	3.1031	3.0695	2.0655	2.2748	1.8345	1.4385	1.1007
Sharpe ratio	0.1746	0.1727	0.1162	0.1280	0.1032	0.0809	0.0619

Panel B. Portfolio Returns Using ESKEW12 - Expected Skewness (12 Months Ahead)

	RET0	RET1	RET2	RET3	RET4	RET5	RET6
1 (Low)	1.3435	1.4113	1.4596	1.2957	1.3356	1.2137	1.1707
2	1.0144	1.0586	0.9790	1.0237	0.9694	1.0373	0.9949
3	0.7665	0.8203	0.8535	0.8665	0.8909	0.9327	0.8908
4	0.6044	0.6943	0.6549	0.5688	0.7594	0.7116	0.6550
5 (High)	0.5166	0.5430	0.7140	0.6167	0.6451	0.4960	0.5403
Hedge (1-5)	0.8268	0.8683	0.7456	0.6790	0.6905	0.7178	0.6305
FM t-stat	3.4031	3.3286	3.0061	2.8029	2.8608	3.1724	2.6446
Sharpe ratio	0.1914	0.1872	0.1691	0.1577	0.1609	0.1785	0.1488

Panel C. Portfolio Returns Using ESKEWDIFF - Expected Skewness (DIFF)

	RET0	RET1	RET2	RET3	RET4	RET5	RET6
1 (Low)	1.2702	1.3365	1.2494	1.2890	1.3163	1.2191	1.0770
2	1.1879	1.2182	1.2015	0.9847	1.2017	1.0637	1.1683
3	1.0020	0.9404	1.0397	0.9723	1.0629	0.9573	0.8897
4	0.8232	0.8440	0.9168	0.8672	0.7666	0.8396	0.7392
5 (High)	0.7579	0.9231	0.9361	0.7887	0.8379	0.8462	0.8390
Hedge (1-5)	0.5123	0.4134	0.3133	0.5003	0.4784	0.3729	0.2380
FM t-stat	3.2066	2.9512	2.1856	3.7118	3.3543	2.2472	1.6980
Sharpe ratio	0.1804	0.1660	0.1229	0.2088	0.1887	0.1264	0.0955