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IDIOSYNCRATIC RISK DURING ECONOMIC DOWNTURNS: IMPLICATIONS FOR THE USE OF EVENT STUDIES IN SECURITIES LITIGATION

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

Abstract

We reported in a recent paper that during the 2008-09 financial crisis, for the average firm, idiosyncratic risk, as measured by variance, increased by five-fold. This finding is important for securities litigation because idiosyncratic risk plays a central role in event study methodology. Event studies are commonly used in securities litigation to determine materiality and loss causation.

Many bits of news affect an issuer's share price at the time of a corporate disclosure that is the subject of litigation. Because of this, even if an issuer's market–adjusted price changes at the time of the disclosure, one cannot determine with certainty whether the disclosure itself had any effect on price. An event study is used to make a probabilistic assessment of whether in fact it did. Use of event studies generates a certain rate of Type I errors (disclosures that had no actual effect on price being identified as having had an effect) and a certain rate of Type II errors (disclosures that had an actual effect not being identified as such).

This paper sets out a simple model of the tradeoff between these Type I and Type II errors. The model is used to establish three fundamental points. First, an economic crisis can radically worsen this tradeoff by making it much more difficult to catch a disclosure of a certain size without introducing more Type I errors. Second, during crisis periods a relaxation of this standard (and hence an increase in the acceptable rate of Type I errors) may actually decrease Type II errors by less than it would in normal times. We prove that whether the decrease is greater or smaller in crisis times depends on whether the disclosure's actual impact on price is more or less negative than a definable crossover point. Third, whether relaxation of the standard in troubled times would increase or decrease social welfare is ambiguous. It depends on distribution of potentially actionable disclosures in terms of their actual impact on price and the social costs and social benefits of imposing liability for disclosures of each given level of actual negative impact on price.

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In a recent paper, we reported findings that have important implications relating to the use of event studies in securities litigation.[1] During the 2008-09 financial crisis, there was a dramatic increase, across all industries, in the volatility of individual firm share prices after adjustment for movements in the market as a whole. As depicted in Figure 1 and reported in Table A below, for the average firm, idiosyncratic risk, as measured by variance, increased by *five-fold* from the one-year period July 1, 2006 through June 30, 2007 to the one-year period of July 1, 2008 through June 30, 2009.[2] Just as dramatically, idiosyncratic risk dropped back to approximately normal levels by June 30, 2010.[3]

[1] Edward G. Fox, Merritt B. Fox & Ronald J. Gilson, *Economic Crisis and Share Price Unpredictability: Reasons and Implications* (August 12, 2013) (manuscript available for the authors) at 13.
[2] *Id.*
[3] *Id.*

Figure 1

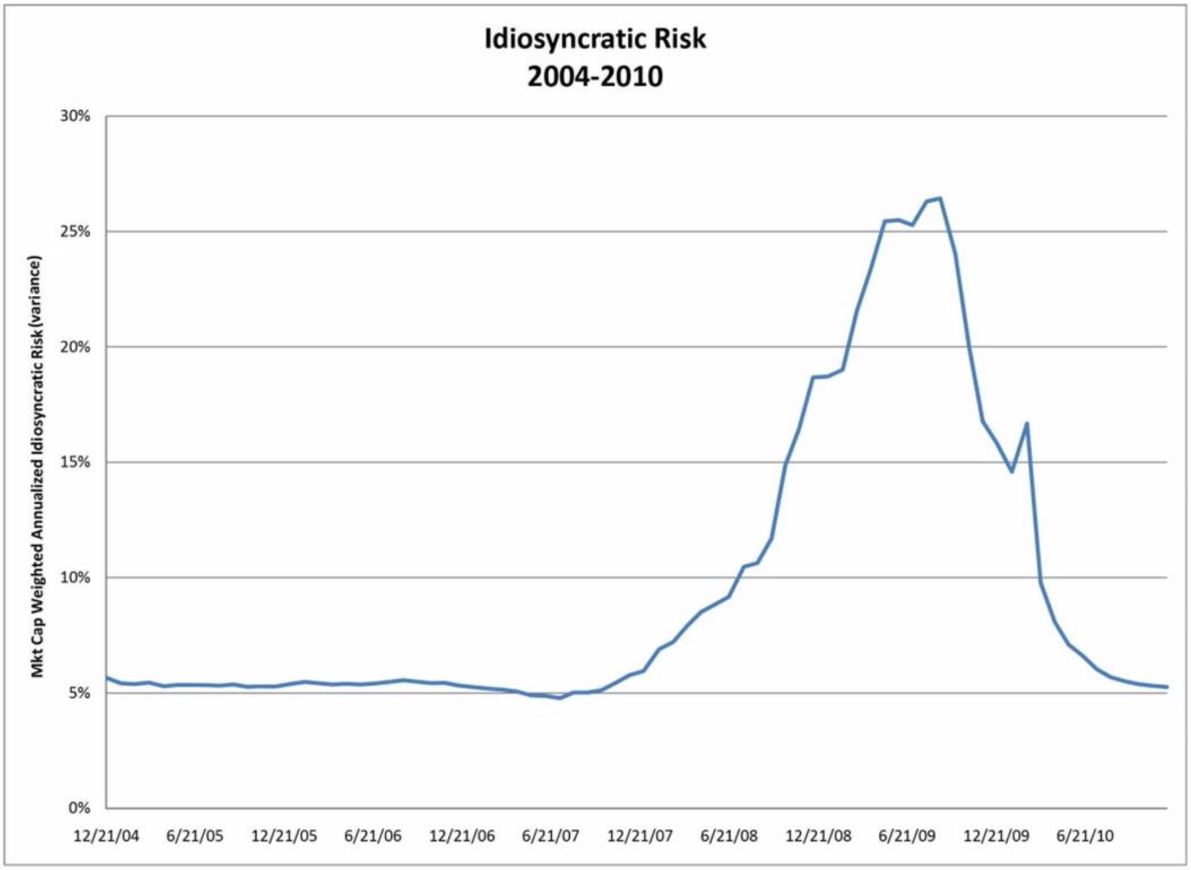
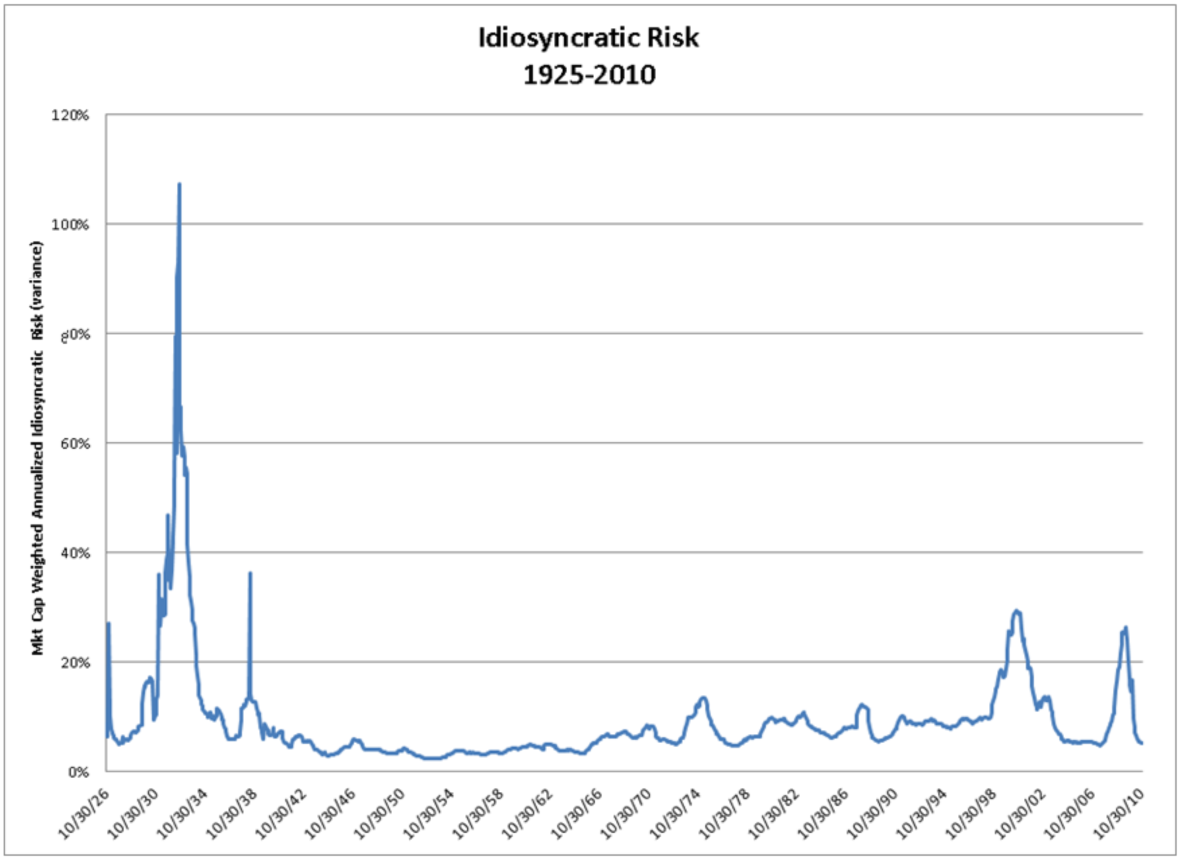


Table A

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%

This turns out to be a recurrent phenomenon. As depicted in Figure 2, looking from 1926 up through the present, we found that the pattern of increased idiosyncratic risk being associated with poor macroeconomic performance regularly repeats itself, 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 the bust of the dot-com boom in 2001.[4]



These results are important for securities litigation because the primary focus of event studies is on idiosyncratic risk. Event studies have grown in the last few decades to play a central role in many kinds of such actions. They are particularly important in class action fraud-on-the-market suits against corporate issuers. These are actions based on the idea that a misstatement by the issuer in violation of Securities Exchange Act of 1934 Rule 10b-5 inflated the price of the issuer's shares thereby damaging investors who purchase the shares at the inflated price and who still hold them after the inflation dissipates. Event studies are the predominate way that plaintiffs in such actions establish the causal link between the Rule 10b-5 violation and their losses, i.e., that the issuer misstatement in fact inflated the prices that they

[4] These results are consistent with those found by Campbell et al. for the 35-year period from 1962 to 1997, where they, as do we, find sharp increases in idiosyncratic risk associated with the 1970, 1974, 1980, 1982 and 1991 recessions as well as with the October 1987 market. 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) at 13 (Figure 4).

paid for their shares.[5] They are also frequently the way that plaintiffs establish the materiality of the misstatements at issue. Event studies have also frequently been used to determine materiality in other kinds of securities actions. These include cases involving claims of insider trading in violation of Rule 10b-5 and cases involving claims by purchasers in public offerings seeking damages under Section 11 of the Securities Act of 1933 for misstatements or omissions in the registration statement. This growing use of event studies has proceeded without an appreciation of the spike in idiosyncratic volatility that accompanies each patch of economic bad times.

An event study is an established tool in financial economics for measuring the effect of an item of news on securities prices.[6] At the time that an item of seemingly negative news relating to a specific issuer becomes public, there are a myriad of other bits of news that also affect the issuer's share price. So the mere fact that the share price moved down simultaneous with the tested item of news becoming public does not prove that the tested item had any negative effect on price.[7] It is possible that the tested item had no negative influence on price and that the observed decline in price is simply the result of the net impact of all these other bits of news. An event study helps sort out the different possible influences on price in order to assess the likelihood that the tested item of news was one of the bits that did in fact influence price negatively.

The starting point for conducting an event study is to determine the market-adjusted change in the issuer's share price at the time of the tested item becomes public. The market-adjusted change is the difference between the observed price change at this time and what the simultaneous change in overall stock market prices predicts would have been the issuer's price change. This prediction is based on the historical relationship (usually over a one year observation period) between price changes in the overall market and price changes of the issuer under study. The point of making this market adjustment is to attempt to remove the influence of bits of news affecting the share price all firms -- i.e., bits of systematic news -- from the observed change in the issuer's share price at the time of the tested disclosure. What is left – the market-adjusted price change – is the portion of the observed change in price that is due to bits of news that relate only to the issuer under study -- i.e., bits of unsystematic news. Because the tested item of information relates specifically to the issuer, if it in fact had any effect on price, it would be among these remaining bits of unsystematic news.

The next step is to determine the likelihood that the tested item of news is one of the remaining bits negatively affecting price after the effects of the systematic bits have been

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[5] 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).

[6] 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).

[7] For simplicity of exposition, the discussion that follows will proceed under the assumption that the question that is legally relevant is whether or not the public dissemination of the item of information being tested had a negative effect on price. A symmetric version of the discussion would be equally valid, however, where the question is whether or not the item had a positive effect on price.

eliminated. This determination is made by comparing the magnitude of the issuer's market-adjusted change on the day that the tested item of news becomes public, with the historical record of the ups and downs in the issuer's daily market-adjusted returns, i.e., with the issuer's historical *idiosyncratic* volatility. Financial economists will often conclude that the market-adjusted price change is "statistically significant" only if its magnitude is sufficiently large 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 firm specific bits of news that have historically been creating idiosyncratic volatility in the issuer's share returns. If the observed change is greater than approximately two standard deviations[8] in the usual day-to-day market-adjusted movement in returns on the issuer's shares, researchers will conclude that there is less than a 5% chance that bits of firm specific news of the kind that historically have been creating idiosyncratic volatility were the sole cause of the price change under study. If the magnitude of the issuer's observed market-adjusted price change is sufficient to pass this test and there are no other identifiable, self-evidently important bits of firm specific information simultaneously becoming available to the market, the observer can, with at least 95% confidence, reject the null hypothesis that the observed market-adjusted price change was due entirely to factors other than the tested item of news. In other words, the observer can reject with this level of confidence the proposition that the tested item had no effect on price.

The foregoing description of event study methodology encapsulates a critical observation. Because there are many other bits of news affecting an issuer's share price at the time that a tested item of news becomes public, we cannot determine for certain whether the tested item in fact impacted price. We instead use an event study to make a probabilistic assessment of whether the item in fact had any effect on price. When applied repeatedly in similar situations, this test will generate a certain rate of false positives ("Type I" errors). Usually a securities litigation is based on the theory that the tested item of news move the price in a particular direction and the evidentiary question is the likelihood that the item in fact moved the price in this direction. For purposes of illustration, we will assume throughout this paper that the theory is that the item moved the price in a negative direction. Type I errors are thus instances where the magnitude of the observed market-adjusted price change at the time the tested item becomes public is sufficiently negative to satisfy the cutoff for statistical significance, but where the tested item of news, in fact, had no negative effect on price. This test will also generate a certain level of false negatives ("Type II" errors). These are situations where the magnitude of the observed market-adjusted price change at the time of the tested item is not sufficiently negative to satisfy the cutoff, but the item in fact did have a negative effect on price. The higher the required level of statistical confidence, the more negative will be the cutoff, and consequently the higher the rate of false negatives and the lower the rate of false positive.

[8] This rule is based on idiosyncratic returns following a normal distribution. In fact these returns are likely not exactly normal. *See, e.g.*, Jonah B. Gelbach, Eric Helland & Jonathan Klick *Valid Inference in Single-Firm, Single-Event Studies*, [forthcoming in ALER]. However, nearly all event studies are performed using the normal distribution and we preserve that assumption here. Since returns are fatter-tailed, the insights of the article seem likely in fact to be strengthened by non-normality.

This paper sets out a simple model of this tradeoff between Type I and Type II errors in the use of an event study to determine whether a corporate disclosure has negatively affected its share price. This model is used to establish three fundamental points. First, an economic crisis can radically worsen the inevitable tradeoff between Type I and Type II errors. If the standard of statistical significance used in normal times is maintained at the same level, a test that in normal times catches most disclosures having, for example, a 5% actual impact on price, would, in times of economic trouble such as 2008-09, catch relatively few. Second, whether relaxing this standard (and hence increasing Type I errors) decreases Type II errors more in troubled times than in normal times depends on the disclosure's actual impact on price. For disclosures with a more negative impact on price than a certain crossover point, Type II errors will be reduced in troubled times. But for disclosures with a less negative impact than this crossover point, the opposite is the case. Third, whether relaxing the standard in troubled times would increase or decrease social welfare is ambiguous and depends on (i) in terms of actual impact on price, the distribution, relative to this crossover point, of disclosures that would generate liability if the market-adjusted price change accompanying the disclosure was sufficiently negative to pass the more relaxed standard, and (ii) the social costs and social benefits of imposing liability with respect to disclosures of each given level of actual negative impact on price.

I. A SIMPLE MODEL RELATING TYPE I ERROR, TYPE II ERROR AND IDIOSYNCRATIC RISK

A. Type II errors

An event study displays Type II error when the actual impact on price ("AI") of the news of the event under study ("AI") is negative but the observed market-adjusted price change ("OC") at the time of the news is not sufficiently negative to allow a rejection, with the specified level of statistical confidence, the null hypothesis that the news of the event had no effect on price. Thus, let:

AI= actual impact of the tested disclosure. We assume there was an impact and that it was negative (AI<0).

OI= the net actual impact of all the other bits of firm specific information influencing share price the same day that are of an ordinary day-to-day nature. OI is distributed normally with a mean of 0 and a standard deviation of SD.

OC = the observed market-adjusted price change, where OC = AI + OI

Because OC = AI + OI, OC will be distributed normally with a mean of AI and a standard deviation of SD:

Z_I = the Z value associated with the acceptable maximum number of Type I errors, where the Z function is a normally distributed random variable with a mean of 0 and a standard deviation of 1

Thus, Z_I would equal -1.96 if no more than 2.5% of Type I errors where the return was highly negative were tolerated (i.e., a two-tailed test at the 95% level of statistical confidence, with -1.96 being the relevant benchmark for examining negative price movements that are statistically significant).

$$OC_C = Z_I \times SD.$$

Thus, OC_C is the least negative value of OC that would pass the test for statistical significance based on the maximum permissible number of Type I errors.

$$Z_C = \frac{OC_C - AI}{SD}$$

$$Z_C = Z_I - \frac{AI}{SD}$$

Z_C is the value of the Z function that corresponds to OC_C after standardizing the distribution of OC (which, as defined above, has a mean of AI and a standard deviation of SD). All values of Z less positive or more negative than Z_C (i.e., to the left of Z_C under the bell-shaped curve) correspond to values of OC that are more negative than OC_C and hence represent observed price changes sufficiently negative to correctly identify the event as having a negative impact on price. All values of Z more positive or less negative than Z_C (i.e., to the right of Z_C under the bell-shaped curve) correspond to values of OC that are less negative than OC_C and hence represent observed price changes insufficiently negative to correctly identify the event as having a negative impact on price and thus represent Type II errors.

> The likelihood of a Type II error = 1 - $\Phi(Z_C)$, where Φ is the cumulative density function (the "CDF") of the normal distribution with mean of zero and a standard deviation of one (the standard normal cumulative density function).[9]

Φ is a increasing function of Z and corresponds to the probability under the normal distribution's bell-shaped curve to the left of the Z value in question. *Thus the more negative or less positive*

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[9] This can be demonstrated as follows:

Pr(Correctly Identifying AI as distinct from ordinary day) = $\Pr(OC<OC_C)$

Pr(Type II) = 1- Pr(Correctly Identifying AI as distinct from ordinary day) = 1- $\Pr(OC<OC_C)$

Pr(Type II) = 1- $\Pr(AI+OI< Z_I \times SD)$ (note $AI+OI \sim Normal(AI, SD^2)$)

Pr(Type II) = 1- $\Pr(OI< Z_I \times SD - AI)$ (note $OI \sim Normal(0, SD^2)$)

Pr(Type II) = 1- $\Pr(\varepsilon< Z_I – AI/SD)$ (where $\varepsilon= OI/SD$; $\varepsilon \sim Normal(0,1)$)

Pr(Type II) = 1-$\Phi(Z_C)$

Z_C, the smaller $\Phi(Z_C)$ and the greater the likelihood of Type II error. This leads to three important conclusions:

(i) *The greater SD, for any given AI, the greater the likelihood of Type II error*. This is because $Z_C = Z_I - AI/SD$ and AI is a negative number and SD is a positive number. So the greater SD, the more negative or less positive will be Z_C.

(ii) *The smaller the actual negative impact of the event, i.e., the less negative AI, the greater the likelihood of Type II error.* This is because $Z_C = Z_I - AI/SD$ and AI is a negative number and SD is a positive number. So the less negative AI, the more negative or less positive will be Z_C.

(iii) *The higher the level of statistical significance and hence the lower the acceptable maximum Type I error rate, the greater the likelihood of Type II error*. This is because $Z_C = Z_I - AI/SD$ and AI is a negative number and SD is a positive number. So the more negative Z_I, the more negative or less positive will be Z_C.

B. Type I errors

In the context of the use of event studies in securities litigation, if an event on its face appears negative, a reasonable simplifying assumption is that news of the event has an actual impact on price that is either 0 or negative, not positive. If so, then an event study can generate Type I error only when AI = 0 because there will be no possible positive values of AI that we will need to consider. Type I error occurs then when AI = 0 but $OC<OC_C$. By definition, the Type I error rate will therefore correspond to the chosen standard of statistical confidence. Thus, for example the Type I error rate would be 2.5% for a two tailed test at the 5% significance level with -1.96 being the relevant benchmark for examining negative price movements that are statistically significant).[10]

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[10] The same setup can be used to analyze the effect of Type I errors without this simplifying assumption. Under these more general conditions, Type I error occurs when the AI = 0 or is > 0, and $OC< OC_C$.

A standard of statistical significance, with its corresponding Z_I is defined in terms of the percentage of false positives when AI = 0. Again the relevant formula is $Z_C = Z_I - AI/SD$. When AI = 0, $Z_C = Z_I$ and Type I error equals the amount of probability under the normal distribution's bell-shaped curve to the left of the Z_I.

The likelihood of a Type I error = $\Phi(Z_C)$, where Φ is the cumulative density function of the normal distribution with a mean of zero and a standard deviation of one (the standard normal CDF).

Again, Φ is a positive function of Z and corresponds to the amount of probability under the normal distribution's bell-shaped curve to the left of the Z value in question. Thus the more negative Z_C, the smaller $F(Z_C)$ and the smaller the likelihood of Type I error.

If AI>0, because $Z_C = Z_I - AI/SD$ and AI is a positive number, for any given AI, the greater SD, the less negative will be Z_C and hence the greater the likelihood of Type I error.

II. THE EFFECT OF AN ECONOMIC-CRISIS INDUCED SPIKE IN IDIOSYNCRATIC RISK ON THE TYPE I/TYPE II ERROR TRADEOFF

This section considers what happens to the Type II error rate with respect to an event with an actual negative impact of -5%, which is often considered by securities lawyers as a rough-rule-of-thumb starting point making a materiality determination. We assume that a "strict" 95% required level of statistical confidence (i.e., a maximum Type I error rate of 2.5%) is retained when an economic crisis boosts idiosyncratic risk sharply above its normal level.

Based on the empirical record for the period from the 1970s up until the financial crisis, we set the daily standard deviation in the typical firm's market-adjusted price in this "normal" period equal to 1.78%.[11] Similarly, we set the daily standard deviation in the typical firm's market-adjusted price during the "volatile" period at the height of the financial crisis, July 1, 2008 through June 30, 2009 equal to 3.23%.[12] So,

Z_I = -1.96% (so in a two-tailed test, the maximum number of (negative) Type I errors is 2.5%).

SD_N = standard deviation during normal times = 1.78%

SD_V = standard deviation during volatile times = 3.23%

Similarly, because $Z_C = Z_I - AI/SD$, the more positive AI, i.e., the more positive the impact of the corrective disclosure on price, the more negative will be Z_C and hence the smaller the likelihood of Type I error.

Finally, because $Z_C = Z_I - AI/SD$, the less negative Z_I, i.e., the lower the level of statistical significance and hence the higher the acceptable maximum percentage of false positives when AI = 0, the less negative will be Z_C for any positive AI. Thus, for a corrective disclosure with a given positive AI, the less negative the observed market-adjusted price change needs to be for it to be considered statistically significant and thus the greater the likelihood of Type I error.

[11] See Fox, Fox & Gilson, *supra* note 1, at 35. The market-cap-weighted average firm specific volatility, as measured by variance, from the 1970s up until the financial crisis was in the range of 6-10% during normal years, with an average of approximately 8%. This annualized variance translates to a daily "standard error" of 1.78%. Our calculations in our earlier paper of these annual figures are based on daily data and so it is these annual variances that are interpolated using the following mathematical formula: $Var(\sum_{i=1}^{252} \varepsilon_i) = 252 * Var(\varepsilon_i)$ where $\sum_{i=1}^{252} \varepsilon_i$ is the sum of the market-adjusted returns on each of the 252 trading days each year, and thus the left hand side is the annual variance of market-adjusted returns. The equality flows because the market-adjusted returns will be independent of one another in an efficient market. A reader can back out the daily variance by dividing the annualized numbers by 252. The daily standard error is the square root of the daily variance. Due to the non-linearity of variance, this is not the exact figure that we yield after market cap weighting the standard errors of the individual firms but this difference is relatively minor.

[12] *Id.* at 44.

From this, we can calculate the respective cutoff values for normal and volatile times if, as assumed, the strict test allowing only 2.5% Type I errors is maintained:

OC_{CN} = Z_I x SD_N (the cutoff in normal times) = -1.96 x 1.78 = -3.5%

OC_{CV} = Z_I x SD_V (the cutoff in volatile times) = -1.96 x 3.23 = -6.33%

In turn, each of these two cutoff values has respectively associated with it a normalized (0 mean, standard deviation of 1) Z value:

$$Z_{CN} = Z_I - AI/SD_N = = -1.96 - \frac{-5.0}{1.78} = \quad .85$$

$$Z_{CV} = Z_I - AI/SD_V = = -1.96 - \frac{-5.0}{3.23} = -.41$$

The likelihood of a Type II error in normal times = 1 - $\Phi(Z_{CN})$ = 1 – $\Phi(.85)$ = 1 - .802 = .198

The likelihood of a Type II error in normal times = 1 - $\Phi(Z_{CN})$ = 1 – $\Phi(-.41)$ = 1 - .340 = .660

Thus, if the Type I error rate is maintained at 2.5%, the Type II error rate jumps in crisis times from 19.8% to 66%. In other words, in high volatility times resembling the 2008-09 financial crisis, only a bit more than one in three disclosures that actually affected an issuer’s price by 5% would pass the test of being considered statistically significant at the 95% level, compared with better than four out of five passing the test in normal times.

III. The Effect of Increase in Idiosyncratic Volatility on How Much Type II Errors are Reduced by Increasing the Maximum Acceptable Level of Type I Errors

This part of the paper considers what happens in terms of Type II errors from a shift from a “strict” test (i.e. from a lower maximum number of allowable Type I errors and thus a higher required standard of statistical confidence level) to a “lax” test (i.e., to a higher maximum allowable Type I errors and thus a lower required standard of statistical confidence) in highly volatile times compared to what happens from such a shift in normal times. We conclude that in volatile times the shift can lead to either a larger or smaller decrease in Type II errors than in normal times, depending on how negative the impact of the tested disclosure is, i.e., how negative AI is.

Consider the following additional definitions:

Z_{IS} = the Z value associated with the acceptable maximum number of Type I errors concerning the existence of a negative AI under the strict regime. For example, Z_{IS} would equal -1.96 if the maximum number of (negative) Type I errors is 2.5%.

Z_{IL} = the Z value associated with the acceptable maximum number of Type I errors concerning the existence of a negative AI under the lax regime. For example, Z_{IL} would equal -1.64 if no more than 5% of (negative) Type I errors were tolerated.

SD_N = standard deviation during normal times

SD_V = standard deviation during volatile times

This suggests four different cutoff values in terms of what the least negative OC, i.e., the observed market-adjusted price change that would pass the test in terms of the maximum allowable number of Type I errors:

$OC_{CLN} = Z_{IL} \times SD_N$ (the cutoff for the lax test in normal times)

$OC_{CSN} = Z_{IS} \times SD_N$ (the cutoff for the strict test in normal times)

$OC_{CLV} = Z_{IL} \times SD_V$ (the cutoff for the lax test in volatile times)

$OC_{CSV} = Z_{IS} \times SD_V$ (the cutoff for the strict test in volatile times)

Note OC_{CLN} will be the largest (least negative) and OC_{CSV} will be the smallest (most negative). In turn, each of these four cutoff values has respectively associated with it a normalized (0 mean, standard deviation of 1) Z value:

$Z_{CLN} = Z_{IL} - AI/SD_N$

$Z_{CSN} = Z_{IS} - AI/SD_N$

$Z_{CLV} = Z_{IL} - AI/SD_V$

$Z_{CSV} = Z_{IS} - AI/SD_V$

The reduction in the likelihood of Type II error in moving from the strict test to the lax test in normal times equals:

$$\text{Reduction N} = [1 - \Phi(Z_{CSN})] - [1 - \Phi(Z_{CLN})] = \Phi(Z_{CLN}) - \Phi(Z_{CSN})$$

The reduction in the likelihood of Type II error in moving from the strict test to the lax test in volatile times equals:

$$\text{Reduction V} = [1 - \Phi(Z_{CSV})] - [1 - \Phi(Z_{CLV})] = \Phi(Z_{CLV}) - \Phi(Z_{CSV})$$

The difference between the reduction in Type II error by moving to the lax standard in volatile times versus normal times is thus:

$$\Delta\text{Reduction} = \text{Reduction V} - \text{Reduction N} = [\Phi(Z_{CLV}) - \Phi(Z_{CSV})] - [\Phi(Z_{CLN}) - \Phi(Z_{CSN})]$$

The object of our inquiry is whether ΔReduction is positive (i.e., moving to a lax standard results in a bigger reduction in Type II error in volatile times) or negative (i.e., moving to a lax standard results in a smaller reduction in Type II error in volatile times)

The critical thing to note is that:

$$Z_{CLV} - Z_{CSV} = Z_{CLN} - Z_{CSN} = Z_{IL} - Z_{IS}$$

(i.e., the difference in the Z values associated with the lax test versus the strict test) because

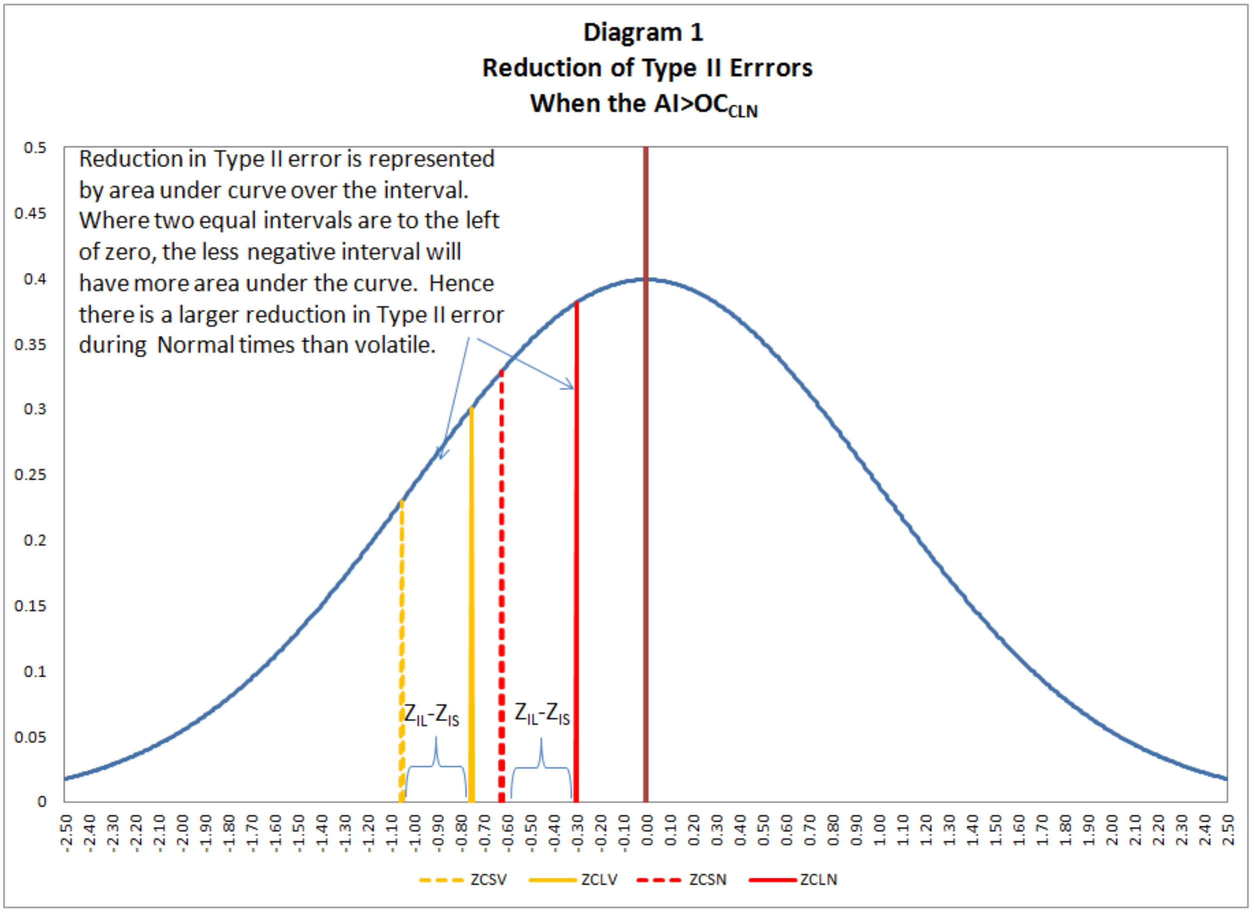
$$Z_{CLV} - Z_{CSV} = [Z_{IL} - AI/SD_V] - [Z_{IS} - AI/SD_V] = Z_{IL} - Z_{IS}$$

$$Z_{CLN} - Z_{CSN} = [Z_{IL} - AI/SD_N] - [Z_{IS} - AI/SD_N] = Z_{IL} - Z_{IS}$$

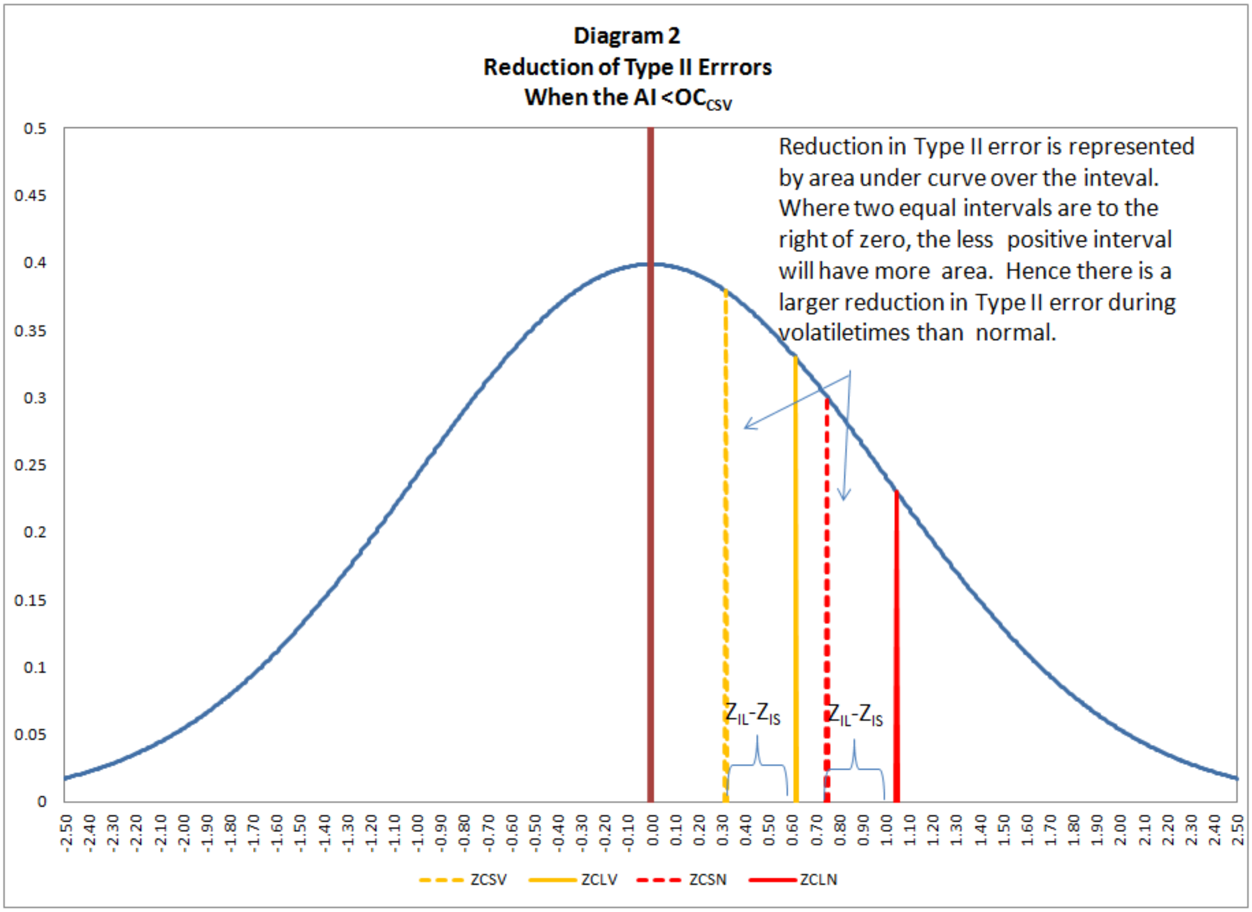
Thus Reduction N and Reduction V each involve the same change in the argument of the Φ function. The difference in the Φ value thus depends only on where along the function this change occurs. In other words, in each of normal and volatile times, the reduction in Type II error is represented by the difference in the value of the cumulative density function (the "CDF") of the standard normal distribution between such time's Z_C for strict and lax tests.

A. A comparison of the effect with a slightly negative AI versus a highly negative AI.

As demonstrated more formally below, consider first where the tested disclosure has a relatively small actual negative impact on price, i.e., where AI is negative by a relatively small amount, such that it is less negative than all the cutoffs, OC_{CLN}, OC_{CLV}, OC_{CSN}, and OC_{CSV} (i.e. $AI>OC_{CLN}$). Recall that for any given AI, OC is a normally distributed random variable with a mean of AI. These cutoffs would thus all be values of OC that are below this mean. Hence the cutoffs all correspond to Z values that are to the left of 0 and are all negative. Since Z_{CSV} is to the left of Z_{CSN}, the difference in the CDF evaluated at Z_{CSV} to Z_{CLV} will be less than the area under the curve running from Z_{CSN} to Z_{CLN}. Thus for AIs of this size, a switch to a lax regime, with its given increase in Type I error will in volatile times yield a smaller reduction in Type II error than the same switch in normal times. This is illustrated in Diagram 1 below.



The mirror opposite analysis applies where the tested disclosure has a relatively large negative impact on price, i.e., where AI is sufficiently negative that it is more negative than all the cutoffs, OC_{CLN}, OC_{CLV}, OC_{CSN} and OC_{CSV} (i.e. $AI<OC_{CSV}$). These cutoffs would thus all be values of OC that are above this mean. Hence the cutoffs all correspond to Z values that are to the right of 0 and are all positive. Since Z_{CSV} is to the left of Z_{CSN}, the difference in the CDF between Z_{CSV} and Z_{CLV} will be more than the difference between Z_{CSN} and Z_{CLN}. Thus for AIs of this size, a switch to a lax regime, with its given increase in Type I error will, in volatile times, yield a greater reduction in Type II error than the same switch in normal times. This is illustrated in Diagram 2 below.



More formally, when AI is sufficiently small in magnitude that $OC_{CLN} < AI$ (recall both are negative), then:

$$Z_{CLN} < 0 \text{ since } AI > OC_{CLN} \rightarrow AI > Z_{IL} \times SD_N \rightarrow AI/SD_N > Z_{IL} \rightarrow Z_{CLN} < 0$$

Because $Z_{CSN} = Z_{IS} - AI/SD_N$, $Z_{CLN} = Z_{IL} - AI/SD_N$, and $Z_{IS} < Z_{IL}$,

$$Z_{CSN} < Z_{CLN}$$

Because $Z_{CSV} = Z_{IS} - AI/SD_V$, $Z_{CSN} = Z_{IS} - AI/SD_N$, $AI < 0$, and $SD_V > SD_N$,

$$Z_{CSV} < Z_{CSN}$$

So $Z_{CSV} < Z_{CSN} < Z_{CLN} < 0$. For values of $Z < 0$, the CDF of the standard normal distribution is convex (i.e., the second derivative of Φ, $d\Phi'/dZ > 0$) and so the increase in cumulative probability (i.e., the decrease in the probability of a false negative) is less going from Z_{CSV} to Z_{CLV} (the more negative interval) than from Z_{CSN} to Z_{CLN} (the less negative interval of the same length). Thus ΔReduction is negative.

When AI is sufficiently negative that AI < OC_{CSV}, then $0 < Z_{CSV}$ and the mirror opposite analysis occurs. $0 < Z_{C\,SV} < Z_{CSN} < Z_{CLN}$. For values of Z > 0, the CDF of the standard normal distribution is concave (i.e., the second derivative of Φ, dΦ'/dZ < 0 and so the increase in cumulative probability (i.e., the decrease in the probability of a false negative) is more going from Z_{CSV} to Z_{CLV} (the less positive interval) than from Z_{CSN} to Z_{CLN} (the more positive interval of the same length). Thus ΔReduction is positive.

B. *An example: For an AI = -5%, a comparison of the decrease in Type II errors from moving from the 95% to 90% standard of statistical confidence (and hence from 2.5% to 5% acceptable (negative) Type I error rate) in normal times (the average volatility for the typical firm for the period from the 1970s until the financial crisis) and doing so in volatile times (the volatility during the peak of the financial crisis)*

Assume an AI of -5%.

As above, based on the empirical record we set "normal" period volatility equal to 1.78%. Similarly, we set the daily standard deviation in the typical firm's market-adjusted price during the "volatile" period at the height of the financial crisis, July 1, 2008 through June 30, 2009, equal to 3.23%.

1. *The lowering of the standard in normal times*

SD_N = 1.78%, Z_{IS} = -1.96 and Z_{IL} = -1.64. Therefore,

$$Z_{CSN} = Z_{IS} - AI/SD_N = = -1.96 - \frac{-5.0}{1.78} = \quad .85$$

$$Z_{CLN} = Z_{IL} - AI/SD_N = = -1.64 - \frac{-5.0}{1.78} = \quad 1.17$$

Φ(.85) = .802. Φ(1.17) = .879. The reduction in Type II error is .077, from about 20% to about 12%, or about 8%

2. *The lowering of the standard in volatile times*

SD_V = 3.23%, Z_{IS} = -1.96 and Z_{IL} = -1.64. Therefore,

$$Z_{CSV} = Z_{IS} - AI/SD_V = = -1.96 - \frac{-5.0}{3.23} = \quad -0.41$$

$$Z_{CLV} = Z_{IL} - AI/SD_V = = -1.64 - \frac{-5.0}{3.23} = \quad -0.09$$

Φ(-.41.) = .341 Φ(-.09) = .464. The reduction in Type II error is .123, from about 66% to about 54%, or about 12%

Thus, a disclosure with an actual price impact of -5% has a sufficiently negative impact that the switch to the lax standard reduces Type II errors more in volatile times than in normal ones.

C. The minimum negative AI (the "Type II Error Crossover Point") for a move from strict to lax (95% to 90% standard of statistical confidence and hence from 2.5% to 5% Type I error) that will yield a bigger decline in Type II error in volatile times (peak of financial crisis) than in ordinary times (post 70s normal).

Set ΔReduction = 0

$$0 = [\Phi(Z_{CLV}) - \Phi(Z_{CSV})] - [\Phi(Z_{CLN}) - \Phi(Z_{CSN})]$$

$$= [\Phi(Z_{IL} - AI^*/SD_V) - \Phi(Z_{IS} - AI^*/SD_V)] - [\Phi(Z_{IL} - AI^*/SD_N) - \Phi(Z_{IS} - AI^*/SD_N)]$$

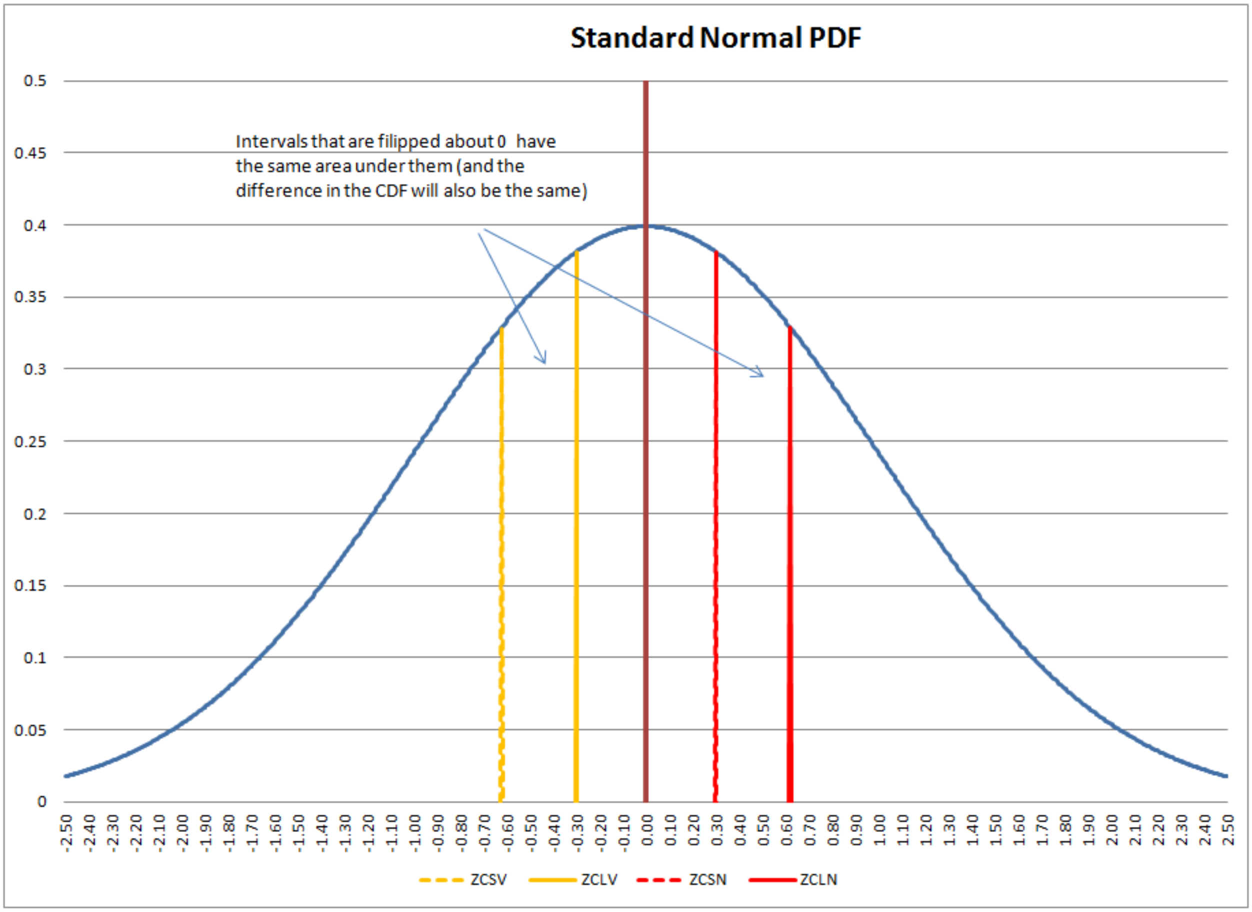
Solving this formula for AI^* gives the value of the Type II Error Crossover point. For AI values more negative than AI^*, moving to a laxer test in a period of heightened volatility reduces Type II error more than the same move in normal volatility times. For AI* values below the crossover point, the opposite is the case.

Filling in the known variables, in the case of a move from the 95% standard to the 90% standard when idiosyncratic risk increases from the normal level to the peak of the financial crisis level and rearranging

$$[\Phi(-1.64 - AI^*/3.23) - \Phi(-1.96 - AI^*/3.23)] = [\Phi(-1.64 - AI^*/1.78) - \Phi(-1.96 - AI^*/1.78)]$$

A formal solution to this problem looks difficult, but the problem can be first approached conceptually by thinking through how things would look under the bell-shaped curve, as illustrated in Diagram 3 below. At the crossover point, the decrease in Type II errors is the same in normal and volatile times. The intervals under the bell-shaped curve corresponding to the drop in standard respectively in volatile and normal times are the same length. They must be located symmetrically around the mean of 0. This is because the difference in the CDF (or equivalently in the area under the probability density function (PDF) of the two intervals) will be the same only if the intervals are the mirror opposites of the other (e.g., one interval runs from -.6 to -.3 and the other runs from .3 to .6 or one interval runs from -.2 to +.1 and the other runs from -.1 to +.2). When the areas are the same, the reduction in Type II errors is the same.

Diagram 3



This point can be formalized and a formula derived for AI^*, the Type II Error Crossover Point, given the strictness of the stricter test, the laxness of the laxer test and the standard deviations for normal and volatile times.

For ΔReduction = 0, $Z_{CLN} = -Z_{CSV}$ because that is where the bands are located symmetrically around 0 below the curve. Thus:

$$Z_{IL} - AI^*/SD_N = -(Z_{IS} - AI^*/SD_V)$$

$$= -Z_{IS} + AI^*/SD_V$$

$$Z_{IL}+Z_{IS} = AI^* \text{ x } (\frac{1}{SD_V} + \frac{1}{SD_N})$$

$$Z_{IL}+Z_{IS} = AI^* \text{ x } (\frac{SD_V + SD_N}{SD_V \text{ x } SD_N})$$

$$AI^{*} = (Z_{IL}+Z_{IS}) \times \left(\frac{SD_V \times SD_N}{SD_V + SD_N}\right)$$

Applying this formula to moving from 2.5% allowable Type I error to 5% allowable Type I error

$$-4.13 = (-1.96 - 1.64) \times \frac{1.78 \times 3.23}{1.78 + 3.23}$$

Thus, the crossover point, AI*, equals -4.13%. At that point, the reduction in Type II will be the same in normal and in volatile times.

When the AI is more negative than -4.13%, then moving from 5% to 10% allowable Type I errors will produce a larger reduction in Type II errors in periods with the volatility of the recent financial crisis than in periods with normal volatility. When the AI is less negative than -4.13%, then moving from 2.5% to 5% allowable Type I errors will actually yield a smaller reduction in such volatile periods than in normal periods.

D. The "Type II Error Crossover Point" for a move at the margin to a laxer regime from the 95% standard of statistical confidence.

A similar calculation can be made to the value of AI^{*} for a reduction at the margin in the standard from the 5% significance level. Here, the value of Z_{IL} would at the limit approach the value $Z_{IS,}$ which is -1.96. Applying the formula, the AI^{*} in this situation is -4.50%.

$$-4.50 = (-1.96 - 1.96) \times \frac{1.78 \times 3.23}{1.78 + 3.23}$$

IV. THE WELFARE EFFECTS OF LOWERING THE STANDARD OF STATISTICAL CONFIDENCE IN CRISIS-INDUCED HIGH IDIOSYNCRATIC VOLATILITY TIMES

As noted earlier, the finding that an issuer disclosure has a statistically significant negative impact on price, combined with other necessary elements, can trigger liability with respect to a number of actions. This is the case, for example, for a disclosure correcting an earlier misstatement made with scienter that is the subject of a Rule 10b-5 fraud-on-the-market action. It is also true in a Rule 10b-5 insider trading case with regard to the disclosure of the previously non-public information on which an insider traded. The actual price impact of the disclosure is a proxy, respectively, for how much the earlier misstatement distorted price or how important the previously non-public information traded on was. The chosen level of statistical confidence thus affects the likelihood that liability will be imposed for the misstatement or inside trade to which the disclosure relates.

There will, for normal times, be some socially optimal standard of statistical significance, the satisfaction of which triggers liability. This standard is determined by whatever is the optimal tradeoff of Type I for Type II errors in normal times. In the discussion that follows, assume that in normal times, the socially optimal tradeoff of Type I for Type II errors occurs at the 95% standard of statistical confidence. This choice is purely conventional and the results hold for whatever level is in fact optimal in normal times. The question being addressed is whether, if the standard being used in normal times is in fact optimal, does the radical worsening of the tradeoff in economic-crisis-driven high idiosyncratic risk times call for a lowering of the standard. The answer, developed below, is that the situation is ambiguous and depends on distribution of potentially actionable disclosures in terms of their actual impact on price and the social costs and social benefits of imposing liability for disclosures of each given level of actual negative impact on price.

Understanding the tradeoff in social welfare terms in turn requires an understanding of both the social benefits and social costs of imposing liability for disclosure that affect's an issuer's share price by any given amount. Forcing a defendant to pay out damages deters undesirable behavior in the future, such as an issuer making a misstatement or an insider trading on non-public information. This gain does not come for free, however, because securities litigation uses scarce resources that could otherwise be deployed to other productive purposes. These resources include the lawyers' and experts' time on both sides of any such litigation, as well as the time and effort associated with such litigation expended by the issuer's executives and the judiciary. The amount of resources consumed by such a litigation is similar whether the disclosure had a large impact on price, a small one or none. Thus, ideally liability should be imposed only in cases where, at the margin, the improvement in economic welfare from the behavior that is deterred is at least as great as the costs of bringing the action. This suggests that there is some degree of actual price effect from the tested disclosure where it would be better not to impose liability. We will call this point the "Materiality Threshold." This is because the relatively small effect of the disclosure on price suggests that the behavior giving rise to the suit is not seriously damaging to society. For example it would suggest that the earlier misstatement that the disclosure corrects did not distort prices by very much or that the non-public information that the insider traded on was not very important. To impose liability in such situations would attract socially wasteful litigation.

With this understanding of the social benefits and social costs associated with imposing liability in response to disclosures in terms of their *actual* effect on price, we can now explore the meaning of the assumption that the 95% standard constitutes the socially optimal point of tradeoff between Type I and Type II errors relating to probabilistic assessments of this actual effect.

Type I error – with its resulting imposition of liability where the actual price impact of the tested disclosure is 0 – unambiguously reduces social welfare. This is because the litigation is costly and there is no gain in deterring behavior so unimportant that the disclosure has no impact on price.

Type II error is slightly more complicated. Consider first a disclosure whose actual impact on price is greater than the Materiality Threshold. Type II error with respect to whether a disclosure had any actual negative effect on price also reduces social welfare. This is because the error results in liability not being imposed in a situation where, by definition, the improvement in economic welfare from the behavior that is deterred by the imposition of liability is greater than the social costs of the legal action necessary to impose it. But for a disclosure whose actual impact on price is less than the Materiality Threshold, the opposite is the case. Type II error, by blocking imposition of liability in a situation where the social costs exceed the social benefits, actually increases social welfare.

The question being addressed here is important because a possible policy reaction to the worsening terms of the tradeoff between Type I and Type II errors brought about by economic-crisis-induced increased idiosyncratic volatility is to reduce the required standard of statistical confidence from what is optimal in normal times (assumed for purposes of example to be 95%). The idea would run that maintaining this standard during times of crisis leads to too large an increase in Type II errors. It is better instead to lower the standard and accept some increase in Type I errors in order to moderate the increase in Type II errors. To see if this idea represents sound policy, we need to know whether there is any good reason to believe that lowering the standard is in fact likely to increase social welfare.

A. The General Approach

The assumption that the 95% level is socially optimal in normal times means that, at the margin, the social cost from an infinitesimal increase in Type I error just equals the social gain from the resulting reduction in Type II error. And it means that the increase in social costs from a greater than infinitesimal increase in Type I error must be greater than the increase in social benefits from the resulting decrease in Type II error. So in normal times there could be no improvement from lowering the standard.

For a lowering of the standard from 95% to be welfare enhancing in high idiosyncratic volatility times, the social cost from an infinitesimal increase in Type I error must be less than the social gain from the resulting reduction in Type II error. A given lowering in the confidence standard will, by the very definition of what the level of statistical significance means, increase Type I error by the same amount in high volatility times as in normal times. So the lowering of the standard's impact on Type I errors will have the same negative effect on social welfare in crisis times as in normal times. *Thus, the critical question is whether, at the margin, the lowering of the standard will result in greater social welfare gains from reduced Type II errors in crisis times than in normal times.* If so, in crisis times, the increased social benefits from the lowering's impact on Type II errors will, at the margin, be greater than the increased social costs from lowering's impact on Type I errors, and hence there will be net gains from lowering the standard to the point where the increased net benefits, at the margin, are again no more than the increased costs.

In the context of this discussion, Type II error must, by definition, relate to tested disclosures with a specified level of actual negative impact on price. For any given level of actual negative price impact and given level of volatility, lowering of the required standard of statistical confidence will decrease the likelihood of Type II error.[13] Thus, in both normal and crisis times, lowering the required level of statistical confidence will reduce the rates of Type II error associated with each level of actual negative price impact over the whole possible range actual negative price impacts. As we saw earlier, however, for tested disclosures with actual price effects more negative than what we called the Type II Error Crossover Point, a given lowering of the standard will decrease Type II error more in high idiosyncratic volatility times than in normal times.[14] And for tested disclosures with actual price effects less negative than this percentage, the opposite is the case. To illustrate, given the standard errors associated with, respectively, normal and crisis times that we have used in our examples above, we saw that the Type II crossover point equals -4.50% for the lowering, at the margin, the standard of statistical confidence from 95%.[15]

As will be developed just below, the relative positions of this Type II Error Crossover Point and the Materiality Threshold are critical factors in the analysis of whether, at the margin, the impact on Type II errors from lowering the standard of statistical confidence would have a greater net positive social welfare effect in a period of high idiosyncratic risk than in ordinary times. These points are illustrated in Figure 2.

B. The Special Case Where the Type II Error Crossover Point Just Equals the Materiality Threshold.

Consider first the special case where the Type II Error Crossover Point just equals the Materiality Threshold. In this special case, the impact on Type II errors from lowering the standard of statistical confidence would unambiguously have a greater net positive effect on social welfare when done in a period of high idiosyncratic risk than when done in normal times.

To see why, recall that, by the definition of the Materiality Threshold, it is socially desirable to impose liability where a tested disclosure has an actual price impact more negative than this threshold because the social benefits from the deterrent effects of imposing liability exceed the social costs of the litigation. And, for the opposite reasons, it is socially undesirable to do so for tested disclosures with actual price impacts less negative than the Materiality Threshold.

Where the Type II Error Crossover Point just equals the Materiality Threshold, for all tested disclosures with actual price impacts more negative than this point, lowering the standard will decrease false negatives by more when done in high idiosyncratic volatility times than when done in normal times. This is the range of price impacts where reducing false negatives is welfare enhancing because it is desirable for liability to be imposed where the tested disclosure's price impact is more negative than the Materiality Threshold.

[13] *See* Part I.A *supra*.
[14] *See* Part III.C *supra*.
[15] *See* Part III.D *supra*.

For all tested disclosures with actual price impacts less negative than this point, lowering the standard will decrease false negatives by less when done in high idiosyncratic volatility times than in normal times. Reducing false negatives for tested disclosures with price impacts in this range is welfare destroying because it is undesirable for liability to be imposed where the price impact is less negative than the Materiality Threshold.

Putting this together, over the full range of possible actual negative price effects from tested disclosures, the impact on Type II errors from lowering the standard of statistical confidence would have a greater net positive effect on social welfare when done in a period of high idiosyncratic risk than when done in normal times. Therefore, in this special situation, lowering the standard in volatile times would unambiguously increase social welfare.

C. The Ordinary Case Where the Type II Error Crossover Point does not equal the Materiality Threshold.

It would be a pure coincidence for the Crossover Point just to equal the Materiality Threshold since the factors determining each are independent of those determining the other. Thus the more ordinary case would be that they are not equal. In this more ordinary case, the comparative welfare effects of lowering the standard in crisis versus doing so in normal times becomes more complicated. If the Crossover Point is either more or less negative than the Materiality Threshold, there will be a range of market-adjusted actual negative price effects from tested disclosures for which the standard lowering's impact on Type II will have a less positive, or a more negative, effect social welfare in a period of high idiosyncratic risk than in normal times. For tested disclosures with actual negative price effects either more or less negative than those in this range, the opposite is the case.

First consider the situation where the Crossover Point is more negative than the Materiality Threshold. In this situation, for tested disclosures with actual price impacts less negative than the Crossover Point but more negative than the Materiality Threshold, lowering the standard in volatile times will reduce false negatives by less than doing so in normal times. This is a range of actual price impacts where false negatives are undesirable. So, for tested disclosures with price effects in this range, lowering the standard in crisis times is, in terms of its impact on Type II errors, less socially beneficial than doing so in normal times.

Next consider the opposite situation, where the Crossover Point is less negative than the Materiality Threshold. In this situation, for tested disclosures with actual price impacts more negative than the Crossover Point but less negative than the Materiality Threshold, lowering the standard in volatile times will reduce false negatives by more than doing so in normal times. This is a range of actual price impacts, however, where false negatives are desirable. So, for tested disclosures with price effects in this range, lowering the standard is, in terms of its impact on Type II errors, more socially harmful than doing so in ordinary times.

Thus, in each of these two situations, for tested disclosures with actual negative price effects over the particular range discussed, the welfare effects of lowering the standard in volatile times would be less beneficial, or more harmful, than in normal times. For tested disclosures that have actual price effects that are either more or less negative than this range, the welfare effects would be comparatively more favorable in crisis times than in normal times. This is so for the same reasons as just discussed with respect to the special situation where the Type II Error Crossover Point equals the Materiality Threshold.

In this ordinary case where the Crossover Point does not equal the Materiality Threshold, figuring out whether the Type II error welfare effects for the two ranges where lowering the standard in crisis times has a relatively more positive effect dominates the Type II error welfare effects from the range where lowering the standard in crisis times has a relatively more negative effect requires knowing the distribution of disapproved behaviors in the economy in terms of the extent of negative effect on price associated with their corresponding tested disclosures. And it requires knowing, for tested disclosures with each such level of price impact, the social gain or loss arising from a comparison of imposing liability's deterrence effect on the disapproved behaviors versus the cost of the litigation.

Figure 2
Social Welfare Effects Due to the Impact on Type II Error from Lowering the Standard of Statistical Significance in Crisis Versus Normal Times

(+) = Social welfare effect from Type II error impact of lowering the standard in crisis times is more positive, or less negative, than in normal times

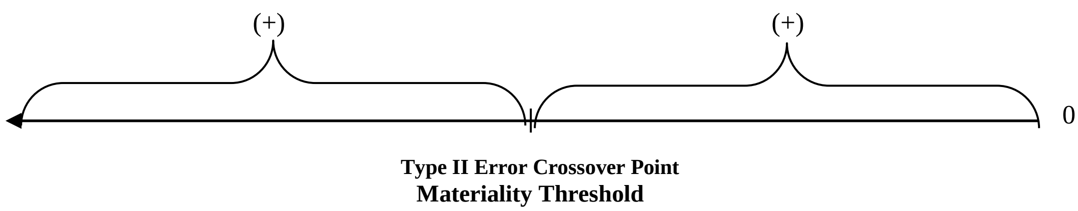
(-) = Social welfare effect from Type II error impact of lowering the standard in crisis times is less positive, or more negative, than in normal times

Type II Error Crossover Point is the level of a tested disclosure's actual negative price impact less negative than which lowering the standard of statistical significance in a crisis-induced period of high idiosyncratic volatility results in a smaller reduction in Type II error than doing so in normal times and more negative than which the opposite is the case.

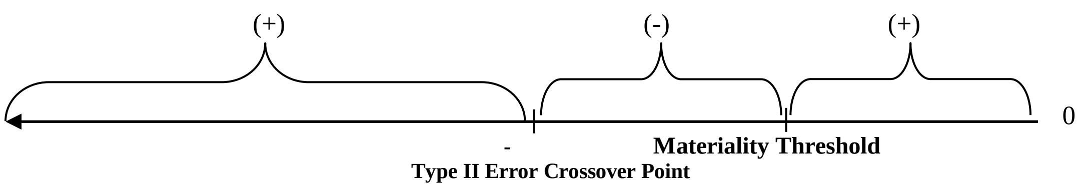
The Materiality Threshold is the level of a tested disclosure's actual negative price impact less negative than which imposing liability for the corresponding disapproved behavior involves greater social costs than benefits and, above which, the opposite is the case.

The comparative welfare effects of lowering the standard in normal versus volatile time is depicted here with regard to three situations: the Type II Error Crossover Point = the Materiality Threshold, < the Materiality Threshold, and > the Materiality Threshold.

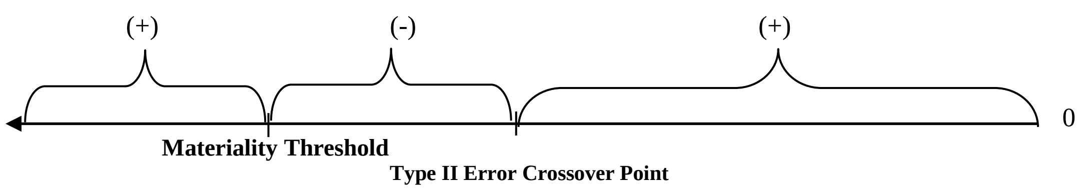
Type II Error Crossover Point =Materiality Threshold



Type II Error Crossover Point more negative than the Materiality Threshold



Type II Error Crossover Point less negative than the Materiality Threshold



D. Summary

The question we have been addressing is whether the steep increase Type II errors during economic-crisis-induced periods of high idiosyncratic volatility calls for lowering the standard of statistical confidence used in event studies of tested disclosures in order to determine whether to impose liability in certain kinds of securities actions. The issue boils down to whether, at the margin, a lowering of the standard would have a more favorable welfare effect in terms of its impact on Type II errors in volatile times compared to doing so in normal times. This distillation follows logically from two observations. First, the negative welfare effects from the lowering's impact on Type I errors will be the same in volatile times as in normal times because by definition it will reduce Type I errors by the same amount in each of these two periods. Second, if the standard used in normal times is socially optimal, this negative welfare effect from the lowering's impact on Type I error will in normal times just equal the positive welfare effect from its impact on Type II error. Thus, it is desirable to lower the standard in volatile times only if the positive welfare effect from the lowering's impact on Type II errors is greater in volatile times than in normal times.

We have seen that as a general matter, without considerably more information, we cannot determine whether in fact the net positive welfare effect from the lowering's impact on Type II errors is greater in volatile times than in normal times. Quite possibly the opposite would be so. The exception is the special case where the Type II Error Crossover Point just equals the Materiality Threshold, but it would be a pure coincidence for these two points to be equally negative because each is determined by factors entirely independent of the factors determining the other.

V. CONCLUSION

Event studies are commonly used in securities litigation to determine such issues as materiality and loss causation. As used in such a litigation, an event study makes a probabilistic assessment of whether a corporate disclosure had an effect on price or not. Use of such a test inevitably involves both Type I errors (false positives) and Type II errors (false negatives). There is an inevitable tradeoff between the two types of errors that is determined by the chosen standard of statistical confidence.

In a recent paper, we reported that there was a sharp increase in idiosyncratic risk for the average firm during the recent financial crisis and that this turned out to be a regular phenomenon associated with economic downturns going back to the early 1920s. Such sharp increases affect the tradeoff between Type I and Type II errors in event study tests and have implications for their use in securities litigation.

This paper sets out a simple model of the tradeoff between these Type I and Type II errors. The model is used to establish three fundamental points. First, an economic crisis can radically worsen this tradeoff. If the normal-times standard of the maximum acceptable number of Type I errors is maintained in crisis times, Type II errors will soar. A test that normally catches most disclosures that have, for example, a 5% actual negative impact on price will, in troubled times, catch relatively few. Second, crisis times may have the effect that a relaxation of this standard (and hence an increase in the rate of Type I errors) actually decreases Type II errors by less, not by more, than it would in normal times. Whether the decrease is greater or smaller in crisis times depends whether the disclosure's actual impact on price is more or less negative than a definable crossover point. Third, whether relaxation of the standard in troubled times would increase or decrease social welfare is ambiguous. It depends on distribution of potentially actionable disclosures in terms of their actual impact on price and the social costs and social benefits of imposing liability for disclosures of each given level of actual negative impact on price.