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Fama-French Three Factor Model **Part II**

by Frank Arsmtrong

The Fama French Three Factor Model finds that stock investors most care about three variables: market, size and value. Each of these three variables has associated with it a priced risk, or equity premium.

This turns out to be extraordinarily useful. Using it we can:

- Explain the past performance of a portfolio, or
- Engineer a portfolio to capture future performance based on systematic exposure to these priced risk factors.

This article will focus on portfolio engineering applications of the model.

Model Limitations

It would be wonderful if the three-factor model explained everything, but it doesn? t.

While the three-factor model is a very powerful tool to explain performance over time, it has certain limitations.

- The analysis says nothing about risk, at least as defined by standard deviation. A portfolio smaller than average might reasonably be expected to have a higher standard deviation than the market, while a value portfolio may not generate any significant additional standard deviation. The three-factor model explains the sources of return rather than the total risk. Portfolio risk measurements must be derived from other sources.

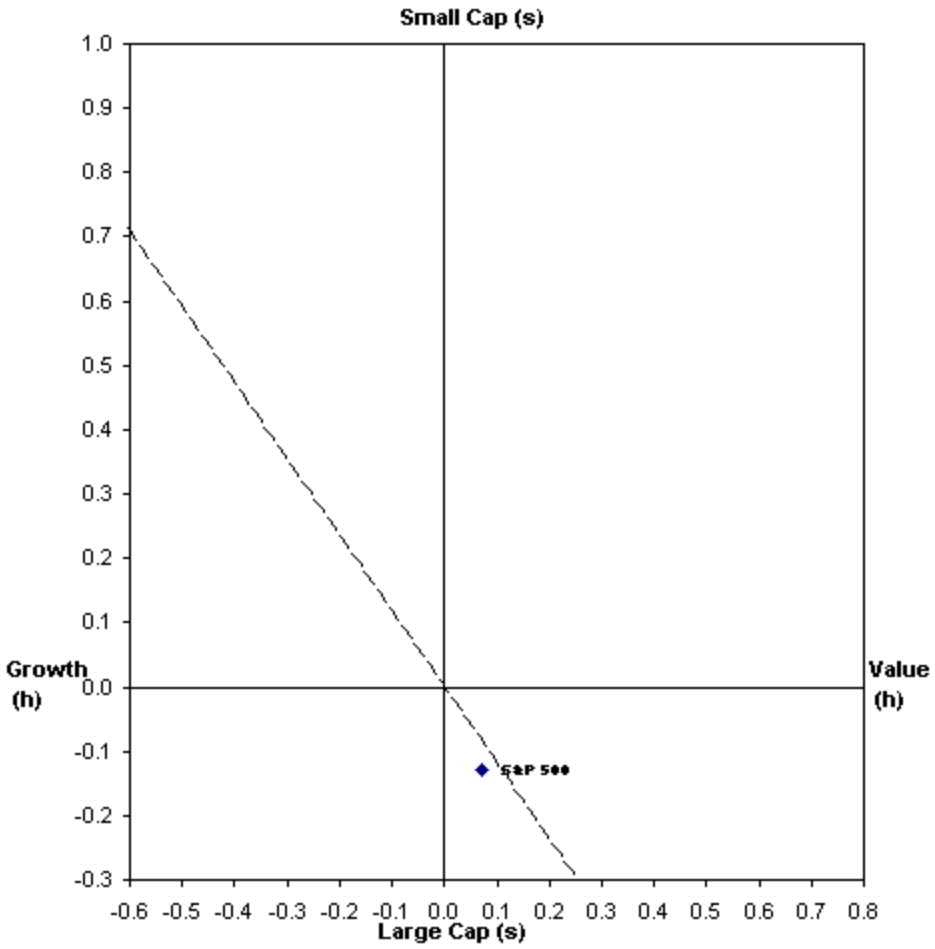
- If a manager drifts around in his style, the regression will generate strange results. For instance, a manager that shifted the portfolio from large to smaller might display significant positive or negative alpha as a result of the change in portfolio characteristics.
- Where above benchmark performance exists, the model is not able to distinguish between skill and pure dumb luck. In the real world, the vast majority of managers fall comfortably below the benchmark by about the amount that can be explained by transaction and management costs plus or minus a little error term.
- Concentrated positions or those that are poorly diversified will have huge random errors, again difficult to distinguish from pure dumb luck.
- If a manager holds fixed income or foreign investments additional factors must be applied to explain these more complicated portfolio performances. A five-factor model readily explains the fixed income portion of the portfolio, and a six-factor model accounts for the foreign market regional weights. (Thank goodness for computers. I can? t imagine doing this stuff with a pencil.)

Incidentally, from a market efficiency standpoint, any portfolio position may be considered equally efficient. Even the largest growth portfolios, which have the lowest expected returns, are efficient because they make reasonable trade-offs between lower expected return and higher quality, larger, ? safer? companies.

We can depict the entire US stock market (Total Market Index or TMI) as a graph graduated from top to bottom by size, and from left to right by value. Small will be on top, and Value to the right. We will scale the chart by using a percentage of the Fama-French size and value weightings.

Every traded stock must fall somewhere in the graph, and every mutual fund or any other account? s weighted average size and value must fall within the graph. It goes without saying that we can build an index that would fall on any point of the graph. Because we are plotting priced risk factors, as we move to the right (more value) and up (smaller), expected rates of return increase.

The weighted average of the entire market is at the cross hairs. We will chart the positions of other assets by their relative size and value weightings. Using the market return as the zero point, we can calculate the expected return over or below the market attributable to a style tilt.



We will have various points with a return equal to the market where smaller size is offset by lower value weights, or larger size is offset by a value tilt. A descending line running through the center from left to right plots those positions. Anything above that diagonal line has a higher expected return than the market; anything below that line has a lower expected return.

For instance, the S&P 500 index is down somewhat from the market center due to its larger size, and has a slightly lower expected return. The S&P 500 is such a large portion of the total market that it tracks very closely with the total market index. Adding all the rest of the US market? s traded stocks to the S&P 500 in proportion to their market weight is roughly equivalent to adding a few fleas to a 500 lb gorilla. We don? t change the relative weight much.

We know the return of the market (TMI), and its equity risk premium. We also know the premiums for both the small company effect, and the value effect.

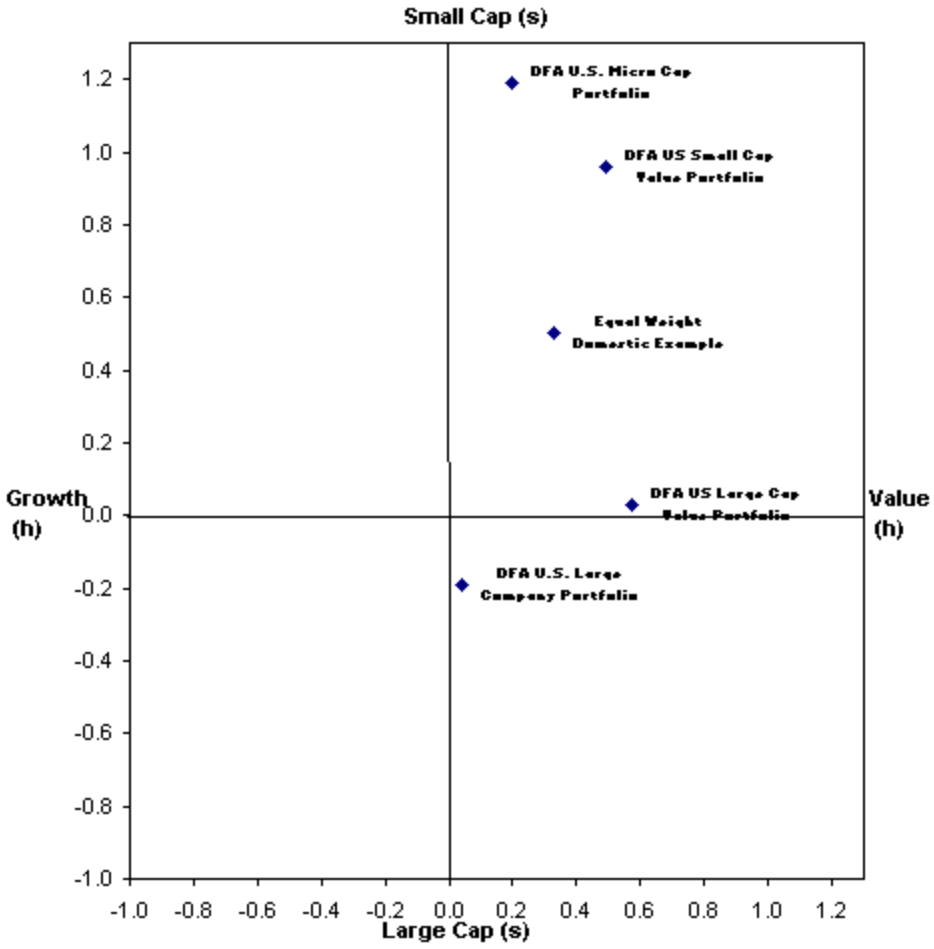
Fama/French average annual returns 1927 - 2002	
Market Premium	8.01
Size Premium	3.59
Value Premium	4.27

So, if we wanted to design a portfolio with a certain expected return above the market, we could plot any number of combinations of size and value that would result in that expected return. It? s then up to us to decide just which of those points satisfies our appetite for the size and value risk while achieving the desired expected return.

Portfolio Engineering

Given the total lack of evidence that active managers can consistently add value to a portfolio though stock selection or market timing, investors may still want to exercise some control over returns. In particular, most would like to achieve above local or global market benchmarks. How might they do that economically and reasonably consistently? Then three-factor model allows investors to engineer equity portfolios to capture additional returns derived from priced risk factors.

The global market equity portfolio can be easily achieved using retail index funds or exchange traded funds. It? s very simple, very effective, very economical. But, over the long haul, investors should expect additional returns over the total market by ? tilting? the portfolio toward small and/or value. This can be accomplished with a simple passive strategy by combining index or structured funds to achieve the desired total portfolio characteristics. For instance, an investor could simply ask himself how much additional return he wants over the long haul, then picks a point on the diagonal line that represents all the possible portfolios with that additional return. Each point has different loadings on small and value. The investor can decide which risks and how much of each he would like to bear in order to reach his desired additional return.



As an example above, we plot four domestic DFA indexes, Large Company, Large Value, Micro Cap, and Small Value. As you can see the three small and value portfolios are pretty far out from the center of the market. Then we plot an equal weight portfolio of the four indexes. This combined portfolio has an expected return of about 3.1% above the domestic Total Market Index. The investor can then examine the results and either increase or decrease the expected return of the portfolio by varying the relative weights of the portfolio components until he has achieved his objective within his tolerance for the various risk dimensions.

This passive strategy relies on sound academic theory and long-term real world experience rather than voodoo finance. Structural portfolio engineering reliably delivers higher expected returns at lower cost, lower risk, and lower tax cost than active mismanagement.

When implementing this strategy, the tilt can most economically be achieved with funds that have heavy concentration of the risk factor. Domestically, it might not be possible or practical to achieve some reasonable tilts using many retail small and value indexes. Internationally, it may not be possible at all using retail funds. The products are simply not available to generate a value or small tilt in foreign markets. This is why many professional investment advisors prefer the DFA funds.

The biggest trade off, or ? cost? that the investor faces is tracking error. The further he deviates from average market weights, the more likely he is to suffer temporary underperformance relative to the popular highly visible indexes. After all, these are real risk factors, which means that they don? t show up as positive additions to performance every time period.

The potential incremental rewards for putting up with this tracking error are huge for an investor that

understands the risks and endorses the strategy. In return for accepting a portfolio that doesn? t look and act like his neighbor? s the investor may expect an additional return of as much as one to three percent over the global equity index over his long term time horizon.

Investor Behavior

Tracking error generates a substantial behavioral risk for investors. If they lose heart during the inevitable periods of underperformance, they will not be there to enjoy the long-term benefits that the strategy predicts. An investor embarking on a meaningful ? tilt? strategy should not minimize the implications of his choices. No one wins when an investor buys high, caves in and sells low, only to wonder why he can? t make money in the capital markets.

Tracking error is also a major business risk for investment advisors. Temporary underperformance can stretch into a long time, and the risk of getting fired increases as the time stretches out. So, many advisors are reluctant to take the business risk. It? s amazing how close most will stick to the market. Even if they understand the issues, many professionals feel trapped between doing the right thing and being fired.

At Investor Solutions, Inc., our approach is to thoroughly explain the trade-offs, so that when the inevitable day of underperformance comes our clients will understand the implications of the strategy, and stay the course. We advocate a strong tilt towards small and value as a strategy with a high probability of enhanced returns. But, if the client isn? t comfortable with the strategy, he is better off in the market portfolio.

Coming up: Using Regression analysis as a benchmark for manager performance.

Read Fama-French Three Factor Model I

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