2011

Economic Crisis and Share Price Unpredictability: Reasons and Implications

Edward G. Fox
University of Michigan Law School, edfox@umich.edu

Merritt B. Fox
Columbia Law School, mfox1@law.columbia.edu

Ronald J. Gilson
Columbia Law School, rgilson@law.columbia.edu

ECONOMIC CRISIS AND SHARE PRICE UNPREDICTABILITY: REASONS AND IMPLICATIONS

Edward G. Fox*, Merritt B. Fox** & Ronald J. Gilson***

The volatility of share returns for individual companies increased sharply during the recent financial crisis. A portion of this increase is explained by economy wide factors that affect share prices of all stocks in the market. The prospects of all firms are affected by the economy as a whole and so when its future is less predictable, share prices of all firms, not surprisingly, can be expected to jump around more. The larger part of this recent increase in overall share price volatility, however, is due to a dramatic rise – five fold as measured by variance – in "idiosyncratic risk," i.e., an increase in the portion of overall share price volatility that is independent of price changes in the market as a whole. This is an increase in the volatility of each individual firm's daily share price after this price has been adjusted the day's changes in the market index. Thus the increase cannot be explained by changes in predictions concerning the future course of the economy as a whole. Rather we saw a large increase, relative to normal times, in the extent to which an individual firm's share price deviated independently from the change in the market index. So, relative to normal times, on any given good day for the market as a whole, we see far more big losers (and far more super winners), and on any given bad day for the market as a whole, we see far more big winners (and far more super losers). Somehow, during the financial crisis, there is less predictability with respect to those factors helping to

* Ph.D. student in Economics, University of Michigan

** Michael E. Patterson Professor of Law, NASDAQ Professor for the Law and Economics of Capital Markets, Columbia Law School

*** Stern Professor of Law and Business, Columbia Law School, Meyers Professor of Law and Business, Stanford Law School, and European Corporate Governance Institute

determine a firm's cash flows that are specific to each given firm, not just less predictability with respect to the factors that affect the future cash flows of all firms in the economy.

Expanding on earlier work by Campbell et al,[1] we conduct an empirical review, extending back to 1926 and forward to the present, that shows that each major economic downturn in this period has been accompanied by a substantial increase in idiosyncratic volatility. We also break down the study to look at what happens in each of 60 two-digit SIC sectors in the economy to see if differences among them can provide any clues as to what is happening.

We have two goals in this paper. Our first goal is to explain why difficult economic times, which are defined in terms of market wide phenomena, make the future of individual firms more difficult to predict, above and beyond the effects of the more difficult to predict economy as a whole. We explore several possible explanations why crisis times might be different from ordinary times. One is that in crisis times, information about a firm contained in current news may become more important, compared to ordinary times, in predicting its future cash flows relative to the role of the already existing stock of knowledge relevant to making such predictions. A second is that the quality of management becomes more important in crisis times; consequently, the ordinary flow of information about this subject can have bigger impact. A third is that crisis may create uncertainty as to what factors are even important to valuation; because of uncertainty, a broader range of information may be seen to shed light on this question, and therefore move stock prices. A fourth is that the increase in idiosyncratic risk is the result of a bad-times-induced separating equilibrium that reveals which firms have fraudulent or inept managers who were able to mask their problems in the preceding good times and which firms

[1] John Y. Campbell, Martin Lettau, Burton G. Malkiel, and Yexiao Xu, *Have Individual Stocks Become More Volatile: An Empirical Exploration of Idiosyncratic Risk*, 56 J. FIN. 1 (2001).

have been genuinely well managed all along. A fifth is noise trading. We ultimately find the first three explanations more convincing than the latter two.

Our second goal is to explore the implications of our results for corporate and securities litigation, which, over the last few decades, has become increasingly enmeshed with the empirical analysis of the idiosyncratic portion of share returns of the companies involved. This increase has occurred without an appreciation of the increase in idiosyncratic volatility that accompanies bad economic times. In this connection, we consider the determination of loss causation in fraud-on-the-market class actions, the determination of materiality necessary for a trade on non-public information to violate the law, the determination of what items of information should be subject to a mandatory disclosure, and the extent of deference that should be paid to a corporate board that reject acquisition offers at a premium above pre-offer market price.

I. THE EMPIRICAL RECORD

A. The Recent Financial Crisis

From July 2008 to July 2009 the average risk for firms in the S&P 100 that cannot be explained by broad market forces ("idiosyncratic risk") increased about five-fold from the same measure in 2006-2007 and three-fold from that of 2007-2008. While the most extraordinary increases were among financial firms in the index – forty-fold over the two year period – the non-financial firms increased almost four-fold themselves.[2] These results are reported in Table A below and are depicted graphically in Figure 1 at the end of the paper.

[2] Firms in the S&P 100 as of March 9, 2009. This is the date we started the analysis. Our analysis of all firms traded on the NYSE, NASDAQ and AMEX yields similar results.

Table A

Period	Average Annual Company-Specific Volatility (Var)		
	All	**Financial**	**Non-Financial**
July 1, 2005-June 30, 2006	3.5%	1.8%	3.8%
July 1, 2006-June 30, 2007	3.3%	1.7%	3.6%
July 1, 2007-June 30, 2008	5.7%	8.9%	5.4%
July 1, 2008-June 30, 2009	18.2%	74.0%	13.3%

B. Looking Back Over Eight Decades

A relationship between downturns in GDP and idiosyncratic risk was previously noted in a 2001 article by Campbell et al. They find, in a study of data from the thirty-five year period from 1962 to 1997, a sharp increase in idiosyncratice risk at the times of the 1970, 1974, 1980, 1982 and 1991 recessions as well as at the time of the October 1987 market break.[3]

We have performed a similar study, but extended the period covered from 1926 to the present. We find that this pattern of increased idiosyncratic risk associated with poor macroeconomic performance repeats itself throughout this much longer 85-year period, with particularly high levels of idiosyncratic risk at the time of the stock market crash of 1929, the early years of the Great Depression in the early 1930s, the economy's retreat into deep recession in 1937 and during the recent financial crisis. (see Figure 2 at the end of the paper)[4] We also find that idiosyncratic risk increases at times of market boom as well, although the relationship is weaker.

[3] Campbell et al, *supra* note 1, at 13 (figure 4)

[4] We use firm specific risk as calculated in the CAPM model to identify idiosyncratic volatility, which is a somewhat different methodology from that used by Campbell et al. Our results for the period that our study and theirs overlap are very similar, however. See Figure 4 at the end of this paper.

C. Sectoral Analysis

As was seen in table A, the increase in risk in the financial sector dramatically outpaced the non-financial sector. It is therefore reasonable to ask whether among non-financial firms, the overall increase in risk was driven by firms in a few industries, such as construction, that were particularly affected by the structural changes precipitated by the crisis. However, as can be seen in Table B at the end of the paper, there was a substantial increase in average idiosyncratic risk in every one of the 60 industries surveyed.[5] Every industry saw its risk increase more than 50% and in 58 of 60 sectors the risk more than doubled.[6] Moreover, controlling for industry-specific factors, along with those of the broad market, did not alter the results. This means that in explaining the increase in risk we must find causes that apply across all industries.

It may be nonetheless helpful, in assessing causal explanations, to look at what distinguishes the sectors whose risk increased the most. Interestingly, the sectors whose firms had the most exposure to changes in overall performance of the economy prior to the crisis, as measured by the extent to which firm returns co-move with an index of the stock market as a whole ("β"), were not the same sectors whose idiosyncratic risk increased the most. In fact, the opposite is true: those sectors with relatively low βs prior to the crisis saw the largest increase in idiosyncratic risk.

---

[5] Industries are broken down by Two-digit Standard Industrial Classification ("SIC") code. The 15 sectors which contain less than 10 firms during the entire 2004-2009 period are not included, because there is not enough data to reach reliable conclusions.

[6] Codes 60-67 are financial. The largest increases among non-financial firms were hotels, amusement services, lumber, and social services. Three of these sectors were particularly vulnerable to the crisis: spending on the first two is among the first things cut when the economy sputters, and lumber is intimately tied into the health of the building trade. Social services is harder to explain. It is likely a result of only having at most 14 firms in the sector during the period.

Changes in β do have a significant impact on which industries saw the largest increase in risk. In particular, sectors whose exposure to the market increased during the crisis were the ones most likely to see spikes in their risk.[7]

II. POSSIBLE EXPLANATIONS

The Campbell et al article, while presenting its interesting findings, was primarily focused on a long-term secular trend in idiosyncratic volatility, which the authors found to be an increasing portion of total volatility. They did not seek to explain their additional findings concerning the pairing of economic downturns and idiosyncratic volatility that is the focus of our inquiry. This pairing is worthy of further analysis, especially given the dramatic example witnessed during the recent financial crisis and our findings of similar pairings occurring regularly in the 35 years prior to period covered by Campbell et al. Our analysis suggests several possible explanations, each of which merits further investigation.

A. Current News Becomes Relatively More Important

Share price in a rational market reflects investors' predictions of an issuer's future net cash flows. This prediction is based on a large collection of bits of information, much of it accumulated over a period of years but some of which is brand new. The information in the brand new bits, which in an informationally efficient market is unpredictable in the direction of its effect in advance of receipt, is what causes the issuer's share price to fluctuate. How much

[7] The results noted in this paragraph are robust to the inclusion or exclusion of financial firms. This result might lead one to conclude that the observed increase in risk is an artifact of β instability, because mismeasurement of β increases the measured risk. However, if this were the case we should also see an increase in risk in sectors whose β's dropped dramatically during the crisis and we do not. Actually, a sector whose β dropped during the crisis was no more likely to see a relatively large increase in risk than those whose β was unchanged. As a sensitivity check we also measured risk using very short periods (20 trading days) to minimize the possible impact of β instability. The results are very similar to those presented above. Thus it does not appear that β instability is what is driving the measured increase in risk.

price fluctuates depends on the predictive importance of the information content of the new bits of information relative to the predictive value of the previously accumulated bits of information.

A period of economic crisis is likely to make the predictive importance of each day's new bits of information relatively more important. This may be true not just in the case of bits relevant to predicting the future of the economy as a whole. It may be true as well for bits relevant to predicting the future of just the firm in question or of its industry, independent of the influence of the performance of the economy.

One reason for thinking that an economic crisis may enhance the predictive importance of firm specific new bits of information is that an economic downturn might typically be expected to be accompanied by a structural change in the real economy (in part because major downturns are usually the result of some kind of imbalances such as, in the case of the recent financial crisis, an unsustainable level of resources going into residential and commercial real estate and into the financial industry), but the exact nature of this structural change and its implications might not yet be fully understood.

Consider, for example, a not-fully-anticipated quarterly earnings announcement that is off by 10%, one way or the other, from the path that earnings had been following the last few years. This could be due to random, fluke factors not likely to repeat themselves, or it could be due to a change in more enduring factors that will continue to influence the firm's cash flows for many periods to come. While such a not-fully-anticipated quarterly earnings change would almost always have some impact on investor predictions about an issuer's future cash flows and hence on its share price, in normal times investors might assign very substantial weight to the longer term pattern of earnings. Suppose, though, there is disruption and a sense that structural change is occurring in the economy, but with no clear understanding of the nature of the change. The

new piece of information takes on more importance because there is a greater likelihood that the change in earnings is due to new enduring factors, not fluke chance factors. Put differently, in such times the news content of new bits of information has increased at the margin.[8]

A period where the market is rising rapidly, for example during the internet bubble, also may signal disruption and structural change where a new piece of information takes on more importance, and our findings are consistent with this as well.

Statistically, this explanation could be viewed as following. Imagine that you have a barrel with 200 balls in it, some red and the rest green. You are trying to estimate the ratio of red to green. Each period, you randomly draw one ball, note its color, put the ball back in the barrel, and stir it again. After, say, 20 periods, you have a pretty good sense of the ratio in the barrel and you will not change your estimate very much whether the 21st ball is red or green. Suppose then 100 randomly selected balls are taken out of the barrel and substituted for them are 100 new balls, with an unknown ratio of red to green that might quite different than the ratio of the 200 original balls. When you take out the 22nd ball, whether it is red or green will change your estimate of the ratio in the barrel much more.

B. Quality of Management Becomes More Important

In an uncertain overall business environment, the quality of management may have a larger impact on a firm's cash flows. The importance of management of an established firm in troubled times is more like the importance of management of a startup in normal times. In early

[8] The opposite outcome is also possible. If the market has a widely shared model of a company's future cash flows, even a small deviation from expected results may dictate a change in the model of predicted cash flows that would be significant when future cash flows are discounted to present value. For example, failure to meet expected earnings even by a small amount by a company that prides itself on always meeting earnings estimates may signal worse news that a few cents per share. The earnings miss may suggest that despite all efforts to massage the numbers, the company still could not make the estimate, signaling a problem more significant than the small reported earnings shortfall. This is the most rational explanation for large price movements as a result of small failures to make expected earnings. Note that the account is largely driven by the precision of the market's valuation model, the importance of which is taken up in part C.

stage companies, management is important because the companies' value is comprised of future growth options as opposed to existing businesses, in connection with which the management quality has a larger impact on performance. Plausibly, management becomes more important even in mature companies in the wake of a crisis where the predictability of future cash flows drops and the marginal value of management in negotiating that increased uncertainty goes up. Thus, in an uncertain overall business environment, even if the rate of flow of bits of information as to the quality of management and the importance of each bit in revealing this quality stay the same, the significance of each bit in predicting future cash flows becomes more important. Thus, the revelation of each bit causes a bigger share price change.

C. Model Failure: Ignorance Concerning Even What Facts are Relevant

Investors' expectations about an issuer's future cash flows are typically based on an implicit model that tells them something about the meaning and importance of some subset of the vast number of new bits of information that are revealed in the world each day – they have a model of future cash flows through which new information is processed. In a period of financial crisis, investors become less confident that they any longer know what is the range of relevant facts. The existing model no longer works and there is as yet no substitute. As a result of this uncertainty about which factors matter, a much wider range of facts potentially matter, and so stock price moves more frequently as a result of the larger range of now relevant facts. In the face of model uncertainty, new bits of information thus tells investors both something both about the the firm's future cash flow and perhaps also something about the shape of a new model; that is, about the range of information that in the future will be relevant for predicting the firm's cash flows. New information therefore provides marginal information both about future cash flows and about how to evaluate that information. It thus can potentially move price a great deal.

This third explanation differs from our first explanation in that the situation in the first explanation could be fully described in terms of risk while the third explanation resembles more Knightian uncertainty. In terms of the analogy of sampling from a barrel of balls, one still needs to estimate the ratio of the colors of the balls in the barrel, but after the crisis you can no longer even be sure that there are only red balls and green balls after the substitution of the 100 new balls. Balls of other colors also may have been put into the barrel as well. Suppose, after this substitution, the 22nd ball drawn is not red or green, but yellow. The draw tells you not only something about the ratio of balls, it tells you of a whole new kind of information relevant to predicting the contents of the barrel.

D. Swimming Naked When the Tide Goes Out

Good times may permit firms with fraudulent or inept managers to report favorable accounting numbers or even to make good payouts to investors. In such times, it is easy to borrow against the future. In good times, the market knows that there are a certain number of "bad" firms – ones with fraudulent or inept managers – but it knows that in such times the bad firms can mask their managerial problems. As a result, no one can tell which are the bad firms among all the firms in the market. Accordingly, the market in good times discounts all firms in the market a certain amount for the chance that each is a masked bad firm – a pooling equilibrium.

In troubled economic times, the bad firms can no longer hide their defects. The share prices of these bad firms then are substantially (or totally) marked down. The share prices of the rest of the firms in the market are now freed from suspicion, and are marked up. This sorting out would cause idiosyncratic movement in share prices.

The problem with this explanation is that the measure of volatility that we and Campbell et al use is the variance of daily price changes over a given period.[9] While it is worth further econometric exploration, it would seem likely that, for most firms in the sample, much of the daily variance in the idiosyncratic portion of the firm's returns comes from an increase in both the upside and the downside. In contrast, the cleansing effect of bad economic times – revealing which are the bad firms and which are the good ones – would, for any given firm, work in just one direction. It is possible, however, that the phenomenon related to this explanation might interact in some augmenting way with one of the other explanations. As we argued above, for example, information revealing the actual quality of management should matter more in bad times than in good thereby resulting in larger price movements on the revelation.

E. Noise trading

One of the explanations that Campbell et al offer as to the source of the long term secular trend of increased idiosyncratic risk is an increase in noise trading, i.e., trading irrationally based on fads and fashions not reflecting individual fundamental analysis.[10] They point out the increasing role of institutional traders and suggest that these traders form a small, relatively homogeneous group whose sentiments may be influenced by a few common factors.[11] Should this group share a common error in their models, then a large segment of the market will be trading on a variant of noise. They also point to the increasing role of day traders in the 1990s, who may also have engaged in noise trading.

---

[9] The volatility measures in Table A are the variance of daily returns over each of the four one year periods indicated. The measure in each of Figures 1, 2 and 3 is the idiosyncratic variance of daily returns (which are annualized) for a one year period looking backward from the date on the x-axis.

[10] Campbell et al, *supra* note 1, at 40.

[11] We note that this is a very different characterization of noise trading than commonly used in the finance literature. There noise traders are uninformed investors, not sophisticated (even if engaging in herd behavior) institutions. See Andrei Shleifer, Inefficient Markets: An Introduction to Behavioral Finance (2000).

Would noise trading of either variety help explain our results as well? Two questions stand out. First, does irrational noise trading based on firm specific factors in fact increase during troubled times? Here we are doubtful since individual investor, who are treated as a proxy for noise trading in the literature,[12] typically desert the market in times of crisis. Second, even if it does, will this noise trading contribute more to daily volatility than the trading that it replaces that was based on changes in rational expectations arising from new fundamental bits of information? As to Campbell et. al.'s institutional noise traders, we question whether the categorization is helpful. The market may be driven by a shared valuation model that proves to be inaccurate ex post, but this is an example of a failure of fundamental efficiency, which is a quite different thing.[13] Unless, however, the institutional noise traders behave irrationally in the face of the crisis, the phenomenon seems to us captured by the model uncertainty discussed in the prior section. These matters warrant further attention.

Again, however, this explanation, even if not convincing standing alone, more plausibly may combine with one of the other explanations to heighten variance. Thus, for example, noise trading may complement the heightened impact of new information, so that it is the combination of the two factors that is reflected in the increased volatility. As well, if any of the previous explanations explained at least part of the increase in idiosyncratic risk during economic bad times, this increased risk would make more costly the activities of rational arbitrageurs who might otherwise profit by trading against noise traders. This is because the decreased portfolio diversification that such trading requires will add more to the total risk of the arbitrageur's portfolio than would be the case if there were less idiosyncratic risk. Noise trading would

[12] See, e.g., Charles Lee, Andrei. Shleifer, and Richard. Thaler, Investment Sentiment and the Closed-End Fund Puzzle, 46 J.Fin. 75 (1991).

[13] See Ronald J. Glson & Reinier Kraakman, Market Efficiency After the Financial Crisis, working paper, Jan. 2011.

therefore play a larger role in pricing, and, if noise trading is inherently more volatile than trading based on fundamentals, idiosyncratic risk would become even more pronounced.

III. LEGAL IMPLICATIONS

Over the last few decades, financial economics tools and concepts have played an increasing role in corporate and securities law. This increased role has proceeded without an appreciation of the increase in idiosyncratic volatility that accompanies economic bad times, precisely those times when dropping share prices likely will give rise to more plaintiffs' suits. The dramatic, several-fold increase in idiosyncratic risk that accompanied the recent financial crisis brings the existence of this pairing into bold relief. With a new understanding of this phenomenon, to what extent, if any, should the use of these concepts and tools be reevaluated?

A. Fraud-on-the-market suits

Fraud-on-the-market suits allow secondary market purchasers of shares that have been inflated in price by the issuer's material misstatement or omission in violation of Rule 10b-5 to sustain a class action suit for damages without having to prove reliance on the part of each member of the class. These actions, based on alleged violations of Sec. 10(b) of the Securities and Exchange Act of 1934 (the "Exchange Act") and Rule 10b-5 promulgated thereunder, give rise to the bulk of all private litigation damages paid out in settlements and judgments under the U.S. securities laws. In these cases, reliance on the issuer's misstatements is functionally eliminated because each class member is presumed to have relied on the market priced of the security, which in an efficient market will reflect the impact of the issuer's misstatement or omission. This central focus on market price makes changes in volatility important.

Simplifying somewhat, courts in these cases have come typically to require plaintiffs to conduct an event study of the market's reaction when the truth comes out and show that the

original misstatement inflated the issuer's share price and that the plaintiffs suffered a loss as a direct result. This is a showing that has been required at an increasingly early stage in the proceedings.[14]

The starting point is for the plaintiff to conduct an event study to determine the market adjusted change in the issuer's share price at the time that the truth comes out. [15] The magnitude of this market adjusted change must then be compared with the historical record of the ups and downs in the issuer's market adjusted returns. Generally, the plaintiff will fail if, based on this comparison, the event study does not show that there is a less than a 5% chance of observing a market adjusted change of this magnitude as the result of the other kinds of factors that have historically been creating idiosyncratic volatility in the issuer's share returns. More specifically, this test of statistical significance involves a comparison of the size of this market adjusted price change to typical day to day market adjusted movements in price – the standard test requiring this movement to be greater than approximately two standard deviations in the usual day to day market adjusted movement. It is commonplace to measure background volatility over a one year period prior to the disclosure in question.

When there has recently been a large increase in idiosyncratic volatility, consider the consequences of using as a baseline the standard deviation of idiosyncratic fluctuations for a period that includes time prior to this increase. Many more than 5% of the days after this increase will appear statistically significant. Thus, if the truth were announced on one of these

[14] A recent article sympathetic to plaintiffs explains the conclusion that an event study is mandatory for a securities class action case to proceed. See Michael J. Kaufman & John Wunderlich, Regressing: The Troubling dispositive Role of Event Studies in Fraud Litigation, 15 Stan. J. Law, Bus. & Fin. 183 (2009).

[15] The basic steps in conducting an event study are set out in John Y. Campbell, Andrew W. Lo & A. Craig MacKinley, The Econometrics of Financial Markets (1998).

days after the increase, there is a considerably greater than a 5% chance that the drop that day was caused by something other than this revelation of the truth.

If instead the period for measuring the baseline volatility starts with the increase in idiosyncratic volatility, it is likely to include the day or days that the truth is revealed and in addition may not be a long enough period to make reliable estimates of the parameters. The econometrics of this approach, particularly if must take into account changes in volatility during the measuring period, are more difficult. These technical problems make the tests less powerful.

These problems do not disappear even if the period of increased idiosyncratic risk extends long enough and the level of this risk is stable enough to avoid these econometric problems. In such times of increased idiosyncratic risk, a misstatement followed by a revelation of truth that in fact has had some impact on price must have a larger impact on price than in normal times for it to be likely that the observed market adjusted price drop that accompanies the revelation to be considered statistically significant. In simpler terms, the price drop at the time of the revelation of the truth will need to be bigger to be statistically significant, without which the plaintiff's claim fails. There may thus be more situations where a misstatement in fact inflated price that will not, at the time of the revelation of the truth, be accompanied by a price drop that is statistically significant at the 5% level. Presumably, more bad acts will go unpunished and hence undetered.

A response to this concern might be that according to at least some of our explanations of crisis-related increased volatility, the same misstatement made in a period of high idiosyncratic volatility will have a commensurately larger impact on price. So the problem is in essence self correcting. To the extent that these explanations are correct, this self correction must indeed occur with respect to some misstatements. But other misstatements may not have a magnified

influence on price during a crisis. We have reason to continue to be concerned with these non-magnified misstatements as well. One of the functions of these suits is to deter price distorting misstatements because of the role that accurate prices play in guiding actions in the real economy. The absolute level of the distortion is what is important here, not how the distortion compares with some elevated level of overall price volatility.

There are no simple answers to either of the econometric problems discussed here or the higher threshold of change in price necessary for it to be considered statistically significant. In essence, a crisis-induced increase in idiosyncratic risk changes the trade off between false positives and false negatives that arise from using event studies. It thus is worthy of consideration whether this crisis-related change in the trade off calls for altering either the econometrics of how variance is measured for purposes of determining statistical significance or the use of 5% as the proper level of statistical significance. Doing so, however, is more than an econometric problem. The focus on event studies results importantly from the focus on market price to justify eliminating proof reliance on an issuer's misstatements. The centrality of the event study follows from that decision. In the context of real litigation, plaintiffs have the ability to choose the days on which they focus their claims. Decreasing the required level of statistical significance in turn increases plaintiffs' ability to find days that, while statistically significant, may not in fact be related to the claimed misrepresentation. Examining and understanding the intersection of financial econometrics and legal standards requires a nuanced touch informed by both statistics and practice..

A. Insider Trading

If the same kinds of information that insiders typically possess will have a bigger effect on price when they are eventually revealed, this means that insiders will have more opportunities

to profit from insider trading. If event studies are used to determine the materiality of the information and are adjusted to account for the increase in idiosyncratic risk, it is possible that more insider trading will go unpunished, and hence undeterred, for the same reasons as discussed just above.

The changed tradeoffs between false positives and false negatives are similar to that with fraud-on-the-market suits, but it is worth asking whether the policy implications may be different. This is because, unlike with fraud-on-the-market cases, there may not be self correction because of magnification in even some cases the magnification of the impact of a given bit of information is self correcting. Insider trading on a bit of information that in normal times is small enough that we do not worry greatly that it goes unpunished and undeterred will be worth more, and hence pose greater policy concerns, when its absolute impact is magnified in times of crisis. But it will be equally unlikely as in normal times to be accompanied at the time it becomes public by a market adjusted price change that is statistically significant at the 5% level.

C. Mandatory Periodic Disclosure

The appropriate level of required mandatory disclosure represents a cost benefit analysis of the gains from providing more information against the additional costs of doing so. One important purpose of mandatory disclosure is, again, to assure relatively accurate share prices because of the role that accurate prices play in guiding actions in the real economy. If a given piece of information has a magnified impact on price in periods of crisis-induced increased idiosyncratic risk, this fact might call for it to be disclosed when a cost-benefit analysis would not call for it being disclosed in more normal times. Such a change in standards could be accomplished by specific rules asking firms more specific questions during such extraordinary

times, but this is likely to be administratively impractical.[16] Once put into an administrative context, it also raises the issue of how to define the "crisis" whose occurrence triggers the change in standards.

It may be, however, that the current disclosure rules already anticipate this issue. Since 1980, issuers registered under the Exchange Act have been subject to the enhanced "Management's Discussion and Analysis" ("MD&A") disclosure rules. The MD&A rules require in Item 303(a)(3)(ii) that the issuer "describe any trends or uncertainties that have had or that the registrant reasonably expects will have a material favorable or unfavorable impact on net sales or revenues or income" and to report on "events that will cause a material change in the relationship between costs and revenues." Most significantly, the instructions tell issuers to "focus specifically on material events and uncertainties known to management that would cause reported financial information not to be necessarily indicative of future operating results or future financial condition." Thus, if disclosure of a given kind of information becomes more important for predicting future cash flows during crisis-induced increased idiosyncratic risk times, it becomes more likely that the MD&A rules call for its disclosure.

D. Deference to Board Rejections of Premium Acquisition Offers

Tolerance of board decisions to reject and defend against hostile acquisition offers depends in part on how accurate one believes share prices are as a prediction of an issuer's future cash flows if incumbent management remains. If these prices are believed to be relatively accurate, it is harder to justify rejection of an offer at a premium as being in shareholders' best interests. The increase in idiosyncratic risk during times of economic distress suggests that share

[16] To the extent that, as is common, disclosure rules are phrased in terms of materiality, the problem may take care of itself to the extent that "material" is interpreted to mean the potential for a given percentage magnitude impact on price.

prices are less accurate predictors during these periods. Does this mean there should be more deference to the board's view of the offer? Or should we assume that the foresight of the board is degraded to the same extent as is that of the market, particularly to the extent the crisis is general?

IV. CONCLUSION

The volatility of share returns for individual companies increased sharply during the recent financial crisis. The larger part of this increase was due to a dramatic rise – five fold as measured by variance – in idiosyncratic risk. We find that this pattern repeats itself during each major economic reversal going back 85 years. Because idiosyncratic risk is what is involved, this increase cannot be explained by changes in predictions concerning the future course of the economy as a whole.

Our first goal is to explain why difficult economic times, which are defined in terms of market wide phenomena, make the future of individual firms more difficult to predict, above and beyond the effects of the more difficult to predict economy as a whole. One explanation is that in crisis times, information about a firm contained in current news may become more important, compared to ordinary times, in predicting its future cash flows relative to the role of the already existing stock of knowledge relevant to making such predictions. A second is that the quality of management becomes more important in crisis times; consequently, the ordinary flow of information about this subject can have bigger impact. A third is that crisis may create uncertainty as to what factors are even important to valuation; because of uncertainty, a broader range of information may be seen to shed light on this question, and therefore move stock prices. We find less convincing two other possible explanations: noise trading and the idea that the increase in idiosyncratic risk is the result of a bad-times-induced separating equilibrium that

reveals which firms have fraudulent or inept managers who were able to mask their problems in the preceding good times and which firms have been genuinely well managed all along.

Our second goal is to explore the implications of our results for corporate and securities litigation, which, over the last few decades, has become increasingly enmeshed with the empirical analysis of the idiosyncratic portion of share returns of the companies involved. In this connection, we consider the determination of loss causation in fraud-on-the-market class actions, the determination of materiality necessary for a trade on non-public information to violate the law, the determination of what items of information should be subject to a mandatory disclosure, and the extent of deference that should be paid to a corporate board that reject acquisition offers at a premium above pre-offer market price. In each of these areas, we find that there are no simple answers to the question of whether the increase in idiosyncratic risk during periods of crisis would justify a change in practice.

.

Figures:

Figure 1
Idiosyncratic Risk (Variance)
Measured by One Year Backward Looking Periods on Each Date From November 2005 to April 2009

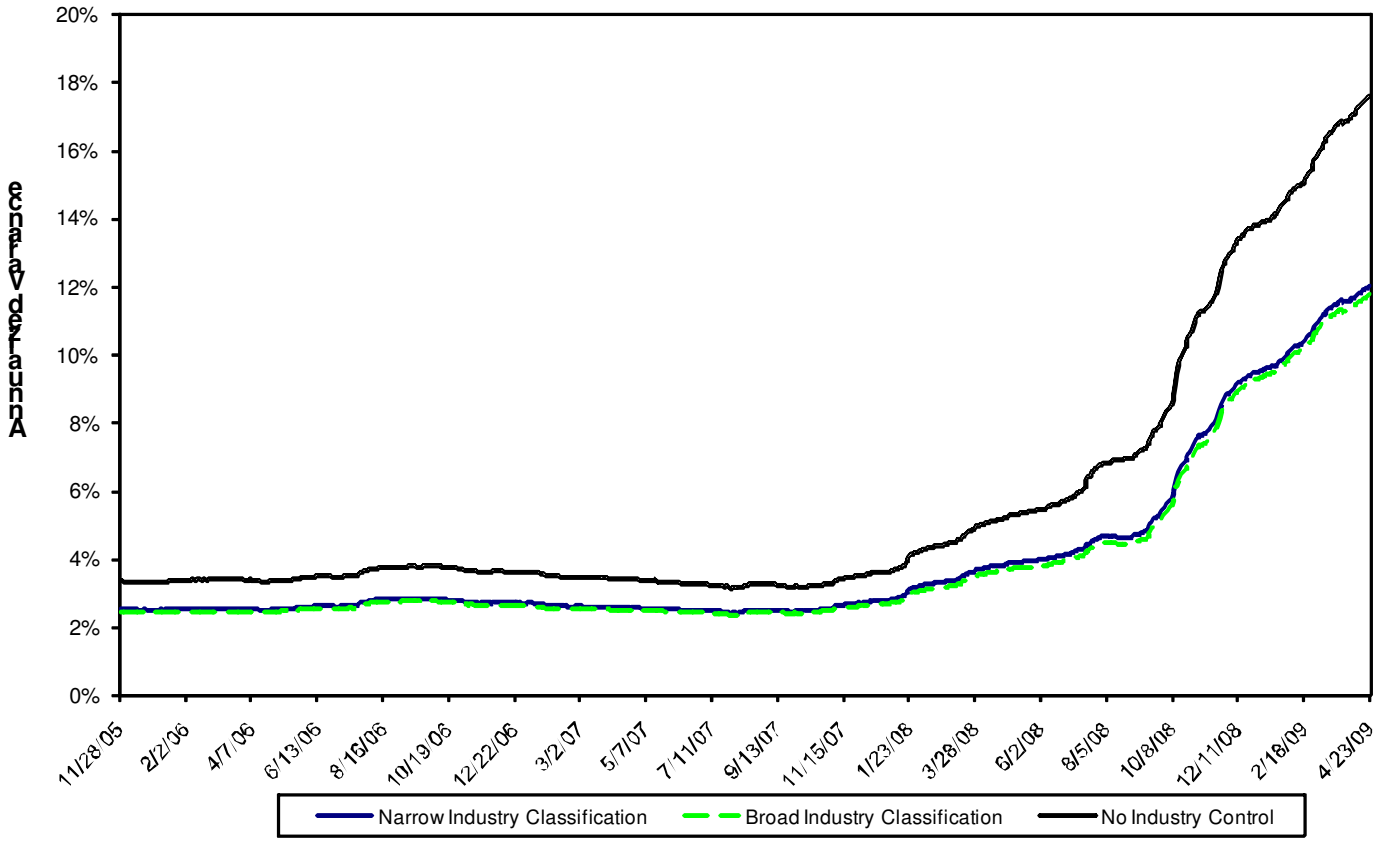

Figure 2
Market-Cap-Weighted-Average Annualized Firm-Specific Risk (Variance)
1925-2009

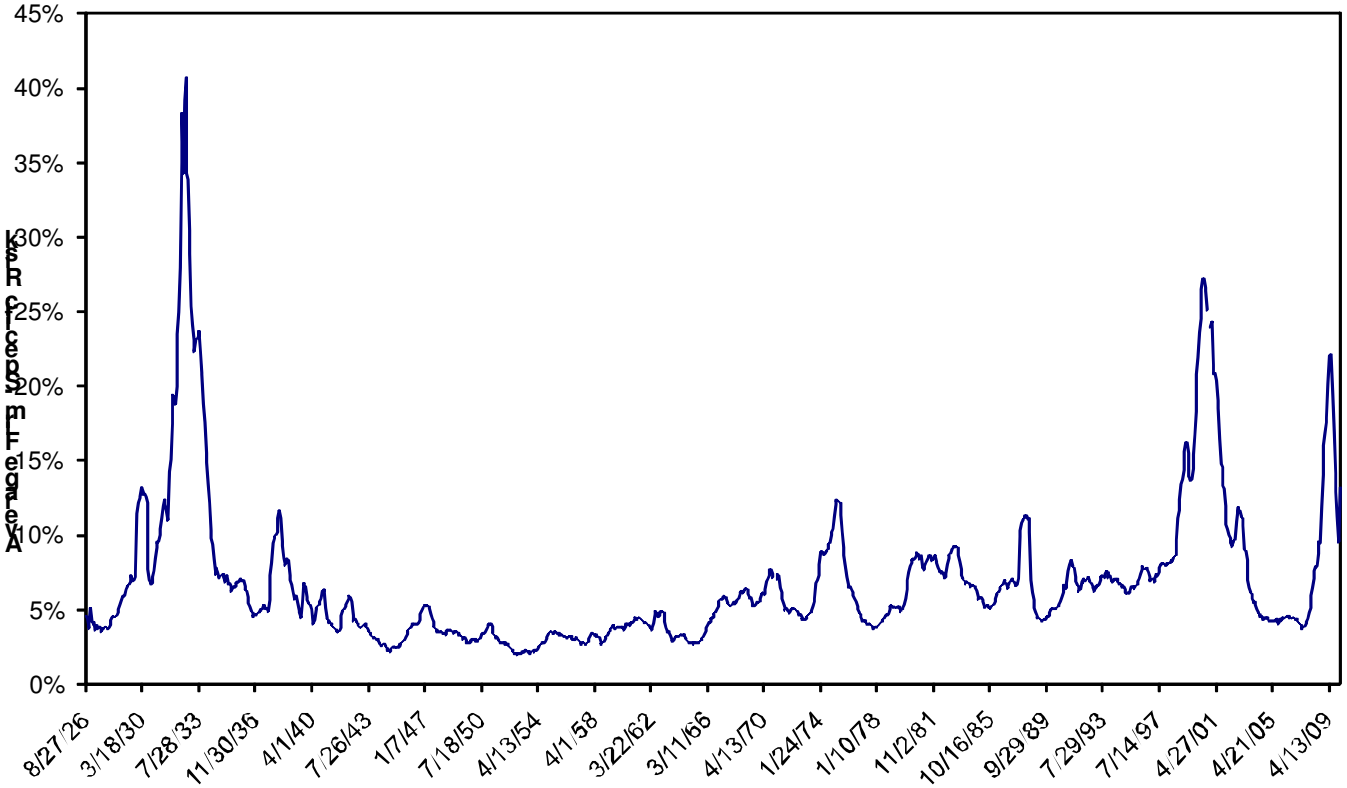

Figure 3
Market-Cap-Weighted-Average Firm-Specific Risk (Variance)
Fox, Fox, and Gilson v. Campbell et al.
1964-1999

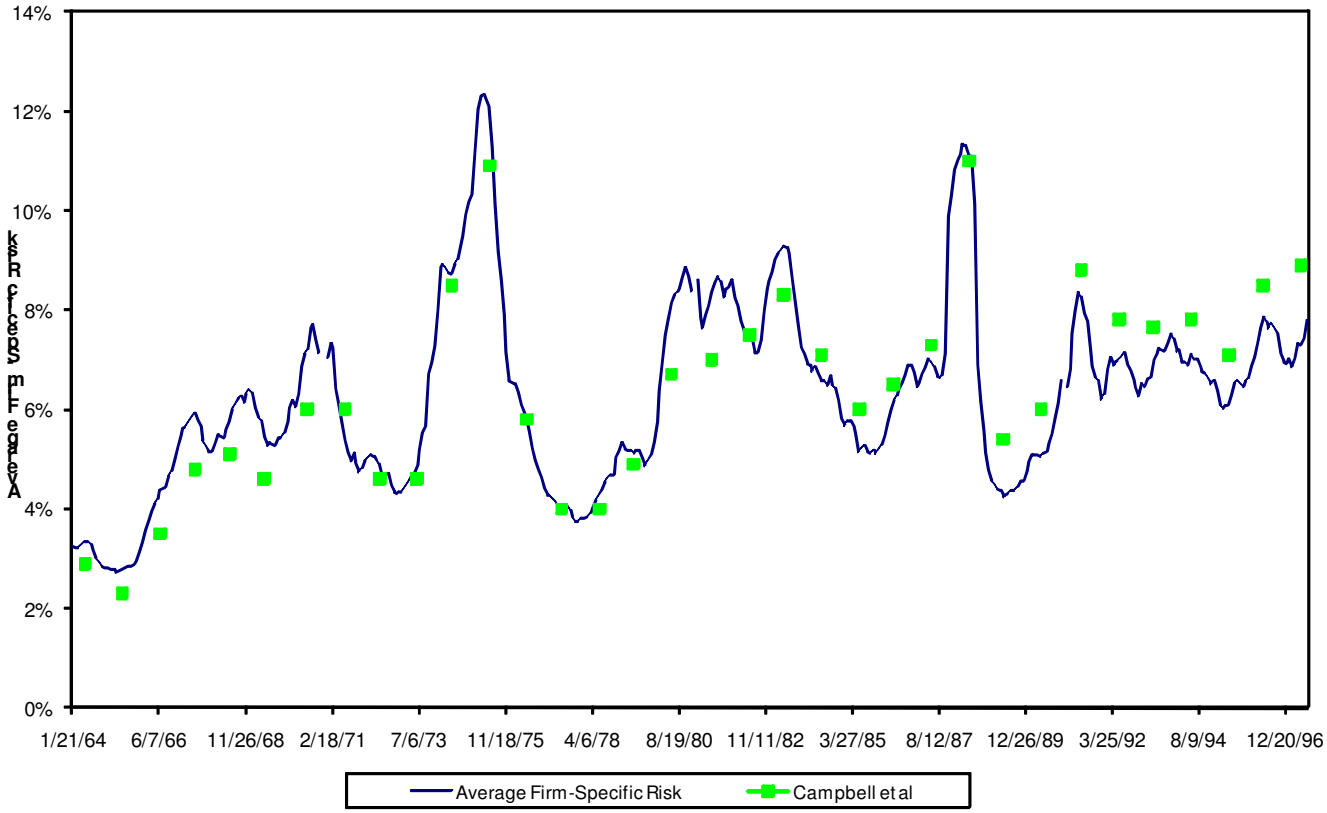

Table B
Idiosyncratic Risk and Co-movement of Returns with the Broad Market
January 2004 to December 2009

	Two Digit SIC Code	Description	Annualized Idiosyncratic Risk of Firms in[1] Each Sector		Ratio of Risk 2008-2009 to 2004-2005	Co-Movement of Returns ("β") with the Broad Market[2]		Change in Co-Movement 2008-2009 to 2004-2005	Max Number of Firms in SIC Code
			Avg. 2004-2005	Avg. 2008-2009		2004-2005	2008-2009		
	(1)	(2)	(3)	(4)	(5) (4)/(3)	(6)	(7)	(8) (7)-(6)	(9)
1)	60	Depository institutions	2.09%	51.84%	24.75	0.88	1.66	0.78	620
2)	64	Insurance agents, brokers	4.18%	65.52%	15.67	0.96	1.71	0.75	21
3)	61	Nondepository credit institutions	4.25%	49.18%	11.56	0.93	1.42	0.49	63
4)	70	Hotels, other temporary lodging	5.21%	47.53%	9.13	1.08	1.67	0.59	30
5)	65	Real estate	6.52%	58.32%	8.95	0.89	1.49	0.60	38
6)	63	Insurance carriers	3.58%	31.32%	8.75	0.82	1.18	0.36	174
7)	67	Holding investment offices	2.40%	20.24%	8.43	0.83	1.13	0.31	1559
8)	83	Social services	10.31%	75.34%	7.31	0.89	1.16	0.27	14
9)	62	Security, commodity brokers	4.07%	29.65%	7.28	1.32	1.60	0.28	80
10)	24	Lumber and wood products	3.88%	25.43%	6.56	1.17	1.44	0.27	12
11)	79	Amusement and recreational services	6.83%	36.53%	5.35	1.12	1.26	0.14	46
12)	46	Pipelines, except natural gas	2.84%	15.02%	5.28	0.46	0.76	0.31	14
13)	44	Water transportation	6.66%	34.39%	5.17	1.11	1.38	0.27	55
14)	45	Transportation by air	8.24%	42.44%	5.15	1.26	1.14	-0.12	39
15)	26	Paper and allied products	4.11%	21.14%	5.14	1.03	0.91	-0.12	45
16)	27	Printing and publishing	3.70%	18.79%	5.08	0.75	1.23	0.48	66
17)	78	Motion pictures	4.41%	22.18%	5.03	0.81	1.04	0.22	23
18)	15	General building contractors	8.46%	39.36%	4.65	1.78	1.39	-0.39	31
19)	12	Coal mining	11.58%	53.90%	4.65	1.70	1.82	0.12	17
20)	32	Stone, glass, and concrete products	8.76%	40.10%	4.58	1.56	1.44	-0.13	28
21)	10	Metal mining	12.87%	57.75%	4.49	1.32	1.14	-0.18	98
22)	55	Car dealers and gasoline stations	6.38%	28.31%	4.44	1.06	0.96	-0.10	23
23)	37	Transportation equipment	4.35%	19.06%	4.38	1.10	1.07	-0.02	99
24)	22	Textile mill products	9.08%	39.40%	4.34	1.14	1.10	-0.04	17
25)	23	Apparel and other textile products	6.49%	27.56%	4.25	1.03	1.09	0.06	33
26)	25	Furniture and fixtures	7.10%	28.14%	3.97	1.01	1.23	0.22	26
27)	48	Communications	4.87%	18.96%	3.89	0.85	0.98	0.13	209

Table B
Idiosyncratic Risk and Co-movement of Returns with the Broad Market
January 2004 to December 2009

	Two Digit SIC Code	Description	Annualized Idiosyncratic Risk of Firms in[1] Each Sector		Ratio of Risk 2008-2009 to 2004-2005	Co-Movement of Returns ("β") with the Broad Market[2]		Change in Co-Movement 2008-2009 to 2004-2005	Max Number of Firms in SIC Code
			Avg. 2004-2005	Avg. 2008-2009		2004-2005	2008-2009		
	(1)	(2)	(3)	(4)	(5) (4)/(3)	(6)	(7)	(8) (7)-(6)	(9)
1)	60	Depository institutions	2.09%	51.84%	24.75	0.88	1.66	0.78	620
2)	64	Insurance agents, brokers	4.18%	65.52%	15.67	0.96	1.71	0.75	21
3)	61	Nondepository credit institutions	4.25%	49.18%	11.56	0.93	1.42	0.49	63
4)	70	Hotels, other temporary lodging	5.21%	47.53%	9.13	1.08	1.67	0.59	30
5)	65	Real estate	6.52%	58.32%	8.95	0.89	1.49	0.60	38
6)	63	Insurance carriers	3.58%	31.32%	8.75	0.82	1.18	0.36	174
7)	67	Holding investment offices	2.40%	20.24%	8.43	0.83	1.13	0.31	1559
8)	83	Social services	10.31%	75.34%	7.31	0.89	1.16	0.27	14
9)	62	Security, commodity brokers	4.07%	29.65%	7.28	1.32	1.60	0.28	80
10)	24	Lumber and wood products	3.88%	25.43%	6.56	1.17	1.44	0.27	12
11)	79	Amusement and recreational services	6.83%	36.53%	5.35	1.12	1.26	0.14	46
12)	46	Pipelines, except natural gas	2.84%	15.02%	5.28	0.46	0.76	0.31	14
13)	44	Water transportation	6.66%	34.39%	5.17	1.11	1.38	0.27	55
14)	45	Transportation by air	8.24%	42.44%	5.15	1.26	1.14	-0.12	39
15)	26	Paper and allied products	4.11%	21.14%	5.14	1.03	0.91	-0.12	45
16)	27	Printing and publishing	3.70%	18.79%	5.08	0.75	1.23	0.48	66
17)	78	Motion pictures	4.41%	22.18%	5.03	0.81	1.04	0.22	23
18)	15	General building contractors	8.46%	39.36%	4.65	1.78	1.39	-0.39	31
19)	12	Coal mining	11.58%	53.90%	4.65	1.70	1.82	0.12	17
20)	32	Stone, glass, and concrete products	8.76%	40.10%	4.58	1.56	1.44	-0.13	28
21)	10	Metal mining	12.87%	57.75%	4.49	1.32	1.14	-0.18	98
22)	55	Car dealers and gasoline stations	6.38%	28.31%	4.44	1.06	0.96	-0.10	23
23)	37	Transportation equipment	4.35%	19.06%	4.38	1.10	1.07	-0.02	99
24)	22	Textile mill products	9.08%	39.40%	4.34	1.14	1.10	-0.04	17
25)	23	Apparel and other textile products	6.49%	27.56%	4.25	1.03	1.09	0.06	33
26)	25	Furniture and fixtures	7.10%	28.14%	3.97	1.01	1.23	0.22	26
27)	48	Communications	4.87%	18.96%	3.89	0.85	0.98	0.13	209

Table B
Idiosyncratic Risk and Co-movement of Returns with the Broad Market
January 2004 to December 2009

	Two Digit SIC Code	Description	Annualized Idiosyncratic Risk of Firms in Each Sector[1]		Ratio of Risk 2008-2009 to 2004-2005	Co-Movement of Returns ("β") with the Broad Market[2]		Change in Co-Movement 2008-2009 to 2004-2005	Max Number of Firms in SIC Code
			Avg. 2004-2005	Avg. 2008-2009	2004-2005	2004-2005	2008-2009		
	(1)	(2)	(3)	(4)	(5) (4)/(3)	(6)	(7)	(8) (7)-(6)	(9)
28)	20	Food and kindred products	2.79%	10.31%	3.69	0.61	0.60	-0.02	114
29)	30	Rubber and misc. plastics products	6.18%	22.62%	3.66	1.00	1.09	0.09	52
30)	31	Leather and leather products	8.87%	32.20%	3.63	1.34	1.03	-0.32	22
31)	49	Electric, gas, and sanitary services	3.40%	11.72%	3.45	0.83	0.77	-0.07	167
32)	56	Apparel and accessory stores	8.32%	27.88%	3.35	1.26	1.07	-0.18	46
33)	57	Furniture, home furnishings and equipment stor	8.14%	26.49%	3.25	1.34	1.07	-0.27	26
34)	72	Personal services	8.09%	24.90%	3.08	0.94	1.11	0.17	22
35)	51	Wholesale trade--nondurable goods	6.70%	20.57%	3.07	0.87	0.85	-0.02	69
36)	40	Railroad Transportation	4.03%	12.00%	2.97	1.19	1.01	-0.18	13
37)	80	Health services	7.30%	21.16%	2.90	0.81	0.77	-0.03	91
38)	39	Misc. manufacturing industries	8.39%	23.66%	2.82	1.07	1.03	-0.04	50
39)	36	Electrical and electronic equipment	6.89%	19.35%	2.81	1.26	1.07	-0.20	446
40)	13	Oil and gas extraction	9.22%	25.74%	2.79	1.31	1.41	0.10	210
41)	53	General merchandise stores	3.87%	10.77%	2.78	0.89	0.63	-0.26	33
42)	16	Heavy construction contractors	11.96%	33.09%	2.77	1.60	1.47	-0.14	16
43)	21	Tobacco manufactures	3.46%	9.41%	2.72	0.75	0.61	-0.14	10
44)	42	Motor freight transit and warehousing	4.76%	12.89%	2.71	1.05	0.88	-0.17	35
45)	99	Unclassified	10.67%	28.87%	2.71	0.48	0.37	-0.11	81
46)	59	Miscellaneous retail	6.66%	17.64%	2.65	1.01	0.82	-0.20	92
47)	28	Chemicals and allied products	6.21%	16.36%	2.63	0.87	0.72	-0.15	444
48)	54	Food stores	6.06%	15.86%	2.62	0.92	0.66	-0.26	24
49)	34	Fabricated metal products	6.58%	16.89%	2.57	1.11	1.14	0.03	57
50)	33	Primary metal industries	11.09%	28.41%	2.56	1.75	1.69	-0.06	65
51)	58	Eating and drinking places	5.33%	13.41%	2.52	0.97	0.74	-0.23	68
52)	87	Engineering and management services	11.34%	28.50%	2.51	1.18	0.99	-0.19	149
53)	35	Industrial machinery and equipment	6.74%	16.85%	2.50	1.18	1.04	-0.15	253
54)	82	Educational services	11.60%	28.83%	2.49	0.94	0.55	-0.39	26
55)	29	Petroleum and coal products	4.06%	9.77%	2.41	1.15	1.04	-0.11	28
56)	50	Wholesale trade--durable goods	8.23%	19.74%	2.40	1.14	0.84	-0.30	132
57)	38	Instruments and related products	7.12%	15.10%	2.12	0.95	0.73	-0.22	295
58)	47	Transportation services	8.00%	16.10%	2.01	1.38	1.03	-0.35	16
59)	73	Business services	8.36%	16.64%	1.99	1.09	0.94	-0.15	599
60)	17	Special trade contractors	14.07%	23.82%	1.69	1.48	1.51	0.03	14

Table B
Idiosyncratic Risk and Co-movement of Returns with the Broad Market
January 2004 to December 2009

Two Digit SIC Code	Description	Annualized Idiosyncratic Risk of Firms in[1] Each Sector		Ratio of Risk 2008-2009 to 2004-2005	Co-Movement of Returns ("β") with the Broad Market[2]		Change in Co-Movement 2008-2009 to 2004-2005	Max Number of Firms in SIC Code
		Avg. 2004-2005	Avg. 2008-2009		2004-2005	2008-2009		
(1)	(2)	(3)	(4)	(5) (4)/(3)	(6)	(7)	(8) (7)-(6)	(9)

Notes and Sources:

Data obtained from CRSP. The 15 sectors which contain less than 10 firms during the entire 2004-2009 period are not included.

[1] As elsewhere in the paper, the idiosyncratic risk is measured using a regression which removes market effects on the return for each firm. This risk measure is calculated once every month measures the risk over a one year period. Thus for each firm we will have a measure of risk for each firm from January 2004 to January 2005, February 2004 to February 2005, …., January 2009 to January 2010.

The risk for a sector is calculated using market capitalization weights. If firm A has capitalization of $1.5b and its sector as a whole has an aggregate market capitalization of $10b, then firm A's idiosyncratic risk will determine 15% of the average idiosyncratic risk of the sector. The risk figures are then averaged over the period listed in columns (3) and (4).

[2] The measure of market co-movement "β" is a market capitalization weighted average calculated in the same way as the idiosyncratic risk. The interpretation of β is the expected percentage movement in the stock of a firm given a 1% move in the broad market. We calculate a β for each firm and then aggregate all the firms in the sector using a market capitalization weighted average. The β's are then averaged over the period listed in columns (6) and (7).

Table C

Percentage Change in Risk as a Function of β and Market Cap

Expanatory Variable(s)	Regression Coefficient	T-Statistic	R^2
Including Financial Firms			
Raw Change in β	10.27	*9.34*	0.60
Absolute Change in β	16.11	*8.44*	0.56
Change in Market Cap	-3.09	*-2.61*	0.11
2004-2005 β	-2.81	*-1.57*	0.04
Raw Change β ***and*** Change in Mkt Cap			
Raw Change in β	9.94	*8.50*	0.61
Change in Market Cap	-0.71	*-0.84*	
Excluding Financial Firms			
Raw Change in β	4.57	*6.49*	0.46
Absolute Change in β	4.55	*2.93*	0.15
Change in Market Cap	-1.38	*-2.89*	0.14
2004-2005 β	-0.45	*-0.61*	0.01
Raw Change β ***and*** Change in Mkt Cap			
Raw Change in β	4.19	*5.94*	0.50
Change in Market Cap	-0.79	*-2.07*	

Level of Risk During Crisis as a Function of β and Market Cap

Expanatory Variable(s)	Regression Coefficient	T-Statistic	R^2
Including Financial Firms			
Raw Change in β	0.26	*4.39*	0.25
Absolute Change in β	0.42	*4.23*	0.24
Change in Market Cap	-0.10	*-1.98*	0.06
2004-2005 β	0.13	*1.90*	0.06
Raw Change β ***and*** Change in Mkt Cap			
Raw Change in β	0.25	*3.85*	0.26
Change in Market Cap	-0.04	*-0.79*	
Excluding Financial Firms			
Raw Change in β	0.16	*1.93*	0.07
Absolute Change in β	0.20	*1.33*	0.03
Change in Market Cap	-0.05	*-1.04*	0.02
2004-2005 β	0.20	*3.23*	0.17
Raw Change β ***and*** Change in Mkt Cap			
Raw Change in β	0.15	*1.70*	0.08
Change in Market Cap	-0.03	*-0.58*	