The Empirical Case For

EVA® and PRVit®

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What's at Stake?

Theoretically, EVA should do a better job of explaining stock prices than measures taken from conventional accounting such as reported earnings, growth rates, profit margins, ROI, and cash flow. As was explained in a companion piece[1], EVA wins because it is based on economic principles rather than man-made accounting rules. EVA is not pre-occupied with conservatively measuring earnings, but with realistically assessing whether wealth is being created or destroyed. It does not incorrectly mix operating and financing decisions, which is a basic corporate finance precept that reported accounting statements flagrantly ignore. Most fundamentally, it deducts a full, weighted average cost of all capital, including a required risk-adjusted return for the shareowners, before it begins to count profit. In so doing, it fuses income statement performance and balance sheet asset management into a reliable overall score that covers all the ways that a company can improve its performance and increase its stock price, and it automatically discounts to the same "net present value" as discounting cash flow does. At root, and most pragmatically, EVA is just a simpler and more effective way to apply discounted cash flow analysis.

That's the theory, but does it work in practice? Most definitely. In the following pages, we will show how EVA does a better job than the usual candidates at both *explaining* share price levels and changes looking back in time and *predicting* share prices and returns going forward.

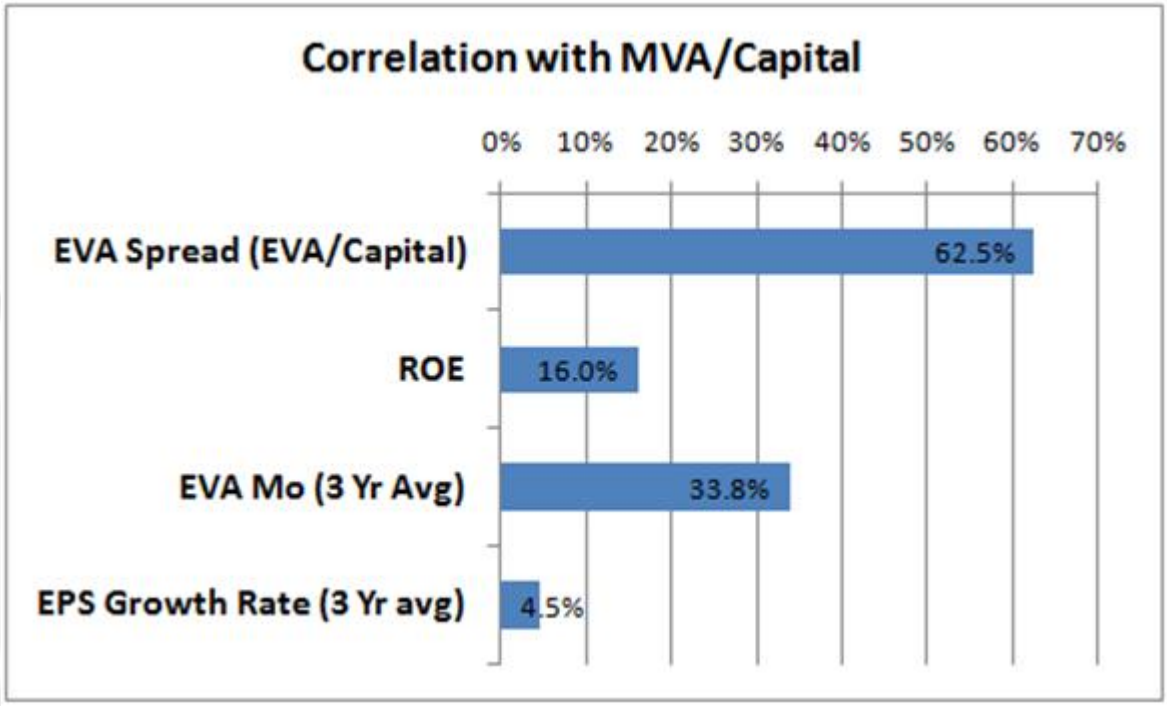
Explaining Value

One simple test is to see how well EVA explains MVA across a large sample of companies. MVA, for market value added, measures a company's market value premium (or discount) to its invested capital. A firm with a $1 billion overall market value, and with invested capital of $600 million, has an MVA of $400 million, the difference. As such, MVA measures the total wealth created for the firm's owners, and at the same time it is the market's implicit estimate of the firm's overall "net present value." An increase in MVA means that shareholder wealth has increased, and that the corporation's managers have wisely allocated, managed and re-deployed scarce capital. And the greater the rate of increase in MVA -- compared to an initial market value -- the greater is the rate of return generated on behalf of all investors, as will be later shown with a relatively painless derivation. The point is -- explain MVA, and you've explained an outcome of real substance.

We chose to regress EVA versus MVA as of June 2008, which was the last quarter before the economy collapsed. If anything, that gives accounting metrics an unfair advantage since we are

[1] The Investors' Guide to EVA, available upon request

looking at the tail end of a solid six year economic expansion period, a period when corporate profits more easily exceeded the cost of capital time than is normally the case. As a result, this makes measures that don't take the full cost of capital into account appear better than they really are. But even handicapped, EVA wins.



In our test, we started with the Russell 3000, and then excluded 704 firms that had less than four years of financial results on record. We also excluded 98 real estate firms and 66 bio-techs -- which resist financial ratio analysis of any kind. Last, we set aside 85 "misfits" – a group of outlier firms with MVA/Sales ratios more than five standard deviations out of alignment with their EVA/Sales ratios. Most of those were embryonic companies that also defy meaningful financial analysis. One example is Evergreen Solar, an emerging producer of photovoltaic wafers that traded for an enormous MVA/Sales ratio of 1,115% when its EVA/Sales margin was running at minus 37.7%. In the end, we were left with a total of 2,031 firms – still a very broad-based and meaningful swath of America's public businesses.

As shown in the chart above, the firms' ratios of MVA to capital as of June 2008 were 62.5% correlated with their ratios of EVA to capital. This clearly indicates a tight link exists between the two. Companies that were generating a high return on capital compared to their cost of capital tended to trade for high premiums to their invested capital, and vice versa. By contrast, the correlation of MVA/Capital with the firms' conventionally calculated return on equity (ROE) over the prior year was just 16%, and laughably, was only 4.5% with the trailing 3 year average

growth in earnings-per-share. You might as well about toss a coin to guess how much wealth a firm has created as look at its EPS growth rate. The trailing 3 year average EVA Momentum, which measured the average growth rate in EVA, was a far better indicator, with a correlation of 33.8% to MVA.

Why don't the EVA measures do even better? Because MVA is forward looking -- it is in principle governed by the expected present value of *projected* EVA -- and we are using a single trailing period EVA and a trailing average EVA growth rate as proxies for that. If a firm's outlook is brightening or worsening, or if it is in a position to turbo-charge growth in EVA with profitable new investments, then trailing EVA metrics will incompletely proxy for the total projected EVA stream that investors are discounting into the current share price. But let's set aside those obvious limitations for now. This test was only intended, at a most rudimentary level, to suggest that the market does factor the cost of capital into valuations -- which is the essence of what distinguishes EVA as a performance metric. On that score, EVA passes with flying colors.

Explaining Returns

The second test is more sophisticated, and a harder hurdle to pass. The question is, how good is EVA at explaining the stock market *returns* that investors have actually realized?

Specifically, we'll focus on explaining the "total investor return," or TIR, which is the overall return that investors as a group realized from their aggregate investment in a firm's securities – from buying its total capital structure in market value proportions. In the same way that shareholders measure returns from cash dividends and cash equivalent capital gains, TIR is derived from the firm's free cash flow after all investment spending ("FCF") plus revisions in the firm's aggregate market value ("V"), divided by the firm's market value at the beginning of the period ("V_0"):

$$TIR = (FCF + \Delta V)/V_0$$

Free Cash Flow measures all cash operating receipts minus all cash operating disbursements, whether those are recorded as expenses that reduce operating profit or as expenditures added to capital. It is operating cash flow after tax minus all investment spending, which is the corporate equivalent of the cash flow that company planners discount for an individual capital project. If it is positive, FCF amounts to the net cash that a company distributes to investors (or uses to accumulate excess cash) and if negative, it is the net amount of cash financing a company must obtain from outside the firm[2]. Either way, FCF either adds to or counts against the return the investors realize from a change in the market value of their holdings.

2 If a dividend is paid to shareholders, then it simply increases funding that must be obtained from other sources, which reduces the shareholders' claim to future cash flows. Paying a dividend per se no more rewards shareholders than would withdrawing cash from one's own bank account make a person richer.

Expressing returns as a function of cash flow and capital gains is mathematically correct, but analytically confusing. Suppose a company decides to invest additional capital in its business. Because there is usually a time lag until an investment generates a return, an increase in investment spending will reduces FCF, and according to the TIR formula, the spending directly deducts from the investors' return. On the surface, *any* capital spending appears a bad idea because it pulls cash back from the table. That is not true, though, because investment spending and value creation are correlated. Generally, an investment adds to a firm's market value because it increases the firm's earnings power. And if the firm's market value increases as a result of an investment by more than the amount actually invested, then net net, the company's investors realize a higher total return and are better off. They are better off, in other words, when an investment produces a positive "net present value" as judged by the market. And the more such positive NPV investments a company makes, and the more negative or lower its free cash flow becomes, even for a long time, the greater is the creation of shareholder wealth and the rate of return generated on behalf of all investors. That's all implicit in the rate of return formula – by definition.

Although the fog of accounting and cash flow make it hard to appreciate, it is nevertheless a mathematical fact that shareholder returns are maximized when companies follow the basic capital budgeting rule and maximize the corporate NPV. But that is also exactly the same thing as maximizing EVA, since the present value of EVA for an investment project is, by definition, its NPV, and at the corporate level, it is MVA. To make that crystal clear, a little algebraic fiddling[3] shows that the original cash flow/capital gain formula for TIR converts into a totally equivalent EVA and ΔMVA formula, as follows:

$$TIR = (FCF + \Delta V)/V_0$$

$$TIR = (EVA + \Delta MVA + COC*CAPITAL)/V_0.$$

The two formulas yield identical measures of a firm's TIR over a given period, and thus they reveal a profound and little known truth. Although returns are *transmitted* to investors via cash flow and cash equivalent capital gains, returns are actually *generated* by the EVA earned over the period plus the change in MVA -- which by definition measures revisions in investors' expectations for the projected present value of EVA. Despite appearances, shareholder returns are driven by EVA all the way.

[3] Start with $TIR = (FCF + \Delta V)/V_0$. "Free" Cash Flow is the cash generated from operations that is free or net of net additions to capital ($FCF = NOPAT - \Delta CAPITAL$). EVA is NOPAT less a full capital charge at the weighted average cost of capital ($EVA = NOPAT - COC * CAPITAL$), so rearranging, NOPAT equals EVA plus the capital charge ($NOPAT = EVA + COC * CAPITAL$). Substitute for NOPAT in the definition of FCF, which leads to $FCF = EVA + COC * CAP - \Delta CAPITAL$. MVA is the prevailing spread between the firm's aggregate market value ("V") and its invested capital ($MVA = V - CAPITAL$), which implies that $\Delta MVA = \Delta V - \Delta CAPITAL$, and $\Delta V = \Delta MVA + \Delta CAPITAL$. Substituting and cancelling ΔCAPITAL gives $TIR = (EVA + \Delta MVA + COC*CAPITAL)/V_0$.

Don't be off put by the last term in the EVA/ΔMVA formula for TIR. It is an add-back for the capital charge, and simply reflects that stocks are always priced to build in a base return from unwinding the discounting process -- which is really how investors earn an expected return, from reversing the discounting of future EVA (or cash flow, if you must). That's even more evident when TIR is converted into "alpha," i.e., into the total excess return over the cost of capital, which we refer to as "TER":

$$TER = TIR - COC = (EVA + \Delta MVA + COC*CAPITAL)/V_0 - (COC*V_0)/V_0$$

$$TER = (EVA + \Delta MVA – (COC*MVA))/V_0$$ [4]

Let's put the TER return formula through its paces. Consider what happens if a firm's EVA is zero and is expected to remain so. MVA, which is the present value of expected EVA, is zero and unchanging, which implies the firm's market value is equal to its capital (which let us assume is $1,000). In this simplest example, TIR is always equal to COC, and TER is always zero. Investors earn no alpha because the company's performance never changes and the stock always trades for what it is worth.

Suppose now that the company manages to step up its performance, such that its EVA increases to $10 and is expected to remain so. Assume the cost of capital is 10%. Then the firm's MVA increases to $100 – the present value of the perpetual $10 EVA discounted at 10% -- and the total investor return that period rises to 21%:

$$TIR = (EVA + \Delta MVA + COC*CAPITAL)/V_0.$$

$$TIR = (\$10 + \$100 + 10\%*\$1000)/\$1000 = 21\%$$

The firm's excess return over the cost of capital (i.e., its TER) is 11%, a nice alpha return for investors who detected the increase in EVA before the market.

What happens the next period? The company's market value starts off at $1,100 once the $100 MVA is added on top of the firm's $1,000 capital base. If the company persists in earning the expected $10 EVA, so that its MVA remains $100, then its TIR once again settles down to 10% and its TER is 0% each period. Thus, a one-time sustained increase in EVA leads to a one time jump in shareholder value and a quantum leap in return, but thereafter, investor returns throttle right back to the cost of capital.

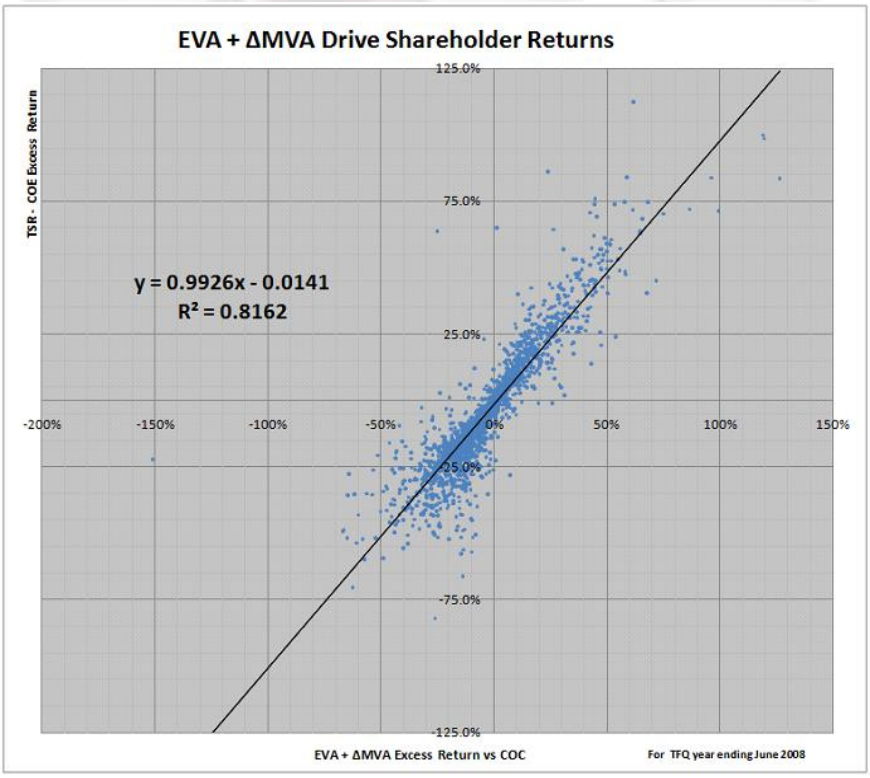
$$TIR = (EVA + \Delta MVA + COC*CAPITAL)/V_0.$$

$$TIR = (\$10 + \$0 + 10\%*\$1000)/\$1,100 = 10\%$$

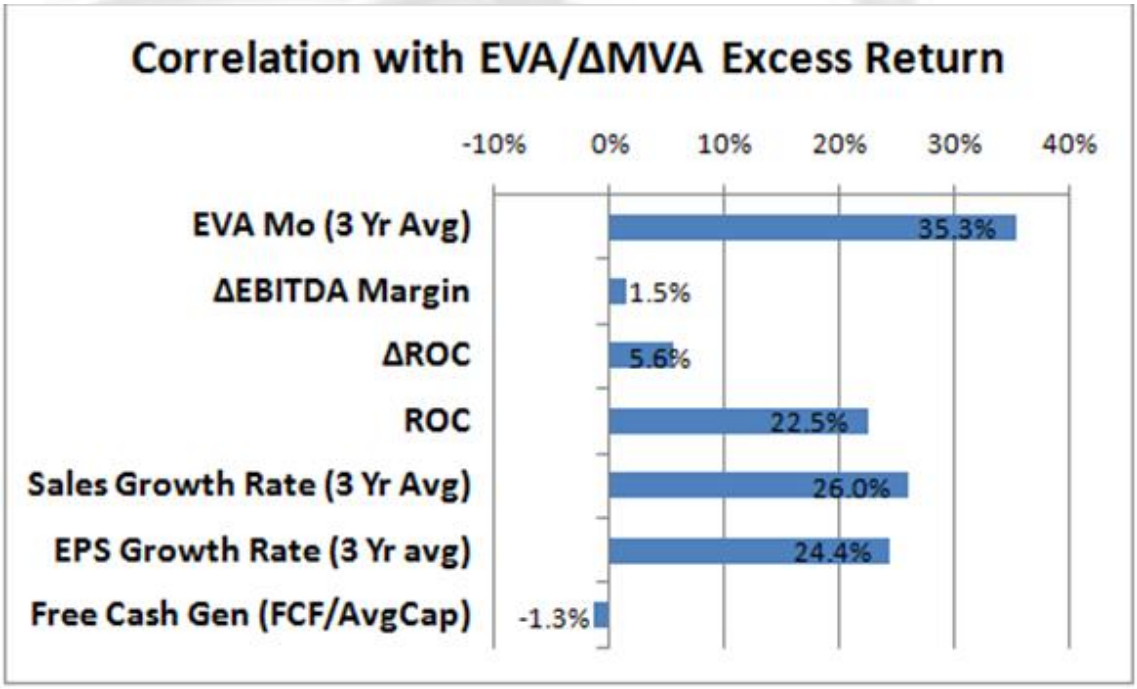
[4] The revised formula involves collapsing COC * CAPITAL - COC * V to - COC * (V - CAPITAL) = - COC * (MVA).

Only by continually surprising investors with higher and higher EVA can a company continue to generate outsized returns and sustained positive alphas. A good way to quantify the degree to which that may be happening is with EVA Momentum, which measures the EVA growth rate. Sustained bouts of positive EVA Momentum usually take investors by surprise because competitive forces and maturation of markets tend to slow EVA growth. Accordingly, we can use EVA Momentum as a proxy for economic profit surprises which will tend to show up as higher returns for investors, all else equal. Our test, then, will consist of comparing EVA Momentum as a driver of returns versus a cackle of accounting type metrics. But first, let's check our math.

We've shown how EVA is the mathematical force behind returns, but, how good are total investor returns as proxies for what ultimately matters to equity investors -- which are returns to shareholders? As the chart below shows -- pretty darn good. The horizontal axis plots TER -- the total investor return from EVA and the change in MVA (plus the capital charge), less the firm's overall cost of capital. The vertical axis is familiar territory -- it is the total shareholder return from dividends and stock price appreciation, less the firm's cost of equity. It is the excess shareholder return. The regression line joining the two has an R-squared of 82% and slope of 0.99 -- almost perfectly 1 for 1. For all practical purposes, the EVA/ΔMVA return on total value is an excellent proxy for total shareholder return. This proves the obvious -- that shareholder returns are the residual of total corporate returns -- but it's gratifying to see it confirmed.



The next step is to see how well a variety of measures explained the EVA/ΔMVA return for the sample of Russell 3000 firms over the 3 year period ending in mid-year 2008. As was mentioned, the EVA candidate for earnings surprise is EVA Momentum. On the accounting side of the ring is EPS growth, and five others. The clear winner is EVA Momentum, with a 35.3% correlation to the investor return. Curiously, the second place finisher is the sales growth rate at a 26.0% correlation, followed closely by EPS growth at 24.4%. Our interpretation is that the mid-2005 to mid-2008 period was one of such robust expansion and profitable growth that even woefully incomplete and highly flawed measures of corporate performance like sales growth showed up reasonably well as a pure statistical matter -- even better than EPS growth, ironically enough.



Three measures were almost totally uncorrelated with investor returns -- change in the EBITDA margin - zilch -- change in ROC -- near zilch -- and generation of FCF -- negative, ever so slightly. Although a projection of FCF discounted over the life of a business is a measure of its value, the FCF a firm actually generates over any interval of time is expected to be a meaningless measure of performance -- and now it turns out, it is.

What are the implications? For one, analysts will be better off attempting to make an accurate forecast of EVA than an accurate forecast of EPS, ROC, or any other accounting type metric because insight into EVA is a more reliable way to make research pay. A second is that it is almost totally fruitless to focus on cash flow or any of its variants, or any of its consequences. A

WSJ Heard on the Street column illustrates how ignorance of this rule leads to erroneous conclusions.

"...And yet Travelers stock, at about 90% of book value, commands a lower multiple than the likes of Goldman Sachs, J.P. Morgan Chase, and many other regional banks. That is questionable, especially since Travelers sports a 2.9% dividend yield and through buybacks, has reduced shares outstanding by 20% over the past year."

David Reilly
Banks' Excess Premium to Travelers
The Wall street Journal, August 4, 2010

Travelers may be a good investment, but that is not because it has a high dividend yield or is buying back shares. Those are merely consequences of the fact that Traveler's was generating a positive free cash flow, which meant Travelers was in a position where it had to return excess capital to its investors. It must either pay dividends, retire debt, buy back stock, or accumulate excess cash, since it has a positive FCF. But far from providing a buy signal, derivative consequences of a positive FCF are as inconsequential as FCF itself -- which "sports" a near zero correlation with shareholder returns. Research analysts who screen stocks or prowl for bargains based on FCF or any of its repercussions or variations are really barking up the wrong tree. Their time would be far more productively applied to finding firms that are trading for less than the true value of their EVA.

So far we've provided evidence to certify that EVA and the rate of growth in EVA are the best measures to explain market valuation and the creation of wealth. Now comes the hard part. Can they predict the creation of wealth better than the other measures?

PRVit -- a Model for Predicting Returns

By mid-year 2010, EVA Dimensions completed a four-year project to significantly revamp and upgrade the measurement of EVA and related metrics. The upgrade consisted of a more accurate and granular mapping of Compustat data, refinements in the formulas and algorithms used to measure EVA, and computation of over 400 ratio metrics covering the entire EVA/MVA framework.

From those, a handful of promising metrics were subjected to rigorous testing by EVAD's quantitative research team that narrowed the list to a total of just 22 that entered the final predictive model. To even be considered in the first place, a metric had to make economic sense, and it had to have a unique and distinguished voice. It could not simply parrot what was already expressed by other, more articulate variables that already had been given seats at the table. Second, the metrics had to meaningfully outperform standard accounting metrics of the

same category. For instance, EVA Margin (EVA/Sales) was chosen over EBIT, EBITDA, and EBITDAR margins, and EVA Momentum was chosen over EPS growth.

Finally, the metrics had to coalesce into overall index of investment merit that was based on a theoretically sound model of intrinsic value. We weren't interested in mining data to find a model that happened to "work" over the back-test period. Rather, we looked for the best set of variables to fit into an EVA valuation model -- a model that would compare a firm's intrinsic EVA value against its actual MVA value.

In particular, we wanted to compare two ways of defining a company's MVA.

1. **Intrinsic Value ("IV")**: MVA = Present Value of Projected EVA

2. **Market Value ("MV")**: MVA = Market Value - Capital

The first formula says that a fairly-valued company's MVA *should* equal the present value of the EVA it is capable of earning over its projected life[5]. The second formula measures the firm's *actual* MVA given its current share price. It is the spread between the firm's "market cap" and its invested capital as of a given point in time.

To develop an investment index, we measure the ratio of intrinsic EVA value to actual MVA value. We call this philosophy "VARP™" -- or buying "Value-At-A-Reasonable-Price™." In our view, VARP supersedes "GARP" -- which is buying "growth-at-a-reasonable-price." GARP is too limiting. Why just buy growth at a reasonable price? Why not also buy poor performers that are trading for even less than they are worth, and why not also sell or sell short if the price is too high compared to fundamental value? We want an investment metric that is bi-directional -- giving buy and sell signals when value is incorrectly priced on the market.

The investment signal we calculate is therefore based on measuring and comparing the ratio of intrinsic value to market value. We call this the VARP signal.

$$\text{VARP} = \frac{\text{Intrinsic Value}}{\text{Market Value}} = \frac{\text{Present Value of Projected EVA}}{\text{Market Value - Capital}}$$

The higher the VARP ratio, the better the buy, the lower the VARP, the stronger the sell.

We don't have access to estimates of the discounted value of future EVA (no one does, of course), so we use the next best thing. We use recent EVA performance trends, adjusted for

[5] This is just a restatement of the idea that a firm's value is the present value sum of its net operational cash flow -- the amount that it can pay out to its investors, less cash infusions -- over the entire future life of the business, as was covered in the companion piece, "The Investors' guide to EVA."

each company's risk profile, to proxy for the discounted present value of EVA. To be specific, we use 9 variables to represent a company's ability to earn and increase its EVA -- together, they represent its "Performance," or "P," and we use 6 variables to reflect the likelihood that the past EVA performance indicators can be confidently extrapolated -- together they represent "Risk", or "R." And then we use 7 measures to proxy for a company's MVA -- collectively representing its "Valuation," or "V." We express each of the individual metrics for any one firm as a percentile rank against the entire Russell 3000 universe, and then we consolidate those into composite P, R, and V scores, which are also percentiles against the whole market. Next, we use the P-R score to proxy for the firm's intrinsic value, and the V score to proxy for the actual market valuation, and we compute the VARP signal as the ratio of the two:

$$\text{VARP} = \frac{\text{Intrinsic Value}}{\text{Market Value}} = \frac{\text{PV of EVA}}{\text{MVA}} = \frac{\text{P - R}}{\text{V}}$$

In the last step we compute a "PRVit Score" by expressing each firm's VARP ratio as a percentile among all Russell 3000 firms. This produces a percentile score that is always evenly distributed from 0 to 100 across all Russell 3000 firms every day. The PRVit score has no inherent bias to buy or sell stocks in general -- which is a distortion that undermines "sell-side" Street research which is generally and arbitrarily weighted to "buy." PRVit distinguishes which stocks across the whole market are better bargains than others. A higher PRVit score means that an investor gets more real economic performance, net of risk, per unit of current market value. Stocks with higher PRVit scores are expected to outperform those with lower scores.

A second score is computed to eliminate common valuation elements across an entire industry. For example, in February 2011, the median PRVit score for Food & Staples Retailing companies was 67, and a large proportion of the scores were in the 90s. That's because the firms' profits had generally held up well during the downturn -- they are not called staples for nothing -- plus their risk factors are and were comparatively low -- staples again -- but because they were not expected to experience as sharp a rebound as other sectors, their MVA valuation multiples were relatively low.

But the across the board high ratings within a single industry are misleading. An investor should not be persuaded to buy any one Food & Staples Retailing stock when most of them garnered a high rating. To eliminate the industry bias, all Food and Staples Retailers are re-rated against each other, and the same across all the other industry groups, which means the real cream rises to the top, the less attractive firms sink to the bottom, scores across each industry are evenly spaced between 0 and 100, and the median PRVit score within each of the industries is re-set to

50. The resulting "in-industry" PRVit scores are not only market neutral but industry neutral -- they are pure buy/sell indicators purged of an across the board or industry-specific bias to buy or sell. Those scores should be able to predict which stocks will outperform others in the same industry.

In January 2011 the EVA Dimensions research team developed a set of modest but valuable refinements to the model without changing its overall format or logic. The refinements consist, first, of revising and expanding the list of variables to a total of 24 in order to measure the firm's valuation multiples more accurately and, second, eliminating a spillover effect from a firm's profitability to its risk and valuation measures. Specifically, we:

- Moved from 3 to 6 metrics to represent a firm's valuation multiples in order to provide more measurement diversification, such as by adding additional multiples of cash flow and EVA, including one that reflects a longer-term, 3 year average EVA multiple.
- Eliminated use of market value as a divisor in measuring the size of some valuation multiples, which had created an unwanted negative stock price Momentum aspect to the valuation factor (lower valuations were leading to higher multiples after dividing by the lower valuations, which contributed to driving PRVit scores lower after a bout of negative stock price momentum). This undesirable effect was eliminated by substituting sales and capital as divisors where appropriate.
- Reduced an excessive influence of profitability as a driver of PRVit scores. We discovered that companies that performed better also tended to generate stronger cash flow and to exhibit lower volatility in their EVA margins, which PRVit considers signs of lower risk. We also found that companies with stronger profitability tended to trade for *lower* valuation multiples, apparently because investors consider it relatively more difficult for them to expand the value of already profitable franchises. The combined effect was to inflate the PRVit scores for profitable firms because their risk and valuation multiples tended to be lower, too. In short, we were over counting how much profitability should matter in determining the PRVit score. To remedy that, statistical regression is now used to remove that part of the R and V scores which are correlated to the firm's profitability, and only the residual portion of the risk and valuation scores that are unrelated to profitability are used in determining the final PRVit scores.

Our testing shows that the revised model renders a somewhat lower stock return prediction, but, the statistical significance of the prediction is materially higher over the past 12 years. It also performs significantly better over the past 2 years, a time when low performing stocks did well.

Tests of the PRVit Metrics

Let's examine how the revised set of 24 P, R, and V metrics in the PRVit model fared at predicting a ranking of stock market returns within each industry, compared against a sample of conventional, "out-of-the-box," generic metrics. The table below lists a subset of the PRVit variables culminating with the in-industry PRVit score in the left column versus a set of generic factors in the right column (a detailed description of the individual PRVit metrics is in the Appendix).

A word on the statistics reported in the table is in order. IC stands for information coefficient. It is a basic indicator of the overall strength of a variable in predicting stock returns. It is the rank correlation of the variable with the total shareholder returns generated over the next month. For the reasons discussed above, the measures and the shareholder returns are ranked within each industry[6]. The reported IC is thus the average signal strength across all industries and all the months from May 1998 to April 2011.

Investors are interested in consistency as well as raw strength. Consistency -- or we should say, inconsistency -- is measured by the standard deviation in the IC. A variable that is strongly predictive in some months but much less so in others will have a higher standard deviation in IC than one with a steadier IC. The T-stat takes that into account. It is essentially the average IC divided by the standard deviation of the IC (with an adjustment for the number of observations). With a higher T-stat, a variable predicts stock returns with more accuracy and reliability.

The last statistic shown is the top-minus-bottom spread. That is the hypothetical average monthly return an investor would have earned by buying the top ten percent and shorting the lowest ten percent of the stocks ranked according to the single measure in question, with monthly rebalancing and ignoring all transactions costs. The larger the spread, the better the signal is able to separate winners from losers at the extreme ends of the spectrum. It is less characteristic of the overall strength of the signal across all companies but more indicative of the value of the insights at the highest and lowest ends of the distribution.

A glance at the table shows that the EVA/MVA metrics on the left side for the most part dominate the conventional, "out-of-the-box" accounting-based metrics on the right. As one example, compare EVA Margin to EBITDA margin. The IC's, respectively, are 3.2% vs. 2.4%, and the IC T-stats are 7.5 versus 4.8 – more than two standard deviations better. True, the top minus bottom spread is the same, but that statistic only characterizes the performance of the extreme deciles and not the full span of all stocks, as the IC stats do. EVA Momentum (3 yr), measuring the growth rate in EVA, handily beats EBITDA and EPS growth.

[6] Shareholder returns are also measured net of the return that would be expected given each stock's beta exposure to the market.

EVAD Factor	Avg IC	T-Stat IC	Avg T/B Spread
P	3.3%	6.9	0.8%
P1: Profitability	3.3%	7.1	0.7%
EVA Margin	3.2%	7.5	0.6%
EVA Spread	3.4%	7.4	0.6%
EVA Spread (Equity)	3.3%	7.2	0.6%
Return on Gross Cap ROGC	2.6%	6.3	0.9%
P2: Momentum	2.3%	5.6	0.7%
EVA Momentum Margin	1.4%	4.1	0.5%
EVA Momentum Spread	1.5%	4.1	0.4%
EVA Mo Spread (Q)	2.1%	5.3	0.5%
EVA Mo Margin (3 Yr)	2.0%	5.7	0.3%
EVA Mo Spread (3 Yr)	2.2%	5.9	0.5%
R	4.3%	10.1	1.2%
R1: Volatility	4.1%	9.5	0.8%
Vol of share price	-4.0%	-8.4	-0.8%
Variability of EVA margin	-2.5%	-8.2	-0.6%
R2: Vulnerability	2.9%	9.2	1.1%
FCF Generation	2.4%	9.6	0.7%
OCGSPREAD	1.8%	7.4	0.6%
Total Debt/EBITDAR	2.7%	7.8	0.9%
V	0.6%	0.9	0.7%
V1: Wealth Ratios	-0.4%	-0.5	0.3%
MVA Margin	0.1%	0.2	-0.4%
MVA Spread	0.5%	0.7	-0.2%
MVA Spread(Equity)	0.6%	0.9	-0.4%
P1 + V1	2.7%	6.3	1.0%
V2: Wealth Multiples	3.6%	8.7	1.1%
EBITDAR Multiple	3.3%	7.8	1.3%
NOPAT Multiple	3.8%	10.8	0.8%
Operating Cash Generation	2.0%	5.4	0.9%
Future Growth Margin	-2.9%	-7.6	-0.7%
Future Growth Spread	-2.6%	-6.3	-0.6%
NOPAT Multiple (3 Yr)	2.8%	9.6	0.4%
PRVIT	**4.0%**	**11.9**	**1.4%**

Generic Factor	Avg IC	T-Stat IC	Avg T/B Spread
P			
P1: Profitability			
EBITDA / SALES	2.4%	4.8	0.6%
ROE	2.7%	5.0	0.5%
ROIC	2.9%	5.3	0.7%
P2: Momentum			
EBITDA 4Q % Change	1.6%	3.9	0.1%
EPS 4Q % Change	1.4%	3.7	0.1%
EPS MOMENTUM	1.7%	4.7	0.3%
R			
R1: Volatility			
VOL _ROE	2.5%	5.6	0.5%
VOL _ROIC	2.0%	4.8	0.3%
R2: Vulnerability			
Basic FCF Generation (Cash From Ops - CAPEX)/(Assets - Cash - NIBCL)	2.5%	6.6	0.5%
Cash From Ops Generation (Cash From Ops)/(Assets - Cash - NIBCL)	3.7%	8.1	1.2%
Total Debt/EBITDA	2.9%	5.9	0.9%
LT Debt to Capital	0.8%	2.1	0.4%
V			
V1: Wealth Ratios			
Book to Price	0.0%	0.0	0.6%
Sales to Price	0.0%	0.0	0.7%
V2: Wealth Multiples			
Earnings to Price	2.7%	5.9	0.6%

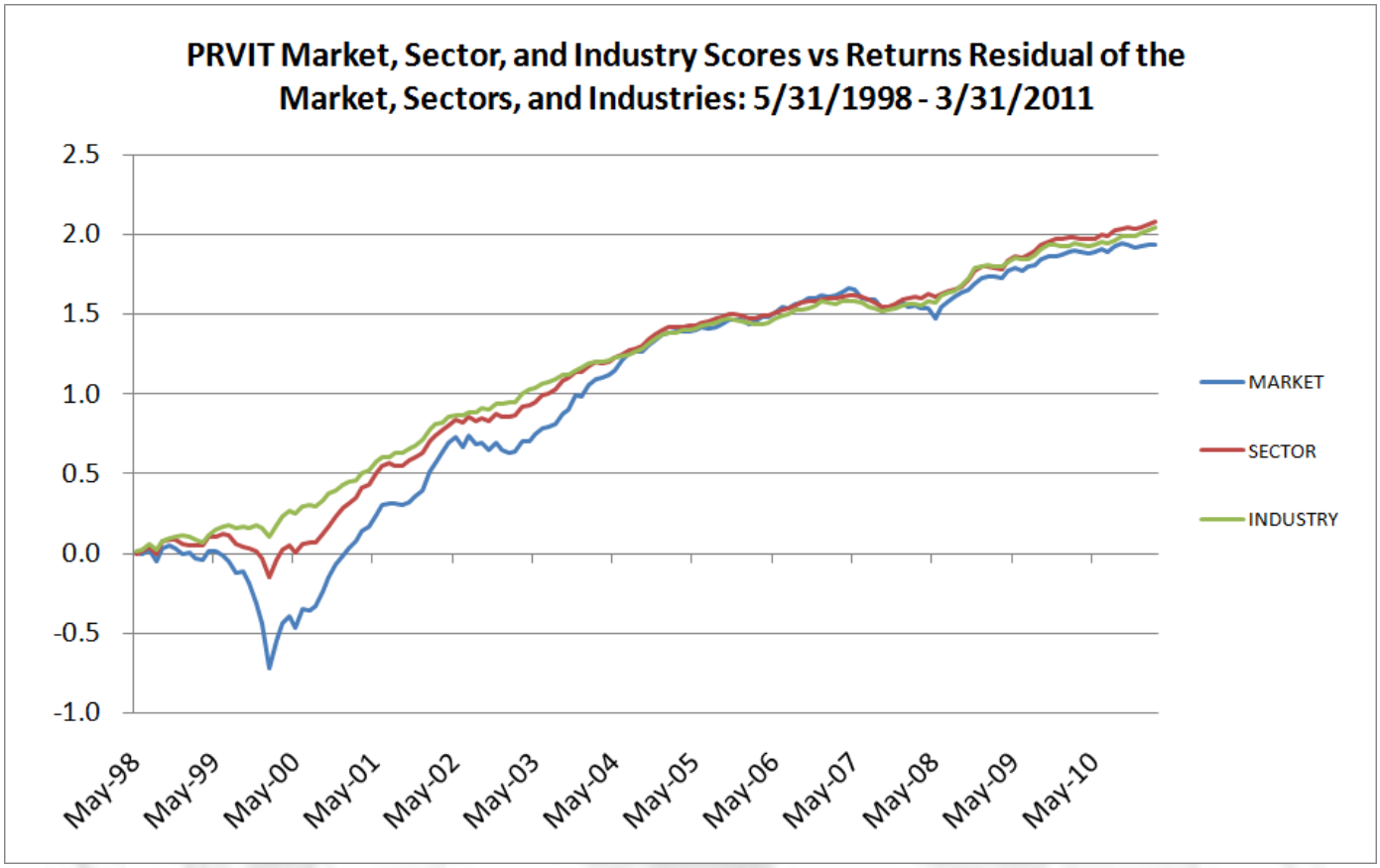
As expected, the in-industry PRVit score is the most predictive of all the variables. Its IC is 4.0%, and even more importantly its T-stat is 11.9 (IR -- the information ratio -- which is the average alpha over the sigma of alpha, i.e., the active return per unit of active risk, is more determined by the T-Stat of the IC than the average IC). One reason PRVit performs so well is that it balances competing indicators. For instance, taken alone the EVA Margin ratio is a strong signal, but if that was the sole criterion used to pick stocks, you'd end up with a portfolio tilted to high performing, highly-valued equities, which would represent a risk factor. That won't happen with PRVit because it is based on indexing the ratio of (P-R)/V. It penalizes firms with high EVA Margins if they also have high MVA Margins. It only lets a buy signal pass if the firm's valuation

score is less than it should be in relation to the risk-adjusted EVA performance it is demonstrating. Not only that, but PRVit uses a number of measures to quantify each factor. For example, a firm's profitability is gauged with 4 measures, and its trend with 5. Combining less than perfectly correlated measures increases the signal strength of each of the factors and sub-factors used in PRVit. In sum, the breadth and diversification of the measures, along with their insertion into a theoretically sound index of intrinsic value to actual valuation, makes the in-industry PRVit score a better overall indicator of whether a stock is fundamentally over or under-valued compared to its peers than all the other signals studied, including the individual EVA/MVA metrics.

PRVit Scores by Market, Sector and Industry

Let's revisit the rationale behind using PRVit scores ranked among industry peers. The chart below shows an accumulation of the monthly returns from following the top-minus-bottom decile investment strategy for three variations of the PRVit score. The blue line plots the cumulative spread for the original PRVit scores measured versus the entire Russell 3000 market, the red one is using the PRVit scores re-ranked within ten broad sectors, like Energy, Financials, and Consumer Durables, and the green one shows the return accumulation using the PRVit scores re-ranked within some 55 industry groups. As is evident, the in-industry PRVit scores outperformed the other scores in terms of risk and return. In view of this, we assign a firm its official "PRVit" score according to its percentile ranking within its industry[7].

[7] In the PRVit Express commercial toolkit from EVA Dimensions, both market and industry scores are reported so that users can decide for themselves which one to use.



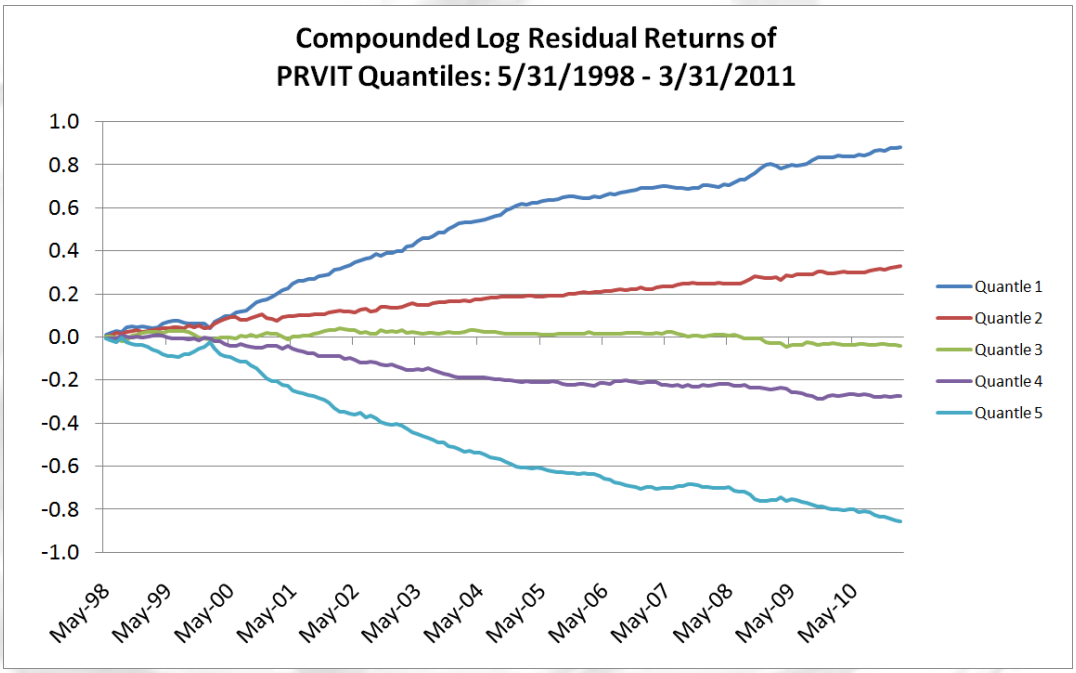
PRVit Rough Patches

As good as it appears to be over the long haul, there were two periods where the PRVit ranking didn't work so well. One was the period leading up to dot-com bubble peak in the first quarter of 2000, where an inspection of the chart shows that PRVit briefly stumbled. But once the so-called "new economy" bubble burst, the PRVit signal very quickly recovered the lost ground. The second period, labeled Quant Distress below, resulted in a smaller drawdown of 6% as the market diverged from quantitative fundamentals. But, the prior high-water-mark was quickly regained and the subsequent 6 months produced a roaring return of 18%.

Date of Max Drawdown	Drawdown	Interpretation	Mark Regained	Subsequent 6-Mo Return
1/31/2000	-8%	Internet Mania	4/30/2000	10%
9/30/2007	-6%	Quant Distress	6/30/2008	18%

Sources of PRVit Returns -- Shorts vs. Longs

What are PRVit's strengths and weaknesses? Where and when does PRVit perform best, and where is it off its game? For one thing, PRVit is almost as good at spotting overvalued stocks as undervalued ones. The plot below shows the cumulative returns for five portfolios, each containing the same number of stocks spread equally across all the industries. The "quantile 1" portfolio consists of the 20% of stocks rated highest in each industry, and the next one the next 20% of stocks ranked by PRVit scores in their industry, and so on down to Quantile 5, which is populated exclusively with PRVit dregs -- the lowest rated firms in their industries.



The portfolios performed exactly as expected, providing cumulative returns that closely aligned with their PRVit scores. Specifically, the top rated one beat the market by an average annual rate of 6.9% while the lowest rated portfolio underperformed the market by 6.6% a year, albeit while exhibiting more risk. The table below provides details on the average returns, volatilities, and Sharpe ratios. It shows that, after accounting for risk, PRVit was still very good at spotting stocks to short -- almost as good as it was in calling out longs to buy.

Quantile	Avg Issues	Ann Avg Returns	Ann Volatility	Sharpe Ratio
1	480	6.9%	2.8%	2.5
2	479	2.6%	2.1%	1.2
3	479	-0.3%	2.1%	-0.1
4	479	-2.1%	2.0%	-1.0
5	479	-6.6%	3.0%	-2.2

Sources of PRVit Returns -- Style Exposure

By construction, PRVit scores have very little correlation to size, as measured by sales, capital or market cap, and very little correlation with price-to-book ratios. The correlation of PRVit to market cap, for instance, nearly zero at just 0.2%. Investing according to PRVit does not force an investor into taking an unwise exposure to any of the classic style dimensions. However, that is not to say that PRVit is equally good at picking stocks across all style cells. Unsurprisingly, PRVit performs somewhat better with small and mid cap stocks that are less actively followed than large caps, and it performs somewhat better with value and core than with growth, as is evident in the table below (which displays average IC, the IC T-stat, and average top-bottom spread, stacked, in each cell).

The consolidated PRVit statistics we've already reviewed appear in the cell in the lower right corner of the table. Along the bottom row are the statistics for small, mid and large caps. The strongest signal is in small caps, but even for large caps the IC T-stat is a very respectable 5.9 and top-less-bottom spread is 0.7% per month. Running up from the lower right corner are the summary cells for value stocks, core, and then growth. PRVit is very strong across all three categories. It's very good in value and core, and still quite strong for growth stocks, where its IC T-stat is 8.0 and top-less-bottom spread is 1.2% per month. This validates that PRVit is a successful "VARP" signal. It finds "value-at-a-reasonable-price" all through the value/growth spectrum.

Price / Book	Market Cap: Small	Market Cap: Mid	Market Cap: Large	IC / IC t-stat / Spread
High	4.9%	3.6%	3.0%	4.0%
	7.0	5.7	4.6	8.0
	2.6%	1.1%	1.0%	1.2%
Mid	5.2%	3.0%	2.1%	3.6%
	8.4	5.7	3.4	9.4
	1.9%	0.7%	0.5%	1.1%
Low	5.3%	3.3%	3.5%	4.2%
	9.5	5.4	4.7	10.5
	2.0%	0.9%	0.7%	1.5%
	5.4%	3.5%	2.9%	4.0%
	11.8	8.2	5.9	11.9
	1.9%	1.1%	0.7%	1.4%

Sources of PRVit Returns -- Sector Strengths and Weaknesses

PRVit scores very well in all but three sectors. It is a relatively weaker predictor of Energy stocks -- most likely because hydrocarbon prices are so unpredictable and because value is buried in reserves in the ground and not on the books -- and it is not a standout predictor of Utilities -- one, because their stock prices are typically so stable there's not much volatility to predict, and two, because the return variations that exist are largely driven by the unfathomable course of regulation and interest rates. Another relatively weak spot is Materials, for much the same reasons as Energy, we suppose. The low statistics reported for Telecom companies are likely misleading because there are so few firms in the sector it is difficult to get an accurate reading. But putting these sectors aside, PRVit shines in all others, as is shown in the table below, where the sectors are ranked by their IC T-stat.

	Avg IC	IC t-stat	Spread
Consumer Discretionary	5.3%	10.2	2.0%
Financials	5.3%	8.2	1.3%
Industrials	4.0%	6.8	1.2%
Health Care	4.3%	6.5	1.6%
Consumer Staples	5.5%	6.4	1.7%
Information Technology	3.6%	6.1	1.3%
Materials	3.2%	3.2	0.9%
Utilities	1.8%	2.0	0.5%
Energy	1.2%	1.2	0.8%
Telecommunication Services	1.2%	0.9	2.4%

Sources of PRVit Returns -- Holding Period

PRVit scores are recomputed daily as new stock prices and financial reports become available. Even if a company has not submitted a new financial filing, its PRVit score will change because stock prices change and because the company is being judged in relation to the distribution of performance, risk and valuation characteristics of all other Russell 3000 stocks, which are in constant flux. Make no mistake, the day-to-day correlation of PRVit scores is very high. A stock highly rated one day is likely to be the next day, too. But as time passes, significant revisions accumulate. The correlation of PRVit scores assigned on a given day with PRVit scores assigned one month later is 93%, over a 3 month interval the PRVit-to-PRVit correlation is 82%, over 6 months 68%, over 9 months 56% and year to year 47%.

In any case, the PRVit model still adjusts the ratings to new information, as it should, and the market adjusts to the information in PRVit. Here's how it works. As stock prices migrate in the direction PRVit predicts, the PRVit scores for top and bottom rated stocks are pulled back to the center. As they move to the middle they displace stocks that PRVit previously deemed to be fairly valued, but which by random jostling and investor inattentiveness, become over or undervalued, which sends their scores away from the center and toward the buy or sell zones at the extremities. A convection current of new information and share price migration keeps PRVit scores in a fairly constant state of circulation. One consequence is that the signal strength of the PRVit scores diminishes the farther out one tries to predict returns. So far we've been talking about IC as the rank correlation of PRVit scores with share returns over the month immediately following the date the PRVit score was computed. The IC for that was 4.0%, and T-stat was 11.9. But if you use the PRVit scores to predict returns over the second month out, the IC drops to 2.7% and T-stat drops to 8.3. And for each month farther out, the predictive power of the PRVit score falls off some more, so that with a six month lag, the IC T-stat is cut in half and the top-minus-bottom spread is cut by one third. Put another way, the IC signal strength decays at the rate of nearly 15% per month, which is the rate at which the initial 4.0% IC turns into a 1.7% IC five months later.

Holding Period	Avg. IC	IC T-Statistic	Avg. Top-Bottom Spread
1 Month	4.0%	11.9	1.4%
2 Months	2.7%	8.3	0.9%
3 Months	2.3%	7.1	0.7%
6 Months	1.7%	5.2	0.4%

Once again, decay in signal strength should not be lamented. It is as inevitable as death and taxes, and a natural reaction to new information coming into the market, and the market responding to the information contained in the PRVit signal. How could it be otherwise?

Sources of PRVit Returns -- Up versus Down Markets

In general, PRVit performed a little better during up markets than down ones. The overall correlation of the IC with the Russell 3000 market movements was 2%, which indicates the

PRVit signal was a hair stronger when the market was rising. In the table below, the average IC for the in-industry PRVit scores is divided into two camps -- one is the average IC across months when the Russell 3000 index rose vs. months when it fell. It confirms that IC and top-minus-bottom spread were higher when the market was rising[8].

	Average IC	Average Top-Bottom Spread
Up Market Russell 3000 Return	4.2%	1.2%
Down Market Russell 3000 Return	3.7%	1.5%

Summing Up

PRVit is the most fundamental of quantitative signals and the most quantitative of fundamental indicators. Like all quantitative models, it relies on the power of statistics to compare, contrast, shift through and sort volumes of data that would overwhelm the most highly skilled security analyst, but it does so in the context of theoretically sound model of market valuation, one that at root is premised on discounted cash flow but that in practice is far better realized through an analysis of economic profit and a comprehensive set of performance, risk and valuation ratio metrics developed by EVA Dimensions. Without a disciplined adherence to a fundamental valuation model, quantitative research tends to degenerate into data mining exercises where numbers overwhelm common sense and economic logic, where models are over-fitted to data that is supposedly being used to test them, and where simulated alphas never come close to realization in practice. At the same time, it is equal folly for fundamental stock pickers to think that they can pick stocks among thousands and size up their relative value without a tool like PRVit to give them a bird's eye view that supplements their deep well of knowledge.

Besides confirming the efficacy of PRVit as a stock research tool and alpha indicator, the findings presented in this memorandum are strong indicators that stock prices and stock returns are driven by economic profit fundamentals. Just as it is not obvious to gamblers that the casino always wins, because they are too close to the action, it is likewise hard for investors in the heat of picking stocks and managing portfolios to realize that stock prices are fundamentally based on weighing and reflecting the real value of firms' true economic performance. But the evidence presented here shows that that is so. In particular, it shows that EVA metrics better explain and predict share prices and shareholder returns than the conventional accounting metrics that many investors now use. Moreover, the research certifies that although it is invisible and not deducted

[8] The IC T-stat is not reported because it depends on the number of observations which varies between the number of up and down months.

on any conventional accounting report, the opportunity cost of capital that is deducted in the measurement of EVA is a real cost and has real consequences for how stocks are actually priced.

Corporate managers and planners, for their part, would be wise to recognize that aspect of market sophistication by building the cost of capital into their management reports and performance metrics, into their planning and pricing of acquisitions, and even as a hurdle that must be exceeded before bonuses are earned and paid. Put bluntly, they should renounce earnings-per-share, ROE, operating margin and even cash flow in any of its manifestations, and they should instead use EVA, EVA Margin and EVA Momentum in managing their businesses.

But as for investors, the simple message is, don't bet against PRVit. Research stocks that have attractive PRVit scores, and consider selling low-scoring ones. Compute the overall PRVit score of your portfolio, and if is it low or falling, reassess your allocation. If the past is a guide, betting against PRVit is not likely to be a winning strategy, but betting with it should prove profitable over any extended time period.

Appendix: PRVit Variables Defined

Performance (P) is a function of:

- **Profitability ("P1")** -- measures a company's ability to earn a return on capital over the full cost of capital and generate true economic profit. This is indicated by variables such as EVA Margin (EVA/Sales) and EVA Spread (EVA/Capital). EVA is measured against sales and capital to account for intrinsic differences in capital intensity across industries. Another measure, the cash return on gross capital ("ROGC"), is included to account for firms where book depreciation and amortization is distorted. It is defined as (NOPAT + DD&A)/(Capital + Accumulated DD&A).

- **Trend (P2)** -- the growth rate in EVA, as measured by EVA Momentum. Momentum is measured over the prior year, quarter, and 3 year trend in order to fully trace the arc of the EVA curve. Similar to EVA, Momentum is measured off trailing sales and trailing capital.

Risk (R) breaks down into:

- **Variability (R1)** -- raw unpredictability, as measured by standard deviations in the company's stock price and in its EVA Margin. Stock price volatility is measured over the trailing 252 trading days. EVA Margin variability is measured by differences versus the same quarter the year before, over the past 3 years.

- **Vulnerability (R2)** -- susceptibility to economic shocks and inability to fund growth, as measured by weak cash flow and suspect debt coverage. Cash flow is measured by FCF Generation (FCF/Capital) and Operating Cash Generation (OCG/Capital, where OCG is cash flow from operations after working capital spending, but before spending on long term assets like plant and goodwill). Debt coverage is measured by Total Debt (including the present value of rents)/EBITDAR. Financial institution leverage -- actually the inverse -- is measured by the capital-to-assets ratio.

Valuation (V) divides into:

- **Wealth Ratios (V1)** -- measures the degree to which investors are paying a market value premium over invested capital, as measured by MVA Margin (MVA/Sales) and MVA Spread (MVA/Capital.

- **Wealth Multiples (V2)** -- valuation multiples of cash flow, earnings, and EVA, as measured by the cash flow multiples like EBITDAR Multiple (Enterprise Value/EBITDAR), total profit multiples like NOPAT Multiple (Market Value/NOPAT), and by variations on Future Growth Reliance, or FGR. FGR is the percent of the company's market value that exceeds the value of capitalizing the firm's current EVA as a perpetuity, and thus it is the portion of the overall value that is at risk of, and depends on, continued growth in EVA. A higher FGR ratio thus calls for a higher expectation hurdle for EVA Momentum.