FOLIO*fn*®
INVESTMENTS, INC.

Dealing With High Volatility
"Low Volatility Folios"

Prepared Specially for FOLIO*fn* Investments, Inc.
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Low Volatility Folios

Summary

FOLIO*fn* has developed two new Folios, the **Low Volatility ETF Folio** and the **Low Volatility Folio** with the intention of generating much of the return of the S&P500 (on average) with lower volatility. The Low Volatility ETF Folio is comprised entirely of ETFs while the Low Volatility Folio is a mixture of ETFs and individual stocks. These Folios are built out of securities with a low correlation to one another and the broader market, as well as using screens on volatility.

During periods when the S&P500 increases or decreases significantly, these portfolios likely will not increase or decrease as much. The lower volatility means the maximum returns and losses in any given period are likely to be of lower magnitude than those experienced by the S&P500. This type of portfolio will therefore not be attractive to an investor who is overly concerned with tracking the market, or who seeks potentially outsized returns in short periods. These portfolios may be attractive to those medium-term and long-term investors who want a portfolio that does not track the market during periods of large market swings but that can provide equity exposure with lower volatility than the broader market.

Background

Many investors attempt to time the market by anticipating periods of decline or growth. If they anticipate a period of high volatility or potentially declining markets, they may concentrate assets in fixed-income securities. If they anticipate a period of low volatility or a rising market, they may concentrate assets in stocks. If you can really time the market, this approach would naturally be to your benefit. However, the historical track record of investors in trying to time the market has generally not been very good. DALBAR, a research firm, has consistently found that mutual fund investors radically under-perform the return of the broader markets because of poor timing. The 2007 study from DALBAR, for example, showed that the average retail equity investor generated an average annual return of 4.3% per year over the 20-year period through 2006[1]. During this same period, the S&P500 averaged 11.8% per year. The massive under-performance of retail investors was predominantly due to bad timing decisions[2].

The same results hold true for retail investors when they invest in fixed-income funds: their long-term performance is far below the returns of the fixed income benchmarks and even lags inflation (by about 1.3% per year over the last 20 years). DALBAR's systematic studies show that investors' returns are far below the overall markets. Given

[1] http://www.investorsalley.com/mc/11-12-07/article4.html
[2] http://www.dalbarinc.com/pages/QAIB2007Highlights.pdf

this evidence of the damaging impacts of market timing for the average retail investor, what can investors do when the markets get volatile?

One approach to dealing with periods of high volatility is to adjust the overall volatility of your portfolio. If your portfolio is generating uncomfortable swings, you can temper these swings by investing in assets that are less volatile, without having to make a timing bet. If you are trying to develop a low volatility strategy, fixed income based securities will play a role. A judicious choice of low volatility sector ETFs can help, however, by allowing you to retain as much potential for total returns as possible.

This document describes two portfolios that have exhibited roughly half the volatility of the S&P500 over the four years through 2007. The first of these portfolios is comprised totally of ETF's, while the second combines ETF's with allocations to individual stocks. The **Low Volatility ETF Folio** ensures that the exposure to any individual stock is very low, which minimize the risk of distress at anyone company. The **Low Volatility Folio** combines ETFs with individual stocks which have historically provided additional benefits, but which increase the exposure to a number of individual stocks.

Why Use These Folios?

These Folios may be attractive if you feel that the volatility in your portfolio is unacceptably high and you are concerned about the potential impacts of market declines, but believe that successfully timing the market is unlikely. The **Low Volatility ETF Folio** is designed for investors who prefer not to own individual stocks directly. The **Low Volatility Folio** is designed for investors who are comfortable with allocations to individual stocks along with broad-based index ETFs.

How These Folios Work

These Folios have the goal of achieving about half the volatility of the S&P500, while still retaining strategic exposure to equities to boost long-term expected return. These portfolios tend to achieve higher historical returns (relative to benchmarks) for a given level of risk because certain stocks (and sectors) tend to exhibit very low correlation to one another and to the broader market.

The Low Volatility ETF Folio

There are four principal ingredients in a low volatility portfolio. The first, of course, is fixed-income ETFs. The second is sector ETFs that are relatively low-Beta (read below for more information on Beta) and low volatility. The third ingredient is low-volatility stocks, and there are plenty of stocks in an index that have consistently lower volatility than the broader index. The fourth ingredient in a low volatility portfolio is assets that have very low correlation to the rest of the portfolio. While these may be fairly volatile (such as commodities), their overall portfolio impacts are positive.

Let's start with a simple benchmark portfolio. If we select a portfolio that is 60% allocated to fixed-income and 40% allocated to an S&P500 index fund (shown below), we have cut out roughly half of the risk in S&P500:

Fund Name	Fund Name	Percentage of Funds
iShares TIPS	TIP	40%
iShares Lehman 1-3 Yr. Treasury Bond	SHY	20%
iShares S&P500	IVV	40%

Low Volatility Benchmark Portfolio

This portfolio has exhibited only 46% of the volatility in the S&P500 over the past four years (through 2007). This reduction in volatility has, of course, come at a price. This portfolio has an average annual return over this period of 5.0% per year, while the S&P500 has averaged 8.2% per year.

It is important for investors to understand that there are two common measures of risk. The first, volatility, is what we have cited above. The second common measure of risk is Beta. Beta measures how much the value of a portfolio tends to move when the market moves. Beta of 100% means that a portfolio tends to move 1% up when the S&P500 moves up 1% (and vice versa). The Beta on our model portfolio over the last four years is 33%, which means that this portfolio tends to go up 0.33% when the S&P500 goes up 1%, and vice versa.

There is another important statistic that we can look at in considering the appeal of this model portfolio in mitigating market volatility: R-squared (also written as R^2). R-squared measures the degree to which the returns from a portfolio can be explained by the returns on the S&P500. While Beta and R^2 are related, you can have high-Beta / low R^2 investments. Emerging markets are one of the best-known examples. R^2 for this portfolio is 52%, which means that 52% of the variability in returns on this portfolio can be explained by moves in the S&P500.

Can we do better than this simple benchmark portfolio?

The portfolio below contains a considerably broader selection of ETFs, albeit with the same 60% allocated to the same fixed-income funds.

Fund Name	Ticker	Percentage of Funds
iShares TIPS	TIP	40%
iShares Lehman 1-3 Yr. Treasury Bond	SHY	20%
iShares Dow Jones U.S. Telecom	IYZ	6%
Industrial Select Sector SPDR	XLI	6%
iShares S&P Global Healthcare	IXJ	5%
iShares MSCI Japan Index	EWJ	5%
iShares Dow Jones U.S. Healthcare	IYH	4%
iShares MSCI Malaysia Index	EWM	4%
iShares MSCI Switzerland Index	EWL	4%
Consumer Staples Select Sector SPDR	XLP	2%
iShares Dow Jones U.S. Consumer Goods	IYK	2%
iShares Dow Jones U.S. Select Dividend Index	DVY	2%

The Low Volatility ETF Folio

This portfolio has been constructed to provide moderately higher return, while keeping risk levels in the same range as the model portfolio. This portfolio has exhibited volatility that is only 44% of that in the S&P500 over the past four years, but with an average annual return of 5.9%. The statistical results for the two portfolios are summarized below:

Portfolio	Annualized Standard Deviation in Return	Beta	Average Annual Return	R-Squared
Benchmark Portfolio	3.5%	33.2%	5.0%	52%
Low Volatility ETF Folio	3.3%	25.0%	5.9%	33%
S&P500 Index	7.7%	100.0%	8.2%	100%

Trailing Four Year Statistics for Portfolios (through 2007)

The benchmark portfolio has generated less return with slightly more volatility (as measured by the standard deviation in return) over the last four years. Beta is also higher for the benchmark portfolio.

The problem with looking at historical data, of course, is that the portfolio performance tends to be biased by assets that have out-performed in recent years. EWM (Malaysia) and EWL (Switzerland) have delivered strong performances in the four year period used to generate the table above. We can partly correct for this bias using a forward-looking model that discounts recent performance[3]. When these two portfolios are run through a forward looking model (details in article cited in footnote 3), the projected performance

[3] http://www.quantext.com/RiskReturnBalance.pdf

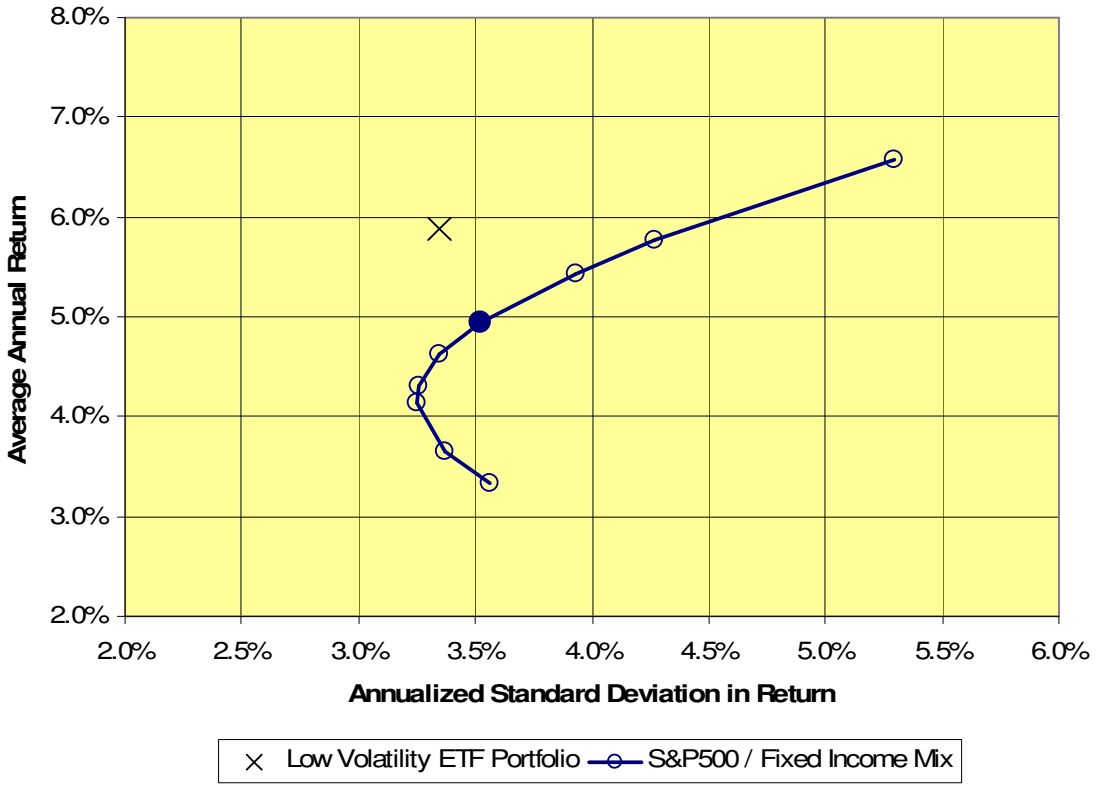
suggests that the model portfolio will outperform the benchmark portfolio (60% fixed-income / 40% S&P500) in the future, but with an additional nuance (see below).

Portfolio	Annualized Standard Deviation in Return	Average Annual Return
Benchmark Portfolio	6.4%	6.6%
Low Volatility ETF Folio	7.0%	7.0%
S&P500 Index	15.1%	8.3%

Projected performance

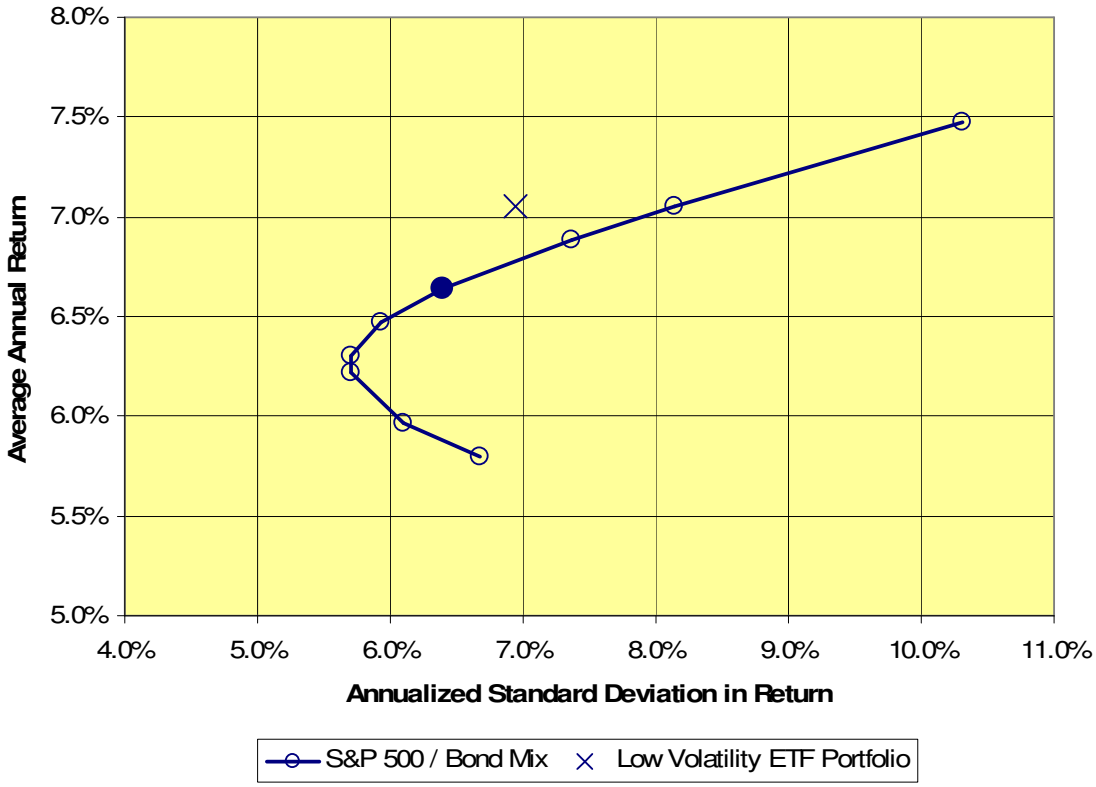
The **Low Volatility ETF Folio** is projected to have slightly higher volatility in the future than the benchmark portfolio, even though it has had lower volatility than the benchmark portfolio over the past four years. The projected average annual return for the **Low Volatility ETF Folio** is 7% per year, as compared to a projected 8.3% per year for the S&P500. The projected volatility in return is 7% for the **Low Volatility ETF Folio**, which is less than half (46%) of the projected volatility for the S&P500 (which is 15.1%). This portfolio is projected to give up 1.3% in annual return relative to the S&P500 (7% vs. 8.3%), but is projected to have half the total volatility of the S&P500.

Because the **Low Volatility ETF Folio** is projected to have higher volatility than the benchmark portfolio, it is useful to take one more step. We need to measure whether the higher projected *return* in the **Low Volatility ETF Folio** portfolio justifies the higher projected *volatility*. This question can be answered in a straightforward way by looking at all possible combinations of the S&P500 with our fixed-income mix (we maintain the 2-to-1 ratio between TIPS and short term fixed-income (SHY) to emphasize inflation protection in the fixed-income holdings). What we want to see is whether increasing the exposure to the S&P500 (which will increase risk and return) will take us to a portfolio that is as good as the **Low Volatility ETF Folio**. The analysis using historical data from the last four years is shown below.



Historical Risk-Return Balances (four years through 2007)

The chart above shows a series of portfolios with varying fraction allocated to the S&P500 index fund. The solid circle is the model portfolio with 60% fixed-income and 40% in the S&P500 (i.e. the benchmark portfolio). The horizontal axis shows volatility (measured by the standard deviation in return) and the vertical axis shows the average annual return. The "improved portfolio" (our **Low Volatility ETF Folio**) is marked with an X. As noted earlier, the **Low Volatility ETF Folio** has generated more return, with less risk, than the benchmark portfolio for the four-year period through 2007. This chart shows what we expect to see. We now create the same type of chart using the expected performance from the forward-looking statistical model (below).



Projected Risk-Return Balance from Forward-Looking Model

Once again, the solid circle shows the benchmark portfolio and the other circles shows different mixes of fixed income with the S&P500. These results suggest that the **Low Volatility ETF Folio** is better than the generic mix of fixed-income ETF's and S&P500 index fund, even when we account for the higher risk outlook from the forward-looking model. The chart above suggests that if we were willing to increase the exposure of the simple model to the S&P500 to 45% (increasing its risk and return) we could get to within about 0.3% of the improved portfolio. In so doing, however, we would increase the historical Beta to 39%, the historical R^2 to 63%, and the historical annualized volatility to 3.7% (compare these values to the table labeled as *Trailing Four Year Statistics for Portfolios (through 2007)*).

This **Low Volatility ETF Folio** has historically provided a modest performance gain over the benchmark portfolio. The forward-looking analysis suggests that there may be some ongoing benefits conferred as well. The next step in our analysis is to add some allocations to individual stocks that have historically assisted in delivering more return, while keeping volatility at the desired level.

Creating the Low Volatility Folio

The **Low Volatility ETF Folio** generated an average return of 5.9% per year over the four years through 2007, as compared to a benchmark of an S&P500 fund and fixed-income funds, which averaged 5% per year in return over this same period, with slightly higher risk. It may be possible to improve the performance of the **Low Volatility ETF Folio** by adding individual stocks to the mix. Direct ownership of individual stocks has a number of advantages for investors. First, and most obvious, there are no ongoing expenses once you buy a stock. Second, there is a body of evidence that the market capitalization weighting of stocks in most indexes is simply not the asset allocation that will provide the most return for a given level of risk[4]. By combining individual stocks with the ETF portfolio, the historical data suggest that it may be possible to gain additional return without increasing overall portfolio risk. A statistical forward-looking model supports these results, although it must be understood that all forward-looking models are highly simplified representations of reality and the results are subject to a wide range of assumptions that go into building the model.

Our approach to finding individual stocks that will improve the ETF portfolio starts with a screen on U.S. stocks with market capitalization between $10B and $25B, and Beta less than 50%. We selected this market cap range because the median market cap in the S&P500 is $14B. The low-Beta constraint helps to find both lower-volatility stocks and those which will provide substantial diversification benefits. With this list of stocks, we sorted by Beta and then screened out stocks with less than four years of data. The next stage was to remove stocks with high historical volatility. The next step was to vary the asset allocations between a number of these stocks and the original set of ETFs. The goal was to find a simple allocation that would provide incremental returns without increasing portfolio risk. The resulting model portfolio is shown below:

[4] http://www.researchaffiliates.com/rafi/rafi.htm

Name	Ticker	Percentage of Funds
iShares TIPS	TIP	40%
iShares Lehman 1-3 Yr. Treasury Bond	SHY	20%
iShares Dow Jones U.S. Telecom	IYZ	3%
Industrial Select Sector SPDR	XLI	3%
iShares S&P Global Healthcare	IXJ	3%
iShares MSCI Japan Index	EWJ	3%
iShares MSCI Malaysia Index	EWM	2%
iShares MSCI Switzerland Index	EWL	2%
DUKE ENERGY CP HL CO	DUK	2%
CAMPBELL SOUP CO	CPB	2%
DOMINION RES NEW	D	2%
ENTERPRISE PT UTS	EPD	2%
PPL CORP	PPL	2%
PROGRESSIVE CP	PGR	2%
CONAGRA FOOD INC	CAG	2%
KELLOGG CO	K	2%
ECOLAB INC	ECL	2%
KINDER MORGAN ENERGY	KMP	2%
ROHM HAAS CO	ROH	2%
BUNGE LTD	BG	2%

The Low Volatility Folio

This Folio combines many ETFs from the **Low Volatility ETF Folio**, but adds individual stocks that have historically provided additional diversification benefits. We retained the same 60% allocation to fixed-incomes via TIP and SHY. The table below compares the performance of the **Low Volatility Folio** to the benchmark portfolio that is 40% allocated to an S&P500 index, 20% allocated to SHY (a short-term fixed-income fund) and 40% allocated to TIP (a fund that invests in inflation-protected fixed-income instruments) as well as to the **Low Volatility ETF Folio** portfolio from the previous section.

Portfolio	Annualized Standard Deviation in Return	Beta	Average Annual Return	R-Squared
Benchmark Portfolio	3.5%	33.2%	5.0%	52%
Low Volatility ETF Folio	3.3%	25.0%	5.9%	33%
Low Volatility Folio	3.1%	12.0%	7.0%	9%
S&P500 Index	7.7%	100.0%	8.2%	100%

Trailing four year statistics for portfolios (through 2007)

The portfolio that combines ETFs and individual stocks has generated an average annual return of 7% over the four years through 2007, with less than half the volatility of the S&P500. This average return is 2% per year higher than that of the benchmark portfolio with 60% in fixed-income ETFs and 40% in the S&P500, even though the **Low Volatility Folio** has exhibited less volatility than the benchmark portfolio. The **Low Volatility Folio** also has considerably lower Beta and R^2 (also written as R-squared) than the benchmark portfolio. The low Beta and low R^2 mean that this portfolio has not, historically, been highly sensitive to moves in the broad market. The **Low Volatility Folio** has also generated higher returns than the **Low Volatility ETF Folio** less volatility.

Looking at historical performance is useful, but can create bias towards assets that have out-performed in the historical period analyzed. To try to account for this effect, it is useful to use forward-looking statistical models[5] [6]. We have used a statistical model that discounts recent out-performance (and under-performance, for that matter). The projected future performance of the **Low Volatility Folio** is shown below, along with the other reference portfolios (see table below).

Portfolio	Annualized Standard Deviation in Return	Average Annual Return
Benchmark Portfolio	6.4%	6.6%
Low Volatility ETF Folio	7.0%	7.0%
Low Volatility Folio	6.1%	8.7%
S&P500 Index	15.1%	8.3%

Projected Performance

The **Low Volatility Folio** is projected to out-perform the benchmark portfolio (40% S&P500 / 60% fixed-incomes) by 2.1% per year—about the same margin of improvement as it has exhibited over the past four years. This projected performance is also 1.7% per year higher than the **Low Volatility ETF Folio** (7% vs. 8.7%). Given all of the uncertainties in forward-looking statistical models, it is not prudent to assume that the **Low Volatility Folio** will, in fact, generate a higher future average annual return than the S&P500, however.

The **Low Volatility Folio** has generated higher returns with less volatility than the benchmark portfolio and the **Low Volatility ETF Folio** over the four years through 2007. This portfolio is also projected to generate generally similar higher returns going forward, again with volatility lower than the broader market. The model used to generate the

[5] See article from Footnote 3
[6] http://www.quantext.com/RiskReturn2.pdf

projections has been tested through multiple economic cycles for this kind of outlook and the results suggest that the model outlooks have some value[7]. In both historical and forward-looking statistical analysis, the **Low Volatility Folio** has generated average annual returns that are similar (within 1%-2% per year) to those of the S&P500, with less than half the volatility of the S&P500.

Conclusion

Periods of high volatility remind investors that they need to be mindful of total portfolio risk. For those who decide that they need less volatile portfolios, there are two key choices to make. The first decision is how much of the portfolio you wish to have in bonds. The second decision is how to get the most return out of the total portfolio at a target level of risk. When the goal is to achieve very low portfolio volatility, the choices of investments for the equity portion of the portfolio must be either low volatility or very low correlation to the other assets in the portfolio, and preferably both.

We have shown historical performance of two portfolios designed to have about half the total volatility of the S&P500, with 40% of the portfolio in equities. The **Low Volatility ETF Folio** has historically out-performed a benchmark portfolio that has the same fixed-income allocation, but allocates its 40% equity stake entirely to an S&P500 index ETF. The **Low Volatility Folio** has historically generated higher incremental returns than the **Low Volatility ETF Folio**. This higher return is accompanied by some additional stock-specific risk (i.e. the risk to the portfolio if a single stock experiences financial distress). The forward-looking statistical models suggest that the historical out-performance of these two low-volatility portfolios is not simply due to recent out-performance.

Choosing a low-volatility asset allocation such as the Folios presented here can provide an investor with substantially less exposure to market volatility, while retaining much of the return from the equity markets. This is likely to be a more effective strategy for investors who are worried about big swings in their portfolios than trying to time the ups and downs of the broader market—something the average retail investor consistently has failed to do[8].

Note: In interpreting any statistical projections, the reader must be aware that all portfolio models that project statistical properties of future performance are highly approximate and rely upon a range of assumptions about the future that may or may not be accurate. Statistical models like the one used in these analyses are <u>not</u> a forecast of what an investment portfolio will return over a specific period.

[7] http://seekingalpha.com/article/38568-projecting-portfolio-risk-and-return
[8] See Footnote 2

About FOLIOfn and Quantext

FOLIO*fn*'s unique, patented Folio Investing offering (www.folioinvesting.com) represents the next generation in investing, after mutual funds and Exchange Traded Funds (ETFs). Folio Investing enables investors both to create their own Folios, much like creating a personalized ETF or mutual fund, or choose from many Ready-To-Go Folios representing different market indices, sectors, geographies, asset classes and investment strategies. Folios provide significant tax efficiencies, customization, and transparency, while allowing for cost-effective diversification. Folios can hold individual stocks, mutual funds, and ETFs. Folios can be managed or unmanaged and are offered by FOLIO*fn* Investments, Inc, a registered broker dealer, and are not registered investment companies.

FOLIO*fn*'s comprehensive, state-of-the-art institutional platform (www.folioadvisor.com) is used by more than 150 registered investment advisory firms, brokerages and financial institutions. FOLIO*Advisor* integrates advanced technology and clearing brokerage capabilities and is offered through FOLIO*fn* Institutional, a division of FOLIO*fn* Investments, Inc. FOLIO*Advisor* utilizes the proprietary and patented FOLIO trading platform in an easy-to-use, Web-based trading system that enables advisors and institutions to customize portfolios of securities (Folios) that can be bought, modified and sold in a single transaction across thousands of clients and accounts.

Quantext is an independent firm that acts as a strategic adviser to FOLIO*fn*, Inc.