The Cross-Sectional Dispersion of Stock Returns, Alpha and the Information Ratio

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Abstract

We find that the cross-sectional dispersion of U.S. stock returns provides economically significant forecasts of alpha dispersion across high- and low-performing portfolios of stocks over 3-month and 1-year horizons. Conventional measures of time-series volatility provide similar signals regarding alpha dispersion, but neither cross-sectional return dispersion nor time-series volatility identify future dispersion in the information ratio. These results suggest that absolute return investors can use both cross-sectional dispersion and time-series volatility as signals to improve the tactical timing of their alpha-focused strategies, but relative return investors, keeping score in an information ratio framework, are unlikely to find dispersion or volatility valuable as signals of when to increase or decrease the activeness of their strategies.

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Abstract

We find that the cross-sectional dispersion of U.S. stock returns provides economically significant forecasts of alpha dispersion across high- and low-performing portfolios of stocks over 3-month and 1-year horizons. Conventional measures of time-series volatility provide similar signals regarding alpha dispersion, but neither cross-sectional return dispersion nor time-series volatility identify future dispersion in the information ratio. These results suggest that absolute return investors can use both cross-sectional dispersion and time-series volatility as signals to improve the tactical timing of their alpha-focused strategies, but relative return investors, keeping score in an information ratio framework, are unlikely to find dispersion or volatility valuable as signals of when to increase or decrease the activeness of their strategies.

The Cross-Sectional Dispersion of Stock Returns, Alpha and the Information Ratio

In recent years a growing literature has emerged that focuses on the performance of active money managers, both in absolute terms and relative to industry benchmarks. The findings of these studies, which are reviewed in the next section, strongly suggest that in the aggregate, professional money managers underperform their benchmarks, and do so with surprising consistency. We provide an additional perspective on the performance of active equity managers by investigating how the dispersion of alpha (the key measure of manager over- and underperformance) changes over time and how performance metrics such as alpha and the information ratio are affected by changes in the cross-sectional dispersion of equity returns. Cross-sectional dispersion (hereafter dispersion) measures the volatility of returns around an index's mean return on the same day, week or month. Gorman, Sapra and Weigand [2009] provide a theoretical framework linking the dispersion of returns to the dispersion of alpha. When the dispersion of alpha is large, the high-conviction stock selections of skilled managers will outperform their benchmark indexes by greater amounts. Therefore, any metric that accurately signals the future dispersion of alpha is valuable to investors.

Our results show that the cross-sectional dispersion of U.S. equity returns provides accurate forecasts of the dispersion of alpha over both 3-month and 1-year horizons. For example, when return dispersion is in its highest quintile (36-90%), it identifies a 160% (annualized) difference in the median alphas of high- and low-performing portfolios of stocks over the next 3 months, vs. a 105% difference when return dispersion is in its lowest quintile. While the 3 month forecasts of the dispersion of alpha are more informative, the magnitude of the alpha dispersion signals over 1-year horizons are also economically significant. When

dispersion is in its highest quintile, the spread between the median alpha for stocks in the 90th vs. 10th alpha percentile over the next year is 74%. This compares to a 53% spread when dispersion is in its lowest quintile.

Our results indicate that return dispersion can be used as an effective alpha dispersion signal for investors whose focus is mainly on either the long or short side, as well as investors pursuing long-short strategies. Moreover, we find that return dispersion and the VIX (a *time-series* oriented volatility measure) are positively correlated, and that the VIX provides similar information regarding the future dispersion of alpha. As reported in greater detail below, investors can observe the VIX at zero cost and infer a forecast of the overall dispersion of equity alpha over the next 3 to 12 months, and use this information to tactically time the aggressiveness of their portfolio strategies as alpha-capture opportunities change.

Our findings suggest that the dispersion and volatility signals will be most useful to investors pursuing absolute return strategies. However, they do not provide reliable signals regarding changes in the dispersion of the information ratio. We find that active (idiosyncratic) risk expands and contracts in proportion with cross-sectional dispersion and the VIX, which explains why changes in the dispersion of alpha do not translate into opportunities to earn higher information ratios.

MOTIVATION AND PRIOR LITERATURE

Most research into active money management concludes that the majority of managers underperform their benchmarks. The prevalence of negative alphas among mutual funds (net of expenses and trading costs) is well-documented by studies such as Elton, et al. [1993], Carhart [1997] and Bogle [1998]. More recently, Standard & Poor's Indices vs. Active Funds (SPIVA) 2008 scorecard reports that from 2003-2007, 69% of large cap mutual funds, 75% of

mid-cap funds, and 78% of small-cap funds trailed their benchmarks. Among international mutual funds, the underperformance rates ranged between 70-87%. Davis [2001] and Ennis and Sebastian [2002] find that small-cap managers do not add alpha when returns are adjusted for risk. Malkiel [2004] argues that even predictable patterns in equity returns cannot be exploited for profit. Barras, Scalliet and Wermers [2008] use an innovative statistical method and conclude that the proportion of zero-alpha mutual funds is higher than previously thought (approximately 75% net of fees and expenses), but find that less than 1% of funds deliver alpha in a way that is consistent with manager skill. Even critics of the efficient markets theory admit to a "... strong conviction that the number of genuinely skilled managers is quite small" [Jaeger 2008, p. 54].

The performance of investment managers in the absolute return and hedge fund space is similarly disappointing. Malkiel and Saha [2005] conclude that hedge fund returns are "... lower than commonly supposed" and that hedge funds are significantly riskier than more conventional investments. Fung, Xu and Yau [2004] also report negative average alphas for hedge funds, and Pojarliev and Levich [2008] find negative mean risk-adjusted alphas among a sample of currency managers. Writing about long-short funds, O'Hara [2009] asks "If managers can't beat the market, what purpose do they serve?" Statman [2004] suggests that investors may tolerate sub-par performance because they want more from investing than the utilitarian benefits of high returns, and use their relationships with money management firms to express their social class and lifestyles.[1]

Samuelson [2004] argues that broader use of inexpensive equity indexing would boost wealth overall and make equity investors better off. French [2008] attempts to quantify this loss of wealth; he estimates that pursuing active rather than passive equity strategies caused

investors' average annual returns to be lower by 0.67% of the total market cap of the U.S. stock market from 1980-2006. Applying French's estimate to 2007 — when the market capitalization of the U.S. stock market approached $15 trillion — investors would have paid the active money management industry $100 billion more in fees, expenses and trading costs than they received in value-added investment returns from active equity management.

We add a new perspective to the active equity management debate by investigating the dispersion of alpha in U.S. equity markets from 1981-2008, and how the dispersion of alpha changes with market volatility. Gorman, Sapra and Weigand [2009, p. 2] discuss how a manager's ability to add value is directly tied to the dispersion of stock returns:

> Ultimately, active portfolio management requires some dispersion of returns across stocks in order to provide a reasonable opportunity set for ranking the relative expected returns of securities.

Ratner, Meric and Meric [2006] find that changes in dispersion are an effective predictor of returns during both bull and bear market cycles in most U.S. stock sectors. Pojarliev and Levich [2008] also present evidence that excess returns are higher in periods of rising volatility. Studies by Amihud and Goyenko [2009] and Duan, Hu and McLean [2009] report similar results on the firm level — stocks with higher idiosyncratic volatility offer greater alpha-capture opportunities. The connection between volatility and alpha is gradually becoming part of the conventional wisdom of investing. For example, Rosanne Pane of Standard & Poors recently cited "lower cross-sectional dispersion" as a major reason that fixed income managers have a harder time than equity managers outperforming their benchmarks (Grene, 2008).

Given the increasing importance of the relation between return dispersion and alpha in understanding what makes active investment strategies successful, we investigate this relation

in U.S. equity markets over the period 1980-2008. In the sections that follow, we show that both the cross-sectional dispersion of stock returns and the VIX provide effective forecasts of the dispersion of alpha over the next 3 and 12 months. Neither dispersion nor the VIX forecast the dispersion of the information ratio in a similar manner, however.

DATA AND METHODOLOGY

Our sample consists of all stocks included in the S&P 500 index from January 1980 to October 2008. Stocks are added to and deleted from the sample as Standard & Poor's changes the composition of the index over this time period. Overall, 1,201 firms have been included in the S&P 500 index from 1980-2008. Daily stock return, stock price and shares outstanding data through 2007 are obtained from the *Center for Research in Securities Prices* database (CRSP). Adjusted stock price, stock split and actual price data from January-October 2008 are obtained from *Yahoo! Finance* and appended to the CRSP data to create one continuous dataset through October 2008. A daily time series of the VIX from 1991-2008 is also obtained from *Yahoo! Finance*. Fama-French daily systematic return factors (Fama and French, 1993), the excess market return and a time series of the risk-free rate are obtained from Ken French's website (French, 2009).

Relative to each day ($t = 0$) in the 28-year sample period, a Fama-French 4-factor market model regression (FF4) is estimated for each firm i over days $t = -252$ to -1:

$$R_i - r_f = \alpha_i^{FF4} + \beta_{i,1}^{FF4}\left(R_{MKT} - r_f\right) + \beta_{i,2}^{FF4}\left(R_{SMB}\right) + \beta_{i,3}^{FF4}\left(R_{HML}\right) + \beta_{i,4}^{FF4}\left(R_{UMD}\right) + \varepsilon_i . \quad (1)$$

The alpha for firm i on event day t is the excess return, computed as the daily return of firm i minus the firm's expected return based on each day's FF4 regression:

$$\hat{\alpha}_{i,t}^{FF4} = R_i - \left[r_f + \hat{\beta}_{i,1}^{FF4}\left(\overline{R_{MKT} - r_f}\right) + \hat{\beta}_{i,2}^{FF4}\left(\overline{R}_{SMB}\right) + \hat{\beta}_{i,3}^{FF4}\left(\overline{R}_{HML}\right) + \hat{\beta}_{i,4}^{FF4}\left(\overline{R}_{UMD}\right)\right]. \quad (2)$$

The active (idiosyncratic) risk for each firm i on day t is computed as the standard error of the regression residuals from Equation 1. The information ratio for firm i on day t equals firm i's estimated daily alpha (Equation 2) divided by its active risk on day t:

$$IR_{i,t} = \frac{\hat{\alpha}_{i,t}^{FF4}}{\hat{\sigma}_{\varepsilon,t}}. \tag{3}$$

We compute the volatility of the S&P 500 for each day t based on the prior 252 trading days, which measures the extent to which the index's returns have been varying around their *time series* mean over the last trading year:

$$\sigma_{Time\ Series,t} = \left[\sum_{t=-252}^{-1} \frac{\left(R_{S\&P500,t} - \bar{R}_{S\&P500} \right)^2}{252-1} \right]^{1/2}. \tag{4}$$

We also compute the dispersion of the index for each day t, which measures the extent to which the returns of all 500 stocks in the index have varied *cross-sectionally* around the index's mean return on day t:

$$\sigma_{Cross\ Section,\ t} = \left[\sum_{i=1}^{500} \frac{\left(R_{i,t} - \bar{R}_{S\&P500,\ t} \right)^2}{500-1} \right]^{1/2}. \tag{5}$$

Additionally, we compute the daily cross-sectional dispersion of alpha:

$$\sigma_{\alpha,\ t} = \left[\sum_{i=1}^{500} \frac{\left(\alpha_{i,t} - \bar{\alpha}_{S\&P500,\ t} \right)^2}{500-1} \right]^{1/2} \tag{6}$$

and the daily cross-sectional dispersion of the information ratio:[2]

$$\sigma_{IR,\ t} = \left[\sum_{i=1}^{500} \frac{\left(\frac{\hat{\alpha}_{i,t}}{\hat{\sigma}_{\varepsilon,t}} - \overline{IR}_{S\&P500,\ t} \right)^2}{500-1} \right]^{1/2}. \tag{7}$$

In the exhibits that follow, the measures of dispersion and volatility are depicted as smoothed moving averages (21 trailing days) to help the viewer more easily discern the patterns and correlations referred to in our analysis.

THE CROSS-SECTIONAL DISPERSION OF RETURNS, ALPHA AND THE IR

This section presents our empirical results. We begin with a comparison of volatility, dispersion and the VIX. In the sections that follow we show how the cross-sectional dispersion of alpha and the information ratio vary with the market volatility metrics.

Time Series and Cross-Sectional Volatility and the VIX

Exhibit 1 depicts the volatility of the S&P 500 from 1981-2008 and the VIX from 1991-2008 (the VIX becomes available as a time series of data in 1991).[3] The VIX is the Chicago Board Options Exchange (CBOE) implied volatility measure, computed from the implied volatilities of a variety of S&P 500 index options. The VIX is usually interpreted as a forecast of equity market volatility over the next 30 days. The shaded vertical bars depict bear market periods in U.S. stocks, identified using the algorithm developed by Pagan and Sossounov [2003].[4] The graph is consistent with the widely-accepted idea that volatility is higher in bear markets. Exhibit 2 shows that the VIX has a contemporaneous correlation coefficient of +0.835 with the volatility of the S&P 500, and is correlated +0.676 with volatility 30 days ahead (21 trading days). This confirms that, consistent with its typical interpretation, the VIX provides reasonably effective forecasts of the time series volatility of U.S. stocks.

Gorman, Sapra and Weigand [2009] show that the cross-sectional dispersion of returns is related to time series volatility. Exhibit 3 depicts the volatility and dispersion of S&P 500 daily returns (computed as shown in Equation 5). The graph shows that return volatility and

dispersion tend to move together, and are generally higher in bear markets. As expected, the series have a strong contemporaneous correlation (+0.728). Exhibit 4 depicts S&P 500 dispersion and the VIX. These series also appear to move together, which is confirmed by their contemporaneous correlation coefficient of +0.758. Moreover, the VIX forecasts dispersion as accurately as it does time series volatility — the correlation coefficient between the VIX and dispersion 30 days ahead is +0.700. The VIX can therefore be interpreted as a signal of not only time-series volatility, but also cross-sectional dispersion over the next trading month.

Stock Return Volatility and the Cross-Sectional Dispersion of Alpha

Gorman, Sapra and Weigand [2009] describe how the dispersion of returns around a benchmark index influences active managers' ability to outperform the benchmark. Specifically, greater dispersion presents active investors with better opportunities to identify high- and low-performing stocks. In this section we examine the cross-sectional dispersion of realized alpha and how it varies with the measures of volatility described in the previous section. Exhibit 5 compares the dispersion of alpha and the S&P 500's daily returns from 1981-2008. As expected, the dispersion of alpha increases and decreases with the overall dispersion of returns.

We take a more detailed look at the dispersion of alpha in Exhibit 6, which depicts the annualized median alphas for the 10^{th}, 25^{th}, 50^{th}, 75^{th} and 90^{th} alpha percentiles from 1981-2008. The exhibit introduces several points that are key to our analysis. First, the dispersion of the alpha percentiles are related to one another — their relative spreads expand and contract together, with these spreads increasing noticeably during bear markets. Second, and most important, the percentage spreads between the alpha categories are large and economically

significant (elaborated on further in Exhibits 9 and 10). The median alphas from the performance percentiles depicted in Exhibit 6 are separated by approximately 14-15% (from the 10th to 25th percentile, 25th to 50th, etc.). This means that in the presence of perfect foresight, the difference in alpha between a manager's positive view stock, which might rank in his/her 75th percentile of conviction, and a stock ranked "strong buy," which might rank in his/her 90th percentile of conviction, would average 14-15% per year. Or, to frame the results in Exhibit 6 another way, a manager who was skilled at going long stocks in the 75th performance percentile and short stocks in the 25th performance percentile should earn average portfolio alphas of 28-30% per year before fees and costs.

Exhibit 7 overlays the cross-sectional dispersion series onto a chart of the 25th, 50th and 75th median alpha percentiles, which confirms that the relative performance of high- and low-performing stocks expands and contracts with the dispersion of stock returns. Of course, the *contemporaneous* correlation between the dispersion of returns and alpha is less interesting than establishing a correlation between changes in stock return dispersion today and *future* alpha dispersion. This is the question we address in Exhibits 8-11: Does the dispersion of stock returns provide a forecast of the future dispersion of alpha?

Exhibit 8 reports the correlation coefficients between return dispersion and the VIX and the median annualized alpha from the 10th and 90th alpha percentiles, 63 and 252 days ahead (3 and 12 trading months, respectively). The Panel A results show that as dispersion increases, the future alphas of low-performing (10th percentile) stocks become more negative, with correlations between return dispersion and alpha of −0.43 and −0.32 over the next 63 and 252 trading days, respectively. Additionally, the future alphas of high-performing (90th percentile) stocks become more positive as cross-sectional dispersion increases, with

correlations between return dispersion and alpha of +0.65 and +0.62 over the next 63 and 252 trading days. This is consistent with the idea that as return dispersion increases, alpha-capture opportunities over the next 3 months improve for both long-only and long-short managers.

Panel B shows that levels of the VIX are also related to the median alpha from the 10th and 90th alpha percentiles 63 and 252 days ahead. The correlations are similar to those observed in Panel A. This raises the interesting possibility that, rather than compute the cross-sectional dispersion of a large number of stocks themselves, active investors might be able to monitor changes in the VIX to obtain signals about the future dispersion of alpha. The following exhibits present results that suggest that this is indeed the case.

Exhibit 9 reports the median annualized alpha from the 10th, 50th and 90th alpha percentiles sorted by quintiles of the dispersion of stock returns (Panel A) and the VIX (Panel B). The alphas in Exhibit 9 are earned over the following 63 trading days (3 calendar months). Focusing first on Panel A, we see that the median alphas in the 10th and 90th percentiles change monotonically with the quintiles of dispersion. As stock return dispersion increases, the alphas of the 10th percentile of stocks decrease across each quintile, and the alphas of the 90th percentile of stocks increase. Moreover, the differences between the median alphas in the extreme dispersion quintiles are large and economically significant: over 23% (−52% vs. −76%) across the highest to lowest 10th performance percentiles and over 33% (86% vs. 53%) across the highest to lowest 90th performance percentiles. Return dispersion therefore provides a signal of when the alphas of high- and low-performing stocks will be larger and smaller.

The differences between the 90th and 10th alpha percentiles for each quintile of return dispersion are also large. When dispersion is in its lowest quintile, the spread between the 90th and 10th stock performance percentiles over the next 63 days is 105% (+53% vs. −52%). This

is the *lowest* median quintile spread of equity alpha. When dispersion is in its highest quintile, the 90th to 10th percentile median annualized alpha spread over the next 63 trading days is greater than 160% (+86% vs. −76%). These findings indicate that return dispersion also provides a signal of when the alpha *spread* between high- and low-performing stock portfolios is expected to expand and contract.

Panel B of Exhibit 9 shows the 10th, 50th and 90th alpha percentiles by quintiles of the VIX, once again forecasting alpha dispersion 63 days ahead. The time-series oriented VIX provides forecasts that are at least as effective as those based on cross-sectional dispersion. Not only are the median alphas in the 10th and 90th performance percentiles once again monotonically decreasing and increasing, respectively (with the exception of the 4th to 5th quintile in the 90th percentile), but the extreme positive performance categories are accurately identified when the VIX is in its top *two* quintiles. When the VIX has ranged from 20.07% to 70.33%, which accounts for 40% of the stock market trading days from 1991-2008, the median annualized alpha of the 10th percentile over the next 3 trading months is approximately −73%, and the median annualized alpha of the 90th performance percentile is approximately +81%, a spread of 154%.

Moreover, the extreme negative performance categories are identified when the VIX is in its *bottom* two quintiles. When the VIX ranges between 9.31% and 16.33%, which accounts for another 40% of the trading days from 1991-2008, the median alphas in the 10th and 90th percentiles are approximately −55% and +55%, respectively — a spread of 110%. Both return dispersion (Panel A) and the VIX (Panel B) therefore provide effective (and in the case of the VIX, costless) market signals of whether the next 3 trading months represent better or worse opportunities for alpha hunters, identifying average differences in alpha-capture

opportunities across high- and low-performing stocks of 54% and 44% (respectively). Return dispersion and the VIX can therefore be thought of as indicators of when equity investors should increase or decrease the "activeness" of their long-only and long-short strategies.

Exhibit 10 extends the previous 63 day (3 month) analysis of Exhibit 9 by reporting median alphas over the following 252 days (1 trading year). Although the magnitude of the median alpha levels is smaller, indicating a less informative forecast overall, the spreads between the high- and low-performing percentiles are still large and economically significant. For example, when dispersion is in its lowest quintile, the median alpha spread between the 10^{th} and 90^{th} percentiles over the next 252 trading days is 53%, whereas the spread in the highest quintile of dispersion is 74%. As was the case in Exhibit 9, the signals based on the VIX are at least as effective as those based on cross-sectional dispersion. The alpha spreads over the 252-day horizon are smaller than those over the 63-day horizon, however, indicating that dispersion and the VIX provide more effective signals of alpha dispersion over 3 month, rather than 1 year, time frames.

Stock Volatility and the Cross-Sectional Dispersion of the Information Ratio

We next investigate whether the cross-sectional dispersion of returns and the time-series focused VIX forecast the future dispersion of the information ratio. Exhibit 11 depicts the dispersion of returns and the information ratio. Visually, the two series do not appear to vary together in any predictable way. This is confirmed by the correlations reported in Exhibit 12. Panel A reports the correlation between dispersion and the 10^{th} and 90^{th} information ratio percentiles 63 and 252 days ahead. The 10^{th} percentile of the information ratio increases with dispersion, with correlations of +0.33 63 days ahead and +0.41 252 days ahead. If cross-sectional dispersion was forecasting wider percentile spreads of the information ratio, we

would expect a *negative* correlation with stocks displaying weaker performance (as was the case with alpha in Exhibit 8). Dispersion has no relation with the 90th information ratio percentile 63 days ahead, and only a weak positive relation 252 days ahead (correlation = +0.27). Cross-sectional volatility does not forecast the dispersion of the information ratio in the same way it forecasted alpha dispersion. Panel B of Exhibit 11 shows that the same is true of the VIX. The correlations are similar to those for cross-sectional dispersion.

Exhibit 13 presents the median information ratio 63 days ahead sorted by quintiles of cross-sectional dispersion (Panel A) and the VIX (Panel B). As the volatility quintiles increase, the dispersion of the information ratio is not forecasted in any meaningful way. Exhibit 14 presents the 252-day forecasts of the median information ratio, once again sorted by volatility quintiles. These forecasts are even less informative than those from Exhibit 13. Return dispersion and the VIX fail to provide forecasts of information ratio dispersion because the dispersion of alpha and tracking error (idiosyncratic volatility) vary proportionately (results not presented but available upon request).[5] These findings indicate that return dispersion and the VIX generate signals that will be useful to absolute return investors keeping score in an alpha-based framework, but not for relative return investors who measure portfolio performance using the information ratio.

Implications for Alpha-Focused Strategies and Manager Performance

The findings presented above provide the opportunity to comment on several additional perspectives regarding alpha generation and the measurement of manager performance. First, the results presented in Exhibits 6, 9 and 10 suggest that active equity managers are not underperforming their indexes due to inadequate dispersion or supply of alpha. In the presence of manager skill, the alphas that can be earned in higher-performing

stocks are large and economically significant. Our analysis shows that even in the 75th performance percentile, annualized alpha has averaged 15.2% since 1981, ranging from a low of 7.8% to a high of 44.0%. This means that for the past 27 years fully one-fourth of all S&P 500 stocks have outperformed the Fama-French 4-factor model by an average of 15.2% per year, and never less than 7.8% every year. Hence, there have *always* been adequate opportunities for outperformance. As we show, the use of signals such as dispersion or the VIX would have enhanced these opportunities.

Our results also suggest that alpha-hunters might also be owed a bit of sympathy, however. Although dispersion and the VIX provide signals of future alpha dispersion, and the alpha spread differences in low- vs. high-volatility periods are quite large — 44% to 54% for the VIX and return dispersion, respectively — dispersion, the VIX and alpha dispersion are significantly higher in bear markets, which means that alpha-generation opportunities are best during periods when equity values are generally declining and volatility is high. From 1981-2008, dispersion averages 38.9% during bear markets, and the spread between the median alphas from the 90th and 10th performance percentiles averages 74.2%. During bull markets, however, dispersion averages 29.7% and the spread between the median alphas from the 90th and 10th performance percentiles shrinks to an average of 57.9%. The best time for skilled managers to increase the aggressiveness of their portfolios is during periods of declining stock prices and high volatility — exactly when investors desire to decrease equity allocations and reduce their overall risk exposure.

CONCLUSIONS

We find that the cross-sectional dispersion of U.S. equity returns and the VIX provide forecasts of the dispersion of alpha over both 3-month and 1-year horizons. As dispersion and

the VIX increase and decrease, they provide signals of when the alphas of high- and low-performing stocks will be larger and smaller, and when the alpha *spreads* between high- and low-performing stock portfolios are expected to expand and contract. Return dispersion and the VIX can therefore be regarded as signals when equity investors should increase or decrease the aggressiveness of their long-only and long-short strategies. Investors can calculate return dispersion or observe the VIX and infer a forecast of the overall dispersion of equity alpha over the next 3 to 12 months, and use this information to tactically time the "activeness" of their portfolio strategies as alpha-capture opportunities change.

Our findings suggest that the dispersion and volatility signals will be most useful to investors pursuing absolute return strategies, however; they do not provide reliable signals regarding changes in the dispersion of the information ratio. We find that active (idiosyncratic) risk expands and contracts in proportion with cross-sectional dispersion and the VIX, which explains why changes in the dispersion of alpha do not translate into opportunities to earn higher information ratios.

One of the main difficulties facing active investors in using the alpha signals arises because return dispersion, the VIX and alpha dispersion increase during bear markets, which means that alpha-capture opportunities are best during periods when equity values are generally declining and volatility is high. The best opportunities for skilled investors to increase portfolio aggressiveness and hunt alpha present themselves when most investors are decreasing equity allocations and trying to reduce the risk exposure of their portfolios.

Endnotes

1. It seems reasonable to conclude that Bernie Madoff was skilled at exploiting investors' need for expressive benefits.
2. Because the estimate of alpha and idiosyncratic volatility (a.k.a. tracking error) are not uncorrelated, the well known relation $\text{cov}(x,y) = E[xy] - E[x] \cdot E[y]$ implies that the proper way to measure the cross-sectional volatility of the information ratio is by computing the cross-sectional volatility of $\frac{\hat{\alpha}}{\hat{\sigma}_\varepsilon}$, rather than the cross-sectional volatility of $\hat{\alpha}$ divided by the cross-sectional volatility of $\hat{\sigma}_\varepsilon$.
3. In Exhibits 2 and 8 the reported correlation coefficients between the VIX and the other volatility measures use daily data from 1991-2008. The correlations between the time series and cross-sectional volatility measures use daily data from 1981-2008.
4. While the general rule that a 20% decline from a market high marks the beginning of a bear market in stocks, there is no widely-accepted rule for identifying the end of a bear market. We therefore use the Pagan and Soussonov [2003] algorithm for dating the beginning and end of bear market periods.
5. Gorman, Sapra and Weigand [2009] present a model that shows that the dispersion of alpha and tracking error are expected to be positively correlated.

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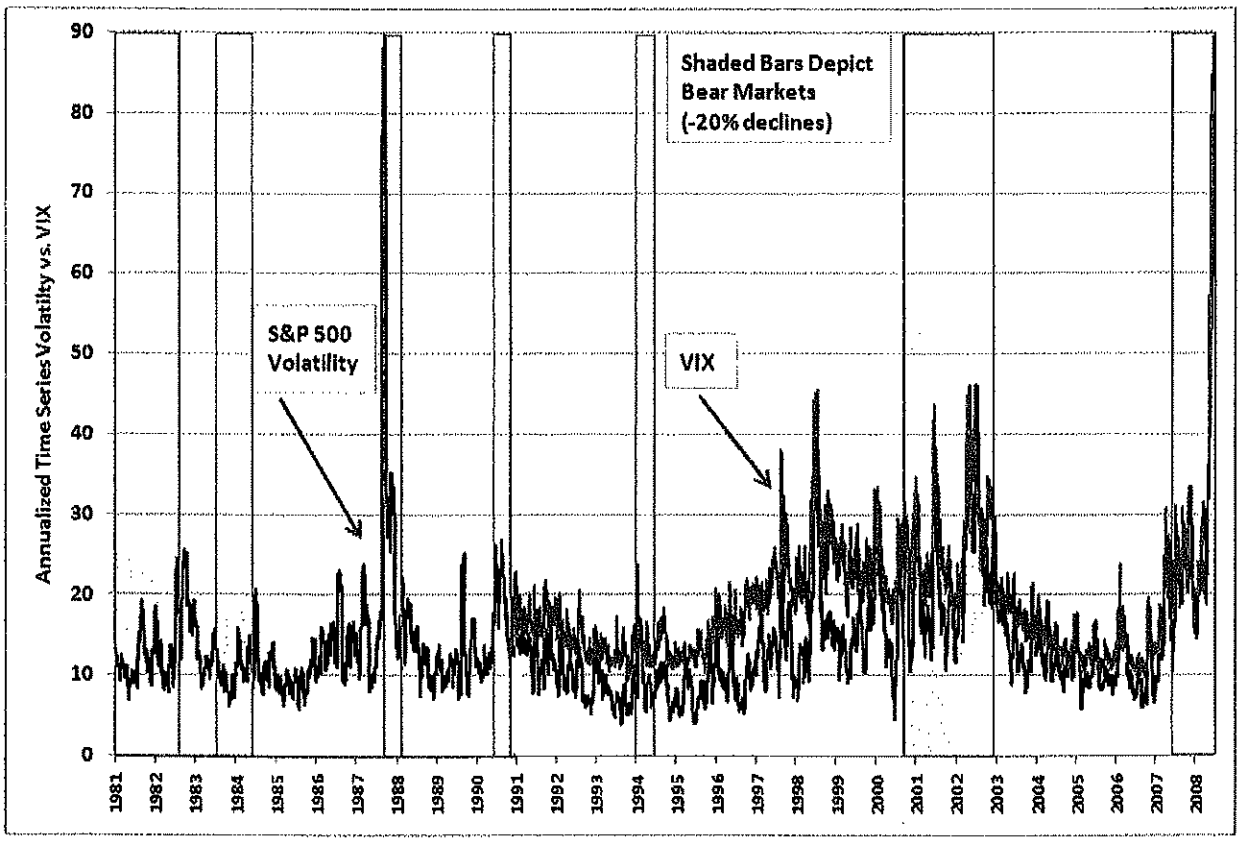

Exhibit 1: Time Series Volatility of the S&P 500 vs. the VIX, 1981-2008, with 21-day Smoothing.

Exhibit 2: Correlations Between Volatility Measures

Panel A: Contemporaneous Correlations

	VIX	Time Series	Cross-Sectional
VIX	1.000		
Time Series	0.835	1.000	
Cross-Sectional	0.758	0.728	1.000

Panel B: Forward-Looking (30-Day Ahead) Correlations

	VIX	Time Series	Cross-Sectional
VIX_{30}	0.790		
Time $Series_{30}$	0.676	0.556	
Cross-$Sectional_{30}$	0.700	0.476	0.823

* Correlation coefficients vs. the VIX are calculated using daily data from 1991-2008, all others are calculated using daily data from 1981-2008.

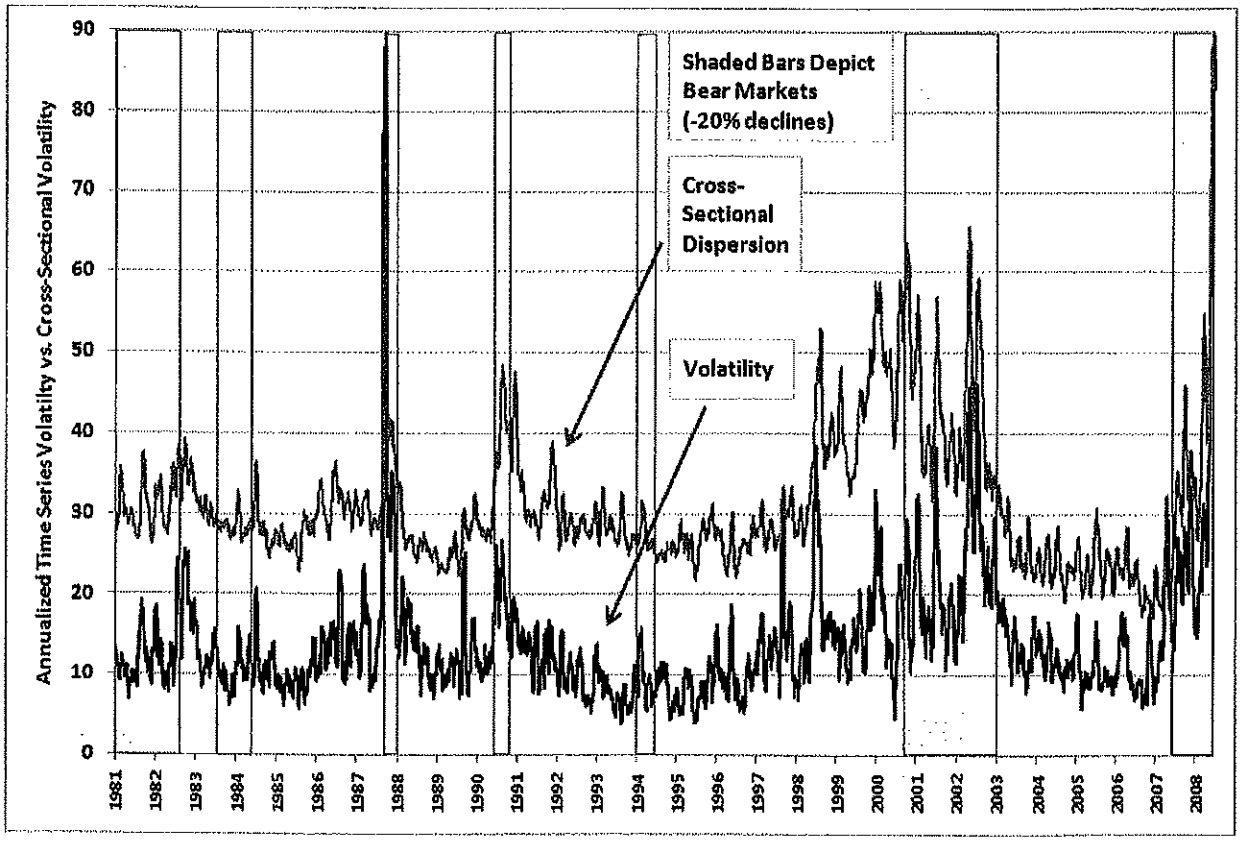

Exhibit 3: Cross-Sectional Dispersion vs. Time Series Volatility of the S&P 500, 1981-2008, with 21-day Smoothing.

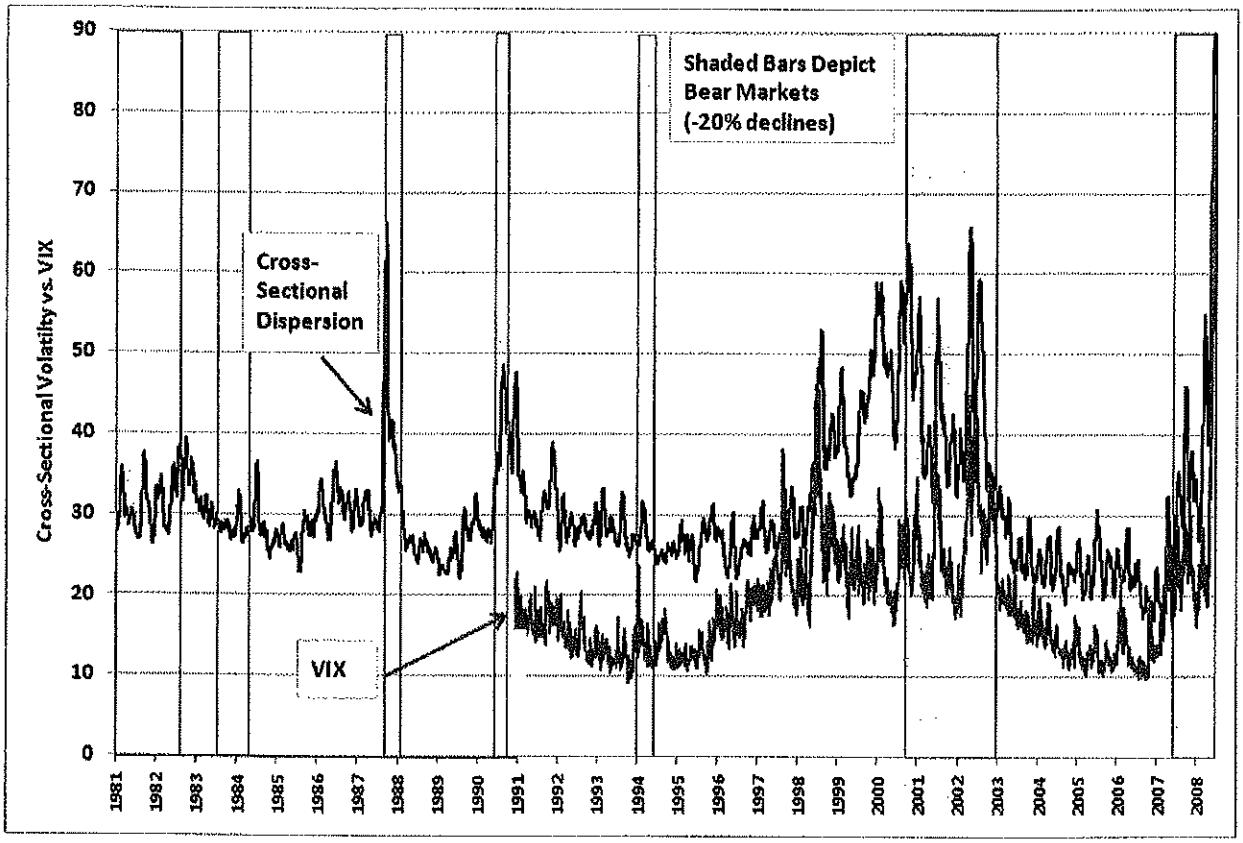

Exhibit 4: Cross-Sectional Dispersion of the S&P 500 vs. the VIX, 1981-2008, with 21-day Smoothing.

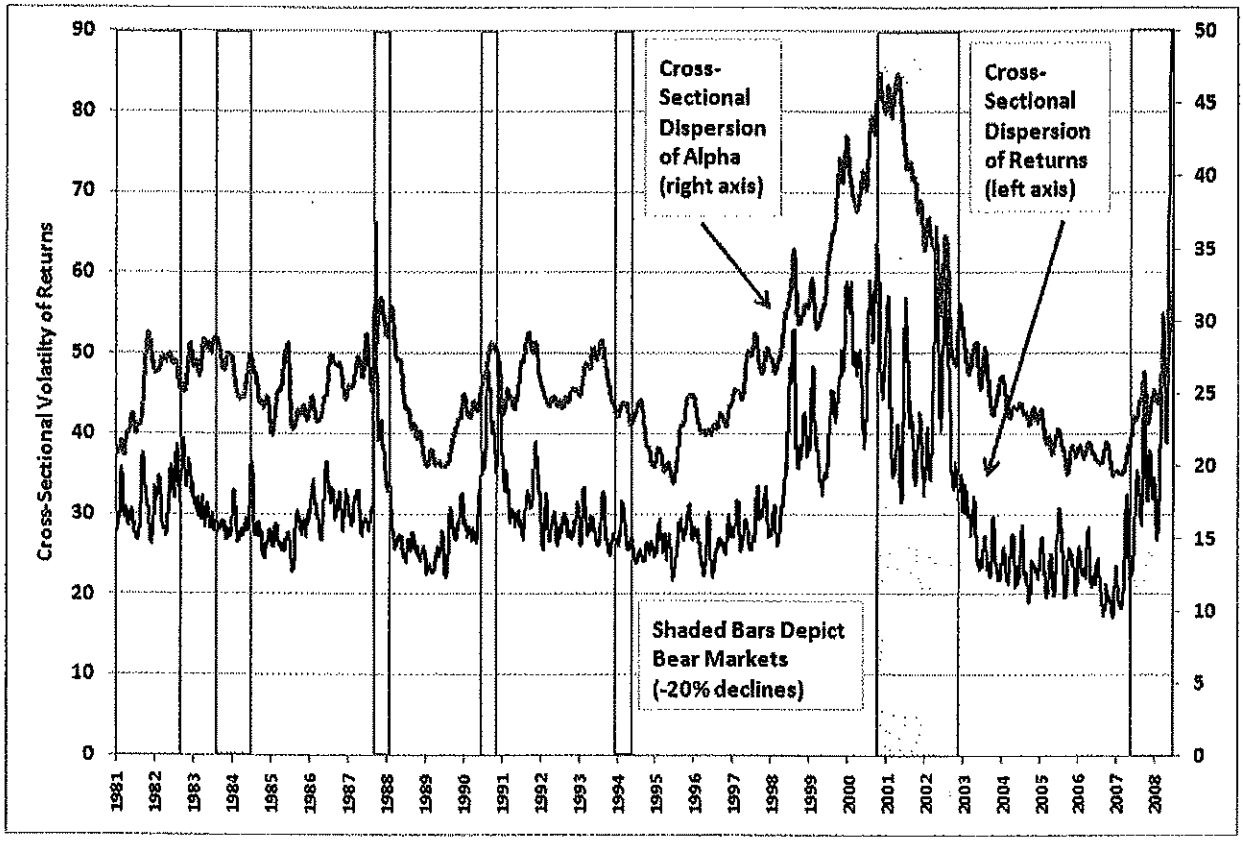

Exhibit 5: Cross-Sectional Volatility of Stock Returns and Alpha, 1981-2008, with 21-day Smoothing.

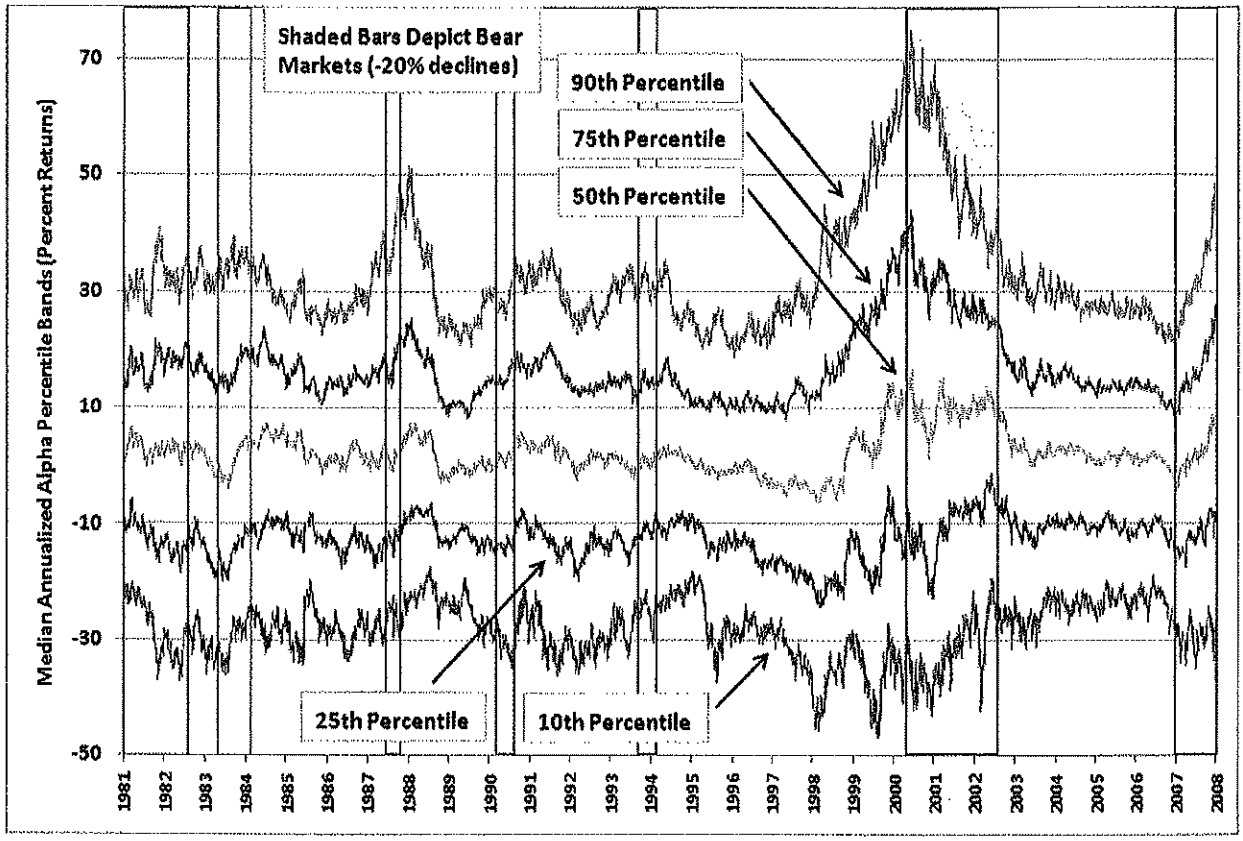

Exhibit 6: Annualized Alpha Percentile Bands, 1981-2008.

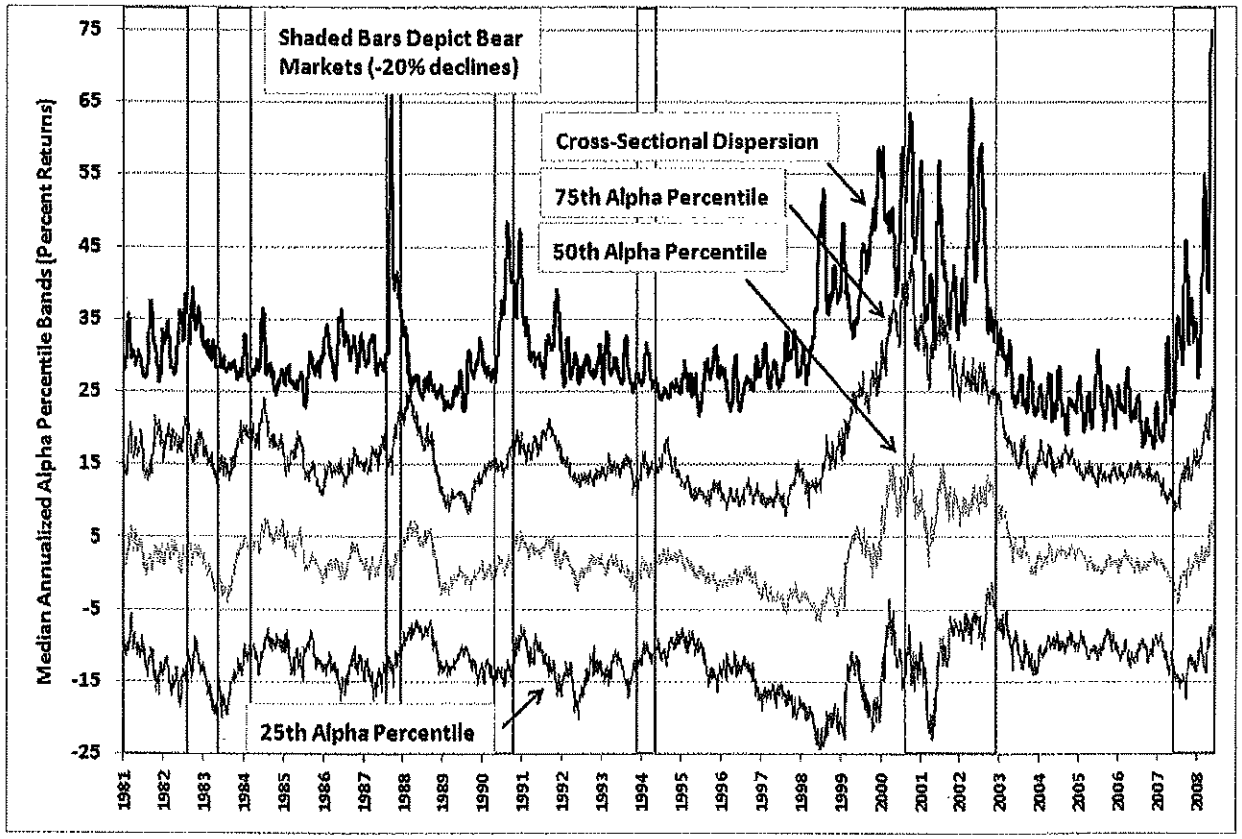

Exhibit 7: Annualized Alpha Percentile Bands and Cross-Sectional Dispersion, 1981-2008.

Exhibit 8: Correlations Between Dispersion, the VIX and Future Alpha

Panel A: Cross-Sectional Dispersion and Alpha

Looking Ahead	10th Alpha Percentile	90th Alpha Percentile
63 Days	−0.43	+0.65
252 Days	−0.32	+0.62

Panel B: The VIX and Alpha

Looking Ahead	10th Alpha Percentile	90th Alpha Percentile
63 Days	−0.43	+0.53
252 Days	−0.44	+0.52

* Correlation coefficients vs. the VIX are calculated using daily data from 1991-2008, all others are calculated using daily data from 1981-2008.

Exhibit 9: Cross-Sectional Dispersion, The VIX and Alpha: 63 Day Forecasts

Panel A: Cross-Sectional Dispersion and Alpha 63 Days Ahead (3 Trading Months)

	Cross-Sectional Dispersion of Returns			Alpha 10th Percentile			Alpha 50th Percentile			Alpha 90th Percentile		
Quintile	Median	Min	Max	Median	Min	Max	Median	Min	Max	Median	Min	Max
1	**23.52**	17.16	25.73	**-52.33**	-105.38	-34.36	**1.31**	-14.35	11.47	**52.59**	39.52	76.06
2	**27.07**	25.74	28.03	**-59.96**	-134.47	-36.54	**0.54**	-15.46	22.67	**60.00**	36.53	137.30
3	**29.08**	28.03	30.43	**-63.20**	-145.32	-37.04	**1.78**	-16.75	27.32	**64.55**	44.04	153.72
4	**32.55**	30.43	35.76	**-64.85**	-128.05	-39.45	**2.05**	-15.65	28.26	**66.54**	46.47	122.23
5	**42.96**	35.76	90.66	**-75.65**	-139.02	-39.30	**8.09**	-13.02	29.88	**86.05**	46.99	136.78

Panel B: The VIX and Alpha 63 Days Ahead (3 Trading Months)

	VIX			Alpha 10th Percentile			Alpha 50th Percentile			Alpha 90th Percentile		
Quintile	Median	Min	Max	Median	Min	Max	Median	Min	Max	Median	Min	Max
1	**11.97**	9.31	13.16	**-54.02**	-99.59	-34.36	**1.40**	-14.35	9.62	**54.49**	40.56	81.65
2	**14.73**	13.17	16.33	**-56.47**	-134.87	-36.54	**1.87**	-12.74	22.17	**55.95**	41.15	115.08
3	**18.15**	16.33	20.07	**-64.17**	-145.32	-39.03	**1.56**	-15.46	29.88	**61.96**	42.03	134.65
4	**21.98**	20.07	24.31	**-73.20**	-132.48	-41.38	**4.60**	-16.75	28.12	**81.61**	45.29	133.54
5	**28.18**	24.32	70.33	**-74.02**	-139.02	-44.94	**6.48**	-13.91	29.62	**81.40**	47.79	136.78

* Results vs. the VIX are calculated using daily data from 1991-2008, all others are calculated using daily data from 1981-2008.

Exhibit 10: Cross-Sectional Dispersion, The VIX and Alpha: 252 Day Forecasts

Panel A: Cross-Sectional Dispersion and Alpha 252 Days Ahead (12 Trading Months)

	Cross-Sectional Dispersion of Returns			Alpha 10th Percentile			Alpha 50th Percentile			Alpha 90th Percentile		
Quintile	Median	Min	Max	Median	Min	Max	Median	Min	Max	Median	Min	Max
1	**23.52**	17.16	25.73	**-26.28**	-40.55	-18.76	**0.91**	-5.73	8.99	**26.73**	19.65	48.53
2	**27.07**	25.74	28.03	**-27.11**	-45.60	-18.05	**0.59**	-6.69	9.04	**27.26**	18.40	46.96
3	**29.08**	28.03	30.43	**-27.97**	-45.58	-17.69	**1.97**	-6.50	10.13	**30.93**	20.29	51.55
4	**32.55**	30.43	35.76	**-27.61**	-38.39	-17.19	**2.21**	-5.89	14.74	**32.97**	20.85	65.12
5	**42.96**	35.76	90.66	**-31.24**	-46.96	-19.45	**5.43**	-4.07	16.65	**43.23**	22.44	75.79

Panel B: The VIX and Alpha 252 Days Ahead (12 Trading Months)

	VIX			Alpha 10th Percentile			Alpha 50th Percentile			Alpha 90th Percentile		
Quintile	Median	Min	Max	Median	Min	Max	Median	Min	Max	Median	Min	Max
1	**11.97**	9.31	13.16	**-24.61**	-37.57	-18.09	**0.67**	-4.24	3.63	**26.13**	18.40	35.17
2	**14.73**	13.17	16.33	**-25.98**	-35.50	-18.05	**0.84**	-5.73	7.78	**26.95**	19.84	45.92
3	**18.15**	16.33	20.07	**-29.08**	-45.13	-20.53	**1.79**	-5.87	14.98	**28.75**	20.66	69.10
4	**21.98**	20.07	24.31	**-31.67**	-45.60	-19.02	**4.52**	-6.69	15.61	**40.03**	22.14	75.79
5	**28.18**	24.32	70.33	**-31.60**	-46.96	-20.24	**4.29**	-6.62	16.65	**41.03**	26.40	72.32

* Results vs. the VIX are calculated using daily data from 1991-2008, all others are calculated using daily data from 1981-2008.

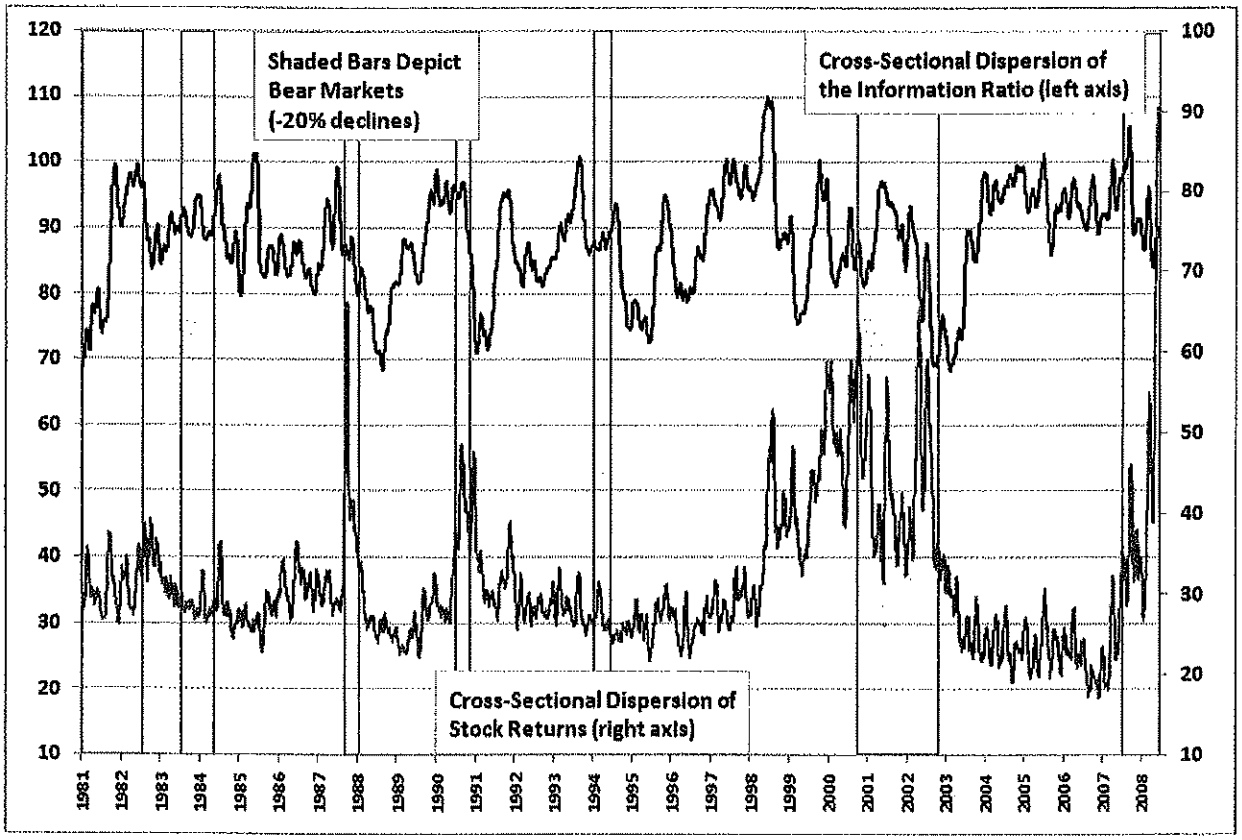

Exhibit 11: Cross-Sectional Dispersion of Returns and the Information Ratio, 1981-2008.

Exhibit 12: Correlations Between Volatility Measures and the Information Ratio

Panel A: Cross-Sectional Volatility and the Information Ratio

Looking Ahead	10th IR Percentile	90th IR Percentile
63 Days	+0.33	0.00
252 Days	+0.41	+0.23

Panel B: The VIX and the Information Ratio

Looking Ahead	10th IR Percentile	90th IR Percentile
63 Days	+0.24	+0.02
252 Days	+0.31	+0.27

* Correlation coefficients vs. the VIX are calculated using daily data from 1991-2008, all others are calculated using daily data from 1981-2008.

Exhibit 13: Cross-Sectional Dispersion, The VIX and the Information Ratio: 63 Day Forecasts

Panel A: Cross-Sectional Dispersion and the Information Ratio 63 Days Ahead (3 Trading Months)

	Cross-Sectional Dispersion of Returns			Information Ratio 10th Percentile			Information Ratio 50th Percentile			Information Ratio 90th Percentile		
Quintile	Median	Min	Max	Median	Min	Max	Median	Min	Max	Median	Min	Max
1	**23.52**	17.16	25.73	**-2.61**	-4.39	-1.69	**0.07**	-0.85	0.64	**2.69**	1.82	3.50
2	**27.07**	25.74	28.03	**-2.66**	-4.39	-1.63	**0.03**	-0.65	1.10	**2.66**	1.73	4.56
3	**29.08**	28.03	30.43	**-2.54**	-4.35	-1.34	**0.08**	-0.67	1.07	**2.69**	1.84	4.52
4	**32.55**	30.43	35.76	**-2.50**	-4.04	-1.26	**0.09**	-0.65	1.18	**2.58**	1.73	4.75
5	**42.96**	35.76	90.66	**-2.19**	-4.23	-1.26	**0.28**	-0.44	1.14	**2.66**	1.79	4.65

Panel B: The VIX and the Information Ratio 63 Days Ahead (3 Trading Months)

	VIX			Information Ratio 10th Percentile			Information Ratio 50th Percentile			Information Ratio 90th Percentile		
Quintile	Median	Min	Max	Median	Min	Max	Median	Min	Max	Median	Min	Max
1	**11.97**	9.31	13.16	**-2.57**	-4.39	-1.70	**0.07**	-0.85	0.48	**2.68**	1.94	3.32
2	**14.73**	13.17	16.33	**-2.50**	-4.24	-1.76	**0.10**	-0.75	0.85	**2.68**	1.93	4.42
3	**18.15**	16.33	20.07	**-2.65**	-4.39	-1.60	**0.08**	-0.67	1.18	**2.71**	1.92	4.56
4	**21.98**	20.07	24.31	**-2.42**	-4.04	-1.59	**0.18**	-0.66	1.09	**2.78**	1.90	4.75
5	**28.18**	24.32	70.33	**-2.28**	-3.85	-1.44	**0.23**	-0.57	1.14	**2.64**	1.89	4.65

* Results vs. the VIX are calculated using daily data from 1991-2008, all others are calculated using daily data from 1981-2008.

Exhibit 14: Cross-Sectional Dispersion, The VIX and the Information Ratio: 252 Day Forecasts

Panel A: Cross-Sectional Dispersion and the Information Ratio 252 Days Ahead (3 Trading Months)

	Cross-Sectional Dispersion of Returns			Information Ratio 10th Percentile			Information Ratio 50th Percentile			Information Ratio 90th Percentile		
Quintile	Median	Min	Max	Median	Min	Max	Median	Min	Max	Median	Min	Max
1	**23.52**	17.16	25.73	**-1.13**	-1.52	-0.79	**0.05**	-0.27	0.36	**1.25**	0.89	1.68
2	**27.07**	25.74	28.03	**-1.07**	-1.75	-0.65	**0.03**	-0.26	0.31	**1.13**	0.85	1.57
3	**29.08**	28.03	30.43	**-1.04**	-1.74	-0.63	**0.08**	-0.27	0.33	**1.18**	0.86	1.61
4	**32.55**	30.43	35.76	**-1.01**	-1.41	-0.49	**0.10**	-0.20	0.42	**1.19**	0.91	1.63
5	**42.96**	35.76	90.66	**-0.91**	-1.33	-0.47	**0.18**	-0.15	0.47	**1.31**	0.90	1.66

Panel B: The VIX and the Information Ratio 252 Days Ahead (3 Trading Months)

	VIX			Information Ratio 10th Percentile			Information Ratio 50th Percentile			Information Ratio 90th Percentile		
Quintile	Median	Min	Max	Median	Min	Max	Median	Min	Max	Median	Min	Max
1	**11.97**	9.31	13.16	**-1.07**	-1.46	-0.79	**0.03**	-0.23	0.18	**1.21**	0.88	1.50
2	**14.73**	13.17	16.33	**-1.10**	-1.58	-0.73	**0.04**	-0.27	0.30	**1.20**	0.85	1.53
3	**18.15**	16.33	20.07	**-1.06**	-1.75	-0.60	**0.08**	-0.25	0.42	**1.15**	0.87	1.63
4	**21.98**	20.07	24.31	**-0.89**	-1.70	-0.47	**0.15**	-0.27	0.45	**1.28**	0.93	1.67
5	**28.18**	24.32	70.33	**-0.92**	-1.72	-0.50	**0.16**	-0.26	0.47	**1.31**	0.98	1.68

* Results vs. the VIX are calculated using daily data from 1991-2008, all others are calculated using daily data from 1981-2008.