Growth Options and Related Stock Market Anomalies: Profitability, Distress, Lotteryness, and Volatility (Online Appendix)

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I Idiosyncratic Skewness and Sample Period

We have focused on the post-80 period partly because of data availability and because volatility, growth options, and idiosyncratic skewness attributed to growth options are more important in this period. To provide further support that the main argument in the paper is valid, we present two pieces of supporting empirical evidence. First, the average idiosyncratic skewness in the post-1980 period has been higher than in the pre-1980 period, and second the average ISKEW has increased over time in the later part of our sample compared to the earlier sample period. Specifically, from July 1963 to December 1979, the average 5-year idiosyncratic skewness based on daily returns is 0.76, while the average skewness post-1980 (from January 1980 to December 2016) is 0.89. The difference is significant at the 1% level (t-stat = 33.17).

Second, to test whether idiosyncratic skewness has increased over time during our sample period, we regress the cross-sectional average of individual firms' ISKEW against a time trend as follows:

$$\overline{\text{IS}} = \alpha + \delta \times \text{Time} + \epsilon \tag{1}$$

where Time is a variable capturing the time trend. A positive and significant δ coefficient would indicate that the average idiosyncratic skewness has increased over the sample period. Estimation of equation (1) leads to the following coefficient estimates:

$$\overline{\text{IS}} = \underbrace{0.792}_{(55.9)} + \underbrace{0.0184}_{(2.56)} \times \text{Time}$$

The significant positive δ coefficient of 0.0184 (with t-stat 2.56) indicates that the average idiosyncratic skewness of individual stocks has also increased over the sample period.

II Expected Skewness and Value Premium

Given the central role of growth options and their impact via the channel of idiosyncratic skewness in explaining the anomalous returns of several related anomalies, it would be interesting to examine the relationship between ISKEW and the value premium and test whether our idiosyncratic skewness factor (FISKEW) can explain the value premium. Although the average value-minus-growth return spread (average value premium) is not significant in our full sample period, we have tested whether our skewness factor is able to "explain" the value premium whenever we observed a significant value premium in the past during our historical sample period (e.g., prior to 2003 or around 2010). Figure A.1 displays the time-series plot of the value-minus-growth return spread (decile 10 minus decile 1 of the value-weighted portfolios of stocks sorted by book-to-market ratio)– and the 95% confidence bounds obtained by regressing the value-minus-growth portfolio returns against the Fama and French (1993) market and size factors (not controlling for HML), Carhart's (1997) momentum and the Pastor and Stambaugh (2003) liquidity factors (FFCPS). We use 10 years of monthly returns with the estimation rolled over the whole sample period. As seen in Panel A of Figure A.1, the value premium was significant in the period preceeding 2003 and around 2010. In Panel B of Figure A.1, we repeat the estimation by augmenting the FFCPS model specification with our idiosyncratic skewness factor (FISKEW). As shown in Panel B, the value premium becomes either weaker or insignificant after including the FISKEW factor. For robustness, we repeat the exercise using the HML factor rather than the value-minus-growth (decile 10-decile 1) return spread on the book-to-market sorted portfolios. Figure A.2 presents the results of such analysis. Again, controlling for the FISKEW factor renders insignificant the HML factor when it has been significant.

III Expected Idiosyncratic Skewness and GO

The measure of expected growth-option skewness given by equation (4) in the manuscript is a linear function of firm lagged skewness and firm growth options (GO). In order to understand how much variation in expected growth-option skewness is driven by each variable (lagged skewness or GO) we propose some additional tests.

First, test results using expected skewness calculated as per equation (4) in the manuscript based only on GO without lagged skewness are qualitatively similar and suggest the variation comes mostly from the GO component and not from the persistence in past skewness. Moreover, classification of stocks into skewness quintiles based on each separate skewness component is quite different and non-overlapping. Table A.1 shows the percentage of stocks classified into skewness quintiles based on expected skewness calculated as in the paper (that is, including both GO and lagged skewness) vs. expected skewness obtained only from GO (Panel A); and compared to simply using GO directly (Panel B). Table A.1 shows that the highest overlap that occurs in the high-skewness quintile (% of stocks) among the alternative measures is 72%, meaning that these measures do not lead to the same exact classification of firms.

In terms of the ability to explain away the four anomalies presented in the paper, Panel B in Table A.2 repeats the tests in Table 4 of the paper using an expected skewness factor derived solely from the GO component, from lagged skewness (ISKEW) or from the full specification of equation (2) in the manuscript (ALL). The results confirm that only the skewness factor based on expected skewness driven by GO ($FISKEW_{\text{ONLY GO}}$) is able to explain the four mentioned anomalies. By contrast, the skewness factor built only on past idiosyncratic skewness ($FISKEW_{\text{ONLY ISKEW}}$) or using the full specification of equation (2) in the manuscript ($FISKEW_{\text{ALL}}$) are unable to explain the four anomalies.

It is worth further explaining the rationale for not using GO directly but channeled through expected skewness, and also for the inclusion of lagged idiosyncratic skewness in the estimation of expected skewness. The measure used for estimating future growth options (GO) is essentially the difference between the market value that investors attribute to the firm and the fundamental cash-flow value of the firm (e.g., see Cao, Simin, and Zhao (2008)). While higher market-implied GO is likely associated with investor expectations of high future growth potential, this measure might also be affected by mispricing driven by optimism (or pessimism) and potentially the existence of bubbles. Whether driven by pure growth options or mispricing, the relation between GO and future returns would be negative, thus not allowing to disentangle the two arguments (future growth options vs. mispricing or bubble). While the relation between GO and future returns is expected to be negative regardless, the relation between GO and future skewness would depend on whether GO is truly proxying for future growth or it reflects investor optimism or a bubble. Empirically, while growth potential is associated with higher future skewness, bubbles are associated with lower skewness (e.g., Chen, Hong, and Stein (2001); Blanchard and Watson (1983)). Using the channel of expected skewness allows us to reduce the noise that may be coming from temporary mispricing and reduce the concern that market-implied GO might be affected by market cycles, investor optimism and potentially bubbles. Supporting this argument, we find in the data that while GO is on average positively associated with skewness in periods that include burst of bubbles, the relation of GO with future skewness turns negative. Figure A.3 provides empirical support for the above argument. It shows the coefficient of regressing current GO on subsequent 5-year skewness. A negative β_{GO} indicates that GO is associated with lower subsequent 5-year skewness, as seen to be the case in bubble periods (preceding market crashes) when previously optimistic expectations are corrected. These periods include Black Monday, Kuwait invasion, Dot-com bubble and the recent financial crisis. In other (normal) periods, the relation between current GO and subsequent skewness is positive, reflecting the presence of growth opportunities.

Regarding our inclusion of lagged skewness in the estimation of expected skewness, the rationale is twofold: (i) to control for other influences in line with Boyer, Mitton, and

Vorkink (2010); and (2) to account for past building up of growth potential and past exercise of growth options that may spawn future follow-on options, particularly in the case of big innovative firms (like Apple) in volatile businesses. The inclusion of lagged skewness in the expectation allows capturing whether a firm has exercised in the past growth options that may have opened up new growth opportunities, possibly not captured by the pure GO component.

One may argue that investments that result in asset growth are mainly manifestations of recently exercised decisions (i.e., investment commitments), but some capital investments also build innovative capacity that leads to future growth options. Past exercised growth involving capital resource commitment and future yet-unexercised growth opportunities are likely to be correlated. An exploited (exercised) growth opportunity today might lead to follow-on growth options and increased investment and profitability in the years to follow. For example, assume Apple Inc. invests in a new factory in Hong Kong to expand sales of iPhoneX. The new investment represents an exercised growth option and it results in higher asset growth and investment-to-assets (INV, via PPE). This investment likely increases cash flow from expanded sales and results in lower volatility and idiosyncratic skewness. However, it may also generate a follow-on growth option to expand sales of iPhoneX in the nearby volatile Chinese market.

IV The Power of the Skewness Factor

To further test how the results in Table 4 of the manuscript are driven by the correlation that the expected skewness factor arising from future growth ($FISKEW_{GO}$) has with standard risk factors SMB, HML, MOM or LIQ factors rather than $FISKEW_{GO}$ alone, we perform a similar analysis as in Table 4 of the manuscript and explain profitability, distress, lottery and idiosyncratic volatility anomalies using only the Market model (MKT) and the Market model augmented by the skewness factor ($MKT{+}FISKEW_{GO}$). As seen in

Panel A of Table A.3, the inclusion of the skewness factor along with MKT alone is sufficient to explain the four seemingly unrelated anomalies. Panel B of Table A.3 contains results obtained performing a similar analysis as contained in Panel B of Table 4 of the manuscript, but by using the market model (MKT) rather than the FFCPS. As clearly noticed, the market model augmented by an analogous skewness factor built on ROE, DR, MAX and IVOL rather than GO is not able to explain the indicated anomalies. The expected skewness factor (FISKEW_{X}) is constructed by forming zero-cost long-short portfolios of the relevant variable X (one of GO, ROE, DR, MAX or IVOL) based on our entire sample. Following Fama and French (1993), the expected skewness factor is formed using independent bivariate sorting based on 2×3 value-weighted portfolios (i.e., median SIZE (50%, 50%) and then 30%, 40%, 30% breakpoints for $\text{E[ISKEW]}_{\text{X}}$). We construct our factor as the difference between the average high (top 30%) $\text{E[ISKEW]}_{\text{X}}$ portfolio return minus the average low (bottom 30%) $\text{E[ISKEW]}_{\text{X}}$ portfolio return. We estimate $\text{E[ISKEW]}_{\text{X}}$ following equations (2) and (4) in the manuscript.

A Does the Skewness Factor Explain the Profitability Factor or Vice Versa?

We further test whether the new skewness factor based on future growth options can explain the profitability factor or vice versa. Table A.4 provides evidence that the extended factor models including the profitability (ROE) and investment (INV) factors of Fama and French (2015) and the Q-factor model of Hou, Xue, and Zhang (2015) are not able to explain our skewness factor (Panel A), while our skewness factor explains the profitability factor (Panel B).

The first column in Panel A of Table A.4 presents the 5-factor FFCPS alpha on the newly proposed skewness factor, which is 0.99% per month with a t-statistic of 6.71, indicating that the standard market (MKT), size (SMB), book-to-market (HML), momentum (MOM), and liquidity risk (LIQ) factors of Fama and French (1993), Carhart (1997), and Pastor and Stambaugh (2003) do not explain the skewness factor. The second column in Panel A of Table A.4 shows that including the profitability (ROE ≡ RMW) and investment (INV ≡ CMA) factors of Fama and French (2015) reduces the alpha from 0.99% to 0.64% per month, but it is still highly significant both economically and statistically. The last column of Panel A presents similar evidence that controlling for the profitability (R_{ROE}) and investment ($R_{I/A}$) Q-factors of Hou, Xue, and Zhang (2015) does not alter the significance of the alpha while the risk-adjusted return on the skewness factor remains highly significant: 0.63% per month with a t-statistic of 2.63.

Panel B of Table A.4 shows, by contrast, that the newly proposed skewness factor does explain the profitability factors. The first column in Panel B confirms that the MKT, SMB, HML, MOM, and LIQ factors of Fama and French (1993), Carhart (1997), and Pastor and Stambaugh (2003) do not explain the profitability factor of Fama and French (2015), denoted by FF5 RMW, as the 5-factor FFCPS alpha on the profitability factor (RMW) is economically and statistically significant: 0.41% per month with a t-statistic of 3.19. The second column in Panel B by contrast shows that including the skewness factor, $\text{FISKEW}_{\text{GO}}$, does remove the significance of the alpha, thus explaining the profitability factor of Fama and French (2015). Specifically, including the skewness factor reduces the alpha to -0.006% per month with a t-statistic of -0.05. Further, adding the skewness factor to the 5-factor FFCPS model increases the adjusted R^2 from 44.6% to 64.4%, providing further support for the incremental predictive power of the skewness factor over the profitability factor of Fama and French (2015).

The last two columns in Panel B of Table A.4 replicate the same analysis based on the profitability factor (R_{ROE}) of Hou, Xue, and Zhang's (2015) Q-factor model. Column (3) in Panel B confirms that the MKT, SMB, HML, MOM, and LIQ factors of FFCPS do not explain the profitability factor of Hou, Xue, and Zhang (2015), as the 5-factor FFCPS alpha on the profitability factor (R_{ROE}) is highly significant: 0.51% per month with a t-statistic of 4.69. The last column in Panel B indicates that accounting for the skewness factor reduces the alpha to 0.15% per month with a t-statistic of 1.44. Similar to our earlier findings, adding the skewness factor to the 5-factor FFCPS model improves the adjusted R^2 from 53.5% to 69.1%, confirming the improved explanatory power of the skewness factor over the profitability factor of Hou, Xue, and Zhang (2015). Overall, these results suggest that the skewness factor associated with future growth options can be viewed as a close substitute but subsumes the predictive power of profitability.

V Expected Skewness Differential ($E[ISKEW]_{GO}$)

We further test whether the expected skewness factor arising from future growth ($FISKEW_{GO}$) is able to explain the spread differential between high and low portfolios built on expected idiosyncratic skewness $E[ISKEW]_{GO}$. Table A.5 contains similar analysis as in Table 5 of the manuscript, where the FFCPS, FF5 and Q-factor models are augmented by adding the $FISKEW_{GO}$ factor in explaining the alpha spreads of portfolios of stocks sorted based on expected idiosyncratic skewness arising from growth options, $E[ISKEW]_{GO}$. Panel A of Table A.5 contains the same results as the bottom of Table 5 in the manuscript. Panel B of Table A.5 contains the results by augmenting the models in Panel A with the addition of $FISKEW_{GO}$. Results confirm that inclusion of $FISKEW_{GO}$ eliminates the significant alpha spreads observed in Panel A. As it can be noticed from Panel B of Table A.5, $FISKEW_{GO}$ remove the significance of the high minus low portfolio spread built on $E[ISKEW]_{GO}$.

To further examine the economic significance of expected idiosyncratic skewness attributed to growth options, we construct value-weighted bivariate portfolios of $E[ISKEW]_{GO}$ controlling for profitability (ROE), distress risk (DR), lotteryness (MAX), and idiosyncratic volatility (IVOL). Table A.6 shows that the predictive power of $E[ISKEW]_{GO}$ remains intact after controlling for these competing variables in bivariate portfolios.

VI Relation of Skewness with Profitability, Distress, Lotteryness and Volatility

In this section, we examine the impact on idiosyncratic skewness (ISKEW) of various related variables (GO, ROE, DR, MAX, IVOL) while controlling for asset growth (AG), size (SIZE), book-to-market (BM), turnover (TURN), and leverage (LEV). Table A.7, Panel A shows the average realized idiosyncratic skewness (ISKEW) calculated over the next 5 years for each decile of the variables above. Each month we sort firms into ten equally-spaced deciles built on GO, ROE, DR, MAX, IVOL, as well as on AG, SIZE, BM, TURN, LEV, exposure to changes in the CBOE S&P 100 volatility index (β^{VXO}) as in Ang, Hodrick, Xing, and Zhang (2006), and on analysts' forecast dispersion (DISP) as in Diether, Malloy, and Scherbina (2002). We then calculate the average realized idiosyncratic skewness (ISKEW) over the subsequent T = 60 months for each decile. All variables are observed at the beginning of the period in which idiosyncratic skewness is calculated.

As expected, higher levels of GO, DR, MAX and IVOL are associated with higher average idiosyncratic skewness (ISKEW). By contrast, higher levels of ROE are associated with lower levels of skewness as past profitability and cash flows are associated with lower return asymmetry and skewness. AG, SIZE and TURN are also negatively related to future skewness. Moreover, low-ISKEW firms have higher operating leverage (OPLEV) and tangible fixed assets (TFA) representing greater operating inflexibility. BM, LEV, β^{VXO} and DISP are positively related to future skewness. Panel B in Table A.7 presents similar analysis where firms are sorted into 10 decile portfolios based on idiosyncratic skewness and the average firm characteristics are reported for each decile. The results are qualitatively similar.

VII Cross-sectional Persistence of $E[ISKEW]_{GO}$

The negative return premia observed for expected idiosyncratic skewness suggest that investors demand higher expected return for holding inflexible, riskier stocks with low or negative $E[ISKEW]_{GO}$. To test if there is support for this reasoning in forming investor expectations, we examine if there is a certain degree of portfolio persistence in low vs. high expected skewness ($E[ISKEW]_{GO}$) stock classifications. Investors may demand higher returns for inflexible stocks (lacking growth options) with negative skewness or may be willing to accept lower returns for stocks that exhibit high skewness in the expectation that this behavior will be repeated in the future. So a natural question is whether these expectations are justified or rational. To investigate this issue, we examine the average month-to-month portfolio transition matrix showing the probability that a stock in quintile i in one month will be found (transition) in quintile j in a subsequent month. If the expected skewness measure were purely random, the probabilities of transitioning among the five quintiles should be roughly 20%. Table A.8 provides reassurance that our expected skewness measure is highly persistent with a probability of around 75% that a stock classified in quintile i a certain month will remain in the same quintile during the next month. The transition probabilities remain high (above 20 or 30%) for up to 6 months. For example, a stock classified as having high expected skewness (quintile 5) in month t has a probability of 47% to remain in the same quintile 6 months later. These results suggest that investors are not irrational in forming skewness expectations based on the presence or absence of growth prospects as these expectations are persistent and they can help explain seemingly anomalous returns, in line with our growth-driven skewness hypothesis.

VIII Cost and Profitability Stickiness

We further study whether high vs. low expected idiosyncratic skewness ($\text{E[ISKEW]}_{\text{GO}}$) firms present differences in the sensitivity of costs and profitability to negative shocks. We follow Anderson, Banker, and Janakiraman (2003) and estimate for each firm in the sample the degree of selling, general and administrative cost stickiness as well as changes in the profitability for negative shocks in revenues. In particular we estimate two alternative model specification:

$$
\begin{aligned}
(2)\quad \ln\left(\frac{\text{XSGA}_{i,t}}{\text{XSGA}_{i,t-1}}\right) &= \alpha + \beta_1 \ln\left(\frac{\text{REV}_{i,t}}{\text{REV}_{i,t-1}}\right) + \beta_2 \ln\left(\frac{\text{REV}_{i,t}}{\text{REV}_{i,t-1}}\right) \mathbb{1}_{\{\text{REV}\}} + \epsilon_{i,t} \\
(3)\quad \ln\left(\frac{\text{XSGA}_{i,t}}{\text{XSGA}_{i,t-1}}\right) &= \alpha + \beta_1^* \ln\left(\frac{\text{REV}_{i,t}}{\text{REV}_{i,t-1}}\right) + \beta_2^* \ln\left(\frac{\text{REV}_{i,t}}{\text{REV}_{i,t-1}}\right) \mathbb{1}_{\{\text{REV}\}}\mathbb{1}_{\{\text{CFNAI}\}} + \epsilon_{i,t}
\end{aligned}
$$

where XSGA are selling, general and administrative expenses, REV are revenues, $\mathbb{1}_{\{\text{REV}\}}$ and $\mathbb{1}_{\{\text{CFNAI}\}}$ are binary dummy variables taking value one if changes in revenues and the CFNAI index are negative, respectively. In the equations above, β_1 measures the percent increase in XSGA when REV increases by one percent; $\beta_1 + \beta_2$ the percent decrease in XSGA when REV decreases by one percent; $\beta_1^* + \beta_2^*$ measures the percent decrease in XSGA when REV decreases by one percent and the state of the economy is bad (negative CFNAI). We estimate the above equations for each firm and then repeat the estimation using profitability (ROE) as the dependent variable rather than changes in XSGA. Table A.9 shows the average XSGA cost and profit increase for a one percent increase in revenue (β_1 in first columns of Panel A and B), the average cost and profit decrease for a one percent decrease in revenue ($\beta_1 + \beta_2$ in second columns of Panel A and B), and the average cost and profit decrease for a one percent decrease in revenue conditional on a bad state of the economy ($\beta_1^* + \beta_2^*$ for negative CFNAI index in third columns). Low-$\text{E[ISKEW]}_{\text{GO}}$ firms exhibit higher cost stickiness compared to high-$\text{E[ISKEW]}_{\text{GO}}$ firms, confirming they tend to adjust costs slower to negative economic shocks. For low-$\text{E[ISKEW]}_{\text{GO}}$ (Decile 1), XSGA costs increase by 0.73% and decrease by 0.59%, respectively, when revenues decrease by 1%. This different sensitivity (0.14%) is significant at 1% level. By contrast, high-E[ISKEW]$_{GO}$ (Decile 10) firms experience an increase of 0.59% and a decrease of 0.50% for a one percent change in revenues, respectively. The different sensitivity of low vs. high E[ISKEW]$_{GO}$ firms is even more pronounced once one conditions on bad states of the economy (negative CFNAI). For high-E[ISKEW]$_{GO}$ firms (which are more flexible, growth firms), we observe the same percent increase and decrease in XSGA costs (0.59-0.54%) exhibiting similar agility to adjust costs in both good and bad states. By contrast, low-E[ISKEW]$_{GO}$ firms (which are more committed in scale and more profitable) still present a 0.13% differential (significant at 1%), suffering more losses on the downside. The higher level of XSGA cost stickiness for low-E[ISKEW]$_{GO}$ firms translates to lower profit increase during good states of the economy but higher profit decreases during bad states. High-E[ISKEW]$_{GO}$ firms experience higher profit increases in good states while being more protected (suffering lower profit declines) on the downside. In this sense, high-E[ISKEW]$_{GO}$ firms provide more hedging benefits so that investors accept lower returns while low-E[ISKEW]$_{GO}$ firms have higher risk exposure to negative economic shocks due to cost rigidity for which investors demand higher returns.

To corroborate the claim that low-E[ISKEW]$_{GO}$ firms involve higher cost rigidity and likely proxy for operating leverage (representing a higher mix of assets-in-place vs. growth options), and hence are more risky requiring higher returns, we examine two additional measures: operating leverage (OPLEV) measured as operating costs divided by total assets as in Novy-Marx (2011) and tangible fixed assets (TFA) measured by property, plant and equipment (PP&E) to total assets capturing operating inflexibility in line with Anderson, Banker, and Janakiraman (2003). Results in Panel C of Table A.9 confirm that firms in low Low-E[ISKEW]$_{GO}$ deciles have significantly higher operating leverage and tangible fixed assets as percentage of total assets, representing greater operating inflexibility and cost rigidity.

IX Firm Flexibility, Growth Options and Cash Balances

We further examine the relation between the four anomalies (profitability (ROE), distress (DR), lottery (MAX) and idiosyncratic volatility (IVOL)) and financial constraints. We estimate the level of financial constraint (SA) following Hadlock and Pierce (2010) as:

$$\text{SA} = -0.737 \times \text{SIZE} + 0.043 \times \text{SIZE}^2 - 0.040 \times \text{AGE},$$

where SIZE is the firm's market capitalization and AGE is the number of years since the firm's listing in Compustat. SA is estimated for each firm/month over the sample period. We independently double sort firms in Low vs. High financial constraint groups using the median point of SA and in Low vs. High anomaly return portfolios using the bottom/top 33% of observations. We then calculate two hedge portfolios for the Low vs. High financial constraints group as the difference between the High anomaly minus Low anomaly return portfolios. Results (unreported) indicate that the anomaly returns are more pronounced in the financially constrained group and that inclusion of the $\text{FISKEW}_{\text{GO}}$ factor removes the significance of the FFCPS alpha spread. This may indicate that low ROE and high DR, MAX, IVOL firms in the financially constrained group have some desired features for investors. This suggests that firm inflexibility arising from the financing side may also affect idiosyncratic skewness arising from growth options, further justifying our control for financial distress in the estimation of skewness. Del Viva, Kasanen, and Trigeorgis (2017) find that financial flexibility is an additional determinant of idiosyncratic skewness and has a positive interaction effect with GO. That is, both real asset and financial flexibility are used by active firm managers in the enhancement of skewness. A firm may have more potential to grow if, for example, it has excess debt capacity in the form of off-balance sheet financial flexibility, such as flexible lower-cost borrowing from its employees. Naturally, the firm's growth plans may be restrained if the firm is financially constrained.

If the $\text{FISKEW}_{\text{GO}}$ factor is capturing the presence or absence of firm flexibility or rigidity, as we argue herein, then it may also help explain the above anomalies for financially constrained firms. This confirms that the four anomalous returns are indeed generated by the presence or absence of flexibility (both real and financial) characterizing certain groups of firms (with low ROE and high DR, MAX, IVOL).

X Expected Skewness and Volatility Risk

Although our growth-option driven expected skewness measure partly helps control for volatility risk exposure on the downside there are other macroeconomic equilibrium explanations for why growth stocks provide a hedge against adverse macroeconomic states besides hedging against volatility risk. Ai and Kiku (2013) offer an alternative explanation not directly related to aggregate volatility risk for the macroeconomic hedging benefits of growth options and why growth options are less risky than assets-in-place and hence carry a low risk premium relative to value stocks. Viewing the firm as a portfolio of value assets (or assets-in-place) and growth options (effectively seen as options on the former), they highlight that the endogenously determined cost of growth option exercise (measured by the marginal cost of capital goods) is time-varying and procyclical: it is lower in bad economic states and higher in good states when demand for capital goods and costs rise and thereby acts as a hedge against macroeconomic risks to assets-in-place. Firms with growth options wish to expedite their exercise in good economic states (also when volatility is low) collectively driving up the cost of capital goods. Analogously, the cost of exercising a growth option is lower in bad economic states when macroeconomic conditions are unfavorable (the higher uncertainty in bad states favors waiting). The procyclical dynamics of the equilibrium price of capital goods partially offsets the cyclical fluctuations in assets-in-place (which follow the state of the economy). This makes growth options less vulnerable to aggregate risks than assets-in-place or value assets. As a result, growth options are less risky than value assets and investors demand lower returns from growth options, justifying the value premium.

Moreover, there are other aspects to our skewness measure such as differential responsiveness in capturing upside opportunity. so the premium would not vanish. Furthermore, as already mentioned, Ai and Kiku (2016), in studying the relation between volatility risk and growth options, find that while exposure to idiosyncratic volatility conveys information regarding future growth options, exposure to aggregate (market) volatility is not informative on future growth because it is contaminated by other variables. To address this potential issue, we control for exposure to market volatility in our main analysis in Table 3 in the original manuscript. As Panel C of Table 3 in the original manuscript shows, our growth-option driven expected skewness measure remains significant after controlling directly for volatility-risk exposure using β^{VXO}. This result indicates that the newly proposed measure of growth-option driven expected skewness is distinct from the market volatility risk premium.

XI Additional Explanations of the Growth Option Premium

In this study we focus on expected idiosyncratic skewness coming from GO rather than GO directly as we aim to highlight that the source of the effect we document is growth options or real options in general that have an asymmetric impact on returns (captured via the third moment or ISKEW) rather than volatility effects (related to second-moment, IVOL or volatility risk). GO and related market-value proxies (e.g., BM, EP) are not able to convincingly differentiate whether the effect is really driven by real (growth) options or e.g., other behavioral effects such as mispricing (via the denominator M of BM or P of EP) related to overoptimism and overpayment for growth options that may eventually lead to correction. To further ensure that the asymmetric effect we document via ISKEW is the one coming from growth options rather than e.g., information asymmetry, we specifically isolate $E[ISKEW]_{GO}$.

If GO is partly capturing mispricing arising from investor optimism (or market bubbles) rather than growth opportunities then it will be associated with lower return but at the same time it will also result in lower skewness (not positive skewness) as unrealistically high expectations eventually get corrected (Hong and Stein (2003), Blanchard and Watson (1983)). The use of the idiosyncratic skewness channel helps filter out the noise arising from mispricing or market bubbles and allows to disentangle the two effects (growth options vs. investor optimism or market bubbles). Indeed, GO and our expected skewness generated by GO lead to different quintile classification. Table A.1 shows the percentage of stocks classified into skewness quintiles based on expected skewness calculated as in the paper (that is, including both GO and lagged skewness) vs. expected skewness obtained only from GO (Panel A); and compared to simply using GO directly (Panel B). Table A.1, Panel A shows that the highest overlap that occurs in the high-skewness quintile (% of stocks) among the alternative measures is 72%, meaning that these measures do not lead to the same exact classification of firms.

As in Boyer, Mitton, and Vorkink (2010), we use a long-term measure of expected skewness (5 years forward), so we do not expect much of a short-term correction in investor expectations (especially given that between skewness estimations over two consecutive months there is only one monthly return (out of 60) difference). In order to help understand how long it takes for investors to correct their expectations, we calculated the long-term predictability of expected skewness from 1 to 24 months ahead. Expected skewness generated solely based on GO is significantly related to lower returns from 1 to 8 months ahead. After the 8th month, we do not observe a significant relation between skewness and returns. On the other hand, we do observe a longer term persistence in expected skewness generated by lagged skewness. The component of expected skewness generated by lagged skewness is negatively associated with future returns from 5 up to 18 months ahead. The combined effect of GO and ISKEW results in expected skewness being negatively associated with future returns from 1 up to 18 months ahead. This makes sense given the high persistence of GO and overlapping long-term ISKEW.

Regarding the time variation in the return premium, Table 6 in the original manuscript shows the average return and alpha spreads of the value-weighted portfolios of stocks sorted by $E[ISKEW]_{GO}$ for good and bad states of the economy separately. The average return spreads between high-$E[ISKEW]_{GO}$ and low-$E[ISKEW]_{GO}$ deciles are much higher during bad states of the economy: -1.78% per month (t-stat. = -2.55) for low CFNAI, -1.62% (t-stat. = -2.69) for high JLN, and -2.03% (t-stat. = -2.37) for high VXO periods, compared to -0.94% per month (t-stat. = -3.20) for the full sample period in Table 5 of the manuscript. The corresponding average return spreads are negative for good states of the economy but much lower in terms of economic magnitude: -0.68% per month (t-stat. = -1.44) for high CFNAI, -0.75% (t-stat. = -1.97) for low JLN, and -0.72% (t-stat. = -1.77) for low VXO periods. As shown in Table 6 of the manuscript, similar findings are obtained based on the risk-adjusted returns.[1]

During bad economic states, investors demand considerably higher expected returns for stocks with negative $E[ISKEW]_{GO}$ because negatively-skewed assets are expected to lose more during bad times as confirmed by the persistent nature of expected skewness.[2] Thus, if an investor were to choose between positively skewed vs. negatively skewed assets, she would prefer positively skewed assets especially during bad economic times. Investors would be willing to pay high prices and accept lower expected returns for stocks with positive $E[ISKEW]_{GO}$ as they are good hedges and deliver benefits exactly in times when most needed.

[1] The average return and alpha spreads in Table 6 of the manuscript are negative for both good and bad states. However, risk (preferences) of holding negatively (positively) skewed assets do matter much more during bad economic states so that the negative $E[ISKEW]_{GO}$ premium is higher during bad states compared to good states.

[2] As shown in Table A.8, $E[ISKEW]_{GO}$ is a highly persistent stock characteristic so during bad economic states with large market declines, investors are exposed to a higher probability of suffering large negative future returns.

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Table A.1 Explaining % of Expected Skewness from its Components or GO.
This table shows the percentage of stocks classified into skewness quintiles based on (i) expected skewness based on both GO and lagged skewness ($E[ISKEW]_{GO}$), (ii) expected skewness based on GO only ($E[ISKEW]_{ONLY\ GO}$), and (iii) directly from GO. Firms are first sorted each month into 5 quintiles based on each variable and then we count the percentage of common firms (same permanent number) inside each quintile based on the alternative measures. 100% indicates that a pair of two variables leads to the same classification (sorting) outcome as the quintile contains all same firms. 0% indicates that the two variables lead to completely different sorting (0% overlap).

Panel A. % Classified Stocks using $E[ISKEW]_{GO}$ and $E[ISKEW]_{ONLY\ GO}$

1	**2**	**3**	**4**	**5**
63.2%	49.2%	47.2%	52.3%	72.0%

Panel B. % Classified Stocks using $E[ISKEW]_{GO}$ and GO

1	**2**	**3**	**4**	**5**
61.5%	48.1%	47.2%	51.3%	70.7%

Table A.2. Portfolio Factor Analysis and Explained Anomalous Returns.
This table contains in Panel A the risk-adjusted returns (in percent) for 10 value-weighted decile portfolios sorted by ROE, DR, MAX and IVOL. Risk-adjusted returns (Alphas) are obtained by regressing each portfolio's excess return on the market (MKT), size (SMB), and book-to-market (HML) factors of Fama and French (1993), the momentum (MOM) factor of Carhart (1997), and the liquidity risk (LIQ) factor of Pastor and Stambaugh (2003). "FFCPS Alpha Diff." is the risk-adjusted return spread between decile 1 and decile 10. Alpha(FFCPS+$\text{FISKEW}_{\text{GO}}$) is the risk-adjusted return obtained by augmenting the 5-factor model with a factor $\text{FISKEW}_{\text{GO}}$ built on expected idiosyncratic skewness differentials attributed to GO. Panel B contains the risk-adjusted return spread between decile 1 and decile 10 when the FFCPS model is augmented by a factor $\text{FISKEW}_{\text{ONLY GO}}$ built on expected idiosyncratic skewness differentials attributed solely to GO, a factor $\text{FISKEW}_{\text{ONLY ISKEW}}$ built on expected idiosyncratic skewness differentials attributed solely to lagged idiosyncratic skewness (ISKEW) and a factor $\text{FISKEW}_{\text{ALL}}$ built using the full specification of equation (2) in the manuscript. Newey and West (1987) corrected t-statistics with 6 lags are reported in parentheses. N = 335 monthly observations.

Panel A. Market anomalies and alternative expected skewness factors

Portfolios	(1) Profitability ROE	(2) Distress DR	(3) Lottery MAX	(4) Volatility IVOL
1 Low	-0.383***	0.192**	0.121	0.177**
	(-2.59)	(2.15)	(1.22)	(2.11)
2	-0.187	0.168**	0.129	0.104
	(-1.56)	(2.05)	(1.53)	(1.14)
3	-0.155*	-0.021	0.078	0.009
	(-1.74)	(-0.24)	(0.60)	(0.13)
4	-0.017	-0.139	0.208	0.025
	(-0.21)	(-1.13)	(1.48)	(0.26)
5	-0.093	0.039	0.138	-0.087
	(-1.01)	(0.33)	(1.17)	(-0.96)
6	-0.038	-0.063	-0.279	0.207*
	(-0.56)	(-0.45)	(-1.64)	(1.86)
7	0.033	-0.126	0.181	-0.071
	(0.51)	(-0.95)	(0.85)	(-0.67)
8	0.176*	-0.295*	-0.155	0.237
	(1.95)	(-1.81)	(-0.99)	(1.56)
9	0.179**	-0.263	-0.406*	-0.049
	(2.50)	(-1.37)	(-1.70)	(-0.30)
10 High	0.203**	-0.316	-0.726**	-0.566***
	(2.18)	(-1.36)	(-2.30)	(-2.93)
FFCPS Alpha Diff. (10-1)	0.586***	-0.509**	-0.847**	-0.743***
t-stat	(2.91)	(-2.02)	(-2.46)	(-3.08)
(FFCPS + $\text{FISKEW}_{\text{GO}}$) Alpha Diff.	0.154	-0.233	0.090	-0.179
t-stat	(0.74)	(-0.87)	(0.24)	(-0.76)

Panel B. Market anomalies and expected skewness factor based on growth options only vs. lagged skewness only

Portfolios	(1) Profitability ROE	(2) Distress DR	(3) Lottery MAX	(4) Volatility IVOL
(FFCPS + $\text{FISKEW}_{\text{ONLY GO}}$) Alpha Diff.	0.028	-0.231	0.149	-0.020
t-stat	(0.11)	(-0.80)	(0.34)	(-0.07)
(FFCPS + $\text{FISKEW}_{\text{ONLY ISKEW}}$) Alpha Diff.	0.553***	-0.462*	-0.766**	-0.695***
t-stat	(2.76)	(-1.92)	(-2.34)	(-3.15)
(FFCPS + $\text{FISKEW}_{\text{ALL}}$) Alpha Diff.	0.523***	-0.371	-0.716**	-0.625***
t-stat	(2.71)	-(1.55)	-(2.09)	-(2.83)

Table A.3. Portfolio Factor Analysis and Explained Anomalies.
Panel A contains risk-adjusted returns (in percent) for 10 value-weighted decile portfolios sorted by ROE, DR, MAX and IVOL. Risk-adjusted returns (alphas) are obtained by regressing each portfolio's excess return on the market (MKT). "MKT Alpha Diff." is the risk-adjusted return spread between decile 1 and decile 10. Alpha(MKT+$FISKEW_{GO}$) is the risk-adjusted return obtained by augmenting the market model with a factor $FISKEW_{GO}$ built on expected skewness differentials attributed to GO as per equation (4) of the manuscript. Panel B presents results with alternative factors $FISKEW_X$ built on expected idiosyncratic skewness attributed to ROE, DR, MAX or IVOL. Newey and West (1987) corrected t-statistics with 6 lags are reported in parentheses. N = 335 monthly observations.

Panel A. Market anomalies and expected skewness factor based on growth options

Portfolios	(1) Profitability ROE	(2) Distress DR	(3) Lottery MAX	(4) Volatility IVOL
1 Low	-0.514***	0.190**	0.210**	0.313***
	(-2.91)	(2.13)	(2.16)	(3.16)
2	-0.248**	0.166*	0.161*	0.181**
	(-2.11)	(1.95)	(1.76)	(2.23)
3	-0.124	-0.010	0.051	0.098
	(-1.45)	(-0.08)	(0.42)	(1.06)
4	0.030	-0.092	0.103	0.102
	(0.31)	(-0.66)	(0.94)	(0.80)
5	-0.055	0.018	0.042	-0.027
	(-0.58)	(0.11)	(0.37)	(-0.20)
6	0.049	-0.142	-0.425**	0.204*
	(0.54)	(-0.78)	(-2.08)	(1.79)
7	-0.014	-0.234	-0.122	-0.170
	(-0.18)	(-1.14)	(-0.45)	(-1.54)
8	0.183**	-0.421*	-0.379	0.069
	(2.40)	(-1.87)	(-1.45)	(0.48)
9	0.199**	-0.392	-0.831***	-0.328*
	(2.58)	(-1.32)	(-2.79)	(-1.71)
10 High	0.188*	-0.667*	-1.072***	-0.996***
	(1.93)	(-1.87)	(-2.92)	(-3.56)
MKT Alpha Diff.	0.702***	-0.857**	-1.282***	-1.308***
t-stat	(2.93)	(-2.44)	(-3.12)	(-3.71)
(MKT+$FISKEW_{GO}$) Alpha Diff.	0.054	-0.620	0.140	-0.187
t-stat	(0.28)	(-1.48)	(0.39)	(-0.62)

Panel B. Robustness using alternative expected skewness factors based on other variables

Hedge Portfolios	(1) Profitability ROE	(2) Distress DR	(3) Lottery MAX	(4) Volatility IVOL
(MKT + $FISKEW_{ROE}$) Alpha Diff.	0.409**	-0.695*	-0.673*	-0.804***
t-stat	(2.01)	(-1.91)	(-1.85)	(-2.63)
(MKT + $FISKEW_{DR}$) Alpha Diff.	0.431**	-0.593	-0.738*	-0.820***
t-stat	(2.17)	(-1.43)	(-1.91)	(-2.83)
(MKT + $FISKEW_{MAX}$) Alpha Diff.	0.674***	-0.831**	-1.202***	-1.252***
t-stat	(3.02)	(-2.28)	(-3.13)	(-4.01)
(MKT + $FISKEW_{IVOL}$) Alpha Diff.	0.543**	-0.724**	-0.952***	-1.011***
t-stat	(2.51)	(-1.97)	(-2.70)	(-3.39)

Table A.4. **Does the Skewness (Profitability) Factor Explain the Profitability (Skewness) Factor?**
Panel A presents the alpha, factor loadings, and R-square values from testing whether three different factor models (FFCPS, FF5, Q-factor) explain the return spread on the newly proposed expected skewness factor driven by growth options ($FISKEW_{GO}$). Panel B reports the alpha, factor loadings, and R-square values from testing whether the newly proposed expected skewness factor driven by growth options ($FISKEW_{GO}$) explains the profitability factor (RMW) of Fama and French (2015) and the profitability factor (R_{ROE}) of Hou, Xue, and Zhang (2015). t-statistics in parenthesis are corrected for autocorrelation and heteroskedasticity using Newey and West (1987) standard errors with 6 lags.

Panel A. Explaining the Skewness Factor with the Profitability Factor

	FFCPS (1)	**FF5** (2)	**Q-factor** (3)
Constant	0.993***	0.636***	0.633***
	(6.71)	(4.24)	(2.63)
MKT	-0.200***	-0.065*	-0.074
	(-3.39)	(-1.73)	(-1.28)
SMB	-0.573***	-0.290***	-0.509**
	(-3.99)	(-3.92)	(-2.53)
HML	0.462***	0.443***	
	(5.30)	(6.39)	
MOM	-0.084		
	(-0.94)		
LIQ	0.028		
	(0.69)		
ROE		0.767***	0.533***
		(8.55)	(3.47)
INV		-0.222**	0.484**
		(-2.32)	(2.26)
R-square	0.534	0.655	0.452
T	335	335	335

Panel B. Explaining the Profitability Factor with the Skewness Factor

	FF5 RMW (1)	(2)	**Q-factor R_{ROE}** (3)	(4)
Constant	0.412***	-0.006	0.512***	0.153
	(3.19)	(-0.05)	(4.69)	(1.44)
MKT	-0.165***	-0.081***	-0.125***	-0.054*
	(-4.14)	(-2.59)	(-3.20)	(-1.88)
SMB	-0.364***	-0.123**	-0.355***	-0.150***
	(-3.68)	(-2.15)	(-4.66)	(-3.47)
HML	0.204**	0.009	-0.060	-0.219***
	(2.48)	(0.14)	(-0.82)	(-3.67)
MOM	0.046	0.081***	0.258***	0.286***
	(0.95)	(2.60)	(5.88)	(13.98)
LIQ	0.005	-0.006	0.000	-0.010
	(0.15)	(-0.23)	(0.01)	(-0.34)
$FISKEW_{GO}$		0.421***		0.349***
		(10.64)		(9.71)
R-square	0.446	0.644	0.535	0.691
T	335	335	323	323

Table A.5. Univariate Portfolio Analysis and Economic Significance of E[ISKEW]$_{GO}$.
This table presents the univariate portfolio results from sorting stocks into value-weighted (VW) decile portfolios based on expected idiosyncratic skewness arising from growth options, E[ISKEW]$_{GO}$. The three rows in Panel A show the risk-adjusted returns (Alphas) with respect to three different factor models: (i) FFCPS alpha is with respect to the market (MKT), size (SMB), book-to-market (HML), momentum (MOM), and liquidity risk (LIQ) factors of Fama and French (1993) , Carhart (1997), and Pastor and Stambaugh (2003); (ii) FF5 alpha is with respect to the market (MKT), size (SMB), book-to-market (HML), investment (CMA), and profitability (RMW) factors of Fama and French (1993, 2015); and (iii) Q-factor alpha is with respect to the market (MKT), size (SMB), investment ($R_{I/A}$), and profitability (R_{ROE}) factors of Hou, Xue, and Zhang (2015). The last column reports the 10-1 differences in alphas. Panel B contains the results obtained by augmenting the three models of Panel A with the skewness factor FISKEW$_{GO}$. t-statistics in parenthesis are corrected for autocorrelation and heteroskedasticity using Newey and West (1987) standard errors with 6 lags.

Panel A. E[ISKEW]$_{GO}$ without controlling for FISKEW$_{GO}$ factor

	1 (Low)	2	3	4	5	6	7	8	9	10 (Low)	Hedge (10-1)
(FFCPS) Alphas	0.587	0.284	0.314	0.007	0.123	-0.383	-0.380	-0.161	-0.456	-0.361	-0.947***
	(3.60)	(2.58)	(2.60)	(0.09)	(1.27)	(-3.34)	(-2.69)	(-0.91)	(-2.17)	(-1.39)	(-3.47)
(FF5) Alphas	0.364	0.148	0.238	-0.078	0.079	-0.324	-0.318	-0.003	-0.233	-0.375	-0.738***
	(2.46)	(1.18)	(1.99)	(-1.02)	(0.73)	(-2.88)	(-1.78)	(-0.01)	(-1.17)	(-1.27)	(-2.76)
(Q-factor) Alphas	0.493	0.178	0.353	-0.049	0.041	-0.383	-0.438	0.006	-0.184	-0.194	-0.687**
	(2.69)	(1.23)	(2.82)	(-0.56)	(0.32)	(-3.11)	(-2.31)	(0.02)	(-0.76)	(-0.62)	(-2.34)

Panel B. E[ISKEW]$_{GO}$ controlling for FISKEW$_{GO}$ factor

	1 (Low)	2	3	4	5	6	7	8	9	10 (High)	Hedge (10-1)
(FFCPS + FISKEW$_{GO}$) Alphas	0.280	0.079	0.209	-0.086	0.098	-0.447	-0.195	0.538	0.283	0.232	-0.047
	(1.66)	(0.61)	(1.40)	(-1.00)	(0.87)	(-3.22)	(-1.16)	(2.59)	(1.53)	(0.73)	(-0.14)
(FF5 + FISKEW$_{GO}$) Alphas	0.180	-0.014	0.134	-0.107	0.077	-0.354	-0.246	0.510	0.192	-0.120	-0.300
	(1.20)	(-0.11)	(0.96)	(-1.40)	(0.63)	(-2.82)	(-1.24)	(2.26)	(1.07)	(-0.32)	(-0.87)
(Q-factor + FISKEW$_{GO}$) Alphas	0.243	0.052	0.278	-0.057	0.091	-0.355	-0.290	0.493	0.266	0.064	-0.179
	(1.48)	(0.37)	(1.91)	(-0.64)	(0.70)	(-2.57)	(-1.31)	(2.00)	(1.32)	(0.16)	(-0.47)

Table A.6. Bivariate Portfolios of E[ISKEW]$_{GO}$ controlling for ROE, DR, MAX and IVOL.
This table presents results from the value weighted (VW) bivariate portfolios of E[ISKEW]$_{GO}$ controlling for ROE, DR, MAX, and IVOL. For each month, stocks are first sorted into three equal-sized groups based on the past month's key control variable: profitability (ROE), distress risk (DR), lottery demand (MAX), and idiosyncratic volatility (IVOL). Within each portfolio, stocks are further sorted into five expected idiosyncratic skewness E[ISKEW]$_{GO}$ portfolios. The first five columns report the value-weighted average portfolio returns along with t-statistics in parentheses. The Hedge (5-1) portfolio return (in %) is the difference between the value-weighted average portfolio returns of the extreme quintiles (high minus low expected idiosyncratic skewness or portfolio (5-1)). The last three columns show the risk-adjusted return spreads (5-1 alpha differences) with respect to three different factor models: (i) FFCPS alpha is with respect to the market (MKT), size (SMB), book-to-market (HML), momentum (MOM), and liquidity risk (LIQ) factors of Fama and French (1993) , Carhart (1997), and Pastor and Stambaugh (2003); (ii) FF5 alpha is with respect to the market (MKT), size (SMB), book-to-market (HML), investment (CMA), and profitability (RMW) factors of Fama and French (1993, 2015); and (iii) Q-factor alpha is with respect to the market (MKT), size (SMB), investment ($R_{I/A}$), and profitability (R_{ROE}) factors of Hou, Xue, and Zhang (2015). t-statistics in parenthesis are corrected for autocorrelation and heteroskedasticity using Newey and West (1987) standard errors with 6 lags.

		E[ISKEW]$_{GO}$								
		1 (Low)	2	3	4	5 (High)	Hedge (5-1)	FFCPS	FF5	Q-factor
ROE	(low)	1.981***	1.741***	1.063***	0.804	1.036*	-0.945**	-0.811**	-0.552*	-0.397
		(4.71)	(3.99)	(2.62)	(1.53)	(1.78)	(-2.53)	(-2.35)	(-1.85)	(-1.60)
	(middle)	1.991***	1.506***	1.048***	0.907***	0.785**	-1.206***	-1.197***	-0.904***	-0.918***
		(6.34)	(4.84)	(3.54)	(2.62)	(2.07)	(-5.07)	(-5.16)	(-4.02)	(-3.60)
	(high)	1.685***	1.540***	1.237***	0.784***	0.614*	-1.071***	-1.113***	-0.872***	-0.836***
		(6.04)	(5.28)	(4.57)	(2.67)	(1.83)	(-5.61)	(-5.97)	(-4.90)	(-4.20)
DR	(low)	1.606***	1.358***	1.138***	0.916***	0.888**	-0.718***	-0.858***	-0.454*	-0.455*
		(6.51)	(5.49)	(4.78)	(3.05)	(2.21)	(-2.55)	(-4.05)	(-1.66)	(-1.64)
	(middle)	1.968***	1.530***	1.092***	0.868**	0.848*	-1.121***	-1.184***	-0.800***	-0.718**
		(6.72)	(4.74)	(3.28)	(2.44)	(1.84)	(-3.46)	(-4.61)	(-3.03)	(-2.11)
	(high)	1.998***	1.933***	0.995**	0.497	0.949*	-1.049***	-0.875***	-0.515*	-0.480
		(4.72)	(4.06)	(2.15)	(1.02)	(1.76)	(-2.87)	(-2.38)	(-1.66)	(-1.11)
MAX	(low)	1.705***	1.579***	1.259***	1.050***	0.893***	-0.812***	-0.850***	-0.739***	-0.692***
		(6.47)	(5.97)	(4.77)	(3.63)	(2.76)	(-4.19)	(-4.08)	(-3.67)	(-3.29)
	(middle)	2.041***	1.586***	1.221***	1.004***	1.096***	-0.946***	-0.928***	-0.683***	-0.676**
		(5.69)	(4.93)	(3.72)	(2.69)	(2.70)	(-4.14)	(-4.74)	(-3.78)	(-2.46)
	(high)	1.984***	1.374***	0.596	0.618	0.908	-1.076***	-0.989***	-0.733**	-0.702*
		(4.41)	(3.28)	(1.40)	(1.14)	(1.55)	(-2.84)	(-2.59)	(-2.25)	(-1.85)
IVOL	(low)	1.491***	1.421***	1.228***	0.860***	0.661**	-0.831***	-0.939***	-0.841***	-0.946***
		(5.47)	(5.50)	(4.74)	(3.35)	(2.34)	(-6.22)	(-6.94)	(-5.93)	(-6.35)
	(middle)	2.119***	1.495***	1.207***	0.986***	0.843**	-1.276***	-1.379***	-1.090***	-1.159***
		(6.09)	(4.14)	(3.35)	(2.76)	(2.10)	(-5.81)	(-7.06)	(-4.81)	(-4.15)
	(high)	2.443***	1.569***	0.898**	0.685	1.014*	-1.429***	-1.332***	-1.140***	-1.056***
		(4.99)	(3.43)	(1.97)	(1.22)	(1.75)	(-4.11)	(-3.88)	(-3.54)	(-2.55)

Table A.7. **Average Idiosyncratic Skewness by Firm Characteristics deciles.**
Panel A contains the average idiosyncratic skewness (ISKEW) over the subsequent 5 years (T = 60) for each decile sorted by GO, ROE, DR, MAX, IVOL, AG, SIZE, BM, TURN, LEV, OPLEV, TFA, β^{VXO} and DISP. Each month stocks are cross-sectionally classified into 10 deciles based on these characteristics and average realized skewness over the next 5 years is calculated. GO is the value of future growth options as per equation (3) of the Manuscript; profitability (ROE) is calculated as the ratio of operating cash flow to shareholder's equity; DR is distress calculated as Merton's (1974) negative distance to default (-d_2); MAX is the maximum daily return observed in the previous month; IVOL is the idiosyncratic volatility calculated over the previous 12 months; AG is the percent change in total assets; SIZE is measured as the natural logarithm of the market value of equity (ME) (price per share multiplied by number of shares outstanding); BM is measured as the book value of equity divided by the market value of equity (ME); TURN is turnover calculated as the ratio of trading volume to total shares outstanding; LEV is the quasi market leverage calculated as the ratio of total liabilities to total liabilities plus market capitalization; OPLEV is the operating leverage calculated as in Novy-Marx (2011); TFA is tangible fixed assets calculated as the ratio of property, plant and equipment (PP&E) to total assets; β^{VXO} is the average exposure to changes in the S&P 100 volatility index (VXO) calculated as in Ang, Hodrick, Xing, and Zhang (2006); DISP is the analysts' forecast dispersion following Diether, Malloy, and Scherbina (2002). Panel B contains averages of the aforementioned variables in each decile formed based on idiosyncratic skewness. $*$, $**$ and $***$ indicate 10%, 5% and 1% significance level with Hansen and Hodrick (1980) and Hodrick (1992) robust standard errors estimated using 6 lags.

Panel A. Average realized idiosyncratic skewness (ISKEW) for each variable decile

	GO_{t-1}	ROE_{t-1}	DR_{t-1}	MAX_{t-1}	$IVOL_{t-T}$	AG_{t-1}	$SIZE_{t-1}$	BM_{t-1}	$TURN_{t-1}$	LEV_{t-1}	$OPLEV_{t-1}$	TFA_{t-1}	β^{VXO}	DISP
1 Low	0.901	1.336	0.346	0.642	0.300	1.223	1.977	0.660	1.371	0.643	0.828	1.044	0.252	0.235
2	0.672	1.007	0.352	0.455	0.388	0.915	1.306	0.398	1.059	0.531	0.688	0.803	0.117	0.144
3	0.543	0.818	0.421	0.472	0.395	0.753	1.011	0.417	0.810	0.557	0.591	0.772	0.071	0.208
4	0.480	0.671	0.508	0.510	0.485	0.699	0.827	0.502	0.668	0.549	0.635	0.683	0.067	0.254
5	0.415	0.611	0.602	0.564	0.503	0.615	0.668	0.534	0.599	0.578	0.653	0.573	0.029	0.304
6	0.391	0.542	0.657	0.633	0.562	0.572	0.494	0.598	0.566	0.635	0.715	0.640	0.064	0.373
7	0.449	0.506	0.774	0.724	0.719	0.544	0.387	0.708	0.542	0.672	0.745	0.628	0.081	0.434
8	0.666	0.438	0.874	0.858	0.957	0.497	0.308	0.822	0.523	0.718	0.751	0.614	0.110	0.505
9	1.014	0.441	1.086	1.022	1.248	0.520	0.180	0.983	0.535	0.841	0.738	0.680	0.140	0.630
10 High	1.545	0.627	1.385	1.405	1.735	0.680	0.135	1.327	0.529	1.245	0.691	0.759	0.315	0.790
High-Low	0.643***	-0.708***	1.038***	0.762***	1.434***	-0.543***	-1.842***	0.667***	-0.842***	0.602***	-0.137***	-0.284***	0.063***	0.555***

Panel B. Average firm characteristics in each idiosyncratic skewness (ISKEW) decile

	GO_{t-1}	ROE_{t-1}	DR_{t-1}	MAX_{t-1}	$IVOL_{t-T}$	AG_{t-1}	$SIZE_{t-1}$	BM_{t-1}	$TURN_{t-1}$	LEV_{t-1}	$OPLEV_{t-1}$	TFA_{t-1}	β^{VXO}	DISP
1 Low	0.595	0.231	-11.282	0.055	0.026	0.152	13.537	0.445	1.303	0.280	1.326	0.256	-0.020	0.096
2	0.537	0.242	-11.289	0.056	0.026	0.136	13.359	0.510	1.233	0.298	1.306	0.285	-0.015	0.119
3	0.502	0.239	-10.931	0.058	0.027	0.133	13.085	0.566	1.151	0.316	1.297	0.307	-0.032	0.128
4	0.527	0.223	-10.416	0.062	0.029	0.125	12.826	0.604	1.113	0.332	1.301	0.306	-0.018	0.147
5	0.552	0.210	-9.880	0.066	0.031	0.113	12.531	0.646	1.048	0.345	1.282	0.303	-0.016	0.172
6	0.611	0.183	-9.146	0.073	0.034	0.104	12.093	0.690	1.005	0.350	1.285	0.288	0.017	0.197
7	0.644	0.157	-8.739	0.078	0.036	0.103	11.781	0.727	0.984	0.363	1.287	0.279	-0.009	0.254
8	0.703	0.136	-8.329	0.083	0.038	0.094	11.560	0.775	0.982	0.375	1.290	0.264	0.017	0.234
9	0.783	0.114	-7.848	0.091	0.041	0.090	11.222	0.789	0.931	0.374	1.274	0.260	0.008	0.302
10 High	0.895	0.086	-7.389	0.099	0.044	0.072	10.745	0.881	0.835	0.396	1.288	0.255	0.041	0.323
High-Low	0.300***	-0.145***	3.893***	0.044***	0.018***	-0.080***	-2.791***	0.437***	-0.468***	0.116***	-0.038***	-0.001	0.061***	0.227***

Table A.8. **Persistence of $E[ISKEW]_{GO}$ (Month-to-Month Portfolio Transition Matrix).** This table reports the average month-to-month portfolio transitions from one to six months ahead. The table presents the average probability that a stock in $E[ISKEW]_{GO}$ portfolio i in one month will be in the same portfolio i in the subsequent month. In a purely random setting, the transition probabilities should be roughly 20% since a high or low expected skewness in one month should say nothing about the prediction in the following month.

	Months Ahead					
$E[ISKEW]_{GO}$	1	2	3	4	5	6
1	79%	67%	58%	50%	44%	39%
2	67%	50%	39%	31%	25%	21%
3	67%	51%	40%	32%	27%	22%
4	71%	56%	46%	38%	32%	27%
5	83%	72%	64%	57%	52%	47%

Table A.9. Cost and Profitability Stickiness.
This table contains the average estimated coefficients for each decile of $E[ISKEW]_{GO}$. In Panel A for each firm i we first estimate the following regressions:

$$\ln\left(\frac{XSGA_{i,t}}{XSGA_{i,t-1}}\right) = \alpha + \beta_1 \ln\left(\frac{REV_{i,t}}{REV_{i,t-1}}\right) + \beta_2 \ln\left(\frac{REV_{i,t}}{REV_{i,t-1}}\right) \mathbb{1}_{\{REV\}} + \epsilon_{i,t}$$

$$\ln\left(\frac{XSGA_{i,t}}{XSGA_{i,t-1}}\right) = \alpha + \beta_1^* \ln\left(\frac{REV_{i,t}}{REV_{i,t-1}}\right) + \beta_2^* \ln\left(\frac{REV_{i,t}}{REV_{i,t-1}}\right) \mathbb{1}_{\{REV\}}\mathbb{1}_{\{CFNAI\}} + \epsilon_{i,t}$$

We then calculate the average estimated coefficients (β) in each idiosyncratic skewness decile. Column "Increase" contains the average percent increase in XSGA for a one percent increase in revenues (β_1), while column "Decrease" contains the average percent decrease in XSGA for a one percent decrease in revenues ($\beta_1 + \beta_2$). Column "Decrease|Bad" contains the average percent decrease in XSGA for a one percent decrease in revenues ($\beta_1^* + \beta_2^*$) conditional on negative values of CFNAI index. Panel B contains a similar analysis where the dependent variable is return on equity (ROE). Panel C contains the average operating leverage ($OPLEV_{t-1}$) measured as in Novy-Marx (2011) and average tangible fixed assets (TFA) measured by Property, Plant and Equipment (PP&E) value scaled by total assets capturing operating inflexibility, for each expected idiosyncratic skewness ($E[ISKEW]_{GO}$) decile.

Panel A. Selling, General & Admin. (XSGA)

$E[ISKEW]_{GO}$	Increase β_1	Decrease $\beta_1+\beta_2$	Decrease|Bad $\beta_1^*+\beta_2^*$
1 Low	0.73	0.59	0.60
2	0.72	0.61	0.63
3	0.73	0.63	0.63
4	0.73	0.61	0.62
5	0.72	0.62	0.62
6	0.72	0.58	0.59
7	0.68	0.56	0.56
8	0.65	0.54	0.55
9	0.63	0.53	0.56
10 High	0.59	0.50	0.54
Hig-Low	-0.14***	-0.09***	-0.05***

Panel B. Profitability (ROE)

$E[ISKEW]_{GO}$	Increase β_1	Decrease $\beta_1+\beta_2$	Decrease|Bad $\beta_1^*+\beta_2^*$
1 Low	0.28	0.70	0.74
2	0.26	0.70	0.66
3	0.25	0.64	0.69
4	0.25	0.62	0.67
5	0.25	0.62	0.66
6	0.25	0.60	0.63
7	0.25	0.64	0.69
8	0.26	0.65	0.70
9	0.30	0.64	0.64
10 High	0.30	0.61	0.59
Hig-Low	0.02***	-0.09***	-0.16***

Panel C. Operating Leverage (OPLEV) and operating inflexibility (TFA)

$E[ISKEW]_{GO}$	$OPLEV_{t-1}$	TFA_{t-1}
1 Low	1.18	0.26
2	1.16	0.29
3	1.16	0.28
4	1.16	0.28
5	1.14	0.27
6	1.13	0.25
7	1.13	0.24
8	1.11	0.23
9	1.12	0.21
10 High	1.09	0.18
Hig-Low	-0.09***	-0.08***

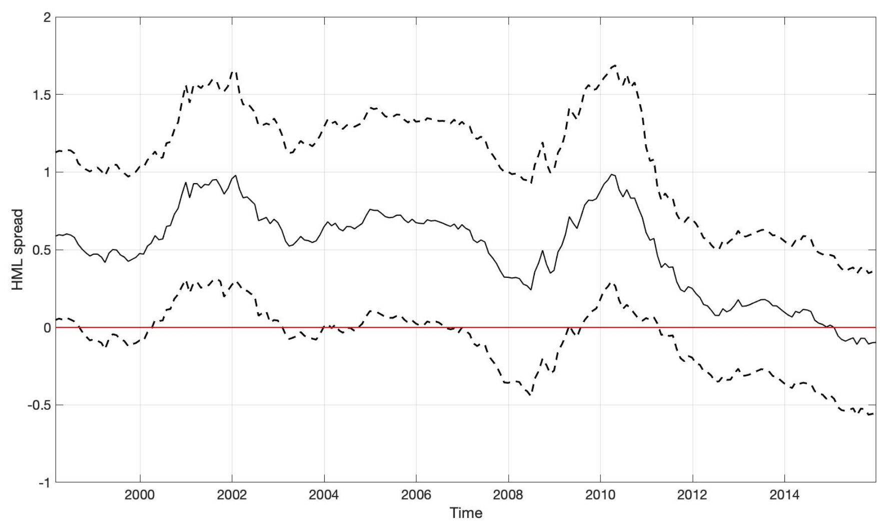
Figure A.1. **Value Spread.**
This figure presents the time-series plot of the risk-adjusted return spread and confidence bounds between decile 1 and decile 10 of the book-to-market portfolios. In Panel A, the risk-adjusted returns are obtained by regressing the value-minus-growth (decile 10 − decile 1) return spread against the Fama and French (1993) market and size factors augmented by Carhart (1997) momentum and Pastor and Stambaugh (2003) liquidity risk factors. Panel B displays the risk-adjusted returns obtained by including the FISKEW factor as an additional risk factor. Standard errors are Newey and West (1987) corrected using 6 lags.

Panel A. Value Spread without FISKEW Factor

Panel B. Value Spread with FISKEW Factor

Figure A.2. HML Spread.
This figure presents the time-series plot of the risk-adjusted return and confidence bounds of the Fama and French's (1993) HML factor. In Panel A, the risk-adjusted returns are obtained by regressing the monthly returns on the HML factor against the Fama and French (1993) market and size factors augmented by Carhart (1997) momentum and Pastor and Stambaugh (2003) liquidity risk factors. Panel B displays the risk-adjusted returns obtained by including the FISKEW factor as an additional risk factor. Standard errors are Newey and West (1987) corrected using 6 lags.

Panel A. HML Spread without FISKEW Factor



Panel B. HML Spread with FISKEW Factor

Figure A.3. Time-series of β_{GO}.
This figure shows the time-series dynamics of the slope coefficient obtained by regressing idiosyncratic skewness estimated over 5 years against past value of growth options (GO) as per equation (2) in the manuscript. The figure highlights four market crash periods: Black Monday in October 1987; Kuwait invasion in July 1990; Dot-com bubble in March 2000; the 2007-2008 financial crisis (October 2007-September 2008).