



# Swedroe: A 5 Factor Evaluation

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The history of asset pricing models is one of evolution. As anomalies are discovered, our knowledge advances and new models are developed.

Building on the work of Harry Markowitz, the trio of John Lintner, William Sharpe and Jack Treynor are generally given most of the credit for introducing the first formal asset pricing model, the capital asset pricing model (CAPM). It was developed in the early 1960s, and provided the first precise definition of risk and how it drives expected returns.

The CAPM looks at risk and return through a “one-factor” lens—the risk and return of a portfolio are determined only by its exposure to market beta. This beta is the measure of the equity-type risk of a stock, mutual fund or portfolio relative to the risk of the overall market. The CAPM was the financial world’s operating model for about 30 years.

With the publication of the 1992 paper “[The Cross-Section of Expected Stock Returns](#)” by Eugene Fama and Kenneth French, the CAPM was replaced by the Fama-French three-factor model, which added the size and value factors.

Mark Carhart, in his 1997 study, “[On Persistence in Mutual Fund Performance](#),” was the first to use momentum, together with the Fama-French factors, to explain mutual fund returns, and the Carhart four-factor model became the new standard.

## Five Factors

Then, Fama and French, in a new paper, “[A Five-Factor Asset Pricing Model](#),” which appeared in the April 2015 issue of the Journal of Financial Economics, explored a five-factor asset pricing model.

Their objective was to determine whether two new factors—profitability (RMW, or robust-minus-weak profitability) and investment (CMA, or conservative-minus-aggressive investment)—first proposed by Kewei Hou, Chen Xue and Lu Zhang and later published in the 2015 study “[Digesting Anomalies: An Investment Approach](#),” added explanatory power.

In other words, if Fama and French knew in 1992 (when they constructed their original three-factor model) what they know today, which would they have chosen?

Following is a summary of their findings:

- While a five-factor model doesn’t fully explain the cross section of returns (there are still anomalies), it provides a good description of average returns.
- The model’s main problem is its failure to explain the low average returns on small stocks that invest a lot despite low profitability. The Fama-French three-factor model, it turns out, has the same problem explaining the poor performance of small growth stocks.
- A four-factor model that excludes the value factor (HML, or high minus low) captures average returns as well as any other four-factor model they considered. A five-factor model including HML doesn’t improve the description of average returns over that of four-factor models, because the average HML return is captured by HML’s exposure to other factors. Thus, in the five-factor model, HML is redundant for explaining average returns.

Fama and French did note that “while the five-factor model doesn’t improve the description of average returns of the four-factor model that drops HML, the five-factor model may be a better choice in applications.

For example, though captured by exposures to other factors, there is a large value premium in average returns that is often targeted by money managers.” Thus, they write, “in evaluating how investment performance relates to known premiums, we probably want to know the tilts of the portfolios toward each of the factors.” They added: “For explaining average returns, nothing is lost in using a redundant factor.”

Importantly, Fama and French furthermore found that their five-factor model performs well. They write: “Unexplained average returns for individual portfolios are almost all close to zero.”

One of the authors' more interesting discoveries is that "the lethal combination for microcaps is low profitability and high investment; low profitability alone doesn't appear to be a problem."

However, Fama and French found this problem doesn't hold for large stocks with low profitability and high investment (note that passive portfolios may benefit from this knowledge by simply screening out stocks with these characteristics).

### **An International Perspective**

Today the five-factor model may be becoming the new workhorse asset pricing model in finance. Furthering its case, Fama and French have now provided an out-of-sample test of their model with the study "[International Tests of a Five-Factor Asset Pricing Model](#)," which was published in the March 2017 issue of the Journal of Financial Economics.

Their study covered 23 developed markets from four regions: North America (United States and Canada); Japan; Asia-Pacific (Australia, New Zealand, Hong Kong and Singapore); and Europe (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom).

These regions by market cap are: North America: 48%; Europe: 30%; Japan: 18%; and Asia-Pacific: 4%. Fama and French tested global as well as local factors. The period covered is July 1990 through 2015.

Following is a summary of some of their more interesting findings:

- While the five-factor model does not perform well at the global level, it does at the regional level.
- Except for Japan, the value premium is larger for small stocks.
- Except for Japan, where there are no reliable profitability and investment premiums, average RMW and CMA returns are also larger for small stocks. However, the evidence is statistically weak.
- The evidence that the expected investment premium is larger for small stocks is stronger, at least for the two regions with the largest market cap (North America and Europe).
- Of the four nonmarket factors, the HML returns of Europe and North America are most correlated (0.61). Next is CMA (0.57), SMB, or small minus big (0.31), and RMW (0.21). The profitability factor, RMW, is least correlated across regions. The 0.21 correlation for Europe and North America is the largest in the matrix.
- The value factor, HML, is important for describing average returns from 1990 through 2015 in all regions.
- RMW is important for describing North American, European and Asia-Pacific average returns. Even for Japan, RMW may have a marginal role in describing average returns.
- The evidence that the investment factor, CMA, helps describe average returns is mixed. It's strong in North America and the Asia-Pacific region, but trivial in Japan and Europe.
- The size factor, SMB, seems redundant everywhere except North America.
- The role of the investment factor in the five-factor model may largely be to absorb the low average returns of high-investment small stocks.
- For North America, Europe and the Asia-Pacific region, the five-factor model almost always outperforms four-factor models that drop HML or RMW.

Fama and French concluded: "In short, all five factors are important for describing NA average returns for 1990-2015." In other regions, not all factors are important. However, they note: "We would not be surprised to find that factors that are redundant for describing average returns in one period are important in another."

Perhaps their most interesting finding is the low average returns in Europe and the Asia-Pacific region for small stocks that have low profitability and high investment.

For example, the average excess return from 1990 through 2015 for a value-weight portfolio of small stocks in the lowest profitability and highest investment groups is -0.65% a month in Europe and -0.71% a month in the Asia-Pacific region. The average excess return for the analogous North American portfolio is low, but much less extreme, at 0.12% a month.

### **Conclusion**

All asset pricing models, by definition, are flawed or wrong. If such models were perfectly correct, they would be laws (such as the laws we have in physics).

But that doesn't mean asset pricing models don't provide value. As Fama and French note in their conclusion: "Complete success is almost certainly impossible, but less-than-perfect models can provide useful descriptions of expected returns."

When using regional pricing models, the international evidence provides out-of-sample support for the Fama-French five-factor model being the new workhorse in evaluating portfolio performance.

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ways -- thank you. I also much enjoyed your post on factor timing on Alpha Arc

; with FF-5:

ally. That seems a big omission for "the premier anomaly".

remium redundant. That seems odd when the value effect is well documented i  
n betting markets.

. Perhaps the "profitability" premium is an aspect of the low-volatility effect. Bur

about all this!

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