The Link Between TSR and EVA

Author:

Bennett Stewart

Senior Advisor, ISS

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TSR is Determined by Economic Profit, or EVA

Total Shareholder Return ("TSR") is straightforward to compute, as it comprises a company's dividend yield and stock price appreciation rate over a period. But what performance factors lie behind TSR? Does TSR respond to rapid growth in sales, earnings-per-share (EPS), or cash flow? What role do profitability metrics – such as earning a high return on capital – play? In short, what really determines TSR?

The answer is important because, when so much pay is being tied to TSR, and when pay alignment is being judged by TSR, major stakeholders – including investors and boards – want to be sure that incentives are motivating managers to aim at the financial targets that lead to attractive shareholder returns. They also need the assurance that TSR is grounded in economic logic and is not just a fickle barometer of market sentiment.

There is good news here. TSR stems from basic blocking and tackling financial fundamentals that every company can measure and use in managing its business. As will be demonstrated, TSR is always a function of the economic profit, EVA, standing for Economic Value Added, that a company earns. Granted, TSR seems to depend on cash dividends and cash-equivalent capital gains. But the truth is, the cash flows are mere messengers, duty bound to transmit the return that a firm generates by earning EVA profit and increasing it over time.

Many corporate managers and boards do not realize this association and operate with a different mental model. Many executives imagine that the market responds to cash distributions and the growth in earnings-per-share (EPS), for example. They attempt to boost TSR though higher dividend payments or by aggressively buying back shares. But, when thinking about long-term shareholder value creation, they are missing the point. Paying dividends or buying back stock change the form of the return, the split between dividends and capital gains, but these methods cannot alter the overall magnitude of the return.[1] This argument will be demonstrated conclusively, not as a mere assertion, but as a mathematical derivation that is confirmed with stock market data.

Enter EVA

EVA measures corporate earnings after deducting a priority return for all investors, for lenders and shareholders alike. EVA is net operating profit after taxes, or NOPAT, less a weighted-average cost-of-capital charge applied to the firm's net business assets. Unlike traditional profit measures, EVA increases when firms turn assets faster and develop leaner business models that free up expensive capital. EVA suffers if new investments fall short of covering a market-mandated minimum return. At the same time, EVA is pro-growth in ways that ROI is not. EVA increases whenever new investments produce returns above the cost of capital, even if those returns are lower than what the company is currently earning.

EVA also eliminates or mitigates the effects of accounting rules that distort the true performance and real value of a business. For example, with EVA, research and development (R&D) is not expensed as accounting rules mandate. It is capitalized, written off over a period of years, and a

[1] Paying a dividend or buying back stock can change value, but only if they change the EVA profit the firm will earn or is perceived to be able to earn, which is a possibility. Paying out cash could reduce the money the firm would otherwise invest in negative EVA endeavors, or it might pressure managers to use the remaining capital more wisely. Even so, it is not the cash distribution per se that counts; it is the prospective impact on EVA that matters.

cost-of-capital interest charge is assessed on the outstanding balance. With EVA, impairment charges are reversed. The charges are added back to earnings and back to balance sheet capital, as if the charges never happened. Adjustments such as these turn EVA into a surer and more comparable measure of true economic profit.[2]

EVA is Directly Tied to Value and to TSR

EVA is directly connected with TSR over time. This is a crucial point, and it is not just an assertion; it is mathematically true. The present value of the EVA profit that a company is forecast to earn over the life of its business is identical to the net present value of the forecast cash flows. Derivations are available,[3] but the basic idea is easy to grasp. By deducting the capital charge, EVA automatically sets aside the profit that must be earned in each period to recover the value of the capital that has been or will be invested in a business, and thus, EVA always discounts to NPV, to the net present value of the cash flows. By definition, to increase EVA is to increase a firm's intrinsic discounted cash flow (DCF) value.

And, because TSR is essentially derived from the rate of increase in a firm's NPV over time, relative to an initial market valuation, TSR is directly a function of the EVA profit a firm is earning and how rapidly it is increasing EVA over time.

Enter MVA, or Market Value Added

The concept of NPV, which is ordinarily applied to individual investments, can be carried to the level of an entire company with a sister measure to EVA called MVA, for Market Value Added. MVA is the spread between a firm's overall market value, or enterprise value, given its current share price, and the capital invested in its business assets.[4] If a firm's total enterprise value is $1 billion and it has invested a $600 million sum in balance-sheet capital, then its MVA is $400 million, the difference.

MVA is a very significant measure, more significant than TSR in many ways. MVA indicates how much wealth a company has created for its owners by comparing the cash that investors have put or left in the business with the present value of the cash that they can expect to take out of it. MVA also measures a firm's franchise value. It is the value of the firm's business as a going concern above and beyond the commodity cost of replacing the resources put into it. It is the proprietary value that hails from all its distinctive assets and intellectual properties.

[2] For more information on EVA and how it is computed, please consult the whitepaper, [The EVA Measurement Formula](https://www.issgovernance.com/file/products/eva-measurement-formula.pdf), by Bennet Stewart, located at https://www.issgovernance.com/file/products/eva-measurement-formula.pdf

[3] Many academic scholars have derived the exact mathematical link between EVA and NPV. One good example is: Discounted Cash Flow and Residual Earnings Valuation: A Comparison in the Context of Valuation Disputes, by Dr. Bradford Cornell, California Institute of Technology, bcornell@hss.caltech.edu, published March 2013, and available at https://www.researchgate.net/publication/235983747_Discounted_Cash_Flow_and_Residual_Earnings_Valuation_A_Comparison_in_the_Context_of_Valuation_Disputes. The article abstract states: "Using actual data from a disputed acquisition, this paper presents a comparison of two related income approaches to valuation – discounted cash flow (DCF) and residual earnings (RE) [note: residual earnings, or RE, is synonymous with EVA]. Although the DCF approach remains predominant in practice, the data and analysis presented here indicate that the RE [i.e., EVA] approach is often a better choice, particularly in the context of disputes and litigation. The RE approach is more anchored on observable data, is less sensitive to parameters that can be subject to discretionary adjustment and is more economically transparent."

[4] Briefly, capital is total assets, net of excess cash and trade funding, and as adjusted to mitigate accounting distortions, such as by capitalizing R&D and impairment charges; put another way, it's the sum of debt and equity money invested in net business assets, net of the accumulated depreciation and amortization of those assets.

Lastly, MVA is the same thing as the corporate aggregate NPV. It is literally a summing up in the market's mind of the net present value of all investments, those the company already has made plus the present value of those deemed likely to materialize down the road. And as such, a company's MVA is determined by the present value of all the company's market-forecasted EVA profits.

When a firm's MVA increases, therefore, it is triply significant. It shows, first, that the owners' wealth expanded, second, that the firm's NPV and franchise value increased; and, third, that firm's TSR has grown larger, too. And what does all that boil down to? Increasing EVA. Increasing EVA is the key to creating wealth, maximizing NPV, and generating TSR, all at the same time.

The Derivation of the EVA Role in TSR

The direct link between EVA and TSR appears like a sweeping assertion that will strike some as radical. But the relationship can be backed up with a formal derivation. The logic presented here confirms that EVA plays a critical role in determining TSR, and it sets the stage for tracing TSR to a set of EVA ratios. The derivation details are covered in full in appendices. In this memo, practical insights and simple numerical examples are emphasized.

The journey to tie EVA to TSR starts with explaining another, more fundamental return measure called Total Investor Return ("TIR"). TIR is the return that an investor would earn if he or she owned a proportionate share of a company's bonds and stock, that is, if they owned a share of its business profits. TIR is thus purely a function of the company's operating performance and changes in the value of the business, and TSR is just a leveraged version of it, as will be shown in step 2.

Step 1: Defining Total Investor Return with Cash Flow and with EVA

TIR is defined as the appreciation in the value of a business over a period plus the net cash distribution from the business during the period, expressed as a percent of the business' initial value. TIR is a cash dividend and capital gain rate of return. In symbols:

TIR = the total return earned in the business on behalf of all investors

$$TIR = \frac{\mathrm{FCF} + \Delta V}{V_0}, \qquad where$$

FCF = "free cash flow," the cash flow from operations, excluding any interest or finance charges, net of capital investment during the period.

As such, FCF is the cash amount that is free to distribute to investors, that is, to pay interest to creditors, to retire debts, pay dividends, buy back stock, or accumulate cash in marketable securities, which can be distributed later. Or, if FCF is negative, which happens when a company is investing more cash in its business than its business is generating in profits, then FCF is the net amount of new debt and equity that would have to be raised from external sources (or drawn down from surplus cash). Put simply, FCF is the net cash "dividend" that a business pays in a year.

V = market value, the value of the firm's debt and equity capital, given its share price. In other words, V is "enterprise value," the value placed on the business as an operating entity

ΔV = the change in the business' value over the period

V_0 = the value at the beginning of the return measurement period

The TIR formula appears to suggest that managers could boost returns by pruning investments and pumping up the distribution of cash in a period. But that may not necessarily be the case. Cutting investment is apt to reduce a firm's growth rate and overall market value. If FCF is up, but ΔV goes down, the TIR outcome is uncertain. The formula computes the return without offering insights into how to improve it.

With a few substitutions, though, a firm's TIR can be expressed directly in terms of EVA and MVA, as follows: (the derivation appears in Appendix 1)

$$TIR = \frac{\overset{\textbf{(1)}}{\text{COC} * \text{Capital (Avg)}} + \overset{\textbf{(2)}}{EVA} + \overset{\textbf{(3)}}{\Delta MVA}}{V_0}$$

The revised formula shows that TIR is mathematically determined by three components:

1. First, as makes sense, the cost of capital is built right into TIR. This return component comes from reversing the discounting process. As time passes, the projected EVA profits that were discounted into a firm's stock price come closer to the present. Their values loom larger, there is a valuation lift, as compounding at the cost of capital rate replaces discounting at that rate. For example, if a firm's EVA is forecast to be $100 next year, and the cost of capital is 10 percent, the forecast EVA enters the firm's current value at $90.91. It is discounted. By year end the $100 in EVA is worth $100, or 10 percent more. It compounds. While not obvious from the cash flow formula, a fully-competitive, market-demanded rate of return is discounted into stock prices and impounded into TSR. There is no excuse for not earning it.

2. The second source is earning EVA. This is a one-for-one relationship. More EVA profit is a higher shareholder return. Not EBITDA, not net income, not EPS. It is earning EVA that counts.

3. The third source is increasing MVA. The return comes from increasing the wealth of the owners, from expanding the firm's franchise value, from enlarging the corporate aggregate NPV. It is not a question of increasing the firm's long-run value, as some say. It is a question of increasing the firm's current market value by *more than* any capital invested in the business. It is a question of increasing the firm's net present value. And that takes increasing EVA.

Putting aside the built-in return, the formula says that TIR depends, as a purely mathematical matter, on earning EVA and on increasing EVA to increase MVA. This formula is coded into ISS software and can be shown to apply for any company, and for any business plan.

The question put earlier – will it be better to cut investments and enhance cash flow to buy back stock or increase dividends, or, to make the investments and postpone cash flow – can now be answered. The answer is, so long as new investments generate rates of return above the cost of capital, they increase EVA, increase NPV, and increase shareholder returns. The insight is, the market does not want cash now, it wants value now, and value is best determined by the prospect for growing EVA profits.

Here's an example calculation of TIR using a simple hypothetical situation.

Example Calculation of TIR

The two TIR formulas, one based on cash yield and capital gain, and the other tethered to EVA, are illustrated below for a hypothetical company based on the following assumptions:

NOPAT =	\$ 80 [Net Operating Profit After Taxes]
CAPITAL =	\$ 800 [Capital, or net assets, at the end of the period]
CAPITAL (Prior) =	\$ 600 [Capital at the start of the return measurement period]
ΔCAPITAL =	\$ 200 [The investment in business assets, net of depreciation]

CAPITAL is the book value sum of debt and equity capital. It is also equal to total assets, net of excess cash in marketable securities, net of trade payables and liability accruals, and net of the accumulated depreciation and amortization of the assets. In short, it is the net book value of the business assets.

ΔCAPITAL = the period-to-period change in Capital; it is the amount of cash put into business assets, minus the depreciation and amortization of the business assets that has been deducted from the balance-sheet book values. It is capital expenditures for growth, above and beyond replenishing the asset base.

FCF (NOPAT – ΔCapital)	\$ -120 [\$90 - \$200; FCF, or free cash flow, is negative]

Since NOPAT and the change in Capital are both net of depreciation and amortization, NOPAT – ΔCAPITAL is a true cash flow number. It is effectively all cash operating receipts minus all cash operating disbursements, whether recorded as expenses on the P&L or as expenditures that add to balance sheet capital.

In the example, Free Cash Flow is negative. The company must raise external financing to fund growth. The cost of obtaining that funding is deducted from EVA by deducting the charge for using capital. So long as EVA is increasing, the cost of financing the new capital is being covered.

Capital Charge (COC x Capital)	\$ 70 [10% x \$700 in average capital (\$600+\$800)/2]
EVA (NOPAT – Cap Charge)	\$ 10 [\$80 - \$70; EVA is positive]

The Capital Charge is computed by applying the cost of capital to the average capital over the period. The Capital Charge represents the NOPAT the firm needs to earn to cover the cost of capital on its net assets and breakeven on EVA. EVA is the profit above or below that market-set profit target.

Value (V) =	\$ 1,300 [the debt and equity “enterprise value,” net of excess cash]
Value (V_0) =	\$ 1,000 [market value at the start of the return measurement period]
ΔValue =	\$ 300 [the firm’s value increased]
MVA (V – Capital) =	\$ 500 [\$1,300 - \$800; MVA is positive]
MVA (Prior) =	\$ 400 [\$1,000 - \$600]
ΔMVA =	\$ +100 [MVA increased \$100 over the period]

Cash Flow TIR Formula

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

$TIR = (\$\text{-}120 + \$300) / \$1{,}000$

$18\% = (-12\% + 30\%)$

EVA TIR Formula

$TIR = (\text{Capital Charge} + EVA + \Delta MVA) / V_0$

$TIR = (\$70 + \$10 + \$100) / \$1{,}000$

$18\% = (7\% + 1\% + 10\%)$

The answers are identical – the formulas are perfectly equivalent – but the EVA version is more informative. It shows that the firm’s 18 percent return was the sum of 7 percent from compounding at the cost of capital rate, 1 percent from the EVA profit earned in the period, and 10 percent due to an increase in the firm’s aggregate NPV, or MVA.

The negative FCF component in the cash flow formula is misleading. It seems a drag but isn’t. FCF is negative because the company invested more than it earned – invested \$200 versus \$80 in NOPAT. But the investment apparently added value. The firm’s market value increased by \$300, or \$100 more than the investment. MVA, owner wealth, expanded. Cutting the investment to generate more cash would likely have led to a lower return, not a higher one, to less NPV, not more, especially in a firm like this that demonstrates it can earn EVA profits.

Bottom line: The two formulas yield identical results. The math works, because the value of EVA and value of projected cash flow are the same. Cash flow and capital gains are now seen for what they are – mere messengers that transmit the rate of return that comes from earning EVA and increasing it to increase the corporate aggregate NPV.

Step 2: TSR is a Leveraged Version of TIR

To derive TSR from TSR, the key insight is this: shareholders own the business after paying off the firm's creditors. Shareholder returns, therefore, are the returns earned in the business magnified, for better or worse, by the firm's debt-to-equity ratio (see Appendix 2 for derivation of the formula below):

$$TSR = \quad TIR \quad + \quad (COE - COC) \quad + \quad (TIR - COC) * \frac{Debt}{Equity}$$

$$TSR = Business\ Return + Equity\ Risk\ Premium + Leveraged\ Return$$

The formula says that three components fundamentally determine every firm's TSR:

1. *TSR begins with TIR:* The return earned in the business is foundational and always underlies TSR.
2. *COE – COC,* the spread between the firm's cost of equity and its weighted average cost of capital, is added. It is a built-in premium to compensate shareholders for taking leverage risk, that is, for assuming extra earnings volatility when fixed interest payments to creditors are paid out of uncertain operating profits. Recall that a COC return is discounted into TIR. This premium converts the COC return in TIR into the cost-of-equity return that shareholders expect.
3. *A leveraged performance premium*. This is the TIR minus COC spread in the period, which indicates the degree to which the business is generating a rate of return above or below the expected return, magnified by, i.e., multiplied times, the firm's debt-to-equity ratio.

In sum, and as advertised, TSR is just a leveraged version of the return earned in the business (which in turn comes from EVA).

Consider a few cases. Suppose a firm is entirely equity financed. Its debt-to-equity ratio is zero, and thus its COC equals the firm's COE. There is no equity risk premium, and there is no leveraging of the return. TSR equals TIR, which makes sense. Shareholders harvest what the business reaps, when there is no debt on the books.

Suppose in the next case that TIR equals COC; that is, assume that the business yields the expected cost-of-capital rate of return. Then according to the formula:

TSR = TIR + (COE – COC) + (TIR – COC) x Debt/Equity

TSR = COC + (COE – COC) + (COC – COC) x Debt/Equity

TSR = COE

TSR will equal COE, which makes sense: when the business performs as expected and generates a COC rate of return, shareholders are rewarded with the COE return they expect. Again, with COC built into TIR, COE is built into TSR.

In case three, the firm is leveraged, and the business return diverges from the expected return. All three elements come into play. For instance, if the business does better than expected, and TIR is more than COC, leverage magnifies the performance premium into an even higher TSR – and vice versa: if TIR is less than COC, leverage amplifies the return shortfall.

The leverage that matters is not the book debt-to-equity ratio on the firm's balance sheet. It is the ratio of the *market value* of debt to the *market value* of equity. This ratio is swayed by fluctuations in the value of a company's equity and is largely outside of management's control. It can be a significant source of noise in the TSRs that companies report.

For example, suppose a company stumbles badly and generates a large negative return that sends its stock price reeling and erases a sizable portion of its equity value. Going into the next period, its market-value leverage ratio is unintentionally much higher because its equity value is unexpectedly much lower. Its TSR is "spring-loaded." Even a relatively modest recovery in business performance, even much lower than what peers produced over the same period, can produce a stellar, top-of-class TSR, which is misleading and should be discounted. It is a higher return, but off a depressed valuation base.

Let's look at a TSR calculation over two years (or over two three-year intervals if you like) taken from an anonymous company:

TSR = TIR + (COE – COC) + (TIR – COC) x Debt/Equity

2017 26.0% = 15.0% + 2.0% + (15.0% – 6.0%) x (100%) [9.0% leveraged premium]

2014 23.2% = 18.0% + 1.6% + (18.0% – 7.0%) x (33%) [3.6% leveraged premium]

In both periods, TSR significantly exceeded TIR. One reason: leverage magnified favorable TIR spreads into higher return-on-equity outcomes. Another: leverage pushed COE above COC, as financial risk was added on top of business risk, and as COC benefitted from blending low-cost debt into the funding mix. Had the firm used no debt, its TSR would have been materially lower, from 5 percent to 11 percent lower depending on the year. However, that is not necessarily a bad thing. With no debt on the books, shareholders would have realized a lower return, but in exchange, they would have taken lower risk.

A comparison of 2017 to 2014 is also instructive. TIR was materially lower in 2017, 15 percent versus 18 percent in 2014. Yet TSR was much higher, 26 percent compared to 23.2 percent in 2014. That's a swing of nearly 6 percentage points from what the business earned to what was passed to the shareholders between those two years. The discrepancy is because leverage *changed*.

The company implemented a sizable increase, basically a tripling, in its debt-to-equity ratio from 2014 to 2017, chiefly due to financing a major acquisition. The increase in leverage sharply increased the amplification of the TIR spread. It also drove COE to an even larger premium over COC, as more financial risk was stacked on top of the firm's business risk.

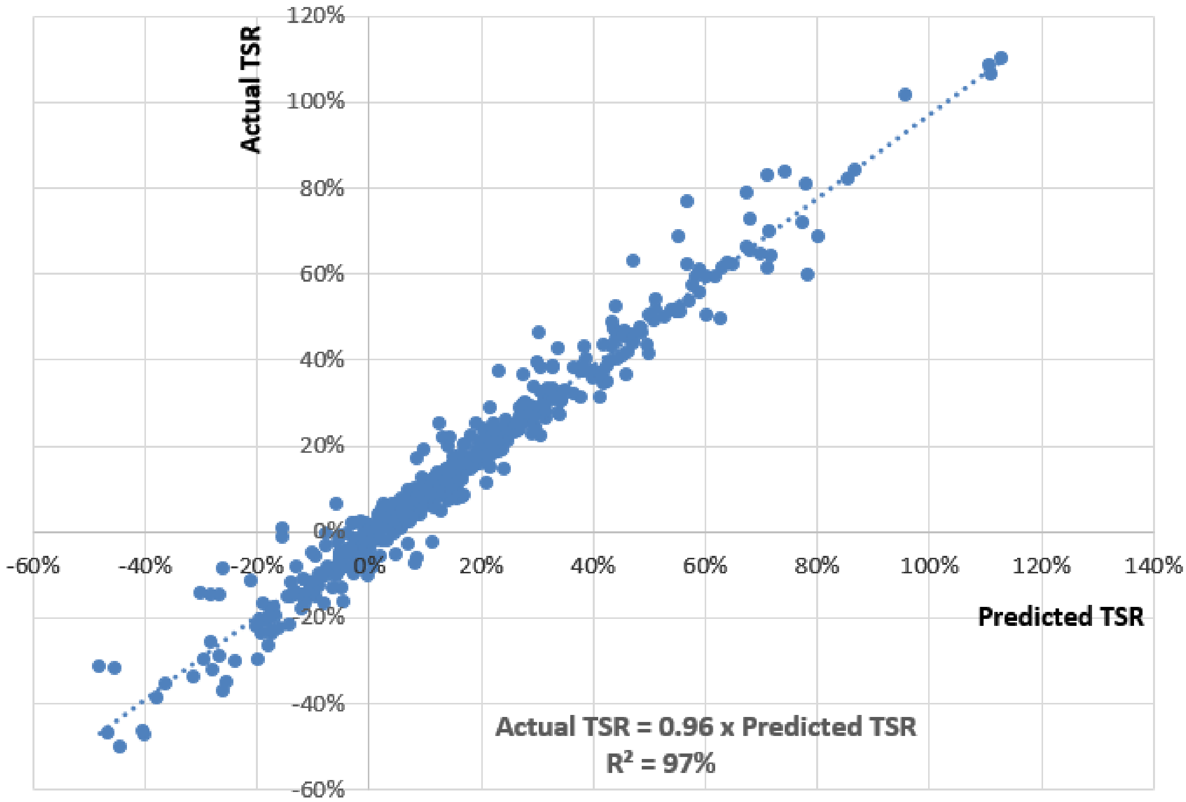
The above is a good example of how TSR can be distorted by leverage and why TIR, the return in the business, and the EVA measures that drive it, can be more fundamental indicators.

A Test of the TSR Formula

How well does the TSR formula presented above explain actual shareholder return?

We tested S&P 500 companies by computing their TSR's in two different ways as portrayed on the chart below.[5] The north-south axis plots TSR computed the conventional way, from dividend yield and share price change over the year. The east-west axis plots the TSR predicted using the formula that says TSR is a leveraged version of the TIR earned in the business, which in turn is computed from recovering the cost of capital, from the EVA generated in the year, and from the change in the firm's MVA over the year.

Predicted TSR matches Actual TSR Quite Closely



As expected, the two answers are *nearly identical.*[6] While there are some exceptions, for most companies the TSR formula is a highly accurate predictor. The math works. TSR is just a leveraged version of TIR, and TIR is a function of the cost of capital, of EVA, and the change in MVA.

Simplifying assumptions were made in deriving the return formulas just discussed. Although the simplifications do not in the main matter, as has been shown, the assumptions can become practical issues for specific companies and situations. The simplifications to be aware of are discussed in Appendix 3.

[5] TSR was computed over the company's most-recently-reported four-quarter period as of October 25th, 2018

[6] The R-squared is not perfect because (1) a whole year is averaged as distinct points, (2) leverage fluctuates and cannot be measured continuously, (2) companies issue or retire shares during the period at prices that differ from end of period prices, (4) the value of prior-claim liabilities change, but the predicted TSR formula assumes the value is constant, and (5) certain "non-operating" items excluded from EVA, like the returns from excess cash and discontinued operations, enter into TSR. These effects are real but apparently small in the overall scheme of returns, as the evidence shows.

Step 3. EVA is the Real Key to Creating Wealth and Driving Shareholder Returns

All the elements in the TSR formula are fundamental financial variables except one – the change in MVA. The remaining question to answer, then, is: what measure best explains the creation of owner wealth?

The sensible answer is EVA, of course. As has been said, a company's MVA at any given time is determined by the market's consensus projection for the firm's EVA profits, discounted to a present value. Even if investors are literally projecting and valuing cash flows to determine intrinsic values, then it will still be true that observed MVA's are governed by the expected present value of forecasted EVA because the two values are mathematically identical. Therefore, the *change* in MVA over a period should be highly correlated with the *change* in EVA over the same period.

The correlation cannot be perfect, however, because a firm's MVA at the end of a period, which determines the change in MVA over the same period, is based on the *forecast* for EVA extending beyond that period. In other words, the change in MVA is influenced by changes in the firm's business prospects extending well down the road, and past trends in EVA, or in *any other financial measure*, can never fully account for that.

The correlation between changes in EVA and changes in MVA should increase, though, as the measurement period is extended. Over a longer span, a larger proportion of the change in MVA is due to the change in EVA realized over that period and a smaller portion is due to revised expectations. A longer period also tends to smooth cycles, removes noise from the data, and more surely establishes the trend for EVA that the market is willing to project. EVA should thus be a stronger MVA predictor over a three-to-five-year interval than year-to-year, for instance – and it is.

The correlation will also vary by business depending on how accurately EVA measures true profit and how strongly past trends in EVA tend to predict future trends. One would expect, for example – and indeed one finds – that changes in EVA are a relatively weak predictor of the contemporaneous change in MVA for oil and gas drillers, which can suddenly make new discoveries or get whipsawed as hydrocarbon prices change, or for real estate firms that are sinking capital into long-gestation developments, or biotech firms, that can abruptly invent valuable drugs after years of research. In other words, one would expect EVA to be relatively ineffective for companies that have considerable value brewing in the ground, on the ground, or in a developmental pipeline – businesses, in other words, in which profits from investments materialize with a considerable lag, or that are highly cyclical. Once again, the limitation is not just a problem for EVA, but for any measure of corporate profit or cash flow.

On the other side, EVA should also be a relatively better predictor of MVA for businesses where strong brands and a loyal client base or a technology lead or highly-scalable business platform sustain a competitive advantage.

Now to the test. We began by establishing the dependent variable, the variable to be explained, which is the change in MVA. But to permit comparisons across companies that vary in size, we calculated a statistic called "MVA Momentum," which is the change in MVA divided by sales in the base period. MVA Momentum measures the rate at which a firm expanded its franchise value relative to the original size of its franchise.

To capture a sufficiently long horizon, MVA Momentum was computed over a five-year interval. A company's MVA Momentum was computed by taking its MVA as of mid-year 2018, given its prevailing stock price, shares outstanding, and capital base, and then subtracting the MVA it recorded five years before, as of mid-year 2013, based on its stock price, shares outstanding, and capital base at that time – and then dividing the five-year change in MVA by the company's sales for the four quarters ending mid-2013.

The most promising candidate to explain MVA Momentum is EVA Momentum, which is calculated the same way. It is the point-to-point *change* in EVA over the five-year interval, divided by the sales in the mid-2013 base period. It measures the rate of growth in economic profit, scaled by the sales of the company. EVA Momentum measures the growth rate in quality earnings, net of the cost of capital, thus it should best explain the growth in MVA, or MVA Momentum.

The other financial candidates examined were:

- *Sales Growth* (average rate over the 5 years);
- *EBITDA Growth* (average rate over the 5 years);[7]
- *EPS Growth* (average rate over the 5 years);[8]
- *Return on Capital* (NOPAT/Average Capital, in the latest reported four-quarter period);
- *Change in Return on Capital* (from the first to last year over the five-year interval;
- *Change in EBITDA Margin* (5-year change in the ratio of EBITDA/Sales); and
- *Free Cash Flow Generation* (cumulative five-year FCF/base period sales).

The study covered a subset of 414 firms out of the S&P 500 as of October 15, 2018 (firms were excluded if they did not have five years of data, operated in long-lead time businesses, or undertook major acquisitions).[9]

Before performing the regressions, we converted all the raw variables to percentile scores. Percentile regressions test the ability of each variable to rank order MVA Momentum as opposed to predicting each observation. Ranking the variables also eliminates the confounding effects of skewed distributions of the variables, which cannot be easily handled with linear regressions.

In a second set of regressions, the twenty firms that had the worst fit with MVA Momentum were pruned for each variable. For EVA Momentum, this meant eliminating the twenty firms that had the greatest revisions in expectations for future EVA growth extending beyond the five years examined, or where EVA and MVA were temporarily out of synch (more on this later).

[7] Measured as the 5-year change in EBITDA/the absolute value of EBITDA 5 years ago. Conventional growth rates simply divide by the initial value, be it positive or negative. But if EBITDA is initially negative, then a positive change, an improvement, is reported as a negative growth rate, and vice versa, exactly the opposite of what is happening. Dividing by the absolute value ensures that a positive change in EBITDA is recorded as growth and a decline in EBITDA is a decline.

[8] As with EBITDA, EPS growth is the 5-year change in basic EPS ex unusual items, divided by the absolute value of EPS five years ago—it's a better and more comparable measure of earnings growth than a traditional growth rate.

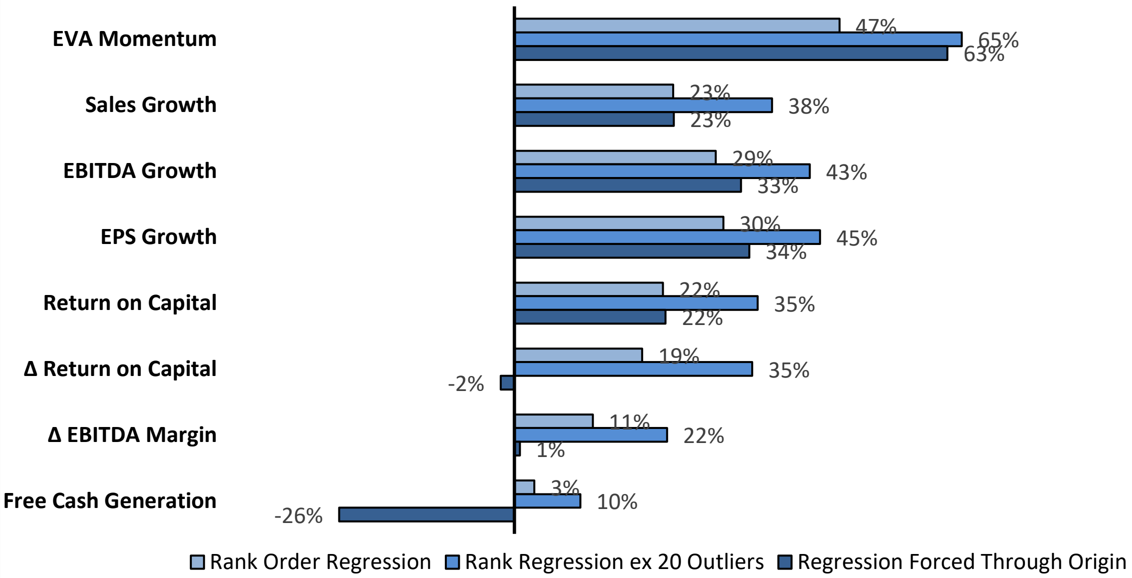
[9] Starting with the 494 companies in the "S&P 500" as of October 15th, 2018, we removed 11 firms that lacked five years of data (such as Hewlett Packard Enterprise, which was spun out of HP in November 2015, and Twitter, which went public in November, 2013), leaving 484 firms. Next, we removed a set of long lead-time firms, which covered 29 real estate firms, 9 biotech firms, and 8 mid-tier oil and gas firms with revenues under $10 billion, leaving a total of 437 firms. Lastly, we removed 23 firms that had undertaken very large acquisitions over the five years (for example, Kraft's acquisition of Heinz in December, 2015), which distorted their financial results. This left a total of 414 firms in the study.

A third set of regressions were also performed on percentile values excluding the outliers, but with the added requirement that the regression must pass through the origin – that is, the zero percentile scores for both variables must be the starting point for the regression line.

Requiring the regression to pass through the origin sensibly asks how well the percentiles scores line up when they are forced to intersect at the starting percentile ranks and not arbitrarily along a "best-fit" line that doesn't make economic sense. In other words, this is an attempt to separate spurious correlation from causation. The slope of that regression line will also be telling. The closer it is to 1.0, the more MVA Momentum and the explanatory variable are aligning all through the percentile ranks. The findings are summarized in the chart below.

EVA Momentum is the Best Predictor of MVA Momentum

R-squares of regressions of select performance metrics with MVA Momentum



Source: ISS EVA

EVA Momentum has by far the highest explanatory power across all regressions. The basic percentile regression containing all 414 companies in the sample yields an R-squared of 47 percent; the next best predictor is EPS growth with an R-squared of 30 percent.

Once the 20 largest outliers are removed, the EVA Momentum R-squared jumps to 65 percent. R-squared improves, because a relative handful of firms distort the connection that generally exists between the change in EVA and the change in MVA. EPS growth is also better correlated once the 20 largest EPS outliers are removed. R-squared jumps to 43 percent from 30 percent, but EPS loses even more ground when compared to EVA. In fact, EVA has a higher R-squared with all outliers left in than all the other measures with outliers removed.

EVA is exceptionally convincing when the regression is forced to pass through the origin. It hardly loses any R-squared when constrained, dropping from 65 percent to 63 percent, and the slope of the regression line is 0.94, very close to 1.0. The relative percentile change in MVA is highly proportionate to the change in EVA. All the signs indicate the correlation between EVA Momentum and MVA Momentum are causal and not coincidental. That is not true of the other measures. Every one of them lost significant explanatory power when the explanation is forced to make sense. Some, such as free cash flow, even end up with a negative r-squared.[10]

The results table speaks volumes about the deficiencies in the other variables. **Sales growth**, for instance, fares quite poorly as a measure of wealth creation. It is apparently a simple matter and rather common occurrence for companies to buy growth in sales, to incur operating and capital costs they cannot cover, while decimating real economic value. It is also common for companies to respond to competitive challenges by cutting sales and streamlining costs and shedding assets in ways that leave more EVA and more value in the wake.

EBITDA, the darling of private equity and one of most popular of the pro-forma, non-GAAP metrics, is not much better. After all, EBITDA is measured before the depreciation and amortization of wasting assets (but assets do wear out and become obsolete, and must be replaced to stay in business), before taxes (but, taxes must be paid, and there is an unacknowledged value to deferring taxes), and before paying interest on debt (to say nothing about providing a decent shareholder return). It is a notably inept measure of the true performance and real value of a company. EBITDA reflects earnings before many things that count.

The **change in EBITDA margin** is not at all correlated either. Granted, some companies do increase EVA and create value by increasing operating margin, and there are times when improving margins is the critical path. But increasing margins is not systemically or cross-sectionally a key variable in creating value, because people are clever. Line managers can always find ways to increase margins by doing things that reduce EVA, such as by slowing growth, spending more capital, resisting outsourcing, or pruning lower margin lines that are still EVA positive, for example. A board and top team can be assured of creating wealth only if all the ingredients that go into EVA are managed.

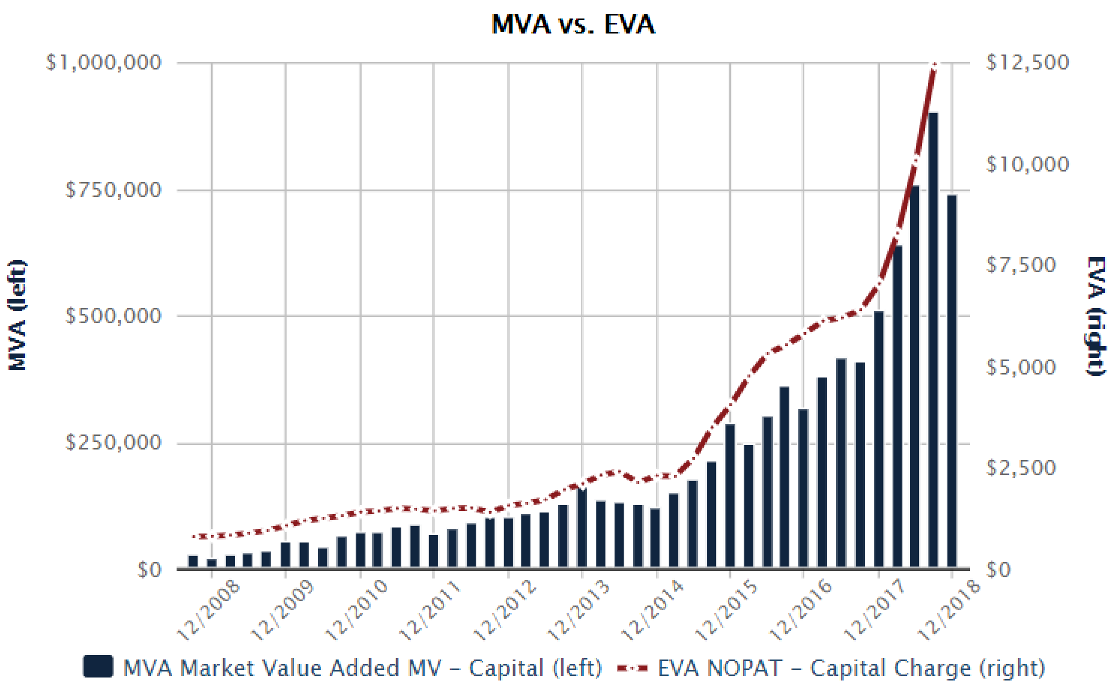
Perhaps surprising, **return on capital**, and even the change in return on capital, are also found to be poor measures of wealth creation, and for a simple reason. Return measures ignore growth and the scale of the investments a company pursues. A company that is earning a 20-percent return on $2 billion of capital is patently worth more than one that earns 20 percent on $1 billion in capital. The larger company has successfully invested in a greater abundance of positive NPV growth opportunities. It is generating more EVA and it is creating more value. But you would never know that by looking at its return on capital.

Free cash flow, too, does not score well. Granted, a company's value is determined by the present value of the cash flow that is available to distribute to investors. But that is considering the cash flow over the life of the business. It does not follow that the cash flow a company generates in one year or even over five years spans determines its value. So long as management is investing capital for returns above the cost of capital, the more money it invests, and the lower its cash flow becomes, the more EVA and the more value it produces. In fact, a negative free cash flow can be positively good for value, which is why FCF has the lowest correlation with wealth creation of any measure on the block.

[10] Forcing the regression to pass through the origin can result in negative a R-squared because R-squared is measured relative to the assumption that no correlation exists between the two variables, and the squared errors against a flat line are summed as the reference deviation. If a regression line forced to pass through the origin leads to a greater sum of squared errors than the reference sum, then the R-squared of that regression line is negative. It is worse than assuming there is no correlation at all, which is the case with the change in return on capital and Free Cash Flow generation.

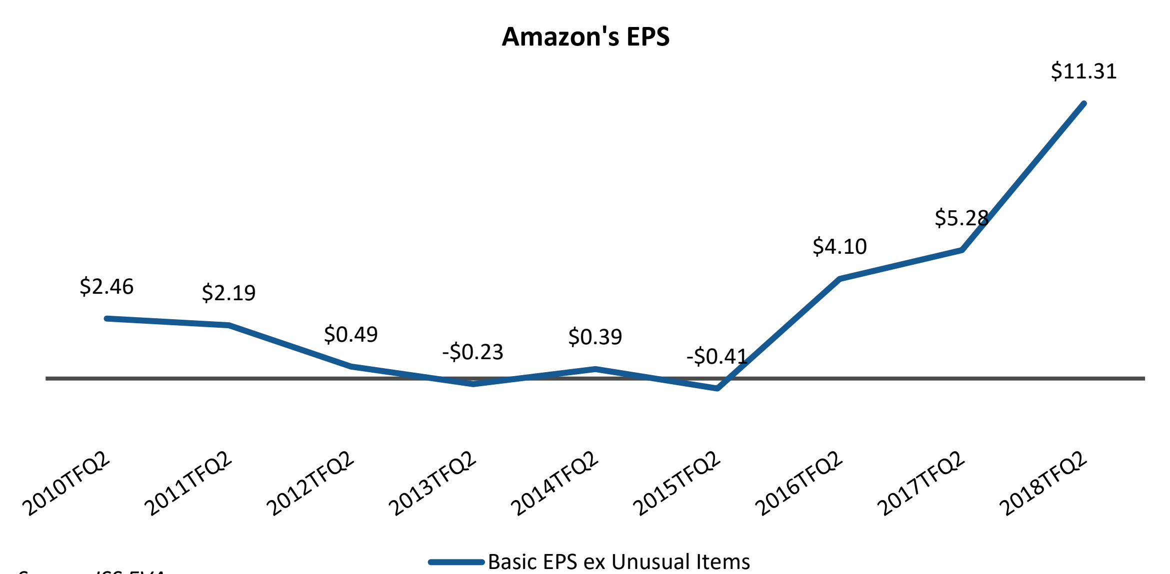
A very good example to illustrate why EVA is so superior to the other measures is Amazon. The firm's EVA profit and its MVA wealth premium are plotted on the chart below:

Amazon's Wealth Creation (MVA) and Economic Profit (EVA)



Amazon's EVA and MVA moved together almost in perfect lockstep, and over virtually the entire history of the company. The change in EVA and change in MVA have been very highly correlated, just as the EVA theory predicts. EVA indeed has been the key to creating wealth and driving shareholder returns.

That certainly has not been true of earnings-per-share (EPS), shown below, which was clearly out of synch with MVA, running down and even turning negative for a stretch before a recent surge.



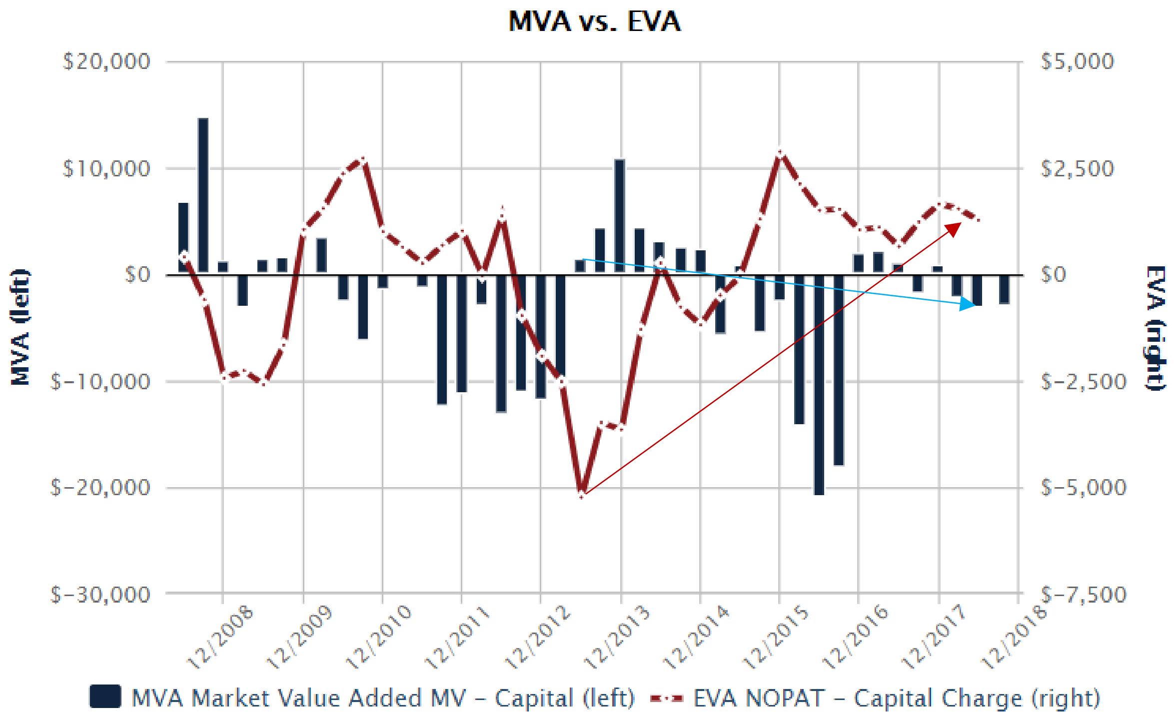
Source: ISS EVA

Amazon radically stepped up the spending on R&D and advertising and promotion, which were expensed under accounting and hit EPS. However, under EVA, R&D and advertising were treated as investments and written off over time. The costs were spread into future periods when sales and profits were higher. The EVA accounting kept EVA in the black, on the rise, and right on track with MVA.

Other measures also failed the Amazon test. Amazon's **return on capital** *declined* from 18.6 percent to 17.6 percent over the past five years, as MVA rose massively. As was said, ROC takes no account of the phenomenal and highly profitable growth in the business. Amazon's **FCF**, its operating cash flow net of all investment spending, was *negative* in each of the past five years and summed to an astonishing deficit of $129.2 billion. No matter. With the investments apparently paying off, evident with EVA rising, the agile internet giant succeeded mightily in creating wealth.

Good as it is, EVA is not perfect, of course. There are times when EVA and MVA are disconnected, which is what led to the removal of the 20 most egregious outliers. One of those cases is Prudential Financial, with EVA (the red line) and MVA (the blue bar) shown below.

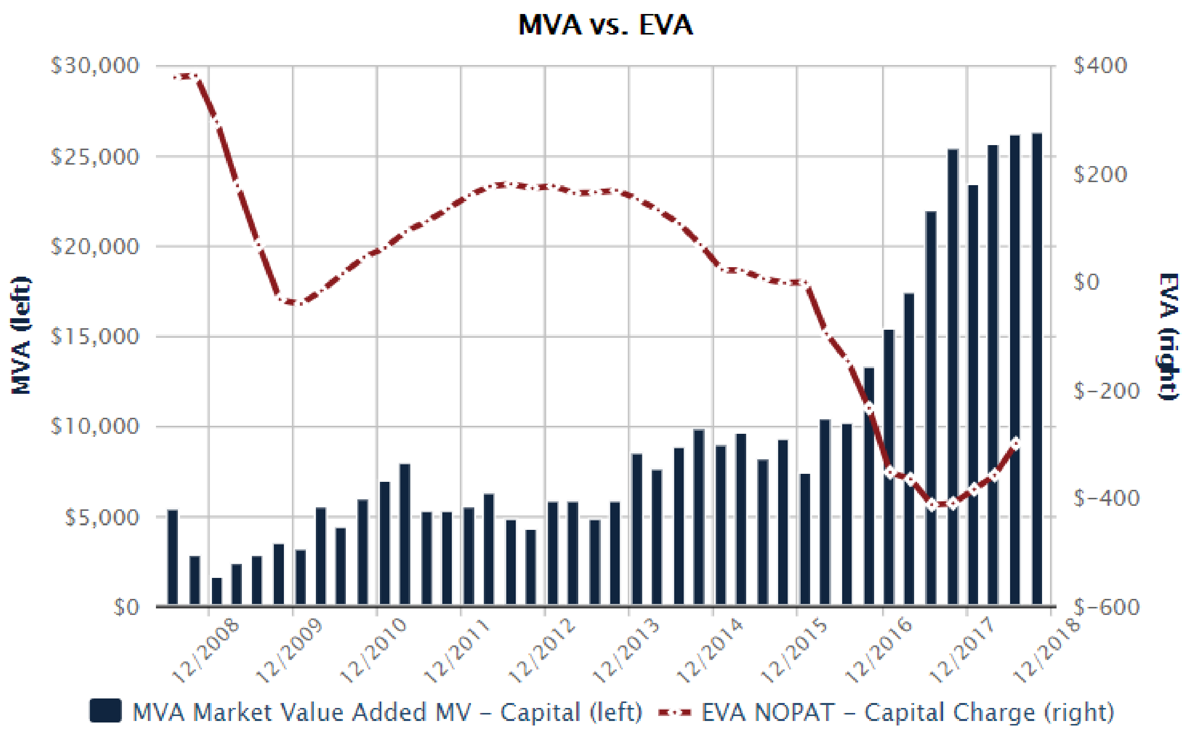
Prudential Financial Wealth Creation (MVA) and Economic Profit (EVA)



Stepping back and looking at the entire history, Prudential's EVA and MVA fluctuated around an average value of zero. Prudential is a classic example of the rule that says, no EVA is no MVA. The strategic link between EVA and MVA is compelling. But over the past five years, and measured point to point, EVA happened to sharply rebound from a deep trough as MVA weakened slightly. EVA Momentum and MVA Momentum were wildly out of synch, but only as a temporary statistical aberration. Removing this one company from the regression increased the R-squared between EVA Momentum and MVA Momentum by 1.5 percentage points. Prudential's EPS, incidentally, also surged over the past five years, from -$4.01 to 10.88, and did no better than EVA in accounting for the subsidence in MVA.

To be fair, there are times when the change in EVA, even over five years, is simply misaligned with a company's inherent value. Autodesk, shown below, is a good example.

Autodesk Wealth Creation (MVA) and Economic Profit (EVA)



Autodesk has been an admirable wealth creator over the long haul, and especially over the past five years when MVA surged, reaching over $25 billion in aggregate wealth creation. At the same time, its EVA tanked and has sunk to a loss.

The disconnect is because Autodesk is in the process of remaking its business model, shifting from selling perpetual licenses to selling subscriptions and incorporating artificial intelligence and machine learning into its computer-aided design software tools. The transition has taken a toll on EVA (and on EPS, too, which sank from $1.12 in the black to a *loss* of $1.34 over the five years ending mid-year 2018). MVA, on the other hand, is based on the outlook for EVA, which is bright. ISS estimates that the consensus analyst estimate for Autodesk implies that the firm's EVA will increase from a current loss of $300 million to nearly $800 million in economic profits five years out, an improvement of $1.1 billion on current sales of $2.2 billion. This is a phenomenal forecast for EVA Momentum – 10 percent a year – and a testimony to how far-sighted the market can be in pricing future EVA growth expectations into current market values.

Autodesk is a good example of why EVA cannot be expected to fully account for the change in MVA for all companies all the time. But when just 20 of the mismatches, firms like Prudential and Autodesk, are removed from the 414 companies in the original sample, the R-squared of the regression between EVA Momentum and MVA Momentum climbs to 65 percent. For most companies, the change in EVA does a very good job of aligning with the change in owner wealth and aggregate NPV, just as the math and economic logic suggests it should. And if EVA drives MVA, there is no escaping the conclusion that EVA drives shareholder returns.

The Connection Between EVA Ratios and TSR

ISS has begun to track a series of four EVA ratio metrics to supply additional information in the evaluation of pay-for-performance alignment, as shown in the table below. For a much more in-depth discussion of these ratios and their usefulness in pay-for-performance analysis, please see The Four Key EVA Performance Ratios and Using EVA in Pay-for-Performance Analysis.

	Profitability: Earn EVA	**Progress:** Increase EVA
Vs Sales	**EVA Margin** = EVA/Sales	**EVA Momentum vs Sales** = Trend *Change* in EVA over Three Years / The Prior 3-Year Average Sales
Vs Capital	**EVA Spread** = EVA/Capital[11]	**EVA Momentum vs Capital** = Trend *Change* in EVA over Three Years / The Prior 3-Year Average Capital

The ratios running down the first column measure a firm's ability to earn EVA in the current period, and those in the second column, the so-called Momentum ratios, gauge a firm's ability to increase EVA over time relative to the size of the firm. The ratios are duplicated, measured relative to sales and capital, to compare companies that have varying degrees of capital intensity.

The four metrics were chosen because they are good proxies for shareholder returns. Consider, for example, how the EVA ratios fit into the TIR formula that underpins TSR:

$$TIR = \frac{COC * Capital\ (Avg) + EVA + \Delta EVA}{V_0}$$

The EVA profitability ratios – EVA Margin and EVA Spread – are indications of how large a firm's EVA is (relative to the size of the firm). The EVA Momentum ratios indicate how fast EVA is growing along a regression line over the past three years, and thus, they are a gauge of how much MVA is being created by the change in EVA that has occurred. Together they are a strong proxy for the two performance factors in the TIR formula that generate returns. But, they will not always perfectly correlate with TSR or fully account for it, and that is by intention. We want the EVA ratio metrics to relate to, but also, to complement TSR as a score of corporate performance.

One reason the EVA ratios diverge from TSR is that EVA is an enterprise measure, not an equity measure; EVA explains MVA and TIR, not stock prices and TSR per se. EVA explains the return in the business before applying the magnifying and at times distorting power of leverage. EVA measures operational and strategic excellence, sans the impact of transitory, and quite possibly unintentional and unmanageable, changes in debt-to-equity ratios.

The EVA ratios are also assessed relative to a firm's sales and capital – to the financial fundamentals of its business. They are not computed, as TSR is, relative to the firm's market value. They are thus not subject to the vagaries of shifting market perceptions. They are based on actual corporate results, and not forecast values in any way, which can be an advantage. TSR, for example, is often a function of when the market projects that value will be created more than the actual creation of value. The EVA metrics capture the creation of value as it is happening and appearing in a company's financial results. Again, EVA metrics complement TSR, by design.

A formula has been developed that shows TIR is a direct math function of the EVA ratios. The formula is rather complicated and beyond the scope of this memorandum. But for the reader who wants a proof that EVA must drive returns as a matter of pure logic, a discussion appears in Appendix 4, with derivation details in Appendix 5 for the sales-based ratios and in Appendix 6 for the capital-based ones.

Summing Up

The evidence presented in this paper strongly supports the view that an economic logic runs through the stock market. The stock market has been shown to generate shareholder returns in accord with long-established principles of corporate finance – namely, that corporate managers should aim to maximize their shareowners' wealth by maximizing the firm's NPV and its EVA profits over time, and not any other measures.

Corporate boards should find comfort in this revelation. They are being asked to ensure the pay of their executives is aligned with total shareholder returns. Until now, it seemed the best way or even only way to do that was to pay for TSR. But as has been shown, TSR has shortcomings of its own. It can be distorted by leverage and changes in the market value ratio of debt-to-equity. It is subject to the whims of investor perceptions at the beginning and end of the measurement period. It is also typically measured point-to-point, which places a lot of weight on those points.

TSR also says nothing about how to increase TSR. It does not provide managers with practical insights into how they can produce higher shareholder returns. TSR cannot be measured by lines of business or applied to individual business decisions. While TSR is a way to keep score, it does not help managers to win the business game, and it can be an imprecise measure for investors to assess the performance of managers over the term of a typical executive compensation program. EVA and MVA, however, may provide better line-of-sight into company performance over time.

Appendix 1: Derivation of the EVA Formula for TIR

Start with TIR defined as a cash flow and capital gain return:

TIR = the total return earned in the business on behalf of all investors

$TIR = \{ FCF + \Delta V) \}/V_0$

FCF = "free cash flow," cash flow from operations, net of investment spending

V = market value, the value of the firm's debt and equity capital, given its share price.

ΔV = the change in the business' market value over the period

V_0 *= the value at the beginning of the return measurement period*

Express FCF as NOPAT – ΔCAPITAL, where

NOPAT = net operating profits after taxes (net of depreciation and amortization)

CAPITAL is the book value sum of debt and equity capital. Because balance sheets balance, it is also equal to the total assets in the business, net of payables and accruals, net of the accumulated depreciation and amortization of the assets, and net of excess cash invested in marketable securities. In short, it is the net book value of the business assets.

ΔCAPITAL = the amount of cash put into the net business assets, minus the depreciation and amortization of the business assets that has been deducted from their balance-sheet book values. It is effectively the capital expenditures for growth, the amount invested above and beyond replenishing the asset base.

Since NOPAT and the change in Capital are both measured net of the depreciation and amortization, the difference, NOPAT – ΔCAPITAL, is truly cash flow from operations. It is effectively all cash operating receipts minus all cash operating disbursements, whether recorded as expenses on the P&L or as expenditures that add to balance sheet capital.

Recognize that EVA = NOPAT – CAPITAL CHARGE, i.e., EVA = NOPAT – COC * CAPITAL(AVG)

EVA is NOPAT less a full, weighted-average cost-of-capital charge applied to the average capital or average net assets employed in the business.

Rearrange the terms to solve for NOPAT:

NOPAT = COC x CAPITAL(AVG) + EVA

Substitute for FCF and NOPAT in the TIR formula:

$TIR = \{ FCF + \Delta V) \}/V_0$

$TIR = \{ NOPAT - \Delta CAPITAL + \Delta V) \}/V_0$

$TIR = \{ COC * CAPITAL(AVG) + EVA + (\Delta V - \Delta CAPITAL) \}/V_0$

Recognize that MVA, or market value added, is V – CAPITAL, therefore:

ΔMVA = ΔV – ΔCAPITAL, which is the last term in the TIR formula. The final TIR formula shows that TIR is mathematically determined by three components:

(1) (2) (3)

TIR = { COC * CAPITAL(AVG) + EVA + ΔMVA }/V_0

Appendix 2: Derivation of TSR from TIR

Shareholders own the business after paying off the firm's creditors. Shareholder returns, therefore, are the returns earned in the business magnified, for better or worse, by the firm's debt-to-equity ratio.

This is best seen with the concept of "excess return," which is defined as the *monetary* gain or loss from investing in a specific company or capital class as compared to investing in a benchmark portfolio of matched risk. A company's overall excess return comes from the performance of its business. It is the TIR earned in the business, less the weighted average cost of capital (COC) appropriate to the business as the relevant return benchmark, multiplied by the firm's opening market value. Expressed as an equation:

$ Excess Business Return = (TIR – COC) x Market Value

To take an example, if TIR is 15 percent and the cost of capital 10 percent, and the spread is earned on a $100 million in market value, the firm's investors realized $5 million in profit above what they could expect to earn from passively investing in a matched-risk portfolio.

The total excess return that a business generates accrues to the firm's investors. It is divvied up among its bankers, bondholders, other creditors, preferred stockholders, and common stockholders. To make the apportionment simple, let's divide the investors into two classes: the common equity shareholders on one side, and on the other, all the prior claim holders:

$ Excess Business Return = $ Excess Common Equity Return + $ Excess Prior Claim Return

As a rule, almost all the excess returns generated by a business falls into the shareholders' laps. A company's creditors are generally paid the return they contracted for. Their downside is protected, their upside limited. Excess returns for the creditor class, therefore, are hard to come by[12], and can be assumed to be zero as a first approximation, which leads to a simplified equation:

$ Excess Total Return = $ Excess Common Equity Return

(TIR – COC) x Market Value = (TSR – COE) x Common Equity Value

Put simply, the excess return the business earns benefits the firm's shareholders. The excess returns must match, where the excess shareholder return is based on the firm's TSR compared to its cost of equity (COE), multiplied by the beginning-of-period common equity market value. In this reckoning, the cost of equity is computed in the standard way – namely, by adding a company-specific "beta" risk premium on top of the prevailing long government bond rate. The excess common equity return is the overall gain or loss that the holders of a company's common shares realize compared to what

[12] There are exceptions, of course. Fixed claims change value when interest rates unexpectedly surge or sink or when a company's creditworthiness changes sharply, the extreme example being when a firm that bankrupt and its creditors suffer losses alongside the shareholders. A company that has issued convertible securities also has carved that security class into shareholder returns to some extent.

they could have expected to earn by investing the firm's initial equity value in a stock portfolio of the same risk class.

Equating the two formulas and solving for TSR leads to this, the final formula for TSR:

TSR = TIR + (COE – COC) + (TIR – COC) x Debt/Equity

TSR = Business Return + Equity Risk Premium + Leveraged Return

Appendix 3: Caveats Concerning the Return Formulas

Simplifying assumptions were made in deriving the return formulas, which can become practical issues for specific companies and situations:

1. The cost of capital was assumed constant, but it changes with changes in interest rates, risk perceptions, and capital structure. The changes will affect share prices and investor returns but were not modelled in the derived formulas.

   A mitigating factor is that COC variations tend to affect all companies in an industry group in a similar way, which means they aren't likely to change relative TSR rankings.

   Also, the changes are mostly outside management's control, and in that respect should be ignored if judging management's performance is the objective.

2. The correspondence between projecting and discounting EVA and projecting and discounting cash flows is perfect only with clean surplus accounting, that is, only when all adjustments to balance sheet values pass through the income statement. But that is not always the case. Accounting restatements, for instance, are usually taken into retained earnings without passing through income.

   As a result, the TIR formula sometimes needs to incorporate a term to account for unrecognized charges or credits, but the adjustment was not included in the derivations shown here (the adjustment is included, however, in the ISS models).

3. ISS excludes certain non-operating items from NOPAT, CAPITAL, EVA (and Free Cash Flow). Excess cash and discontinued operations, for example, are removed to reveal underlying business performance. But to the extent that the returns from non-operating items like those differ from expected returns, that is, differ from the appropriate cost of capital, the returns that shareholders realize will be affected.

4. With equity investments under the cost method, dividends are recognized as income rather than the share in the underlying profits, which means the true EVA and return generation from those sources tend to be understated.

5. TSR is a leveraged version of TIR, but the relevant leverage ratio is a continuously-changing market-value debt/equity ratio, which cannot be precisely estimated in practice.

6. In deriving the TSR formula, it was assumed that the realized rates of return on prior claims were equal to the expected returns. However, to the extent that prior claims materially decrease in value, for example, TSR will be greater than the formula suggests—wealth will be transferred from the prior claimants to the shareholders—and vice versa.

7. As it is conventionally computed, TSR is the return for a shareholder who is assumed to own the company's stock through the return measurement period. TSR, therefore, does not account for the returns of shareholders who enter the stock though equity issuances or exit in a stock buy-back during the period.

   If, for example, a company buys back shares during the period at a price greater than the end of period stock price, its TSR will understate the return earned by all shareholders who held stock during the period. TSR, in short, is the return of a continuing shareholder, not of all the shareholders, plural. EVA, MVA and TIR, on the other hand, measure total company performance and total investor performance, and are unaffected by wealth transfers from one class of investor to another.

8. The formula for TSR assumes that the cost of equity (COE) and weighted average cost of capital (COC) are consistent with modern finance theory, which says that both are derived from an underlying cost of capital for business risk, denoted as "C", which is equal to the cost of equity in the all equity financed firm.

   C = cost of capital for business risk = cost of equity in all equity financed firm

   b = firm's borrowing rate on debt

   t = tax rate for deducting interest expense

   D/E = debt/equity ratio [= D/V / (1-D/V)]

   D/V = debt/value ratio [= 1 + D/E]

   COE = cost of equity = C + (1-t)(C-b)D/E = C plus after tax financial risk premium

   COC = weighted average cost of capital = C*(1 – t*(D/V)), C less tax benefit of debt

   Our derivation says:

   (1) TSR = TIR + (COE – COC) + (TIR – COC) D/E

   This is equivalent to:

   (2) TSR = (Dividends + Buybacks – New Equity + ΔE) / Eo

   Given: TIR*Vo = FCF + ΔV = [(1- t)bD – ΔDebt + Dividends + Buybacks – New E] + [ΔD + ΔE]

   (3) TSR = (TIR * Vo – (1-t) b D) / Eo; note Vo = Do + Eo

   (4) TSR = TIR + (TIR – (1-t) b) D/E

   Compute (4) – (1)

   (5) 0 = TIR D/E – (1-t) b D/E – (COE – COC) – TIR D/E + COC D/E

   (6) COE = COC (1 + D/E) – (1-t) b D/E; (which also implies COE = COC + (COC-(1-t)b) D/E)

   Substitute for COE, and (1 + D/E) = V/E:

   (7) C + (1-t) (C-b) D/E = COC (V/E) - (1-t) b D/E

   (8) C + (1-t) (C) D/E = COC (V/E)

(9) C (1 + (1-t) D/E) = COC (V/E)

(10) COC = C (1 + (1-t) D/E) / V/E

Multiply top and bottom by E/V

(11) COC = C (E/V + (1-t) D/V)

(12) COC = C (V/D + V/E – t D/V)

(13) COC = C (1 – t D/V); which is the classic Miller-Modigliani ("MM") formula[13]

In sum, TSR = TIR + (COE – COC) + (TIR – COC) D/E is correct if the cost of equity and cost of capital follow the MM formulas; else TSR = TIR + (TIR – (1-t) b) D/E is true

Appendix 4: The Connection Between EVA Ratios and TSR

ISS is tracking and reporting a family of four EVA ratio metrics to assist with pay-and-performance evaluation. Those metrics include:

- EVA Margin
- EVA Spread
- EVA Momentum (Denominated by Lagging Capital)
- EVA Momentum (Denominated by Lagging Sales)

The ratios were selected because they are good proxies for shareholder returns and fall out of the formulas for TIR and TSR developed in this paper. To prove this, two additional versions of the TIR formula have been derived, one that shows TIR is mathematically a function of the EVA Margin and EVA Momentum ratios relative to sales (derived in Appendix 5), and the second that TIR is a function of the EVA Spread and EVA Momentum ratios relative to capital (derived in Appendix 6).

Let's now examine the TIR formula related to the sales-based version.

Classic EVA Money Formula

(1) (2) (3)

TIR = { COC * CAPITAL(AVG) + EVA + ΔMVA } / (V_0

[13] Dividend Policy, Growth, and the Valuation of Shares, by Merton H. Miller (University of Chicago) and Franco Modigliani (MIT); the Journal of Business, Vol 34, No. 4 (Oct 1961)

New EVA Ratio Formula:

(1) (2) (3) (4)

TIR = { COC*CAPMARG + EVAMARG + [EVAMOMARG + MIMMOMARG*(PVF*COC)]*(1/COC)/(1+g) } / (V_0/SALES)

Recover the Cost of Capital	Earn EVA	Increase EVA	Revise Expectations for EVA Growth

The ratio formula computes the same return (see Appendix 5 for a numerical example) but with four ratio elements that fall out of the EVA model.

The first is familiar—it's realizing the built-in cost-of-capital rate of return—though usually not fully as is evident once the full factor is exposed:

*= COC * CAPMARG / (V_0/SALES)* *[CAPMARG = Average Capital/Sales]*

*= COC * CAPITAL(AVG)/SALES / (V_0/SALES)*

*= COC * [CAPITAL(AVG)/V_0]*

The expansion reveals something not discussed so far, namely, that the cost of capital is attenuated by a book-to-market ratio. COC is fully realized in TIR, and COE is fully realized in TSR, only if a firm's market value is equal to the average capital it has in place, which is true only of companies that break even on EVA. In that special case, all other terms in the formula are zero and TIR boils down to compounding at the cost of capital.

But for companies that trade for premiums to capital, which is more typical, the built-in return falls short. A firm that trades for twice its capital, for two times book if you will, can only count on recovering half its cost of capital from a reversal of the discounting process. To provide a fully-competitive return, the firm must earn EVA or increase it – which is what the other ratio factors are about.

The second factor, for example, labelled EVAMARG, standing for EVA Margin, measures a firm's ability to earn EVA expressed as a profit margin percentage of its sales. The bigger a firm's EVA Margin is, that is, the more EVA it can derive from sales by charging premium prices or by reining in operating costs and capital costs, the more of a return lift it gets. A firm's EVA Margin is thus a comparative statistic that quantifies how profitable a company is and how successful it is this return category.

The third and fourth ratios take the increase in MVA and break it into two sources. The first reflects the added MVA that comes from increasing EVA over the return measurement period. If EVA increases by $5, for example, and if the market saw the increase as sustainable, that would cause MVA to increase by $50, assuming a cost of capital of 10%. And the bigger the increase in EVA, the bigger the added value and return are likely to be.

A company's success at improving MVA by increasing EVA is rated with EVAMOMARG, standing for EVA Momentum (versus sales). It is computed as the *change* in EVA divided by the company's sales in the *prior period*. For example, if EVA increased by $5, and if sales in the period prior to the return measurement period were $400, then EVA Momentum would be 1.25 percent. It is essentially an EVA growth rate, scaled to the sales size of the business. The bigger it is, the more MVA a company is creating with EVA growth over the return measurement period, and the more successful a company is deemed to be in this return category.

The last ratio measures revisions in investor expectations with MIMMOMARG, for MIM Momentum. It is based off MIM, which stands for Market-Implied Momentum; MIM measures the projected EVA growth that is implied by a company's stock price using math formulas developed in Appendix 4. MIM Momentum is a derivative of that. It is the *change* in the forecast rate of increase in EVA that is implied by the *change* in the company's stock price, expressed as a percent of sales. If MIM Momentum is 0.1 percent, for example, that indicates the market is projecting the firm's EVA to increase each year over ten forecast years in an amount that is 0.1 percent of sales higher than was being projected by investors and priced into the stock price at the beginning of the return measurement period.

Positive MIM Momentum, in other words, represents a favorable revision of expectations, a projection that more EVA profits lie ahead, which gives MVA and shareholder returns a lift. Technically speaking, the improvement could come from an increase in the forecast EVA growth rate, from extending the EVA growth horizon until maturity is assumed to set in, or from increasing the probability of success. In the return formula, however, those three are reduced to a single statistic, MIM Momentum. That is a second driver of the change in MVA above and beyond the actual increase in EVA obtained over the period.

MIM Momentum, however, is not one of the ratio factors ISS has chosen to use to supplement TSR in its assessments of corporate performance. One reason is that investors' expectations are already reflected in TIR and in TSR. In fact, a distinctive strength of market-based measures is their ability to reflect a consensus view on a company's outlook. Including MIM Momentum as a ratio factor would be redundant, therefore. A second reason is that the corporate performance measures are intended to measure actual results apart from a future forecast or market value. MIM Momentum does not fit that criteria, but EVA Margin and EVA Momentum do.

The formula components, incidentally, are not all equal in impact. EVA Margin, for example, enters the TIR formula with a multiple of 1. A 1-percent EVA Margin is a 1-percent contribution. EVA Momentum, by contrast, is multiplied by the inverse of the cost of capital. If COC is 10 percent, EVA Momentum is multiplied by a factor of 10. A seemingly trivial EVA Momentum of 0.1 percent is thus as significant as a 1-percent improvement in the EVA profit margin. EVA Margin represents the value of earning EVA purely as profit in the period, but EVA Momentum quantifies the change in EVA, it's new EVA, it is a profit advance that gets capitalized into value and into the returns with a forecast multiple.

MIM Momentum is even more amplified. Before being capitalized by the cost of capital, in the return formula it is multiplied by (PVF x COC), where PVF, standing for present value factor, is the present value of $1 a year over ten years, with each $1 capitalized as a perpetuity. At a cost of capital of 10 percent, PVF is $64.44. Each forecast $1 is worth $10 when capitalized at 10 percent. Over 10 years, that sums to $100. But when discounting is applied, PVF whittles down to $64.44 in present value. Multiply that by the 10-percent COC, and the net multiplier is 6.44. As a ratio, MIM

Momentum is 6.44 times as significant as EVA Momentum, and 64.44 times as influential as EVA Margin.[14]

MIM Momentum is so significant because, in computing it, the assumption is made that any value due to the forecast growth in EVA is spread over ten forecast years. Unlike EVA Momentum, which represents only a one-year change in EVA, MIM Momentum encapsulates a forecast change in EVA *in each year of ten forecast years*. It is a highly amplified statistic, both by how it is computed, but also based on what it is – the change in outlook for EVA growth extending into the indefinite future.

The EVA growth forecast that goes into computing MIM Momentum is not determined by making a 10-year projection, surveying investors or tapping into consensus estimates. That would be wildly inaccurate and inconsistent. It also would not tie to investor returns, which are based on market values. Instead, the growth forecast is determined right from the company's stock price.

Suppose, for example, a company trades for an MVA premium over book capital of $400, given its share price. MVA, recall, is the present value of all projected EVA profits. If EVA profits are currently running at $10, and the firm's cost of capital is 10 percent, then $100 of the $400 in MVA is the value of just maintaining EVA at the current level. The $300 remainder is implicitly the value that investors are paying for the anticipated growth in EVA. Using math formulas, we can then determine how rapidly EVA must increase in even increments over ten years to discount back to the firm's growth value, and then we can turn that into a Momentum statistic in relation to the company's sales. Again, the derivation details and a comprehensive example are in Appendix 4.

Before summing up, let's look at the denominator in the ratio-based return formula. The return investors realize by moving the needle on EVA Margin, EVA Momentum and MIM Momentum is divided by the firm's value-to-sales ratio, which can be expanded, recognizing that MVA = Value – Capital, and hence Value = Capital + MVA; thus:

$$\frac{V_0}{Sales} = \frac{Capital + MVA}{Sales}$$
$$= \frac{Capital}{Sales} + \frac{MVA}{Sales}$$

The more capital intense a business is or chooses to be, that is, the more it requires capital to generate or support sales, and thus, the higher its Capital-to-Sales ratio is, the less impact the EVA Margin and Momentum ratios will have on its returns. A chemical or paper company will need to upshift the EVA margin and Momentum metrics more than a retailer or service company, for example, to generate the same rate-of-return benefit. The capital intensity which is baked into market value muffles the sounds the business is making.

So long as companies are compared to industry peers, chemical companies to chemicals, retailers to retailers, that tend to operate with similar capital requirements, the effect is mitigated. But specific decisions can still affect it.

Say one firm outsources all computer operations to the cloud and even outsources production to a third party suppler, which frees up capital, while an industry peer keeps all the operations and the related capital in house. By dropping the ratio of Capital-to-Sales, the virtual firm amplifies its

[14] As a technical matter, after being capitalized at the cost of capital, EVA Momentum and MIM Momentum are divided by (1+g) in the return formula, where g is the sales growth rate over the return measurement period.

operating results. Equal improvements in its EVA Margin and EVA Momentum will translate into much higher rates of return than for peers – and vice versa. This can be good thing, because the firm's stock price and TSR become more sensitive to how well the business is being managed.

The second denominator factor is the ratio of MVA-to-Sales. As with capital intensity, the higher the ratio, the more any EVA improvements are diluted. A firm that generates significant EVA, and which therefore trades for a significant MVA premium, would need to produce a far greater increase in EVA to deliver the same excess return as a matched firm that starts off with less EVA and less MVA. Put simply, $1 on $10 is 10 percent, but $1 on $100 is only 1 percent.

It is thus unfairly harder for well-managed companies to rise into the upper percentile TSR ranks. Any given increase in EVA and in the value that a management team produces is discounted by dividing it by a necessarily higher valuation base (and vice versa). That the valuation base is higher, and managers are required to generate more EVA to live up to those expectations, is fair. But when unexpected *improvements* in EVA or in the forecast outlook for EVA are divided by different valuation bases, then that can be viewed as unfair and misleading. Looking at the EVA ratio metrics can help by shining a light on how well the business is performing apart from how the market is valuing the business.

Appendix 5: The Derivation of the EVA Ratios Behind TSR

TIR, which underpins TSR, will be explained with ratios relative to sales. A separate version relative to capital is covered in Appendix 5.

Start with the basic TIR formula, which expresses a firm's total investor return as a function of compounding the cost of capital, earning EVA, and the change in MVA, as derived in Appendix 1:

$$TIR = \frac{COC * Capital\ (Avg) + EVA + \Delta MVA}{V_0}$$

Divide top and bottom by the company's Sales in the return measurement period:

$$TIR = \frac{\frac{COC * Capital\ (Avg)}{Sales} + \frac{EVA}{Sales} + \frac{\Delta MVA}{Sales}}{\frac{V_0}{Sales}}$$

$$TIR = \frac{COC * CAPITALMARG + EVAMARG + \frac{\Delta MVA}{Sales}}{\frac{V_0}{Sales}}$$

Where:

CAPITALMARG = CAPITAL(AVG)/SALES, a measure of the capital intensity of the business

EVAMARG = EVA/SALES, or EVA Margin, the percent of revenue that reaches bottom-line EVA

The change in MVA needs further development. Recall that MVA is equal to the present value of the EVA profits a company is forecast to earn, and as such, it can be divided into two parts. The first is the value of the company's existing EVA assuming it continues at the current level forever. The second part is the remainder, implicitly the value of the projected growth in EVA, or in symbols:

MVA = present value of forecast "free" cash flow = present value of forecast EVA

MVA = CVA + FVA, where

CVA = current value added = the value of the firm's embedded EVA, capitalized as a perpetuity

FVA = future value added = the present value of the projected growth in EVA

The formula to compute CVA is simple—capitalize, i.e., divide, the embedded EVA by the cost of capital:

CVA = EVA/COC

FVA could be estimated by discounting the forecast growth EVA, but it is normally derived from a company's market value, given MVA and CVA:

FVA = MVA - CVA

To compute FVA this way, first measure MVA, given the company's stock price, as the spread between the firm's market value and its capital, then compute CVA by capitalizing the company's EVA as a perpetuity; FVA is the plug difference. It is MVA minus CVA. Given that MVA is the present value of all EVA, and CVA is the value of the company's current EVA, FVA is implicitly the value that investors are paying for the projected growth in EVA (or if FVA is negative, FVA is the value that investors foresee losing due to a projected drop in EVA).

Take an example. Assume a firm's market value is $1,000 and capital is $600. Its MVA is $400, the difference. Suppose EVA is currently $5 and the firm's cost of capital is 10 percent; CVA, the value of maintaining EVA forever, is $50 ($5/10 percent). FVA, then, is $350, the plug difference, which is quite sizable, implying that the bulk of the $400 MVA that investors are paying is due to a robust projection for growth in EVA. The firm's strategic outlook apparently is bright.

The next step in the derivation is to convert a company's FVA into a projected stream of EVA that has the same value, and then convert that stream into a projected growth rate statistic. To do this, we make a standard assumption. We assume that EVA will increase in equal increments each year for ten years, and then will hold steady at the accumulated level thereafter. The assumption is that after a decade of growth, competition and market saturation will limit the company to earning just the cost of capital on new investments and its EVA will no longer grow (and nor will it ever decrease). It's a simplifying assumption, but it enables us to express FVA for all companies on a common scale.

In symbols, we assume:

EI = FVA / PVF, where

FVA is the present value of the projected growth in EVA

EI, for expected improvement, is the annual increase in EVA over a ten-year forecast that discounts back to FVA, and

PVF, for present value factor, is the present value sum of $1 a year, capitalized as a perpetuity, for each year over ten forecast years.

For example, at a cost of capital of 10 percent (and using mid -year discounting for more accuracy), the present value factor is $64.44. Put differently, a $1 increase in EVA in each of the next ten years is worth \$64.44 in present value, assuming each increase is sustained in perpetuity. Each \$1 capitalized at 10 percent is worth \$10. The sum over ten years is \$100. Discounting whittles the \$100 sum to \$64.44.

With this, we can solve for the EI that equates to a given EVA. In the example, FVA is \$350 and PVF is \$64.44, resulting in an EI, an expected improvement in EVA, of \$4.66:

$EI = FVA / PVF$

\$5.43 = \$350 / \$64.44

Said another way, from a current level of \$5, EVA must increase \$5.43 a year over the next ten years to reach a level of \$59.30, so that the total *increase* in EVA is worth a present value of \$350, the firm's FVA.

So far, we have established that:

$MVA = CVA + FVA$

$CVA = EVA / COC$

$FVA = EI \times PVF$ [once EI is established, FVA can be expressed as EI times the PV factor]

The change in MVA can be expressed as the sum of the changes in CVA and FVA:

$\Delta MVA = \Delta CVA + \Delta FVA$

Assume for simplicity the cost of capital is constant (or little changing period to period as a practical matter) and thus PVF also is constant. Then the change in MVA is entirely due to changes in EVA and EI:

$\Delta MVA = \Delta EVA/COC + \Delta EI * PVF$

Divide by SALES, the revenues in the return measurement period:

$\Delta MVA/SALES = \Delta EVA/SALES * (1/COC) + \Delta EI/SALES * PVF$

Now multiply by SALES/SALES(-1), by the ratio of current Sales to prior-period sales, which is the same as (1 + g), where g is the sales growth rate over the period, and divide the whole expression by (1 + g):

$\Delta MVA/SALES = [\ \Delta EVA/SALES * (1/COC) + \Delta EI/SALES * PVF\ ] * SALES/SALES(-1) / (1+g)$

$\Delta MVA/SALES = [\ \Delta EVA/SALES(-1) * (1/COC) + \Delta EI/SALES(-1) * PVF\ ] / (1+g)$

Define EVA Momentum, denoted by EVAMOMARG, as the change in EVA divided by prior-period sales (denoted as SALES(-1)):

$EVA\ Momentum = \Delta EVA/ SALES(-1) = EVAMOMARG$

A sister variable, called MIM Momentum, or MIMMOMARG for short, is like EVA Momentum, but it is based on the change in EI rather than the change in EVA. It is the revision in the forecast for the annual improvement in EVA extending over the next ten years, as a percent of prior-period sales:

$MIM\ Momentum = \Delta EI / SALES(-1) = MIMMOMARG$

Substitute:

*ΔMVA/SALES = [ΔEVA/SALES(-1) * (1/COC) + ΔEI/SALES(-1) * PVF] / (1+g)*

*ΔMVA/SALES = [EVAMOMARG * (1/COC) + MIMMOMENTUM * PVF] / (1+g)*

Substitute into the TIR formula:

TIR = { COC * CAPITAL(AVG) + EVA + ΔMVA } / V_0

TIR = { COC * CAPITAL(AVG)/SALES + EVA/SALES + ΔMVA/SALES } / (V_0 / SALES)

TIR = { COC * CAPITALMARG + EVAMARG + [*EVAMOMARG*(1/COC)+MIMM0MARG*PVF]/(1+g)* } / (V_0 / SALES)

One final adjustment is needed. In the formula, EVA Momentum contributes to TIR after being capitalized at COC, in this case, after multiplication by 10, but MIM Momentum is multiplied by the present value factor, which is 64.44 in this example and always a much larger factor. It's much larger because MIM Momentum represents the change in the forecast increase in EVA in each year over 10 years whereas EVA Momentum represents the increase in EVA in just one year. MIM Momentum, therefore, is much more valuable than the same EVA Momentum.

To put them on the same scale, MIM Momentum can be multiplied by PVF*COC, in this case, by 64.44 x 10 percent, or 6.44, and then capitalized at the same COC rate as is applied to EVA Momentum:

(1) (2) (3) (4)

TIR = { COC*CAPMARG + EVAMARG + [EVAMOMARG + MIMMOMARG*(PVF * COC)] * (1/COC)/(1+ g) } / (V_0/SALES)

This, then, is the final formula tracing TIR to a set of EVA ratios. What follows is a comprehensive example to illustrate the formula, building off the hypothetical company examined before.

<u>Assumptions</u>

SALES =	$ 500 [sales in the return measurement period]
SALES (-1) =	$ 400 [prior period sales]
NOPAT =	$ 80
NOPAT (-1) =	$ 60
Capital =	$ 800
Capital (-1) =	$ 600
Capital (-2) =	$ 500
Value (V) =	$1,300
Value (V-1) = Vo =	$1,000

<u>Computations</u>

ΔCapital =	$ 200 [$800 - $600]
FCF (NOPAT – ΔCapital)	$ -120 [$80 - $120; FCF is negative]

Sales Growth (g) =	25% [$500/$400 -1]
Capital Charge (COC x Avg Capital) =	$ 70 [10% x $700 in average capital]
Capital Charge (-1) =	$ 55 [10% x $550 in average capital)
EVA (NOPAT – Capital Charge) =	$ 10 [$80 - $70 ; EVA is positive]
EVA (-1) =	$ 5 [$60 -$55]
ΔEVA =	$ + 5 [EVA increased over the period]
ΔValue =	$ 300 [$1,300 - $1,000]
MVA (V – Capital) =	$ 500 [$1,300 - $800; MVA is positive]
MVA (-1) =	$ 400 [$1,000 - $600]
ΔMVA =	$+ 100 [MVA increased over the period]
CVA (EVA/COCI) =	$ 100 [$10/10%]
CVA (-1) =	$ 50 [$ 5/10%]
FVA (MVA - CVA) =	$ 400 [$500 - $100]
FVA(-1) =	$ 350 [$400 - $ 50]
EVAMARG (EVA/SALES) =	2.00% [EVA Margin; $10/$500]
EVAMOMARG (ΔEVA/SALES(-1)) =	1.25% [EVA Momentum; $5/$400;]
PVF (present value factor) =	$64.44 [present value of $1 a year, over 10 years, capitalized at COC]
EI (FVA / PVF) =	$ 6.20 [$400 / 64.44]
EI (-1) =	$ 5.43 [$350 / 64.44]
ΔEI =	$ 0.77 [$6.20 - $5.43]
MIM (EI/SALES) =	1.241% [Market-Implied EVA Momentum]
MIM (-1) (EI(-1)/SALES(-1)) =	1.358%
MIMMOMARG =	0.194% [MIM Momentum; ΔEI/SALES(-1) = ($6.20-$5.43)/$400]
CAPMARG (Avg(CAPITAL)/SALES)	140% [0.5*($800 + $600) / $500]
Vo/SALES	2.0 [$1,000/$500]

TIR = { COC*CAPMARG + EVAMARG + [EVAMOMARG + MIMMOMARG*(PVF * COC)] * (1/COC)/(1+ g)} / (V_0/SALES)

TIR = { 10%* 140% + 2% + [1.25% + 0.1940% * (64.44 * 10%)] * (1/10%)/(1+25%)} / 2.0

TIR = { 14% + 2% + [1.25% + 1.25%] * (10)/(1+25%)} / 2.0

TIR = { 14% + 2% + 10% + 10% } / 2.0

18% = 7% + 1% + 5% + 5%

(1) (2) (3) (4)

TIR, once again, is 18%. It is the same TIR as computed using the basic cash flow and EVA formulas:

Cash Flow TIR Formula

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

$TIR = (\$-120 + \$300) / \$1,000$

$18\% = (-12\% + 30\%)$

EVA TIR Formula

$TIR = (Capital\ Charge + EVA + \Delta MVA) / V_0$

$TIR = (\$70 + \$10 + \$100) / \$1,000$

$18\% = (7\% + 1\% + 10\%)$

The math checks, but TIR is now explained by four comparative ratio elements:

1. 7 percent from the cost of capital
2. 1 percent from earning EVA
3. 5 percent from increasing EVA
4. 5 percent from increasing expectations for the projected growth in EVA

Although it is a contrived example, the relative proportions are instructive. It's true that increasing EVA, i.e., generating EVA Momentum, can often be more significant than earning EVA. As was said, EVA Momentum enters with a multiple, EVA Margin just one-for-one.

Also, in this example, the increase in MVA was evenly split between the increase in EVA realized over the period and a projected increase in EVA extending into future periods. EVA Momentum and MIM Momentum both contributed 5 percent to the return and $50 to MVA. In general, though, MIM Momentum tends to be more significant over shorter return periods (and for more volatile businesses). Stock price movements dominate business fundamentals in the near term. But eventually the fundamentals take precedence. The actual EVA Momentum a firm earns and accumulates over time becomes the dominant driver of investor returns over the long haul.

Incidentally, the EVA ratios can be disaggregated to shed additional light on the return sources. EVA Momentum, for example, can be traced to two main drivers:

$$
\begin{aligned}
EVA\ Momentum &= (EVA - EVA(-1)) / SALES(-1) \\
&= EVA/(SALES(-1)) - EVA(-1)/SALES(-1) \\
&= EVA/SALES * (SALES/SALES(-1)) - EVAMARG(-1) \\
&= EVAMARG * (1+g) - EVAMARG(-1) \\
&= EVAMARG + g*EVAMARG - EVAMARG(-1) \\
&= \Delta EVAMARG + g*EVAMARG
\end{aligned}
$$

= Productivity Gains + Profitable Growth

The first EVA Momentum driver is the change in a firm's EVA Margin—in its EVA-to-Sales ratio—referred to as Productivity Gains. Holding sales constant, a firm can increase EVA and drive returns by increasing the ratio of EVA-to-Sales, at least up to some point of diminishing returns. It can do that by improving the overall profitability of the business model spanning P&L efficiency and asset management. The second Momentum factor is the sales growth rate over the period times the EVA Margin during the period, referred to as Profitable Growth. It is the value added from adding sales at a positive EVA profit margin. It is the main driver of value and returns for well-managed companies.

Let's illustrate. Recall that the example company had $400 in sales two years ago and $500 in sales in the current year, for 25-percent sales growth. Its EVA was $5, or 1.25 percent of sales, before increasing to $10, or 2 percent of sales, in the current period. The $5 increase in EVA represented a Momentum rate of 1.25 percent of prior-period sales.

EVA Momentum ***= ΔEVA / SALES(-1)***

= ($10 - $5) / $400

1.25% ***= $5 / $400***

And, as is shown below, the firm's EVA was firing on both Momentum cylinders:

EVA Momentum ***= ΔEVAMARG + g * EVAMARG***

= (2.00% - 1.25%) + 25% * 2.00%

1.25% ***= 0.75% + 0.50%***

= Productivity Gains + Profitable Growth

The formula tells us that Momentum of 0.75 percent, or 60 percent of the total, was from expansion in the firm's EVA profit margin, and 0.50 percent, or 40 percent of the total, was due to profitable growth—from generating an additional 25 percent in sales that yielded a 2 percent EVA Margin.

Thus, of the $50 increase in MVA and 5% TIR that were attributable to EVA Momentum, $30 in MVA and 3 percent of the return, i.e., 60 percent of it, came from running a more efficient, finely-tuned engine, and $20 of MVA and 2 percent of TIR, i.e., 40 percent, came from throttling a greater velocity of profitable business activity. The math works and always does.

The same math shows that MIM Momentum is the sum of these two components:

*= ΔMIM + g*MIM*

= Revised Expectations + Added Expectations

MIM, standing for Market-Implied Momentum, is EI/SALES; it is the forecast improvement in EVA, scaled to sales (its divided by current sales, not prior-period sales, because EI is a forward-looking forecast for EI, and current sales lag the forecast). In the example, EI increased from $5.43 to $6.20 over the period, a 14-percent increase, but a decrease relative to sales, which increased by 25 percent:

MIM **= $6.20/$500 = 1.2415%**

MIM(-1) **= $5.43/$500 = 1.3579%**

Plugging in:

MIM Momentum = ΔEI / SALES (-1)

= (\$6.2037 - \$5.4314) / \$400

+0.1940% = \$0.7759 / \$400

MIM Momentum = ΔMIM + g * MIM

= (1.2415% - 1.3579%) + 25% * 1.2415%

+0.1940% = -0.1164% + 0.3104%

EI increased. The outlook for the growth in EVA was brighter as of the end of the return measurement period than it was at the beginning of it. MIM Momentum, therefore, is positive. But why? The components show MIM Momentum is the result of two offsetting factors, one, a decline in the growth expectations relative to sales, the other, a lift, because although MIM is lower, it remains strongly positive and is applied to a 25 percent larger sales base.

In sum, EVA Momentum, and its components, and MIM Momentum, and its components, can offer a wealth of additional insights into the performance factors and investor perceptions that are driving investor returns.

Appendix 6: The Return on Capital Version of the TIR Formula

TIR also can be expressed in terms of ratios divided by the average capital employed over the measurement period. Sparing the reader the math, here is the formula:

$$TIR = \frac{COC + EVASPREAD + [EVAMOSPREAD + MIMMOSPREAD * (PVF * COC)] * \frac{\frac{1}{COC}}{(1+G)}}{\frac{V_0}{CAPITAL(AVG)}}$$

Where:

EVASPREAD = EVA / CAPITAL(AVG) = Return on Capital (ROC) – Cost of Capital (COC)

ROC = NOPAT / CAPITAL(AVG)

CAPITAL(AVG) = the average Capital outstanding over the period

EVAMOSPREAD = ΔEVA/CAPITAL(AVG)(-1), divided by prior period average capital

*EVAMOSPREAD = ΔROC + G * (ROC – COC) = Productivity Gains + Profitable Capital Growth*

G = growth rate in average Capital = CAPITAL(AVG) / CAPITAL(AVG)(-1) - 1

MIMMOSPREAD = ΔEI/CAPITAL(AVG), divided by average capital

*MIMMOSPREAD = ΔMIMSPREAD + G*MIMSPREAD = Revised Expectations + Added Expectations*

MIMSPREAD = EI/CAPITAL(AVG)

<u>Assumptions</u>

SALES = $ 500 (sales in the return measurement period)

SALES (-1) = $ 400 (prior period sales)

NOPAT = $ 80

NOPAT (-1) = $ 60

Capital = $ 800

Capital (-1) = $ 600

Capital (-2) = $ 500

Value (V) = $1,300

Value (V-1) = Vo = $1,000

EVA (NOPAT – Capital Charge) = $ 10 ($80 - $70 ; EVA is positive)

EVA (-1) = $ 5 ($60 - $55)

ΔEVA = $ + 5 (EVA increased over the period)

EI ((MVA - (EVA/COC)) / PVF) = $ 6.20 (($500 – $10/10%) / 64.44)

EI (-1) = $ 5.43 (($400 – $ 5/10%) / 64.44)

ΔEI = $ 0.77 ($6.20 - $5.43)

CAPITAL(AVG) = $ 700 (($600 + $800)/2)

CAPITAL(AVG) GROWTH (G) 27.3% ($700 / $550)

Vo/CAPITAL(AVG) 1.43 ($1,000 / $700)

EVASPREAD (EVA/CAPITALL(AVG)) = 1.42% ($10 /$ 700)

EVAMOSPREAD (ΔEVA/CAP(AVG)(-1) = .91% ($ 5/ $700)

MIMOSPREAD (ΔEI/CAP(AVG)) = .11% ($0.77585 / $700)

TIR = { COC + EVASPREAD + [EVAMOSPREAD + MIMMOSPREAD*(PVF*COC)] * (1/COC) /(1+G) } / (V_0/CAPITAL(AVG))

TIR = { 10% + 1.42% + [0.91%/(1+27.3%) + 0.11%*(64.44*10%)] * (1/10%) } / 1.43

TIR = { 10% + 1.42% + [0.7143% + 0.7143%] * 10 } / 1.43

TIR = { 10% + 1.42% + 7.143% + 7.143% } / 1.43

TIR = { 7% + 1% + 5% + 5%

Given the same inputs for NOPAT, Capital, COC, and market value, the TIR answer is the same as with the other formulas presented in this paper. It is just a mathematical transformation.

TIR is also based on the same four factors as the sales-denominated version, but converted into capital ratios:

1. Recovering the cost of capital—reversing discounting into compounding
2. Earning EVA (this time, in terms of EVA Spread, of EVA divided by average capital)
3. Growing EVA (EVA Momentum, spread version, divided by lagging average capital)
4. Revising expectations for future growth in EVA (MIM Momentum, spread version)

The conclusion is the same, namely, that to increase TIR and drive TSR, a company must earn EVA and increase EVA, this time, by investing capital for a rate of return above the cost of capital.

Appendix 7: The Chronology of Investor Returns

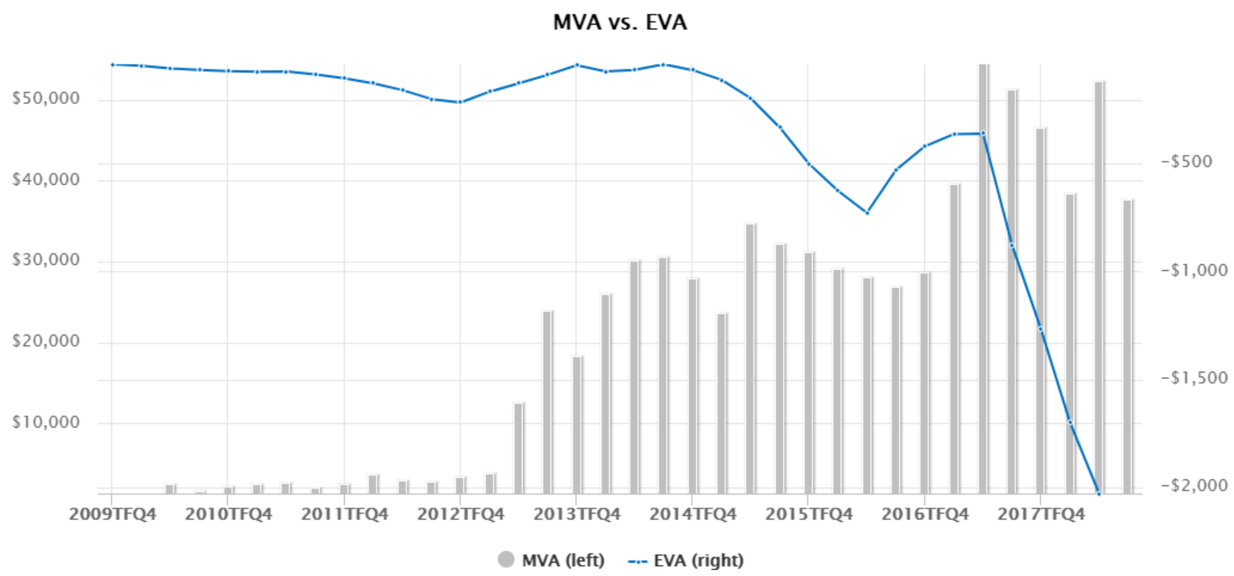
Companies tend to follow a natural chronological sequence in the return formulas, which are repeated below for convenience:

(1) (2) (3) (4)

TIR = { COC*CAPMARG + EVAMARG + [EVAMOMARG + MIMMOMARG*(PVF*COC)]*(1/COC)/(1+g) } / (V_0/SALES)

TIR = { COC + EVASPREAD + [EVAMOSPREAD + MIMMOSPREAD*(PVF*COC)] * (1/COC)/(1+G) } / (V_0/CAP(AVG))

Take Tesla as an example. Since its inception, Tesla has produced a phenomenal return, but did so while not producing any EVA and except rarely, any EVA Momentum. In fact, not only has EVA been negative; it has generally been growing more negative (EVA is the blue line on the chart below; MVA is the gray bar). The return so far has come from factor (4), from MIM Momentum, from favorable revisions in investor expectations for the EVA that will materialize some time down the road, which has tended to generate improvements in MVA, far ahead of any actual improvements in EVA. Its an excellent example of how far-sighted and patient investors and the market can be.



Assuming Tesla eventually produces electric cars profitably and at scale, EVA will start gushing in. At first, Tesla's EVA would just turn less negative, but less negative EVA is positive EVA Momentum. It is the change that counts. Positive EVA Momentum would drive the valuation through factor (3), which will supplant factor (4) and likely for quite a while.

As more time passes and Tesla matures, two things should happen. One, if positive EVA Momentum is sustained for long enough, Tesla will start to generate sizable EVA profits from the accumulation of the EVA gains over time. The positive EVA will support the return through factor (2). That development will be essential, because as a company uses up the well of projected EVA growth opportunities, as it converts potential EVA profits into kinetic EVA performance, MIM, or market-implied EVA Momentum, the look-ahead forecast growth rate for EVA, will deteriorate. In addition, the firm's EVA Momentum rate also will slow as the market matures, competitors enter, substitutes develop, in short, as EVA gains become harder to come by and as those gains are divided by an ever-larger sales and valuation base. Factor 4 turns negative, factor 3 slows to a stall, and so, factor 2—earning EVA—must kick in with a vengeance to take up the slack.

Some companies plateau at that long-run equilibrium, essentially deriving all their returns from factors (1) and (2), from the build-in return and a positive EVA stream that they can defend. Others are not as fortunate. The entropic forces of competition, saturation, substitution, disruption, fading fads, overpriced acquisitions, management missteps, and bureaucratic sclerosis tend to erode the embedded EVA base. And as EVA evaporates (think of firms like Xerox, Sears), the last line of defense is merely to generate a return from the reversing the discounting of future EVA, even if that EVA prospect is negative.

In sum, there is a predictable progression of value creation and return generation from the right to the left in the formula, from creating a potentially valuable business, to realizing EVA growth, to sustaining a profitable EVA franchise, to simply reversing the discounting process. It's all accounted for and clearly visible in the formula.

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