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Why does idiosyncratic risk increase with market risk?

Söhnke M. Bartram, Gregory Brown, and René M. Stulz*

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Abstract

From 1963 through 2015, idiosyncratic risk (IR) is high when market risk (MR) is high. We show that the positive relation between IR and MR is highly stable through time and is robust across exchanges, firm size, liquidity, and market-to-book groupings. Though stock liquidity affects the strength of the relation, the relation is strong for the most liquid stocks. The relation has roots in fundamentals as higher market risk predicts greater idiosyncratic earnings volatility and as firm characteristics related to the ability of firms to adjust to higher uncertainty help explain the strength of the relation. Consistent with the view that growth options provide a hedge against macroeconomic uncertainty, we find evidence that the relation is weaker for firms with more growth options.

Keywords: Uncertainty, idiosyncratic risk, market risk, growth options, liquidity, limits to arbitrage
JEL Classification: G10, G11, G12

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In this paper, we investigate how a firm's idiosyncratic risk (IR) is related to its market risk (MR) and to aggregate uncertainty. Using the market model, we find that firm market risk averages 9.2% when the within-month volatility of the CRSP value-weighted index, a proxy for macroeconomic or aggregate uncertainty (Bloom, 2009), is below the median and 17.7% when it is above the median. The comparable figures for idiosyncratic risk are 30.1% when uncertainty is low and 38.2% when it is high. Consequently, average market risk is higher by 8.5 percentage points when aggregate uncertainty is high, and average idiosyncratic risk is higher by 8.1 percentage points. Similar results hold for other proxies for macroeconomic or aggregate uncertainty. After showing that there is a very robust and economically significant positive relation between MR and IR, we investigate possible explanations for that relation and find that liquidity and firm fundamentals help explain it. Specifically, we find that the relation is weaker for more liquid stocks and for growth stocks. Further, an increase in a firm's market risk is associated with an increase in its idiosyncratic earnings volatility.

Since a stock's idiosyncratic return is, by definition, uncorrelated with the return of the market, one might be tempted to conclude that MR and IR should be unrelated as well. Alternatively, it would seem plausible that when the market is highly volatile, market movements would drive stock returns, so that IR would be low. Both of these hypotheses are strongly rejected in the data. While some previous research has noted that there is a positive relation between IR and MR, no analysis to date has shown that this relation persists since 1963, holds across a variety of subsamples, or attempted to explain it.[1] In this paper, we demonstrate that the relation is extremely persistent across a variety of subsamples. We examine several possible explanations for this relation and show that it arises partly because shocks to aggregate uncertainty are magnified at the firm level and that the extent to which these shocks are magnified depends on firm characteristics.

[1] A positive correlation between idiosyncratic and market risk was first noted by Campbell, Lettau, Malkiel and Xu (2001). More recently, Duarte, Kamara, Siegel, and Sun (2012) identify common components in measures of idiosyncratic volatility and show that these are related to business cycles and a variety of pricing anomalies including the IVOL anomaly of Ang, Hodrick, Xing and Zhang (2006). In a recent paper, Kalay, Nallareddy and Sadka (2016) find that the effects of firm-level and aggregate-level uncertainty are exacerbated in the presence of the other.

The relation between MR and IR is important for many issues in finance and macroeconomics. There is a growing recent literature that relates investment to idiosyncratic uncertainty. For instance, Gilchrist, Sim and Zakrajsek (2014) show that firm-level investment is negatively related to the firm's idiosyncratic uncertainty which they measure with idiosyncratic risk from a market model regression. A positive relation between MR and IR has implications for business-cycle theories, as it implies that aggregate uncertainty may be magnified at the firm level through changes in firm-level uncertainty. Shocks to idiosyncratic risk adversely affect a firm's distance to default in a structural debt pricing model such as Merton (1973). In a recent paper, Atkeson, Eisfeldt, and Weill (2014) show that changes in idiosyncratic risk are a more important factor in explaining changes in the financial soundness of firms than changes in stock price. Hence, understanding why idiosyncratic risk changes is important to assess both firm-level financial soundness as well as the financial soundness of the corporate sector as a whole. In corporate finance, it is frequently noted that insiders cannot diversify their stake in their firm, so that they have to bear large amounts of idiosyncratic risk. Idiosyncratic risk shocks mean that these insiders have to bear more risk, which can affect the policies of their firms. For instance, Dou (2016) shows that idiosyncratic shocks can lead insiders to invest less when they find it difficult to share firm-specific risks. A positive relation between MR and IR also has important implications for the benefits of portfolio diversification since it predicts that the costs of under-diversification are highest when the market is most volatile. In theories of asset pricing, if IR is high when MR is high, the value of firm-specific growth options is higher in times of higher market volatility, everything else equal, so that growth firms would be affected differently by increases in MR than value firms.

The first possible explanation for the positive correlation between IR and MR is what we call the illiquidity hypothesis. The literature has shown that illiquidity and IR are positively related (see, for instance, Spiegel and Wang (2005)). For less liquid stocks, information from market changes should be incorporated in prices less quickly than for the most liquid stocks. Consequently, for less liquid stocks, the lagged incorporation of market information could be misconstrued as idiosyncratic risk, since market information would be incorporated with a lag and hence unrelated to contemporaneous market shocks. This hypothesis predicts that the relation should be strongest for the most illiquid firms. When we control for additional firm characteristics, we find that the relation becomes stronger as illiquidity increases, which is consistent with the illiquidity hypothesis. However, the relation holds strongly even for the most liquid firms, so that the relation cannot be explained by illiquidity alone.

Our second potential explanation, the arbitrage cost hypothesis, is that, as markets become more volatile, there is potentially less funding for arbitrage transactions, and such transactions become riskier. As a result, prices should deviate more from fundamentals, which leads to more idiosyncratic risk if deviations from fundamentals are uncorrelated with market returns. Therefore, this explanation predicts that the relation between IR and MR should be strongest for firms where arbitrage is more difficult. Following the literature, we use the level of lagged IR as a measure of arbitrage risk. We do not find consistent evidence that the relation between MR and IR is stronger for stocks with higher lagged IR, so that there is not consistent support for the arbitrage cost hypothesis. The literature also suggests that pricing mistakes should be more likely for smaller firms, as short-selling is more difficult and less information is available. We find that the relation between IR and MR is generally stronger for smaller firms.

Our third potential explanation, the fundamental uncertainty hypothesis, is that, as increases in aggregate fundamental uncertainty propagate through firms, they generate increased firm-specific uncertainty. To motivate this hypothesis, consider a simple two-state model for the economy with the states being expansion and recession. Suppose uncertainty increases in that the states become farther apart – the expansion is better and the recession is worse. We would expect that, as the states of the economy are farther apart, there is more uncertainty about how firms will adjust to these more extreme states, so that there is increased firm-level uncertainty. For some firms, the adjustment will be more predictable, so that these firms experience less of an increase in uncertainty.

A direct prediction of the fundamental uncertainty hypothesis is that an increase in market risk should be associated with an increase in firm-level idiosyncratic earnings volatility. We find evidence supportive of this prediction but, perhaps not surprisingly, the explanatory power of the regressions is low. Further, if, as advanced in the literature, increases in aggregate uncertainty have adverse effects for firms, growth options are hedges against these adverse effects since the value of growth options increases with uncertainty. Consistent with the view that growth options provide a hedge against macroeconomic uncertainty, we find that the relation between MR and IR is weaker for firms with more growth options.

In our analysis, we examine all publicly traded U.S. firms from 1963-2015. We construct monthly measures of market and idiosyncratic risk using daily data on individual stock returns and market returns from CRSP. These measures, combined with variables constructed from firm-level accounting data, as well as several market-wide and economic variables, allow us to examine the determinants of the relation between market risk and idiosyncratic risk. We first document the relation between market risk and idiosyncratic risk by splitting the sample into periods of high and low market risk as defined by different proxies. We find that the strong positive relation is evident regardless of which subperiod we examine, for NYSE/AMEX and NASDAQ firms, and in a variety of economic and market conditions. We explicitly investigate the possibility that measurement error in the estimation of market risk could explain the relation and show that this is not the case.

We estimate time-series regressions with monthly measures of average IR as the dependent variable and average MR as the independent variable. These regressions show that changes in MR explain more than half of the time-series variation in IR for the whole sample. The adjusted R-squareds of the regressions increase minimally when we add variables that proxy for economic conditions. We find that the IR/MR relation is nonlinear in that it is much stronger when MR is high. We also examine the IR/MR relation in regressions with different control variables, for subperiods, and for sorts based on firm characteristics such as illiquidity, lagged IR, book-to-market, and market capitalization. We find that the IR/MR relation holds for all subperiods and subsamples created by sorting on firm characteristics.

In order to test our hypotheses for explanations of the IR/MR relation, we estimate two different sets of panel regressions. With the first set of regressions, idiosyncratic earnings volatility is the dependent variable and contemporaneous as well as four lags of market risk are the independent variables. We find that all market risk variables have a positive significant coefficient. We find similar results when we repeat the exercise using alternative proxies for idiosyncratic risk in fundamentals.

With the second set of regressions, we use IR as the dependent variable. The independent variables include market risk, squared market risk, lagged idiosyncratic and market risk, as well as proxies for the different explanatory hypotheses (i.e. illiquidity, the percentage of zero returns, lagged IR, book/market, earnings/price, etc.). By interacting these proxies with our firm-specific measure of market risk, we are able to determine how the relation between IR and MR is related to firm characteristics. We find that firms with higher proportions of zero-return days (i.e., less liquid stocks) tend to have a stronger relation between increases in market risk and idiosyncratic risk. With the Amihud illiquidity measure, the same result holds only when we control for additional firm characteristics. However, these tests find mixed support for the limits to arbitrage hypothesis. At the same time, we find consistent results that the relation is weaker for growth firms with lower B/M and E/P ratios, and firms with a higher level of R&D expenses. Nevertheless, in the panel regressions, the marginal effect of MR dwarfs the marginal effect of the proxies for our hypotheses, so that, while some of these proxies help explain the IR/MR relation, they explain only a fraction of it. Similar results hold for when we split the sample and examine NYSE/AMEX firms and NASDAQ firms separately.

The next section provides a summary of the related literature and more details on our hypotheses. Section 2 describes our data and construction of risk variables. Section 3 presents the results of univariate and multivariate tests from time-series regressions. Section 4 investigates the relation between idiosyncratic earnings volatility and market risk, while Section 5 uses firm characteristics to explain the IR/MR relation. Section 6 offers additional robustness tests. Finally, Section 7 concludes.

1 Related Literature and Hypotheses

Campbell, Lettau, Malkiel, and Xu (2001, hereafter CLMX) find that not only does the idiosyncratic component comprise the majority of total firm risk, but also that idiosyncratic risk more than doubled for the average U.S. public firm between 1962 to 1997. More related to our study is the observation by CLMX that their measures of market risk and idiosyncratic risk appear correlated over time. Subsequent research has primarily addressed the CLMX finding of a trend in risk and attributed it to changes in a variety of firm characteristics over the last five decades including industry growth rates, institutional ownership, average firm size, growth options, firm age, and profitability risk (Brown and Kapadia, 2007; Wei and Zhang, 2004; Malkiel and Xu, 2003; Bennett and Sias, 2006; Cao, Simin and Zhao, 2004). Researchers have also questioned whether the conclusions of CLMX were overly influenced by the behavior of stocks in the second half of the 1990s (Brandt, Graham, and Kumar, 2010).

Another strand of recent research has found that the idiosyncratic component of stock price volatility may be a priced risk factor (Ghysels, Santa-Clara and Valkanov, 2005; Goyal and Santa-Clara, 2003; Ang, Hodrick, Xing and Zhang, 2006, 2009; Spiegel and Wang, 2005). Herskovic, Kelly, Lustig, and Van Nieuwerburgh (2014) find that a common component to idiosyncratic volatility is priced. Other research has related fundamental economic risks to priced risk factors in equity markets (see, for example, Vassalou, 2003). At the firm level, Pástor and Veronesi (2003) show how investor uncertainty about firm profitability is an important determinant of idiosyncratic risk and firm value. Recent work has also analyzed differences in idiosyncratic risk (as well as market risk and R-Squared) across firms and countries (e.g., Bartram, Brown and Stulz, 2012). At the aggregate level, Engle, Ghysels and Sohn (2009) relate business cycle risks to stock market volatility using a GARCH model incorporating macroeconomic variables.

Our paper is also related to a developing literature on how uncertainty affects individual firms. Real options theory suggests higher incentives to delay irreversible investment, hiring and consumption as uncertainty increases. On the other hand, uncertainty can have a positive effect on investment and growth, because growth options become more valuable. Using structural models, Bloom et al. (2012) and Bachmann and Bayer (2012, 2013) show that uncertainty shocks generate drops in output due to their effect on investment and labor, and empirical studies also show evidence of a negative relationship between uncertainty and investment (see, e.g. Gilchrist, Sim and Zakrajsek, 2014; Kellogg, 2014; Bloom et al., 2007; Guiso and Parigi, 1999; Leahy and Whited, 1996). At the same time, uncertainty appears to increase research and development spending (Stein and Stone, 2012). Firms with more growth opportunities also have cash flows with longer duration, which is positively related to their level of firm-specific risk (Dechow, Sloan and Soliman, 2004).

Despite this large and growing literature examining idiosyncratic risk, a yet unexplored phenomenon is the observation of a strong positive correlation between contemporaneous levels of idiosyncratic risk and market risk. In this study, we document the ubiquitous nature of this relation and try to explain why there is an economically important relation between idiosyncratic risk and market risk. We consider three possible explanations that are not mutually exclusive: illiquidity, limits to arbitrage, and fundamental uncertainty propagation.

First, we consider the possibility that illiquidity drives the strong relation between market risk and idiosyncratic risk. If stocks differ in liquidity, we would expect information about the market to be incorporated in more liquid stocks faster than in less liquid stocks. We therefore expect that the relation between market risk and idiosyncratic risk to be strongest for firms with low liquidity.

Second, we consider the possibility that limits to arbitrage may explain the relation between IR and MR. As markets become more volatile, we would expect financial intermediaries to decrease funding for arbitrage transactions and for such transactions to become riskier.[2] As a result, prices are more likely to deviate from fundamental value, which leads to more idiosyncratic risk. With this hypothesis, we would expect that IR should increase more for firms where arbitrage is more difficult because it is riskier. The literature generally considers that mispriced firms are more likely to be firms that are small, have high idiosyncratic risk, and face obstacles to short sales (see, e.g., Pontiff, 2006, and Shleifer and Vishny, 1997). We therefore investigate whether the relation between MR and IR is stronger for smaller firms and for firms with high lagged idiosyncratic risk.

Third, we consider if uncertainty about economic fundamentals can explain the relation between MR and IR. Consider an economy with two equally likely states of the world (recession and expansion) and

[2] See Adrian and Shin (2013) for evidence that availability of credit is inversely related to the value-at-risk of financial intermediaries.

suppose firms plan for the expected value, which is mid-way between recession and expansion. If there is an increase in uncertainty, which is equivalent to the two states becoming farther apart, firms will have to adjust more when they find out what the state of the economy is. If the process of adjusting involves uncertainty and if this uncertainty increases as the adjustment is larger, we would expect that the idiosyncratic uncertainty would increase with aggregate uncertainty.

The value of firms depends on assets in place and on growth options. As uncertainty increases, growth options become more valuable and growth firms will therefore be affected less by increases in uncertainty if these increases have an adverse impact on firm value. This reasoning implies that, under this fundamental uncertainty hypothesis, firms with more growth options have a weaker IR/MR relation. However, more limited credit in times of high uncertainty might affect growth firms more adversely because they invest more. It could be possible, therefore, that adverse effects of increases in market risk on growth firms dominate, so that growth firms are more affected by increases in uncertainty than value firms.

2 Data and Variable Construction

Our sample includes all publicly traded U.S. firms for the period 1963-2015. We use daily data on individual stock returns and market returns from CRSP as well as quarterly and annual accounting data and firm characteristics from Compustat.[3] We limit our analysis to common stocks (CRSP share codes 10 and 11) listed on the NYSE, AMEX, or NASDAQ markets. We exclude micro-cap stocks by dropping firms that are in the bottom 20% of the distribution of NYSE market capitalization based on the one-month lagged value as well as penny stocks with prices less than $1.00 (in January 2006 dollars), in order to avoid concerns that small-size effects might confound our tests. Our final sample covers an average of 93.9% of the market capitalization of all stocks with available data on CRSP. Coverage is only an issue for a few years

[3] We sum quarterly flow variables over the most recent four quarters. We combine annual and quarterly accounting data by replacing missing values in the 4th quarter with the respective annual observation. We replace missing values in other fiscal quarters with prior observations from fiscal quarters in the same fiscal year or the 4th quarter from the prior fiscal year. Results are robust to using only annual accounting data.

early in our sample period (1963-1966) when Compustat coverage is relatively poor. Since 1966 our sample covers an average of 96.3% of total market capitalization.

We use two primary methods for defining market risk and idiosyncratic risk. Our first method is based on standard market-model regressions to allow for monthly firm-specific measures of risk, following the literature. Specifically, using daily data, we estimate (for each firm and month in our sample) the model

$$R_t = \alpha + \beta R^M{}_t + \varepsilon_t \quad (1)$$

where R_t is the firm's stock return on day t, and $R^M{}_t$ is the return on the CRSP value-weighted market index on day t. Our estimate of idiosyncratic risk, σ_{IR}, is the (annualized) standard deviation of ε_t, and our estimate of market risk, σ_{MM}, is beta times the (annualized) standard deviation of $R^M{}_t$.

We estimate the market model for all firm-months with at least 15 daily return observations available in CRSP and drop any firm-months with idiosyncratic risk, σ_{IR}, less than 0.001. Estimating this model monthly for all stocks provides a panel of volatility estimates across firms and months as well as aggregated time-series of market and idiosyncratic risk by averaging the respective firm-level measures by month. Our second method utilizes the approach of CLMX to create aggregated time-series for market risk and idiosyncratic risk for all firms. Daily data are used to construct monthly observations for each month. Alternatively, we also construct these risk measures using daily series of overlapping 5-day returns.

From CRSP we also obtain information on market capitalization (*MarketCap*), and the percentage of zero returns in the observation month (*PctZeroReturns*). As a measure of illiquidity, we calculate the Amihud (2002) *ILLIQ* measure for each firm for each month in our sample by taking the average of daily absolute stock returns divided by dollar volume. Poor liquidity in some stocks could cause asynchronous price movements that would affect risk estimates. These effects should be mitigated by considering returns over longer periods. Thus, to examine our liquidity hypothesis we also calculate our market-model risk measure using daily 5-day returns instead of daily 1-day returns.

For our firm-level analysis we combine data from CRSP and Compustat. We drop observations for which Compustat data are unavailable. For our measures of idiosyncratic earnings risk, we denote the earnings-to-sales ratio for firm *i* in quarter *t* as $ES_i(t)$. The respective measure for the market is $MES(t)$, and it is calculated as the value-weighted average of firm-level $ES_i(t)$ using prior period market capitalization. The idiosyncratic earnings risk for firm *i* for quarter *t* is then:

$$IdioEarningsRisk_i(t) = ((ES_i(t) - MES_i(t)) - (ES_i(t\text{-}4) - MES_i(t\text{-}4))^2 \quad (2)$$

We proceed in the same way for idiosyncratic profitability risk ($IdioProfitRisk_i(t)$), where we define profitability as operating income divided by net sales, and for idiosyncratic profit margin risk ($IdioMarginRisk_i(t)$), where profit margin is defined as net sales minus cost of goods sold, depreciation and amortization, divided by net sales.

Using Compustat data, we define monthly values for firm-level variables of interest by using the most recent quarterly/annual values. We calculate the book-to-market ratio as the ratio of the sum of common equity and balance sheet deferred taxes to market capitalization (*BookToMarket*). The earnings-to-price (*EarningsToPrice*) ratio is defined as income before extraordinary items plus deferred taxes minus preferred dividends all divided by market capitalization. We also calculate the natural logarithm of one plus the ratio of the sum of cash and short-term investments to total assets (*LogCashAndSTInvToTA*), and the ratio of research and development (R&D) expenses to the sum of R&D and capital expenditures (*RAndDShare*).[4] Financial leverage (*Leverage*) is measured as the sum of long-term debt plus preferred stock divided by the market value of the firm's assets (calculated as the sum of market capitalization, preferred stock and total debt).

[4] We set *RAndDShare* equal to zero when R&D expenses are missing and set capital expenditures equal to zero when capital expenditures are missing. Thus, a firm with reported R&D expenses but missing capital expenditures will have *RAndDShare* equal to 1.

We augment our dataset of firm-level risk estimates and fundamental characteristics with a range of economic and financial measures that are alternative proxies for aggregate market risk. In particular, we define the credit spread (*CreditSpread*) as the difference between Moody's seasoned Baa corporate bond yield and the 10-year U.S. Treasury constant maturity rate, both provided by the Board of Governors of the Federal Reserve System. We source the S&P 500 volatility index (*VIX*) from the CBOE website. NBER business cycle dates are from the NBER website. The Chicago Fed National Activity Index (*CFNAITot*) is sourced from the Chicago Fed website. We use a regression analysis to construct values of *CFNAITot* prior to March 1967 using available subcomponents. We obtain the value-weighted stock market return from CRSP (*CRSP-VW-Return*) and the uncertainty index (*Uncertainty Index*) from Kozeniauskas, Orlik and Veldkamp (2014). Appendix A defines all the variables used in our analysis.

3 The Relation between Idiosyncratic Volatility and Market Risk

3.1 Preliminary Evidence

Figure 1 plots our time-series estimates for market risk and idiosyncratic risk for both the market-model (MM) (Panel A) and the CLMX methods (Panel B). Several features are immediately obvious. First, the two different methods provide nearly indistinguishable patterns. This is a useful feature for our firm-level analysis that relies on firm-specific measures of risk and firm characteristics (thus, allowing us to examine a panel of firms instead of just an aggregate time series).[5] Second and most importantly, the market risk series and the idiosyncratic risk series appear highly correlated over the full sample period and subperiods. We have adjusted the scales so that changes in levels are more obvious. This reveals that while IR is generally higher than MR, the ratio is fairly constant except during the period from roughly 1990 to 2000, when IR is much higher than MR, and the period immediately before the credit crisis and most recently, when IR falls to a level that is markedly below MR. Finally, we note that almost every MR spike coincides with a spike in IR, but that the strong correlation is not limited to these episodes.

[5] We also note that the correlation between the CLMX idiosyncratic measure and the MM risk measure is 0.942.

Panels A and B of Figure 2 show the same figure, but separately for the NYSE and for NASDAQ. As with Figure 1, IR and MR are typically very similar until the early 1990s for both exchanges. However, IR is much higher relative to MR for NASDAQ stocks in the 1990s. For NYSE stocks, there is no evidence that IR is higher relative to MR in the 1990s. In contrast, IR falls more for NYSE stocks relative to MR before and after the credit crisis than it does for NASDAQ stocks.

Table 1 provides some preliminary evidence on drivers of differences in firm risk as well as descriptive statistics for our risk measures. For the risk measures, we report results using both the market model (MM) approach and the CLMX approach. Panel A shows differences in risk measures after splitting the monthly sample based on alternative proxies for macroeconomic conditions. The first section reports values based on splitting the sample evenly between periods of high and low monthly market volatility measured using the standard deviation of daily CRSP value-weighted index returns. By construction, market risk measures will be higher when the standard deviation of the daily CRSP value-weighted index returns is higher. However, IR could fall or increase when the standard deviation of the index increases. We see that IR increases by about the same amount as MR during periods of high MR. This is true for both the market model and CLMX results. In all cases the differences are statistically significant at the 1% level. From these results we also see no support for the illiquidity hypothesis: Differences for risk measures using 5-day returns are very similar to those using 1-day returns.

The next part of Panel A splits the sample based on whether the month is an NBER recession (High) or expansion (Low). Here we see evidence of the strong business-cycle component of risk identified by other researchers with recessions having significantly higher MR. However, it is again the case that IR increases by about the same amount as market risk for each of the three measures we examine. The next section provides results for a similar comparison using the Chicago Fed index, splitting the sample evenly based on whether economic activity (e.g., output growth) is above or below median. The results again show a strong relation between risk and economic activity, but a relation that is slightly stronger for IR than MR. Credit spreads have been utilized in prior research as measures of economic conditions, financial stress, and market liquidity. When we split the sample evenly based on the level of the credit spread, we find that all measures of risk are higher when credit spreads are higher, but differences for IR tend to be larger than differences for MR.

We next split the sample based on the VIX index which is a good measure of expected volatility. Even though the VIX is only available since 1986, the results based on VIX are very similar to those based on the realized volatility of the CRSP index for the full sample. However, the differences between MR and IR are even more pronounced when splitting on VIX over the more recent sample period. Finally, we split the sample based on the Economic Uncertainty Index described in Bloom (2012) and Kozeniauskas, Orlik and Veldkamp (2014). Though this series is also not available for our full sample period (and only in quarterly frequency), we again find that idiosyncratic risk is high when economic uncertainty is high.

Panel B of Table 1 reports differences in risk measures for three subperiods for the splits based on CRSP index volatility. As was the case in Panel A, each of the MR and IR measures is higher when the CRSP index volatility is higher, and this is true in all three subperiods. The 1980-1999 subperiod shows the smallest differences in each of the risk measures, and the 2000-2015 period shows the largest differences. However, the differences in risk measures track each other closely in each subperiod. Only in the 1980-1999 subperiod are the IR differences notably less than the MR differences.

Panel C of Table 1 examines differences in volatility for other subsamples to further gauge the robustness of the results in Panels A and B. During our sample period many small firms entered the sample when the CRSP database began to include stocks listed on NASDAQ. To see if our results are affected by this change, the first section of Panel C reports results only for stocks listed on the NYSE. These results are quite similar to those for the full sample overall, but show a slightly lower increase in IR than for the full sample. These results together suggest both that the results are not driven by the emergence of NASDAQ stocks and that the small illiquid stocks more commonly found on NASDAQ do not drive the relation between MR and IR. Panel C also reports results excluding the technology bubble years of 1995-2002, which some previous research associates with the trend in IR documented by CLMX. The last section of

Panel C examines only NYSE stocks and excludes 1995-2002. Overall, the conclusions for these subsamples are very similar to those for the full sample and other subsamples suggesting a strong and robust relationship between high MR and high IR.

Though we do not tabulate the results, we also examine whether the results of Table 1 Panel A hold if we weight the observations by the market value of firms instead of weighting the observations equally. We find that with value-weighted averages, IR increases for all splits of Table 1 Panel A. The difference in IR between high uncertainty regimes and low uncertainty regimes is lower, but not dramatically so. For instance, for IR estimated using the market model, the difference in IR between the periods with high and low CRSP index standard deviation is 0.081 for the equally-weighted average and is 0.062 for the value-weighted average.

3.2 Time-series Regressions

We now turn to a more detailed analysis of the time-series relations between market risk and idiosyncratic risk. We first estimate regressions of idiosyncratic risk measures on contemporaneous and lagged measures of market risk as well as other time-series indicators to determine the strength and consistency of the relations. We conduct the analysis after taking the natural logarithm of the risk variables to reduce the importance of the large volatility spikes in 1987, 2000, and 2008. Results without taking logs are generally stronger. We also include the square of contemporaneous risk variables to better model the positive skewness inherent in volatility time-series.

Table 2 presents results of this analysis. We show results for both approaches of estimating idiosyncratic risk. The results indicate that idiosyncratic risk is strongly related to contemporaneous market risk even after accounting for the strong autocorrelation in idiosyncratic risk. The coefficients on the market risk variables of around 0.5 suggest an economically strong effect. Since the average level of idiosyncratic risk is about twice the level of market risk, a coefficient of 0.5 when we use logarithms implies that a change of a given absolute amount in market risk is associated with a change of the same absolute amount for idiosyncratic risk (which is consistent with IR and MR increasing by about the same amount in Table 1).

The positive coefficients on the squared terms suggest that the effect is even stronger for large moves in market risk. After accounting for the contemporaneous effects, lagged market risk has a small negative relation with idiosyncratic risk. The insignificant coefficient on the Chicago Fed Index suggests that it may be hard to identify precise business-cycle effects on risk since both economic conditions and volatility are highly persistent.

We include a time trend in the regression to account for the possibility of an unexplained trend in risk and find no evidence of such a trend. While some studies find evidence of a trend in idiosyncratic risk, the fact that we are controlling for market risk and lagged idiosyncratic risk makes these tests substantially different from those performed in earlier studies.

We note that the results for both the CLMX and MM methods are very similar and that the adjusted R-squareds for both methods are very high (0.88). Panels B and C of Table 2 show results separately for NYSE/AMEX-listed firms and NASDAQ-listed firms. The results are quite similar in that the very strong relation between market risk (and squared market risk) and idiosyncratic risk is independent of exchange listing. That said, the relation between IR and MR for NASDAQ firms is stronger (when using the CLMX method). In results not reported, we repeat the analysis for the three subperiods examined in Panel B of Table 1 and find nearly identical results in each case. Overall, the results in Table 2 show that there is a strong contemporaneous relation, both economically and statistically, between market risk and idiosyncratic risk even after accounting for the persistence of each variable.

Because the risk variables are persistent, we also conduct an analysis similar to that in Table 2 in first differences. We report the results in Table 3. Regressions (1) and (2) use the CLMX method to estimate idiosyncratic risk, and regressions (3) and (4) use the market model method. In regressions (1) and (3), we include only an intercept, the time trend, and the change in market risk. We again observe the very strong statistical relation between changes in market risk and changes in idiosyncratic risk. The estimated coefficients of, respectively, 0.632 and 0.527, and high adjusted R-squareds suggest a very strong economic relation.

Adding economic and market characteristics in regressions (2) and (4) does not change the relation between market risk and idiosyncratic risk and, in addition to the change in market risk, only the change in the credit spread and the return on the CRSP value-weighted index are consistently significant. Both an increase in credit spreads and an increase in the value-weighted index are associated with higher idiosyncratic volatility. It is notable that adding these variables has almost no effect on the coefficient on market risk and has little impact on R-squareds. Panels B through D of Table 3 repeat the analysis for the various subperiods we examine in Table 1. We always find a statistically significant positive relation between changes in market risk and changes in idiosyncratic risk with coefficients in the range of 0.335 to 0.755. The only economic or financial factor that is consistently significant in these regressions is the change in the credit spread.

The last set of time-series regressions estimates the relation between idiosyncratic risk and market risk for portfolio sorts over our whole sample period. Each month, we sort all stocks into five portfolios with the same number of stocks based on alternative lagged characteristics. It is important to note that this analysis is strictly in the time-series and does not represent tests of how these factors affect the relation between market risk and idiosyncratic risk in the cross-section. For example, the level of idiosyncratic risk varies across the sorts, so comparing coefficient magnitudes across sorts is not straightforward. In Section 5, we estimate firm-level regressions where we allow these variables to be related to idiosyncratic risk both directly and through an interaction with market risk. Our hypotheses to explain the IR/MR relation can then be tested by examining the interaction of these variables with market risk.

Table 4 presents results of separate regressions based on quintile sorts across the characteristics of interest. Remarkably, in every one of these tests we again find the strong relation between the level of market risk and the level of idiosyncratic risk. Results for the quadratic market risk term vary depending on the characteristic quantile, but the relation is always positive (convex) and in almost all cases statistically significant. Controlling for lagged market and idiosyncratic risk does not affect the significance of the relation between market risk and idiosyncratic risk. Furthermore, in all of the regressions we estimate, the adjusted R-squareds are in the vicinity of 0.90.

In summary, this section has shown a strong and consistent positive relation between market risk and idiosyncratic risk that is robust to considering various subsamples, exchange listings, and explanatory variables.

4 Market Risk and Idiosyncratic Earnings Volatility

The fundamental uncertainty hypothesis predicts that greater market risk is associated with greater idiosyncratic earnings volatility. Intuitively, if higher economy-wide uncertainty results in higher firm-specific risk we should find higher market risk today resulting in higher idiosyncratic earnings risk in subsequent quarters.

To test this hypothesis, we estimate panel regressions where we regress our measures of idiosyncratic volatility of firm fundamental performance, namely idiosyncratic earnings risk for firm *i* for quarter *t* *($IdioEarningsRisk_i(t)$)*, idiosyncratic profitability risk *($IdioProfitRisk_i(t)$)*, and idiosyncratic profit margin risk *($IdioMarginRisk_i(t)$)*, on contemporaneous market risk and four lags of market risk and idiosyncratic risk. We include lags of market risk because we would expect there to be a lag between the time that the market expects higher uncertainty and the time it is realized in earnings measures. We examine several lags because the length of the lag may depend on the specific circumstances generating the economic uncertainty and the effects may be persistent. We examine standard errors corrected for clustering by quarter. The results are shown in Table 5.

Regression (1) in Table 5 shows estimates for our idiosyncratic earnings risk measure. We find that all the coefficients on market risk are positive and significant at the 1% level. The largest coefficient is the coefficient on contemporaneous market risk, and the coefficients on the lagged terms are each about half the magnitude of the contemporaneous coefficient so that together the lagged effects are larger than the contemporaneous relation. The fundamental uncertainty hypothesis predicts positive coefficients. Consequently, these results are supportive of that hypothesis. To gauge the economic significance of the relation between market risk and idiosyncratic earnings risk we calculate how a one standard deviation (SD) change in market risk (across all lagged quarters) would change idiosyncratic earnings risk. We find that such a change in market risk would result in an increase of about 0.346 standard deviations in idiosyncratic earnings risk. We interpret this as a fairly large effect given the coarse nature of our proxies and analysis.[6]

We find quite similar results when we use our other two measures of idiosyncratic volatility of firm fundamental performance. Regression (2) shows the results for idiosyncratic profitability risk. All coefficients on the market risk variables are significant at the 1% level. The marginal effects are somewhat smaller but still economically significant. Finally, we provide the results for idiosyncratic gross margin risk in the third set of regression results. As before, all coefficients on the market risk variables are positive and significant at the 1% level. All regressions have rather small R-squareds, which is not surprising since we attempt to explain the volatility of firm-level accounting performance with stock market volatility.

It is also interesting to note that the relation between a firm's idiosyncratic stock return risk and its idiosyncratic earnings risk is generally positive but always weaker than the relation with market risk (and not statistically significant for idiosyncratic profitability or gross margin risk). This finding suggests that changes in economy-wide uncertainty driving market risk (that we have previously shown to be correlated with idiosyncratic stock return risk) may be the primary driver of changes in firm-specific risk at the firm's operating level.

5 Using Firm Characteristics to Explain the Relation between Idiosyncratic Volatility and Market Risk

We now turn to panel regressions with idiosyncratic risk from the market model as the dependent variable to investigate further our hypotheses about the determinants of the IR/MR relation. These hypotheses focus on how this relation depends on a firm's illiquidity for the illiquidity hypothesis, its level of idiosyncratic risk for the limits to arbitrage hypothesis, and its prospects for growth for the firm fundamentals hypothesis. To test our hypotheses, we estimate regressions using our panel data in Table 6. We cluster the standard

[6] Of course, it is not often that market risk in all contemporaneous and lagged quarters increases by one standard deviation. However, in about 13% of years the average level of market risk is more than 1.0 standard deviations higher than the average level in the previous year. In addition, volatility is quite persistent so this increases the frequency of sequentially high (or low) values of market risk.

errors by month. Because the proxies for our hypotheses are sometimes highly correlated, we estimate regressions with just one proxy in regressions (2) to (8). We then include all proxies in regression (9).

In regression (1) of Table 6, we regress the log of IR on the log of MR and an intercept. As we would expect given the results already shown, there is also a strong positive relation between the log of IR and the log of MR when using this panel approach. To examine whether a specific variable helps explain the relation between IR and MR, we use interactions. In regression (2), we consider how the IR/MR relation is related to illiquidity. When we use Amihud's illiquidity measure, we find that more illiquid firms actually have a weaker IR/MR relation, which is contrary to the illiquidity hypothesis. In unreported results, we find that the IR/MR relation is stronger for firms with more zero returns, but adding the zero returns variable to the regression adds very little explanatory power. In contrast, the adjusted R-squared of the regression with the Amihud illiquidity measure is substantially higher than the adjusted R-squared of the regression that uses only the log of MR.

Next, we investigate in regression (3) how the IR/MR relation is related to the lagged log of idiosyncratic risk. With the limits to arbitrage hypothesis, we would expect firms with higher lagged idiosyncratic risk to become more mispriced as market risk increases, so that their idiosyncratic risk should increase. We find that the interaction between market risk and lagged idiosyncratic risk is positive and significant, which is supportive of the limits to arbitrage hypothesis.

We turn next to variables related to growth opportunities. In regression (4), we examine whether firms with a higher book-to-market ratio (BM) have a stronger relation between IR and MR as predicted by the fundamentals explanation for the relation, which can be evaluated by introducing an interaction between MR and BM in the regression. We see in regression (4) that the IR/MR relation is indeed stronger for firms with a higher BM. In regression (5), we use Earnings/Price (EP). We find that IR falls as EP increases, but the relation between MR and IR is stronger for firms with higher EP. In regression (6), we use the R&D share as an explanatory variable. Since regressions (4) and (5) show that value firms have a stronger IR/MR relation, we would expect that firms with higher R&D share should have a weaker IR/MR relation. This is what we find. We also investigate whether firm size and leverage condition the IR/MR relation. We find no evidence in regression (7) that the IR/MR relation is related to size and no evidence in regressions (8) that it is related to leverage.

In the last regression of Table 6, regression (9), we include all the variables used in regressions (1) through (8). In regression (9), the slopes for the interactions are similar to the slopes when we include the proxies for our hypotheses one at a time, except those for lagged IR, market capitalization and leverage, which are now negative and significant. Consequently, while regression (3) was supportive of the arbitrage hypothesis, regression (9) provides evidence against that hypothesis. In contrast, the evidence in favor of the illiquidity hypothesis and the fundamental uncertainty hypothesis from the regressions that include one variable at a time is confirmed by regression (9). We also report estimates of marginal effects. These marginal effects are computed as the product of the standard deviation of the dependent variable and the regression coefficient. The highest marginal effects are by far those for lagged IR, market risk and market capitalization. An increase of one standard deviation of market risk increases IR by roughly 17%, controlling for last month's IR, which is large relative to the average IR of 36% across the firms in our sample. Without controlling for lagged IR, the increase is roughly 28%. The largest economic effect for the interactions is for market capitalization, followed by illiquidity. Regression (9) effectively estimates the effect of explanatory variables on changes in IR as we control for lagged IR. When we do not include lagged IR in the regression, the (absolute values of the) marginal effects increase for all interaction variables.

To obtain a clearer picture of the IR/MR relation, we estimate panel regressions of idiosyncratic risk on market risk in Table 7 that allow for the relation between IR and MR to be nonlinear, allow for IR to be related to the lag of MR and its squared value, and control for additional firm characteristics in all regressions, namely the log of lagged cash to assets, lagged leverage, and the contemporaneous stock return. The additional firm characteristics help alleviate the following concerns. First, cash holdings and leverage are related to growth opportunities empirically (see, for instance, Opler, Pinkowitz, Stulz, and Williamson, 1999), so that the proxies for growth opportunities we use could actually proxy for cash holdings and leverage. Hence, by controlling for these firm characteristics, we help alleviate the concern that our variables that proxy for growth could be proxies for factors other than growth. Another concern is that IR could be high because the stock moved a lot. It is important to note, however, that the additional firm characteristics we consider are likely to depend on IR, so that they are not truly exogenous. As before, we cluster the standard errors by month.

In Table 7, all the additional variables related to MR (MR squared, lagged MR, and lagged MR squared) are significant and have a positive coefficient except that the lagged market risk variables have a negative significant coefficient in regression (2), which includes idiosyncratic risk, and are insignificant in regression (8). The coefficients on MR in Table 7 are all larger than in the corresponding regressions in Table 6. The coefficient on MR squared is positive and significant in all regressions, indicating that the relation between IR and MR is nonlinear, so that the slope in the relation becomes steeper as MR increases. All three additional firm characteristics (i.e. lagged leverage, lagged cash, and contemporaneous stock return) have a positive significant coefficient, and the coefficient on lagged cash-to-assets is quite large. The additional firm characteristics add substantially to the explanatory power of the regressions.

When we control for the additional firm characteristics in Table 7, the coefficient on the illiquidity ratio turns positive and significant (and, in unreported results, the coefficient on the *PctZeroReturns* variable also remains positive and significant). However, the interaction of MR with lagged IR now has a negative significant coefficient. The results for the proxies of fundamental uncertainty are robust to including the additional variables. In particular, as in Table 7, we find that the IR/MR relation is stronger for value firms than it is for growth firms, and the coefficient on the interaction between book-to-market and MR increases from 0.016 to 0.025. Similarly, earnings-to-price and R&D share have the same sign as in Table 6 but larger regression coefficients. Finally, the coefficient on the interaction with market capitalization becomes negative, while the interaction of leverage and MR is significant and positive.

As before, we estimate a regression specification that uses all the proxies for our hypotheses similar to regression (9) in Table 6, and we also report the marginal effects. In regression (8) of Table 7, the coefficient on MR is more than twice as large as in the comparable regression of Table 6 (0.303 versus 0.139) and the marginal effect is also more than twice as large (0.360 versus 0.166). Adding the additional variables therefore does not reduce the effect of MR on IR that we document. The marginal effect on MR is such that if

MR increases by one standard deviation, IR increases by one third. In addition, we find large economic significance for squared MR: A one-standard deviation increase in MR squared increases IR by roughly 22%.

We repeat the analysis presented in Panel A of Table 7 after splitting firms based on listing exchange. Panel B shows results for just NYSE/AMEX-listed firms, and Panel C shows results for just NASDAQ-listed firms. Results in both panels confirm the strong relation between market risk and idiosyncratic risk. The marginal effect of MR is slightly larger for NASDAQ stocks (0.381) compared to NYSE/AMEX stocks (0.318). Apart from two exceptions, all interactions of firm characteristics with market risk are significant in the regressions of Panels B and C, and the marginal effects are consistent with the marginal effects reported in Panel A. The first exception is the interaction of the illiquidity ratio with market risk in the comprehensive specification for NASDAQ stocks, where the coefficient is negative; however it is positive and significant in that specification when excluding market capitalization which is correlated with liquidity. The second exception is that the interaction with leverage is not significant in regression (8) of Panel B and significantly negative in Panel C in the same regression.

This section has documented evidence largely supporting the hypothesis that growth firms have a weaker relation between market risk and idiosyncratic risk because growth opportunities represent options on future projects whose value should be less related to short-run variation in economic fundamentals. We find conflicting support for the limits to arbitrage hypothesis. We find some evidence that the relation is stronger for smaller and less liquid firms.

6 Robustness Checks and Other Tests

Our results are robust to a wide array of alternative specifications and analysis permutations. For example, we have conducted all of our analysis using value-weighted averages of idiosyncratic and market risk and find very similar results to those reported in the tables. Because the value-weighted series will be less affected by small stocks which are more volatile, the level of the relation differs somewhat, but patterns for changes and differences in risk are nearly identical. We have also estimated a variety of alternative specifications in our regression analysis, such as using equal-weighted CRSP market returns to estimate risk measures, and find results that are always consistent with the strong contemporaneous relation between market risk and idiosyncratic risk. We also find a positive relation between MR and IR when estimating time-series regressions by industry (using 17 Fama French industries).

One concern about our main finding is whether market risk is exogenous to idiosyncratic risk, or whether the causality is reversed. To this end, we estimate a bivariate VAR model with IR and MR. The lag lengths are selected by minimizing the Akaike information criterion. The results show that while the hypothesis that MR is independent of IR can rejected (*p*-value = 0.01; χ^2 = 16.6), the evidence is much stronger that IR is not exogenous to MR (*p*-value < 0.0001; χ^2 = 29.0). Thus, market risk appears to forecast idiosyncratic risk, but less so the other way round. However, in both MR and IR equations the autoregressive component vastly dominates the other variable, so these may not be informative tests for economically significant causality.

One could also be concerned that there is some mechanical relation driven by estimation error of idiosyncratic risk. Specifically, if the risk models we are using are not sufficient to decompose total risk into market risk and idiosyncratic risk when risks are asymmetric and time-varying, we could be miscategorizing some market risk as idiosyncratic risk. To investigate this possibility we conduct a simulation exercise that suggests our methodology and results are robust to random time-variation in both market risk and idiosyncratic risk.

Specifically, we conduct the following experiment: We create simulated daily returns for 1,000 firms for 60 months. Each firm's simulated return series is created by adding together the returns from i) a market return series generated by an EGARCH(1,1) model with parameters calibrated to our historical market risk series and with a random CAPM β distributed uniformly on the interval [0.5, 1.5], and ii) an orthogonal idiosyncratic risk factor generated by an EGARCH(1) model with parameters roughly calibrated to our historical idiosyncratic risk series.[7] We then apply the same CLMX and market-model methods to calculate the monthly risk measures that we use in the main analysis. The differences between idiosyncratic risk measures in high and low market risk periods are close to zero for both methods. This suggests that there is nothing obviously wrong with our approaches to risk decomposition that would lead to our results when risks vary randomly over time.

As another robustness check to address estimation error, we estimate market models over 3-month periods corresponding to calendar quarters over the full sample period, which provides more degrees of freedom and more precision in the regression estimates. Moreover, the quarterly volatility estimates are in similar frequency to the quarterly accounting data. Using these quarterly observations yields similar results to those reported in the paper for monthly frequency and nearly identical results for the time series relations presented in Table 1-4. We have also explored the use of alternative risk models in our analysis. Specifically, we have estimated idiosyncratic risk using residuals from the Fama and French 3-factor and 5-factor models (Fama and French, 1993, 2014) or using a GARCH (1,1) model. The relations between market risk and idiosyncratic risk remain both economically and statistically very strong.[8] In short, we have undertaken our analysis examining the relation between idiosyncratic risk and market risk in a variety of ways and always find very similar results.

7 Conclusion

We document a remarkably strong and consistently positive relation between measures of idiosyncratic risk and market risk. This relation holds in all subperiods, across listing exchanges, and after accounting for economic conditions, market conditions, and firm-specific factors. In panel regressions, this effect is stronger for less liquid firms but still strong for the most liquid firms. We find strong evidence that higher

[7] See Nelson (1991) for a detailed discussion of GARCH models in asset pricing.

[8] Because the models include factors based on firm size and book-to-market, we do not utilize panel regression results from these models.

market risk causes subsequent measures of idiosyncratic earnings risk to increase. Further, the relation between idiosyncratic risk and market risk seems to be attenuated for growth firms, which is consistent with the hypothesis that the value of these firms derives more from long-term idiosyncratic growth options that are less sensitive to short-term fluctuations in risk. However, most of the relation between idiosyncratic risk and market risk cannot be explained by the firm characteristics we investigate. Overall, our evidence is consistent with the existence of an "uncertainty" risk factor that drives both broad market risk and firm-specific risks.

Our findings have implications for corporate finance, asset pricing, and macroeconomics. For corporate finance, our results show that the impact of high uncertainty is magnified for firms through an increase in firm-specific uncertainty. This magnification effect means, for instance, that the cost of debt of firms in periods of high uncertainty increases by more than would be predicted by the increase in aggregate uncertainty alone.

Our results suggest that investors not holding fully diversified portfolios need to consider time-variation in idiosyncratic risk in addition to time-variation in market risk. This additional risk may complicate risk management and portfolio rebalancing decisions especially when considering that the time-series patterns of risk are important for many dynamic investment strategies (e.g., style timing).

Our results also suggest that regulators need to consider a broader set of time-varying risks than just those captured by existing factor models when assessing systemic risk or when assessing the risks to which financial institutions are exposed. From a macroeconomic perspective, the increased firm-specific uncertainty associated with greater aggregate uncertainty means that firms whose value is affected adversely by uncertainty shocks will suffer more from aggregate uncertainty shocks and that their ability to raise funding will be further limited.

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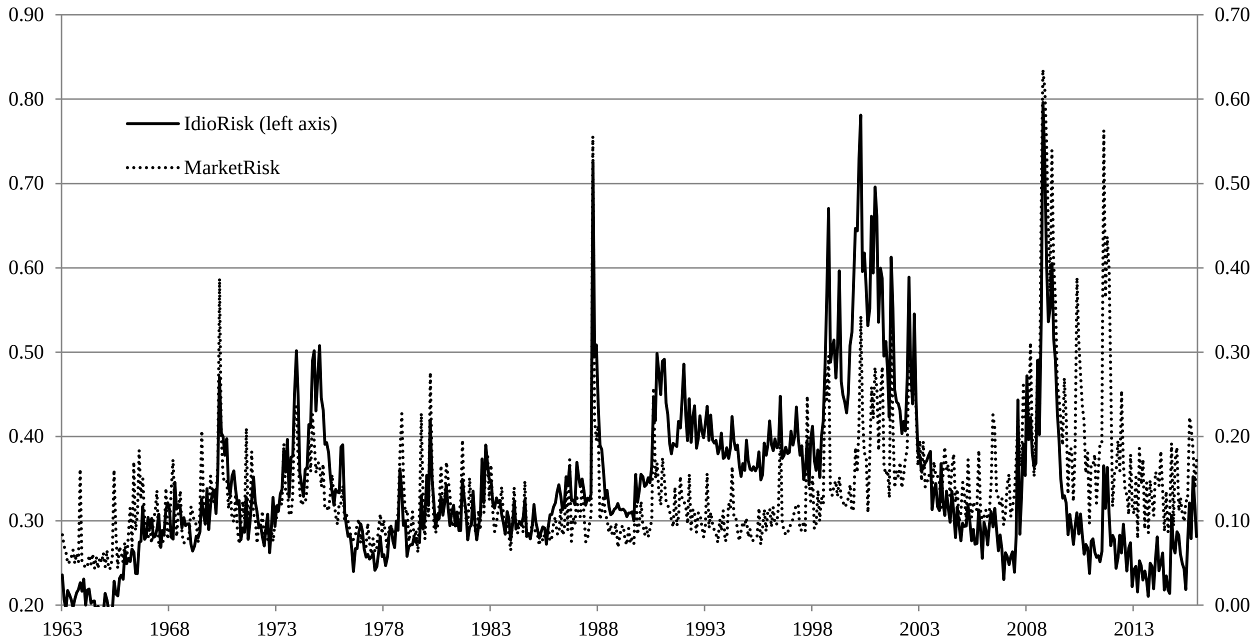
Figure 1. Measures of Market Risk and Idiosyncratic Risk

This figure plots average measures of monthly idiosyncratic and market risk. Panel A plots measures using the market model method in Equation (1), and Panel B plots measures using the method of CLMX.

Panel A: Market-Model Method



Panel B: CLMX Method

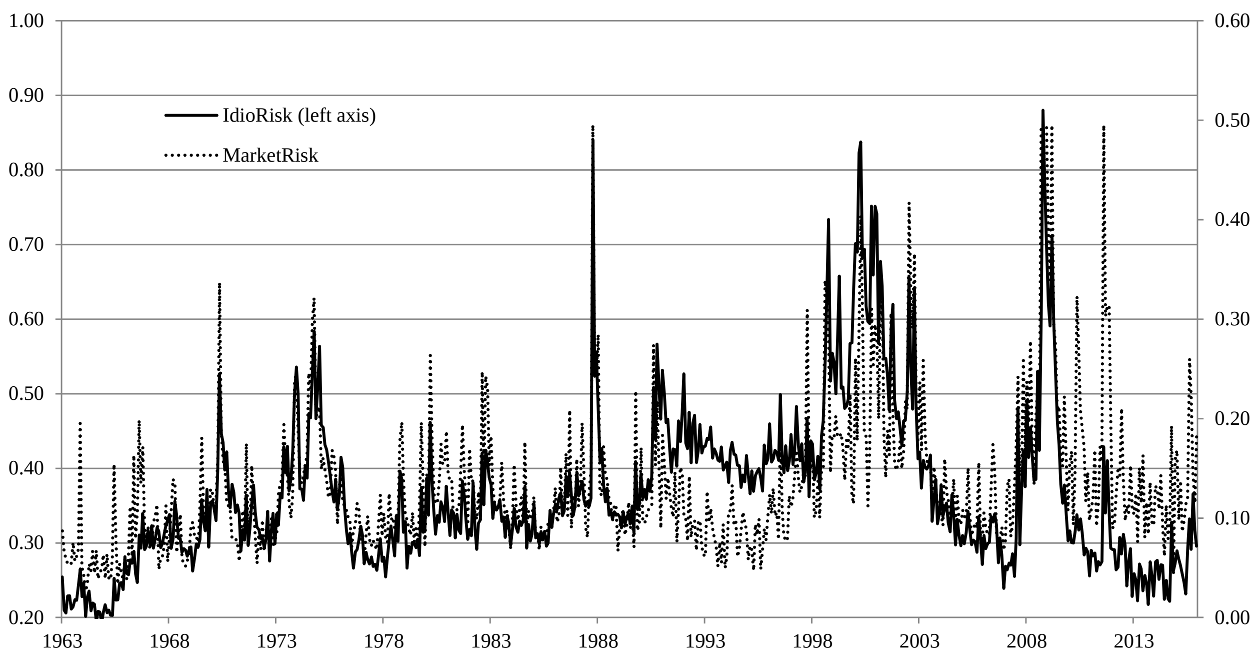
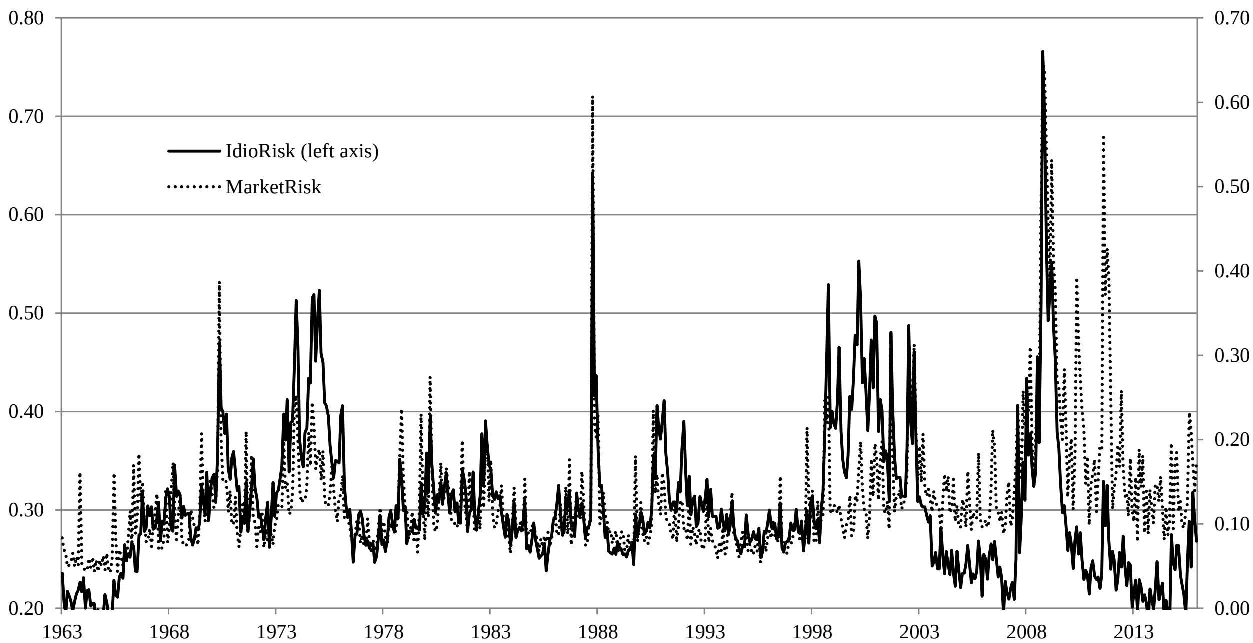


Figure 2. Market Risk and Idiosyncratic Risk by Exchange Listing

This figure plots average measures of monthly idiosyncratic and market risk using the market model method in Equation (1). Panel A plots measures based on NYSE/AMEX stocks, and Panel B plots measures based on NASDAQ stocks.

Panel A: NYSE/AMEX



Panel B: NASDAQ

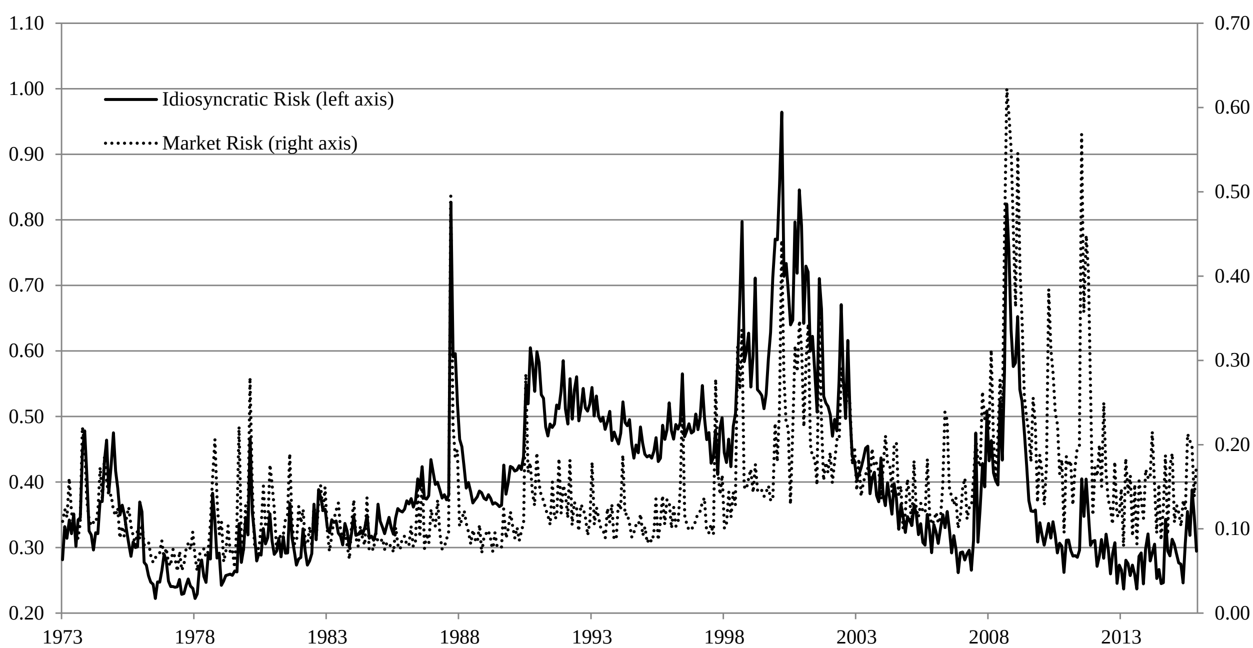


Table 1. Differences in Risk Measures

The table reports means and median of average risk levels from the monthly time-series estimates of risk based on the CLMX method and market-model (MM) method. We present difference in means and medians and *p*-values for differences in sample means and medians based on non-parametric Wilcoxon tests. Panel A shows results by market and economic conditions based on various factors such as market risk, NBER recessions, the Chicago Fed National Activity Index, the level of the Credit Spread, the VIX index, and the uncertainty index. Panel B shows results for subperiods, and Panel C shows results for NYSE/AMEX only and excluding the period 1995-2002. *p*-values reported as [0.00] are significant at better than the 1% level. Appendix A provides definitions of all variables.

Panel A: Results by Market and Economic Condition

	High			Low			Difference			
Risk Measure	N	Mean	Median	N	Mean	Median	Mean	p-value	Median	p-value
CRSP Volatility (CRSPVol)										
Total Risk-MM	318	0.440	0.405	318	0.322	0.316	0.118	[0.00]	0.088	[0.00]
Market Risk-CLMX	318	0.182	0.156	318	0.085	0.089	0.097	[0.00]	0.066	[0.00]
Market Risk-MM	318	0.177	0.155	318	0.092	0.091	0.085	[0.00]	0.064	[0.00]
Market Risk-CLMX 5 Days	318	0.184	0.167	318	0.096	0.095	0.089	[0.00]	0.072	[0.00]
Idio Risk-CLMX	318	0.416	0.386	318	0.320	0.312	0.095	[0.00]	0.075	[0.00]
Idio Risk-MM	318	0.382	0.355	318	0.301	0.294	0.081	[0.00]	0.061	[0.00]
Idio Risk-CLMX 5 Days	318	0.385	0.363	318	0.298	0.295	0.088	[0.00]	0.068	[0.00]
NBER Recessions										
Total Risk-MM	83	0.489	0.464	553	0.365	0.342	0.124	[0.00]	0.122	[0.00]
Market Risk-CLMX	83	0.203	0.181	553	0.123	0.108	0.080	[0.00]	0.073	[0.00]
Market Risk-MM	83	0.201	0.160	553	0.125	0.109	0.076	[0.00]	0.051	[0.00]
Market Risk-CLMX 5 Days	83	0.214	0.189	553	0.129	0.116	0.085	[0.00]	0.072	[0.00]
Idio Risk-CLMX	83	0.457	0.446	553	0.354	0.336	0.103	[0.00]	0.110	[0.00]
Idio Risk-MM	83	0.420	0.411	553	0.330	0.313	0.090	[0.00]	0.098	[0.00]
Idio Risk-CLMX 5 Days	83	0.425	0.411	553	0.329	0.313	0.096	[0.00]	0.098	[0.00]
Chicago Fed National Activity Index (CFNAITot)										
Total Risk-MM	318	0.353	0.339	318	0.409	0.377	-0.056	[0.00]	-0.039	[0.00]
Market Risk-CLMX	318	0.114	0.102	318	0.153	0.132	-0.039	[0.00]	-0.030	[0.00]
Market Risk-MM	318	0.116	0.103	318	0.154	0.129	-0.038	[0.00]	-0.027	[0.00]
Market Risk-CLMX 5 Days	318	0.125	0.115	318	0.155	0.136	-0.031	[0.00]	-0.021	[0.00]
Idio Risk-CLMX	318	0.345	0.331	318	0.391	0.364	-0.045	[0.00]	-0.033	[0.00]
Idio Risk-MM	318	0.322	0.310	318	0.361	0.335	-0.039	[0.00]	-0.025	[0.00]
Idio Risk-CLMX 5 Days	318	0.320	0.312	318	0.363	0.339	-0.043	[0.00]	-0.027	[0.00]
Credit Spread										
Total Risk-MM	317	0.420	0.379	319	0.343	0.330	0.077	[0.00]	0.048	[0.00]
Market Risk-CLMX	317	0.160	0.138	319	0.107	0.099	0.053	[0.00]	0.039	[0.00]
Market Risk-MM	317	0.162	0.140	319	0.108	0.099	0.055	[0.00]	0.042	[0.00]
Market Risk-CLMX 5 Days	317	0.161	0.142	319	0.120	0.110	0.041	[0.00]	0.032	[0.00]
Idio Risk-CLMX	317	0.397	0.360	319	0.339	0.325	0.059	[0.00]	0.035	[0.00]
Idio Risk-MM	317	0.368	0.334	319	0.316	0.305	0.052	[0.00]	0.030	[0.00]
Idio Risk-CLMX 5 Days	317	0.372	0.342	319	0.312	0.309	0.060	[0.00]	0.034	[0.00]
VIX Index										
Total Risk-MM	177	0.494	0.453	178	0.351	0.341	0.142	[0.00]	0.112	[0.00]
Market Risk-CLMX	177	0.200	0.172	178	0.103	0.098	0.097	[0.00]	0.073	[0.00]
Market Risk-MM	177	0.193	0.159	178	0.120	0.112	0.073	[0.00]	0.047	[0.00]
Market Risk-CLMX 5 Days	177	0.192	0.169	178	0.102	0.101	0.090	[0.00]	0.068	[0.00]
Idio Risk-CLMX	177	0.468	0.433	178	0.338	0.332	0.130	[0.00]	0.101	[0.00]
Idio Risk-MM	177	0.429	0.400	178	0.318	0.311	0.111	[0.00]	0.089	[0.00]
Idio Risk-CLMX 5 Days	177	0.428	0.399	178	0.309	0.307	0.119	[0.00]	0.092	[0.00]

(continued)

Table 1. Differences in Risk Measures (continued)

Panel A: Results by Market and Economic Condition (continued)

	High			Low			Difference			
Risk Measure	N	Mean	Median	N	Mean	Median	Mean	p-value	Median	p-value
Uncertainty Index										
Total Risk-MM	258	0.427	0.394	261	0.379	0.358	0.048	[0.00]	0.036	[0.00]
Market Risk-CLMX	258	0.156	0.130	261	0.128	0.112	0.028	[0.00]	0.018	[0.00]
Market Risk-MM	258	0.155	0.123	261	0.127	0.111	0.028	[0.00]	0.011	[0.00]
Market Risk-CLMX 5 Days	258	0.158	0.140	261	0.139	0.126	0.019	[0.00]	0.015	[0.04]
Idio Risk-CLMX	258	0.411	0.385	261	0.372	0.347	0.039	[0.00]	0.039	[0.00]
Idio Risk-MM	258	0.379	0.359	261	0.345	0.324	0.035	[0.00]	0.036	[0.00]
Idio Risk-CLMX 5 Days	258	0.379	0.356	261	0.346	0.326	0.033	[0.00]	0.030	[0.00]

Panel B: Results by Subperiod

	High CRSP Vol			Low CRSP Vol			Difference			
Risk Measure	N	Mean	Median	N	Mean	Median	Mean	p-value	Median	p-value
1963-2015										
Total Risk-MM	318	0.440	0.405	318	0.322	0.316	0.118	[0.00]	0.088	[0.00]
Market Risk-CLMX	318	0.182	0.156	318	0.085	0.089	0.097	[0.00]	0.066	[0.00]
Market Risk-MM	318	0.177	0.155	318	0.092	0.091	0.085	[0.00]	0.064	[0.00]
Market Risk-CLMX 5 Days	318	0.184	0.167	318	0.096	0.095	0.089	[0.00]	0.072	[0.00]
Idio Risk-CLMX	318	0.416	0.386	318	0.320	0.312	0.095	[0.00]	0.075	[0.00]
Idio Risk-MM	318	0.382	0.355	318	0.301	0.294	0.081	[0.00]	0.061	[0.00]
Idio Risk-CLMX 5 Days	318	0.385	0.363	318	0.298	0.295	0.088	[0.00]	0.068	[0.00]
1963-1979										
Total Risk-MM	102	0.374	0.363	102	0.276	0.282	0.098	[0.00]	0.081	[0.00]
Market Risk-CLMX	102	0.142	0.127	102	0.067	0.069	0.075	[0.00]	0.057	[0.00]
Market Risk-MM	102	0.138	0.124	102	0.074	0.074	0.063	[0.00]	0.050	[0.00]
Market Risk-CLMX 5 Days	102	0.170	0.157	102	0.085	0.083	0.085	[0.00]	0.074	[0.00]
Idio Risk-CLMX	102	0.363	0.354	102	0.274	0.282	0.089	[0.00]	0.072	[0.00]
Idio Risk-MM	102	0.335	0.328	102	0.260	0.267	0.075	[0.00]	0.061	[0.00]
Idio Risk-CLMX 5 Days	102	0.339	0.327	102	0.260	0.269	0.080	[0.00]	0.058	[0.00]
1980-1999										
Total Risk-MM	120	0.422	0.400	120	0.369	0.371	0.053	[0.00]	0.029	[0.00]
Market Risk-CLMX	120	0.163	0.146	120	0.090	0.095	0.073	[0.00]	0.051	[0.00]
Market Risk-MM	120	0.138	0.123	120	0.091	0.089	0.047	[0.00]	0.034	[0.00]
Market Risk-CLMX 5 Days	120	0.172	0.160	120	0.099	0.098	0.074	[0.00]	0.062	[0.00]
Idio Risk-CLMX	120	0.419	0.395	120	0.376	0.372	0.044	[0.00]	0.023	[0.00]
Idio Risk-MM	120	0.385	0.364	120	0.351	0.352	0.034	[0.00]	0.012	[0.00]
Idio Risk-CLMX 5 Days	120	0.386	0.368	120	0.339	0.336	0.047	[0.00]	0.032	[0.00]
2000-2015										
Total Risk-MM	96	0.523	0.481	96	0.323	0.314	0.200	[0.00]	0.167	[0.00]
Market Risk-CLMX	96	0.237	0.201	96	0.108	0.106	0.129	[0.00]	0.094	[0.00]
Market Risk-MM	96	0.249	0.219	96	0.131	0.130	0.118	[0.00]	0.089	[0.00]
Market Risk-CLMX 5 Days	96	0.215	0.189	96	0.104	0.104	0.111	[0.00]	0.085	[0.00]
Idio Risk-CLMX	96	0.466	0.426	96	0.300	0.292	0.166	[0.00]	0.135	[0.00]
Idio Risk-MM	96	0.427	0.396	96	0.284	0.276	0.143	[0.00]	0.120	[0.00]
Idio Risk-CLMX 5 Days	96	0.432	0.407	96	0.288	0.280	0.144	[0.00]	0.127	[0.00]

(continued)

Table 1. Differences in Risk Measures (continued)

Panel C: Results for NYSE/AMEX Only and Excluding 1995-2002

	High CRSP Vol			Low CRSP Vol			Differenœ			
Risk Measure	N	Mean	Median	N	Mean	Median	Mean	p-value	Median	p-value
NYSE/AMEX										
Total Risk-MM	318	0.395	0.364	318	0.290	0.292	0.105	[0.00]	0.072	[0.00]
Market Risk-CLMX	318	0.182	0.156	318	0.085	0.089	0.097	[0.00]	0.066	[0.00]
Market Risk-MM	318	0.171	0.145	318	0.088	0.088	0.083	[0.00]	0.057	[0.00]
Market Risk-CLMX 5 Days	318	0.184	0.167	318	0.096	0.095	0.089	[0.00]	0.072	[0.00]
Idio Risk-CLMX	318	0.362	0.341	318	0.284	0.291	0.078	[0.00]	0.051	[0.00]
Idio Risk-MM	318	0.336	0.317	318	0.269	0.271	0.067	[0.00]	0.047	[0.00]
Idio Risk-CLMX 5 Days	318	0.337	0.320	318	0.268	0.270	0.069	[0.00]	0.051	[0.00]
Exduding 1995-2002										
Total Risk-MM	270	0.405	0.372	270	0.314	0.312	0.091	[0.00]	0.061	[0.00]
Market Risk-CLMX	270	0.170	0.148	270	0.083	0.086	0.087	[0.00]	0.062	[0.00]
Market Risk-MM	270	0.173	0.151	270	0.090	0.089	0.082	[0.00]	0.062	[0.00]
Market Risk-CLMX 5 Days	270	0.175	0.158	270	0.094	0.091	0.082	[0.00]	0.067	[0.00]
Idio Risk-CLMX	270	0.376	0.355	270	0.311	0.305	0.065	[0.00]	0.050	[0.00]
Idio Risk-MM	270	0.347	0.327	270	0.293	0.290	0.054	[0.00]	0.037	[0.00]
Idio Risk-CLMX 5 Days	270	0.351	0.335	270	0.290	0.290	0.061	[0.00]	0.046	[0.00]
NYSE/AMEX, Exduding 1995-2002										
Total Risk-MM	270	0.384	0.350	270	0.287	0.292	0.097	[0.00]	0.058	[0.00]
Market Risk-CLMX	270	0.170	0.148	270	0.083	0.086	0.087	[0.00]	0.062	[0.00]
Market Risk-MM	270	0.174	0.148	270	0.087	0.088	0.087	[0.00]	0.060	[0.00]
Market Risk-CLMX 5 Days	270	0.175	0.158	270	0.094	0.091	0.082	[0.00]	0.067	[0.00]
Idio Risk-CLMX	270	0.345	0.329	270	0.280	0.288	0.064	[0.00]	0.041	[0.00]
Idio Risk-MM	270	0.322	0.309	270	0.266	0.270	0.056	[0.00]	0.038	[0.00]
Idio Risk-CLMX 5 Days	270	0.320	0.308	270	0.264	0.266	0.056	[0.00]	0.042	[0.00]

Table 2. Time-Series Regressions of Risk Measures

The table presents results of time-series regressions with monthly measures of idiosyncratic risk as the dependent variables. Average risk variables are alternatively from the market model or the CLMX model. Regressions include data from 1963-2015. Explanatory variables include lagged risk measures and market returns as well as the Chicago Fed economic activity index. Panel A shows results for all firms, Panel B for NYSE/AMEX firms, and Panel C for NASDAQ firms. *p*-values reported as [0.00] are significant at better than the 1% level. Appendix A provides definitions of all variables.

Panel A: All Firms

	Log Idiosyncratic Risk CLMX				Log Idiosyncratic Risk MM			
	(1)		(2)		(3)		(4)	
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value
Log Market Risk	0.529	[0.00]	0.539	[0.00]	0.455	[0.00]	0.459	[0.00]
Log Market Risk^2	0.068	[0.00]	0.070	[0.00]	0.054	[0.00]	0.055	[0.00]
Lag Log Idio Risk	0.839	[0.00]	0.841	[0.00]	0.887	[0.00]	0.889	[0.00]
Lag Log Market Risk	-0.159	[0.00]	-0.157	[0.00]	-0.149	[0.00]	-0.148	[0.00]
Chicago Fed Index			0.006	[0.18]			0.003	[0.49]
CRSP-VW-Return	0.294	[0.00]	0.300	[0.00]	0.271	[0.00]	0.275	[0.00]
Time	-0.040	[0.08]	-0.037	[0.10]	0.009	[0.72]	0.009	[0.72]
Intercept	0.281	[0.00]	0.299	[0.00]	0.196	[0.00]	0.206	[0.00]
Adjusted R^2	0.88		0.88		0.88		0.88	
Observations	636		636		636		636	

Panel B: NYSE/AMEX Firms

	Log Idiosyncratic Risk CLMX				Log Idiosyncratic Risk MM			
	(1)		(2)		(3)		(4)	
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value
Log Market Risk	0.548	[0.00]	0.550	[0.00]	0.447	[0.00]	0.448	[0.00]
Log Market Risk^2	0.069	[0.00]	0.070	[0.00]	0.053	[0.00]	0.053	[0.00]
Lag Log Idio Risk	0.726	[0.00]	0.727	[0.00]	0.843	[0.00]	0.844	[0.00]
Lag Log Market Risk	-0.119	[0.00]	-0.119	[0.00]	-0.132	[0.00]	-0.132	[0.00]
Chicago Fed Index			0.001	[0.76]			0.001	[0.87]
CRSP-VW-Return	0.319	[0.00]	0.321	[0.00]	0.266	[0.00]	0.266	[0.00]
Time	-0.180	[0.00]	-0.179	[0.00]	-0.057	[0.02]	-0.056	[0.03]
Intercept	0.285	[0.00]	0.289	[0.00]	0.188	[0.00]	0.190	[0.00]
Adjusted R^2	0.86		0.86		0.85		0.85	
Observations	636		636		636		636	

(continued)

Table 2. Time-Series Regressions of Risk Measures (continued)

Panel C: NASDAQ Firms

	Log Idiosyncratic Risk CLMX				Log Idiosyncratic Risk MM			
	(1)		(2)		(3)		(4)	
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value
Log Market Risk	0.679	[0.00]	0.681	[0.00]	0.419	[0.00]	0.407	[0.00]
Log Market Risk^2	0.111	[0.00]	0.112	[0.00]	0.047	[0.00]	0.045	[0.00]
Lag Log Idio Risk	0.854	[0.00]	0.854	[0.00]	0.910	[0.00]	0.907	[0.00]
Lag Log Market Risk	-0.181	[0.00]	-0.181	[0.00]	-0.170	[0.00]	-0.172	[0.00]
Chicago Fed Index			0.001	[0.92]			-0.005	[0.41]
CRSP-VW-Return	0.238	[0.06]	0.240	[0.06]	0.107	[0.35]	0.100	[0.39]
Time	-0.205	[0.00]	-0.203	[0.00]	-0.033	[0.71]	-0.043	[0.63]
Intercept	0.478	[0.00]	0.480	[0.00]	0.167	[0.00]	0.152	[0.01]
Adjusted R^2	0.89		0.89		0.90		0.90	
Observations	396		396		396		396	

Table 3. Time-Series Regressions with Changes in Idiosyncratic Risk

This table presents results of time-series regressions with first-differences in monthly idiosyncratic risk as the dependent variables. Average risk variables are alternatively from the market model or the CLMX model. Regressions include data from 1963-2015. Explanatory variables include changes in market risk, market returns, a time trend and levels and changes of various economic/market indicators. *p*-values reported as [0.00] are significant at better than the 1% level. Appendix A provides definitions of all variables.

	Change Idiosyncratic Risk-CLMX				Change Idiosyncratic Risk-MM			
	(1)		(2)		(3)		(4)	
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value
Panel A: Full Sample								
Change Market Risk	0.632	[0.00]	0.637	[0.00]	0.527	[0.00]	0.531	[0.00]
Change Credit Spread			0.053	[0.00]			0.046	[0.00]
NBER Recession			0.005	[0.46]			0.008	[0.14]
Chicago Fed Index (CFNAITot)			0.003	[0.19]			0.005	[0.03]
Change Chicago Fed Index (CFNAITot)			0.000	[0.85]			-0.001	[0.44]
CRSP-VW Return			0.093	[0.01]			0.089	[0.00]
Time	-0.002	[0.84]	0.003	[0.76]	-0.002	[0.75]	0.004	[0.58]
Intercept	-0.001	[0.72]	-0.005	[0.24]	-0.001	[0.72]	-0.005	[0.09]
Adjusted R^2	0.44		0.48		0.45		0.49	
Observations	636		636		636		636	
Panel B: 1963-1979								
Change Market Risk	0.562	[0.00]	0.630	[0.00]	0.335	[0.00]	0.413	[0.00]
Change Credit Spread			0.042	[0.00]			0.047	[0.00]
NBER Recession			0.005	[0.49]			0.008	[0.26]
Chicago Fed Index (CFNAITot)			0.003	[0.19]			0.005	[0.03]
Change Chicago Fed Index (CFNAITot)			0.001	[0.79]			-0.001	[0.69]
CRSP-VW Return			0.128	[0.01]			0.106	[0.02]
Time	-0.013	[0.70]	-0.010	[0.76]	-0.015	[0.63]	-0.012	[0.68]
Intercept	0.000	[0.98]	-0.003	[0.47]	0.000	[0.92]	-0.004	[0.35]
Adjusted R^2	0.38		0.45		0.23		0.34	
Observations	204		204		204		204	
Panel C: 1980-1999								
Change Market Risk	0.755	[0.00]	0.763	[0.00]	0.647	[0.00]	0.68	[0.00]
Change Credit Spread			0.036	[0.01]			0.032	[0.00]
NBER Recession			0.005	[0.70]			0.006	[0.45]
Chicago Fed Index (CFNAITot)			0.003	[0.51]			0.003	[0.33]
Change Chicago Fed Index (CFNAITot)			-0.004	[0.33]			-0.005	[0.05]
CRSP-VW Return			0.037	[0.55]			0.105	[0.01]
Time	0.021	[0.58]	0.021	[0.59]	0.016	[0.54]	0.018	[0.50]
Intercept	-0.008	[0.53]	-0.01	[0.50]	-0.006	[0.48]	-0.009	[0.33]
Adjusted R^2	0.53		0.53		0.63		0.66	
Observations	240		240		240		240	

(continued)

Table 3. Time-Series Regressions with Changes in Idiosyncratic Risk (continued)

	Change Idiosyncratic Risk-CLMX				Change Idiosyncratic Risk-MM			
	(1)		(2)		(3)		(4)	
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value
Panel D: 2000-2015								
Change Market Risk	0.564	[0.00]	0.531	[0.00]	0.511	[0.00]	0.45	[0.00]
Change Credit Spread			0.099	[0.00]			0.062	[0.00]
NBER Recession			0.002	[0.90]			0.009	[0.53]
Chicago Fed Index (CFNAITot)			-0.001	[0.92]			0.004	[0.53]
Change Chicago Fed Index (CFNAITot)			0.008	[0.18]			0.004	[0.52]
CRSP-VW Return			0.214	[0.01]			0.065	[0.38]
Time	0.042	[0.52]	0.030	[0.63]	0.044	[0.44]	0.043	[0.43]
Intercept	-0.026	[0.46]	-0.022	[0.53]	-0.027	[0.38]	-0.028	[0.37]
Adjusted R^2	0.40		0.48		0.40		0.43	
Observations	192		192		192		192	

Table 4. Regression Analysis of Idiosyncratic Risk by Characteristic Quintile

The table presents results of regressions of monthly idiosyncratic risk on contemporaneous and lagged market risk and lagged idiosyncratic risk. Separate results are presented for portfolios sorted on characteristic quintiles. Average risk measures are obtained from the market model method. Results are for firms from all exchanges. Data are from 1963-2015. *p*-values reported as [0.00] are significant at better than the 1% level. Appendix A provides definitions of all variables.

		Low		2		3		4		High	
		Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value
Lag Log Illiquidity Ratio	Log Market Risk	0.576	[0.00]	0.418	[0.00]	0.383	[0.00]	0.325	[0.00]	0.322	[0.00]
	Log Market Risk^2	0.084	[0.00]	0.053	[0.00]	0.046	[0.00]	0.032	[0.00]	0.028	[0.00]
	Lag Log Market Risk	-0.110	[0.00]	-0.114	[0.00]	-0.124	[0.00]	-0.134	[0.00]	-0.150	[0.00]
	Lag Log Idio Risk	0.815	[0.00]	0.866	[0.00]	0.898	[0.00]	0.900	[0.00]	0.916	[0.00]
	Intercept	0.250	[0.00]	0.171	[0.00]	0.169	[0.00]	0.117	[0.00]	0.111	[0.01]
	Adjusted R^2	0.85		0.87		0.88		0.88		0.89	
	Observations	636		636		636		636		636	
Lag PctZeroReturns	Log Market Risk	0.465	[0.00]	0.448	[0.00]	0.548	[0.00]	0.410	[0.00]	0.199	[0.00]
	Log Market Risk^2	0.064	[0.00]	0.055	[0.00]	0.067	[0.00]	0.042	[0.00]	0.001	[0.89]
	Lag Log Market Risk	-0.076	[0.00]	-0.098	[0.00]	-0.104	[0.00]	-0.138	[0.00]	-0.226	[0.00]
	Lag Log Idio Risk	0.814	[0.00]	0.846	[0.00]	0.875	[0.00]	0.889	[0.00]	0.983	[0.00]
	Intercept	0.190	[0.00]	0.227	[0.00]	0.444	[0.00]	0.240	[0.00]	-0.056	[0.33]
	Adjusted R^2	0.86		0.89		0.92		0.89		0.86	
	Observations	636		636		462		551		636	
Lag IdioRisk	Log Market Risk	0.454	[0.00]	0.385	[0.00]	0.356	[0.00]	0.393	[0.00]	0.507	[0.00]
	Log Market Risk^2	0.042	[0.00]	0.036	[0.00]	0.037	[0.00]	0.051	[0.00]	0.092	[0.00]
	Lag Log Market Risk	-0.167	[0.00]	-0.127	[0.00]	-0.123	[0.00]	-0.120	[0.00]	-0.129	[0.00]
	Lag Log Idio Risk	0.826	[0.00]	0.837	[0.00]	0.884	[0.00]	0.922	[0.00]	0.957	[0.00]
	Intercept	0.285	[0.00]	0.206	[0.00]	0.164	[0.00]	0.144	[0.00]	-0.021	[0.59]
	Adjusted R^2	0.82		0.87		0.88		0.89		0.86	
	Observations	636		636		636		636		636	
Lag BookToMarket	Log Market Risk	0.454	[0.00]	0.344	[0.00]	0.373	[0.00]	0.412	[0.00]	0.394	[0.00]
	Log Market Risk^2	0.062	[0.00]	0.035	[0.00]	0.040	[0.00]	0.046	[0.00]	0.043	[0.00]
	Lag Log Market Risk	-0.113	[0.00]	-0.135	[0.00]	-0.140	[0.00]	-0.146	[0.00]	-0.150	[0.00]
	Lag Log Idio Risk	0.886	[0.00]	0.909	[0.00]	0.888	[0.00]	0.874	[0.00]	0.899	[0.00]
	Intercept	0.235	[0.00]	0.130	[0.00]	0.123	[0.00]	0.140	[0.00]	0.154	[0.00]
	Adjusted R^2	0.89		0.88		0.86		0.86		0.90	
	Observations	636		636		636		636		636	
Lag EarningsToPrice	Log Market Risk	0.373	[0.00]	0.334	[0.00]	0.422	[0.00]	0.462	[0.00]	0.415	[0.00]
	Log Market Risk^2	0.047	[0.00]	0.033	[0.00]	0.049	[0.00]	0.055	[0.00]	0.048	[0.00]
	Lag Log Market Risk	-0.117	[0.00]	-0.132	[0.00]	-0.137	[0.00]	-0.149	[0.00]	-0.144	[0.00]
	Lag Log Idio Risk	0.915	[0.00]	0.904	[0.00]	0.878	[0.00]	0.864	[0.00]	0.877	[0.00]
	Intercept	0.185	[0.00]	0.122	[0.00]	0.165	[0.00]	0.164	[0.00]	0.152	[0.00]
	Adjusted R^2	0.91		0.90		0.86		0.85		0.86	
	Observations	636		636		636		636		636	

(continued)

Table 4. Regression Analysis of Idiosyncratic Risk by Characteristic Quintile (continued)

		Low		2		3		4		High	
		Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value
Lag R&D-Share	Log Market Risk	0.433	[0.00]	0.245	[0.00]	0.283	[0.00]	0.127	[0.00]	0.213	[0.00]
	Log Market Risk^2	0.052	[0.00]	0.024	[0.00]	0.017	[0.06]	0.011	[0.01]	0.016	[0.16]
	Lag Log Market Risk	-0.144	[0.00]	-0.033	[0.03]	-0.052	[0.00]	-0.037	[0.01]	-0.067	[0.00]
	Lag Log Idio Risk	0.884	[0.00]	0.714	[0.00]	0.665	[0.00]	0.800	[0.00]	0.818	[0.00]
	Intercept	0.170	[0.00]	-0.005	[0.93]	0.013	[0.84]	-0.066	[0.14]	0.051	[0.42]
	Adjusted R^2	0.87		0.62		0.61		0.68		0.75	
	Observations	629		629		548		591		486	
Lag MarketCap	Log Market Risk	0.356	[0.00]	0.425	[0.00]	0.393	[0.00]	0.459	[0.00]	0.516	[0.00]
	Log Market Risk^2	0.037	[0.00]	0.054	[0.00]	0.045	[0.00]	0.057	[0.00]	0.068	[0.00]
	Lag Log Market Risk	-0.149	[0.00]	-0.122	[0.00]	-0.128	[0.00]	-0.120	[0.00]	-0.106	[0.00]
	Lag Log Idio Risk	0.907	[0.00]	0.871	[0.00]	0.869	[0.00]	0.835	[0.00]	0.801	[0.00]
	Intercept	0.126	[0.00]	0.173	[0.00]	0.133	[0.00]	0.168	[0.00]	0.195	[0.00]
	Adjusted R^2	0.86		0.85		0.86		0.84		0.84	
	Observations	636		636		636		636		636	

Table 5. Regression Analysis of Idiosyncratic Earnings Risk

The table presents results of panel regressions with quarterly idiosyncratic risk of firm fundamentals as dependent variable. In particular, alternative measures of idiosyncratic volatility of firm fundamental performance are idiosyncratic earnings risk (*IdioEarningsRisk)*, idiosyncratic profitability risk (*IdioProfitRisk*), and idiosyncratic profit margin risk (*IdioMarginRisk*). The explanatory variables are contemporaneous market risk and four lags of market risk as well as contemporaneous idiosyncratic risk and four lags of idiosyncratic risk from the market model. The sample period is 1963-2015. The table reports the regression coefficients, associated *p*-values as well as the R-Squared and the number of observations. It also reports marginal effects calculated as the effect of a one standard deviation increase in market risk across all quarters on idiosyncratic volatility of fundamental firm performance. Standard errors are corrected for clustering by quarter. *p*-values reported as [0.00] are significant at better than the 1% level. Appendix A provides definitions of all variables.

	IdioEarningsToSales		IdioProfitability		IdioGrossProfitMargin	
	Coef	*p*-value	Coef	*p*-value	Coef	*p*-value
LogMarketRisk (t)	0.013	[0.00]	0.006	[0.00]	0.003	[0.00]
LogMarketRisk (t-1)	0.008	[0.00]	0.004	[0.00]	0.002	[0.00]
LogMarketRisk (t-2)	0.006	[0.00]	0.003	[0.00]	0.002	[0.00]
LogMarketRisk (t-3)	0.006	[0.00]	0.003	[0.00]	0.002	[0.00]
LogMarketRisk (t-4)	0.008	[0.00]	0.004	[0.00]	0.003	[0.00]
LogIdioRisk (t)	0.001	[0.02]	0.000	[0.55]	0.000	[0.55]
LogIdioRisk (t-1)	0.001	[0.00]	0.000	[0.11]	0.000	[0.22]
LogIdioRisk (t-2)	0.001	[0.02]	0.000	[0.59]	0.000	[0.25]
LogIdioRisk (t-3)	0.001	[0.02]	0.000	[0.35]	0.000	[0.63]
LogIdioRisk (t-4)	0.001	[0.01]	0.000	[0.27]	0.000	[0.33]
Intercept	0.078	[0.00]	0.035	[0.00]	0.022	[0.00]
Marginal Effect of +1 SD MR	0.346		0.282		0.284	
R^2	0.031		0.019		0.018	
Observations	413,746		410,300		394,578	

Table 6. Regression Analysis of Idiosyncratic Risk with Market Risk Interactions

The table presents results of panel regressions with (the natural logarithm of) monthly idiosyncratic risk as dependent variable. The explanatory variables include (the natural logarithm of) market risk as well as its interactions with various firm characteristics. All risk variables are from the market model. The sample period is 1963-2015. The table reports the regression coefficients, associated *p*-values as well as the R-Squared and the number of observations. Standard errors are corrected for clustering by month. The last specification also reports marginal effects calculated as the regression coefficient multiplied with the standard deviation of the regressor. *p*-values reported as [0.00] are significant at better than the 1% level. Appendix A provides definitions of all variables.

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)		(9)		
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	MarEff
Log Market Risk	0.172	[0.00]	0.196	[0.00]	0.094	[0.00]	0.161	[0.00]	0.156	[0.00]	0.16	[0.00]	0.187	[0.00]	0.177	[0.00]	0.139	[0.00]	0.166
Lag Log Illiquidity Ratio			0.072	[0.00]													-0.013	[0.00]	-0.035
Log Market Risk * Lag Log Illiquidity Ratio			-0.004	[0.00]													-0.008	[0.00]	-0.058
Lag Log IdioRisk					0.688	[0.00]											0.538	[0.00]	0.324
Log Market Risk * Lag Log IdioRisk					0.008	[0.00]											-0.007	[0.05]	-0.016
Lag BookToMarket							0.045	[0.00]									-0.012	[0.04]	-0.007
Log Market Risk * Lag BookToMarket							0.016	[0.00]									0.007	[0.00]	0.013
Lag EarningsToPrice									-0.916	[0.00]							-0.303	[0.00]	-0.044
Log Market Risk * Lag EarningsToPrice									0.035	[0.00]							0.004	[0.37]	0.001
Lag R&D-Share											0.332	[0.00]					0.108	[0.00]	0.030
Log Market Risk * Lag R&D-Share											-0.018	[0.05]					-0.014	[0.00]	-0.009
Lag Log MarketCap													-0.136	[0.00]			-0.088	[0.00]	-0.152
Log Market Risk * Lag Log MarketCap													0.002	[0.13]			-0.012	[0.00]	-0.088
Lag Leverage															-0.054	[0.11]	-0.019	[0.14]	-0.004
Log Market Risk * Lag Leverage															-0.016	[0.11]	-0.019	[0.00]	-0.015
Intercept	-0.771	[0.00]	-0.415	[0.00]	-0.168	[0.00]	-0.802	[0.00]	-0.773	[0.00]	-0.844	[0.00]	0.101	[0.00]	-0.755	[0.00]	0.185	[0.00]	
Adjusted R^2	0.114		0.244		0.528		0.115		0.169		0.142		0.276		0.114		0.562		
Observations		1,547,083		1,547,083		1,547,083		1,547,083		1,547,083		1,547,083		1,547,083		1,547,083		1,547,083	

Table 7. Regression Analysis of Idiosyncratic Risk with Additional Controls

The table presents results of panel regressions with (the natural logarithm of) monthly idiosyncratic risk as dependent variable. The explanatory variables include (the natural logarithm of) market risk, lagged and squared market risk, interactions of market risk with various firm characteristics as well as a number of additional controls. All risk variables are from the market model. Panel A reports results for all firms. Panel B reports results for only NYSE/AMEX firms. Panel C reports results for only NASDAQ firms. The sample period is 1963-2015. The table reports the regression coefficients, associated *p*-values as well as the R-Squared and the number of observations. Standard errors are corrected for clustering by month. The last specification also reports marginal effects calculated as the regression coefficient multiplied with the standard deviation of the regressor. *p*-values reported as [0.00] are significant at better than the 1% level. Appendix A provides definitions of all variables.

Panel A: All Firms

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)		
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	MarEff
Log Market Risk	0.421	[0.00]	0.223	[0.00]	0.334	[0.00]	0.332	[0.00]	0.359	[0.00]	0.433	[0.00]	0.344	[0.00]	0.303	[0.00]	0.360
Log Market Risk^2	0.038	[0.00]	0.024	[0.00]	0.035	[0.00]	0.033	[0.00]	0.035	[0.00]	0.035	[0.00]	0.034	[0.00]	0.028	[0.00]	0.222
Lag Log Market Risk	0.202	[0.00]	-0.047	[0.00]	0.178	[0.00]	0.158	[0.00]	0.174	[0.00]	0.198	[0.00]	0.179	[0.00]	-0.002	[0.79]	-0.002
Lag Log Market Risk^2	0.019	[0.00]	-0.004	[0.00]	0.019	[0.00]	0.017	[0.00]	0.018	[0.00]	0.018	[0.00]	0.019	[0.00]	0.000	[0.85]	-0.001
Lag Log Illiquidity Ratio	0.103	[0.00]													0.010	[0.00]	0.028
Log Market Risk * Lag Log Illiquidity Ratio	0.006	[0.00]													-0.002	[0.05]	-0.013
Lag Log IdioRisk			0.606	[0.00]											0.432	[0.00]	0.260
Log Market Risk * Lag Log IdioRisk			-0.018	[0.00]											-0.036	[0.00]	-0.087
Lag BookToMarket					0.090	[0.00]									-0.027	[0.00]	-0.016
Log Market Risk * Lag BookToMarket					0.025	[0.00]									0.003	[0.08]	0.005
Lag EarningsToPrice							-0.560	[0.00]							-0.275	[0.00]	-0.040
Log Market Risk * Lag EarningsToPrice							0.094	[0.00]							0.013	[0.01]	0.004
Lag R&D-Share									0.014	[0.40]					0.048	[0.00]	0.013
Log Market Risk * Lag R&D-Share									-0.066	[0.00]					-0.021	[0.00]	-0.014
Lag Log MarketCap											-0.168	[0.00]			-0.078	[0.00]	-0.136
Log Market Risk * Lag Log MarketCap											-0.010	[0.00]			-0.011	[0.00]	-0.081
Lag Leverage	0.107	[0.00]	0.077	[0.00]	0.170	[0.00]	0.142	[0.00]	0.213	[0.00]	0.073	[0.00]	0.258	[0.00]	0.024	[0.04]	0.006
Log Market Risk * Lag Leverage													0.023	[0.00]	-0.014	[0.00]	-0.011
Lag Log Cash&STI-to-TA	0.839	[0.00]	0.288	[0.00]	0.852	[0.00]	0.681	[0.00]	0.697	[0.00]	0.688	[0.00]	0.841	[0.00]	0.189	[0.00]	0.027
Return	0.075	[0.09]	0.122	[0.00]	0.070	[0.16]	0.108	[0.03]	0.074	[0.14]	0.066	[0.14]	0.077	[0.13]	0.121	[0.00]	0.016
Intercept	0.112	[0.00]	-0.195	[0.00]	-0.506	[0.00]	-0.455	[0.00]	-0.452	[0.00]	0.702	[0.00]	-0.471	[0.00]	0.307	[0.00]	
Adjusted R^2	0.358		0.539		0.206		0.235		0.209		0.371		0.205		0.574		
Observations	1,526,630		1,526,630		1,526,630		1,526,630		1,526,630		1,526,630		1,526,630		1,526,630		

(continued)

Table 7. Regression Analysis of Idiosyncratic Risk with Additional Controls (continued)

Panel B: NYSE/AMEX Firms

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)		
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	MarEff
Log Market Risk	0.422	[0.00]	0.228	[0.00]	0.341	[0.00]	0.342	[0.00]	0.361	[0.00]	0.431	[0.00]	0.345	[0.00]	0.274	[0.00]	0.318
Log Market Risk^2	0.038	[0.00]	0.025	[0.00]	0.035	[0.00]	0.034	[0.00]	0.036	[0.00]	0.035	[0.00]	0.035	[0.00]	0.029	[0.00]	0.231
Lag Log Market Risk	0.201	[0.00]	-0.039	[0.00]	0.184	[0.00]	0.171	[0.00]	0.185	[0.00]	0.197	[0.00]	0.184	[0.00]	0.010	[0.14]	0.011
Lag Log Market Risk^2	0.019	[0.00]	-0.003	[0.00]	0.019	[0.00]	0.018	[0.00]	0.019	[0.00]	0.018	[0.00]	0.019	[0.00]	0.001	[0.24]	0.007
Lag Log Illiquidity Ratio	0.095	[0.00]													0.017	[0.00]	0.049
Log Market Risk * Lag Log Illiquidity Ratio	0.007	[0.00]													0.002	[0.09]	0.017
Lag Log IdioRisk			0.590	[0.00]											0.394	[0.00]	0.218
Log Market Risk * Lag Log IdioRisk			-0.016	[0.00]											-0.042	[0.00]	-0.100
Lag BookToMarket					0.128	[0.00]									-0.006	[0.17]	-0.004
Log Market Risk * Lag BookToMarket					0.019	[0.00]									0.004	[0.01]	0.007
Lag EarningsToPrice							-0.439	[0.00]							-0.277	[0.00]	-0.039
Log Market Risk * Lag EarningsToPrice							0.062	[0.00]							0.009	[0.05]	0.003
Lag R&D-Share									-0.125	[0.00]					0.078	[0.00]	0.013
Log Market Risk * Lag R&D-Share									-0.063	[0.00]					-0.011	[0.04]	-0.005
Lag Log MarketCap											-0.145	[0.00]			-0.062	[0.00]	-0.119
Log Market Risk * Lag Log MarketCap											-0.009	[0.00]			-0.005	[0.00]	-0.043
Lag Leverage	0.198	[0.00]	0.110	[0.00]	0.192	[0.00]	0.250	[0.00]	0.286	[0.00]	0.159	[0.00]	0.361	[0.00]	0.089	[0.00]	0.021
Log Market Risk * Lag Leverage													0.031	[0.00]	0.000	[0.91]	0.000
Lag Log Cash&STI-to-TA	0.349	[0.00]	0.136	[0.00]	0.406	[0.00]	0.335	[0.00]	0.385	[0.00]	0.268	[0.00]	0.388	[0.00]	0.072	[0.00]	0.007
Return	0.170	[0.00]	0.218	[0.00]	0.172	[0.00]	0.216	[0.00]	0.189	[0.00]	0.164	[0.00]	0.188	[0.00]	0.213	[0.00]	0.025
Intercept	0.004	[0.83]	-0.233	[0.00]	-0.590	[0.00]	-0.524	[0.00]	-0.517	[0.00]	0.497	[0.00]	-0.553	[0.00]	0.148	[0.00]	
Adjusted R^2	0.342		0.504		0.187		0.200		0.180		0.354		0.180		0.543		
Observations		919,008		919,008		919,008		919,008		919,008		919,008		919,008		919,008	

(continued)

Table 7. Regression Analysis of Idiosyncratic Risk with Additional Controls (continued)

Panel C: NASDAQ Firms

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)		
	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value	MarEff
Log Market Risk	0.391	[0.00]	0.210	[0.00]	0.291	[0.00]	0.296	[0.00]	0.334	[0.00]	0.387	[0.00]	0.302	[0.00]	0.312	[0.00]	0.381
Log Market Risk^2	0.034	[0.00]	0.022	[0.00]	0.029	[0.00]	0.028	[0.00]	0.030	[0.00]	0.032	[0.00]	0.029	[0.00]	0.027	[0.00]	0.215
Lag Log Market Risk	0.178	[0.00]	-0.053	[0.00]	0.140	[0.00]	0.119	[0.00]	0.137	[0.00]	0.180	[0.00]	0.142	[0.00]	-0.004	[0.57]	-0.005
Lag Log Market Risk^2	0.016	[0.00]	-0.004	[0.00]	0.014	[0.00]	0.012	[0.00]	0.014	[0.00]	0.016	[0.00]	0.014	[0.00]	0.000	[0.74]	-0.002
Lag Log Illiquidity Ratio	0.109	[0.00]													0.010	[0.00]	0.025
Log Market Risk * Lag Log Illiquidity Ratio	0.005	[0.00]													-0.004	[0.00]	-0.026
Lag Log IdioRisk			0.571	[0.00]											0.426	[0.00]	0.260
Log Market Risk * Lag Log IdioRisk			-0.025	[0.00]											-0.036	[0.00]	-0.082
Lag BookToMarket					0.060	[0.00]									-0.046	[0.00]	-0.021
Log Market Risk * Lag BookToMarket					0.040	[0.00]									0.002	[0.45]	0.003
Lag EarningsToPrice							-0.549	[0.00]							-0.245	[0.00]	-0.036
Log Market Risk * Lag EarningsToPrice							0.128	[0.00]							0.017	[0.01]	0.006
Lag R&D-Share									-0.078	[0.00]					-0.018	[0.07]	-0.007
Log Market Risk * Lag R&D-Share									-0.077	[0.00]					-0.035	[0.00]	-0.029
Lag Log MarketCap											-0.196	[0.00]			-0.090	[0.00]	-0.122
Log Market Risk * Lag Log MarketCap											-0.005	[0.05]			-0.012	[0.00]	-0.084
Lag Leverage	0.079	[0.00]	0.095	[0.00]	0.256	[0.00]	0.111	[0.00]	0.243	[0.00]	0.029	[0.00]	0.323	[0.00]	-0.012	[0.41]	-0.002
Log Market Risk * Lag Leverage													0.037	[0.00]	-0.016	[0.00]	-0.010
Lag Log Cash&STI-to-TA	0.720	[0.00]	0.231	[0.00]	0.634	[0.00]	0.452	[0.00]	0.553	[0.00]	0.582	[0.00]	0.642	[0.00]	0.173	[0.00]	0.031
Return	0.001	[0.99]	0.039	[0.27]	-0.015	[0.81]	0.013	[0.82]	-0.017	[0.78]	-0.009	[0.87]	-0.014	[0.81]	0.044	[0.21]	0.007
Intercept	0.211	[0.00]	-0.184	[0.00]	-0.430	[0.00]	-0.384	[0.00]	-0.360	[0.00]	0.942	[0.00]	-0.413	[0.00]	0.452	[0.00]	
Adjusted R^2	0.329		0.507		0.188		0.218		0.190		0.337		0.186		0.541		
Observations		607,622		607,622		607,622		607,622		607,622		607,622		607,622		607,622	

Appendix A. Variable Definitions

The table shows the names and definitions of the main variables used in the paper.

Variable	Definition
Panel A: Macro economic variables	
Change Credit Spread	First difference of monthly CreditSpread
Change Chicago Fed Index (CFNAITot)	First difference of monthly Chicago Fed Index (CFNAITot)
CreditSpread	BAA - GS10
CRSP Volatility (CRSPVol)	Annualized monthly volatility of CRSP value-weighted market return calculated using daily return observations.
CRSP-VW-Return	Value-weighted CRSP stock market index (incl. dividends)
BAA	Moody's seasoned Baa corporate bond yield provided by Board of Governors of the Federal Reserve System, averages of business days (H.15 release)
GS10	Constant maturity 10-year U.S. Treasury yield provided by Board of Governors of the Federal Reserve System, averages of business days (H.15 release)
NBER Recessions	Equal to 1.0 for months during an NBER-dated recession. 0 otherwise
Chicago Fed Index (CFNAITot)	Chicago Fed National Activity Index: Total. Prior to March 1967, this series is the sum of the subcomponents listed above.
Uncertainty Index	From Kozeniauskas, Orlik and Velkamp (2014)
VIX Index	Implied Volatility Index (CBOE)
Panel B: Firm-level variables	
BookToMarket	(CommonEquity + DeferredTaxesBS)/MarketCap
Cash&STI-to-TA	Cash and Short-term Investments / Total Assets
Change Idio Risk-CLMX	First difference of monthly IdioRisk from CLMX model
Change Idio Risk-MM	First difference of monthly IdioRiskMM
Change Market Risk-CLMX	First difference of monthly MarketRisk from CLMX model
Change Market Risk-MM	First difference of monthly MarketRiskMM
Change Return	First difference of monthly Return
EarningsToPrice	(IncomeBeforeExtraItems + DeferredTaxesIS - PreferredDividends)/ MarketCap
Idio Risk-CLMX	Idiosyncratic risk from CLMX model using daily returns in a month
Idio Risk-CLMX 5 Days	Idiosyncratic risk from CLMX model using daily returns of rolling 5-day returns in a month
Idio Risk-MM	Idiosyncratic risk from market model
IdioEarningsRisk	$((ES_i(t) – MESi(t)) – (ESi(t\text{-}4) – MESi(t\text{-}4))^2$, where $ES_i(t)$ is the earnings-to-sales ratio for quarter t for firm i and MES(t) is the value-weighted average of firm-level $ES_i(t)$ using prior period market capitalization
IdioMarginRisk	$((GPM_i(t) – MGPMi(t)) – (GPMi(t\text{-}4) – MGPMi(t\text{-}4))^2$, where $GPM_i(t)$ is the gross profit margin (defined as net sales or revenues minus cost of goods sold and minus depreciation and amortization, divided by net sales or revenues) for quarter t for firm i and MGPM(t) is the value-weighted average of firm-level $GPM_i(t)$ using prior period market capitalization
IdioProfitRisk	$((P_i(t) – MPi(t)) – (Pi(t\text{-}4) – MPi(t\text{-}4))^2$, where $P_i(t)$ is operating income divided by net sales or revenues for quarter t for firm i and MP(t) is the value-weighted average of firm-level $P_i(t)$ using prior period market capitalization
Illiquidity Ratio	Monthly average of (Absolute Stock Return (stock i)/Trading Volume (stock i))
Leverage	(TotalDebt + PreferredStock) / Size
Log Cash&STI-to-TA	log (1 + Cash&STI-to-TA)
Market Risk-CLMX	Market risk from CLMX model
Market Risk-CLMX 5 Days	Market risk from market model using daily returns of rolling 5-day returns in a month
Market Risk-MM	Market risk from market model using daily returns in a month

(continued)

Appendix A. Variable Definitions (continued)

Variable	Definition
MarketCap	Market capitalization in millions
PctZeroReturns	Percentage of zero returns (%)
R&DShare	Max(R&Dexpense, 0) / (Max(R&Dexpense, 0) + Max(CapEx, 0))
Return	Stock Return
Size	Total debt + Market capitalization
TotalRisk-MM	Total risk (standard deviation of daily returns in a month)

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