Thinking Ahead Institute

Fundamental return attribution

Separating returns due to short-term noise from intrinsic portfolio growth

Fundamental return attribution

Separating returns due to short-term noise from intrinsic portfolio growth

Contents

Section 1: Executive summary

This paper describes a new attribution and monitoring framework that separates a portfolio's returns into three main components. Returns arising from changes in market sentiment (multiple return), the growth of the portfolio's fundamental characteristics (growth return) and the change in those fundamental characteristics due to changes in the portfolio's holdings (activity return).

Decomposing returns into these three components enables a deeper understanding and assessment of how an investment strategy generates returns. Compared to more traditional attribution methods that focus on explaining returns by the performance of different groupings of securities this approach considers how the investment process generates returns in aggregate due to the current decisions of the asset manager or its past asset selection decision. The approach separates out returns arising from changes in short-term market sentiment enabling a longer-term outlook by asset owners and asset managers when evaluating recent performance or setting future return expectations.

"The framework allows the evaluation of an asset manager's decisions to be based not only on market value returns, but also on changes in the fundamental attributes of the portfolio over time."

The framework allows the evaluation of an asset manager's decisions to be based not only on market value returns, but also on changes in the fundamental attributes of the portfolio over time. This is intended to promote a longer-term outlook, and to enable an improved dialogue between asset owners and asset managers. Specifically, it broadens the portfolio review discussion away from an exclusive focus on short-term performance towards the asset manager's decision-making and the health of the portfolio.

To demonstrate the framework this paper applies the methodology to a simple equity strategy. We believe this framework also has applications in other asset classes and that by using ESG data discussions between asset owners, consultants and asset managers about how a portfolio's ESG credentials are being managed and evolving through time could be enhanced.

We are tremendously grateful to Thinking Ahead Institute members – Baillie Gifford, MFS and S&P Dow Jones Indices – for their time, insights and expertise in assisting the production of this research.

Section 2: Using fundamentals in performance attribution

The framework we propose uses the change in a portfolio's fundamentals to identify the impact of an asset manager's portfolio activity and the underlying growth of the portfolio's fundamentals on performance.

Similar approaches have been used in the past to explore the relationship between performance and underlying fundamentals. For example: Straehl and Ibbotson (2017) investigates the decomposition of long-term equity returns (1871-2014) into various components: income; inflation; and the change in various fundamentals, including earnings per share growth, and book value growth. They conclude that long-term returns are linked to changes in underlying company fundamentals.

Livermore, Meredith, and O'Shaughnessy (2018) uses a similar approach to investigate the return drivers of factor-based equity strategies. The portfolios that they study (unlike those of Straehl and Ibbotson) include frequent rebalancing, so the effect of turnover must be allowed for. They do this by separating fundamental growth into rebalancing and holding components.

The framework we propose builds on these approaches. As outlined in the next section, our proposed framework allows us to separate returns into constituent components in continuous time and to apply the methodology to different asset management approaches[1].

A framework to assess decisions not outcomes

Our proposed framework considers the decisions an asset manager is able to make, how these change the portfolio's properties and how these manifest into returns over time. We believe there are two main ways that an asset manager can influence the future returns of a portfolio, it can:

1 **Buy or sell a security** – an asset manager will buy or sell a security (or asset) based on its view of the current price compared to its current forecast of the price in the future. The future price will rise (or fall) depending on an increase (decrease) in fundamentals and/or decreases (increases) in the riskiness of those fundamentals as perceived by the market.

2 **Influence the future cash flows from a security** – equity owners can use their ownership rights to influence the running of a company to increase the company's future cash flows. An example of this is an asset manager taking action to replace ineffective company management in a company it owns.

This framework will focus on how we can better evaluate the ability of an asset manager at undertaking the first action. The impact of the second action is included in the framework through a change in the growth returns of the portfolio (and the multiple returns) but is not directly measurable as a standalone influence on returns.

[1] Approaches to asset management include discretionary investing, where an investor makes investment decisions based on their evaluation of company fundamentals or market technicals, and quantitative investing where an automated process makes those same decisions. In practice, there is some overlap between these approaches; most discretionary investors use quantitative tools to some extent and quantitative investors make discretionary judgements about how to evaluate/design an automated investment process.

Decisions affect the underlying fundamental characteristics of a portfolio

Underpinning this framework is an assumption that the objective is to own a portfolio (a) with the largest possible current intrinsic value and / or (b) with the largest possible expected future growth in that intrinsic value. Returns are due to the portfolio's current market value converging towards its intrinsic value, and to increases in the intrinsic value itself over time. The larger the difference between the portfolio's current market value and its intrinsic value the greater the potential returns.

In the short term a portfolio's returns are dominated by changes in the market's valuation of the current holdings. Over the long term a portfolio's returns are driven by the change in the portfolio's intrinsic value and the convergence between price and intrinsic value.

Over time a portfolio's intrinsic value can be increased in two ways. The asset manager can exchange two securities of equal market value where the purchased security has higher intrinsic value than the one being sold. Alternatively, the portfolio's intrinsic value can increase if the asset manager has selected securities in the past where the underlying assets are currently growing their intrinsic value.

Not all investment strategies are explicitly based on the idea of intrinsic value. For example, an investment strategy that attempts to predict a stock's earnings upgrades and the resulting price reaction is not explicitly based on the concept of intrinsic value. We believe our characterisation remains valid even in this case. The expected earnings are, in effect, playing the role of intrinsic value. In this case the higher realised earnings represent an increase [2] in the intrinsic value of the stock and the price rises (unless it already reflects the higher intrinsic value) in response.

"In the short term a portfolio's returns are dominated by changes in the market's valuation of the current holdings. Over the long term a portfolio's returns are driven by the change in the portfolio's intrinsic value and the convergence between price and intrinsic value."

Potential proxies for intrinsic value

Intrinsic value is, of course, unobservable and often highly subjective. That said, are there observable measures that might be used to approximate it? For example, is revenue the most meaningful proxy? Or earnings? Or book value? What about intangible assets? There is no perfect answer.

However, we do not need to directly measure intrinsic value for this framework to provide useful insights. We only need to be able to track the changes in intrinsic value – did a change in portfolio holdings increase the portfolio's intrinsic value or has the intrinsic value of the current holdings increased? This is what we are seeking to measure and for that we require proxies where the change in the proxy is likely to be correlated to the change in intrinsic value.

Given this requirement, while imperfect, we believe that many of the company fundamentals that an asset manager already uses as part of its evaluation of an investment opportunity are likely to be suitable measures in this framework. In practice, it's better to use several measures (both balance sheet and flow) to avoid being too reliant on any particular one.

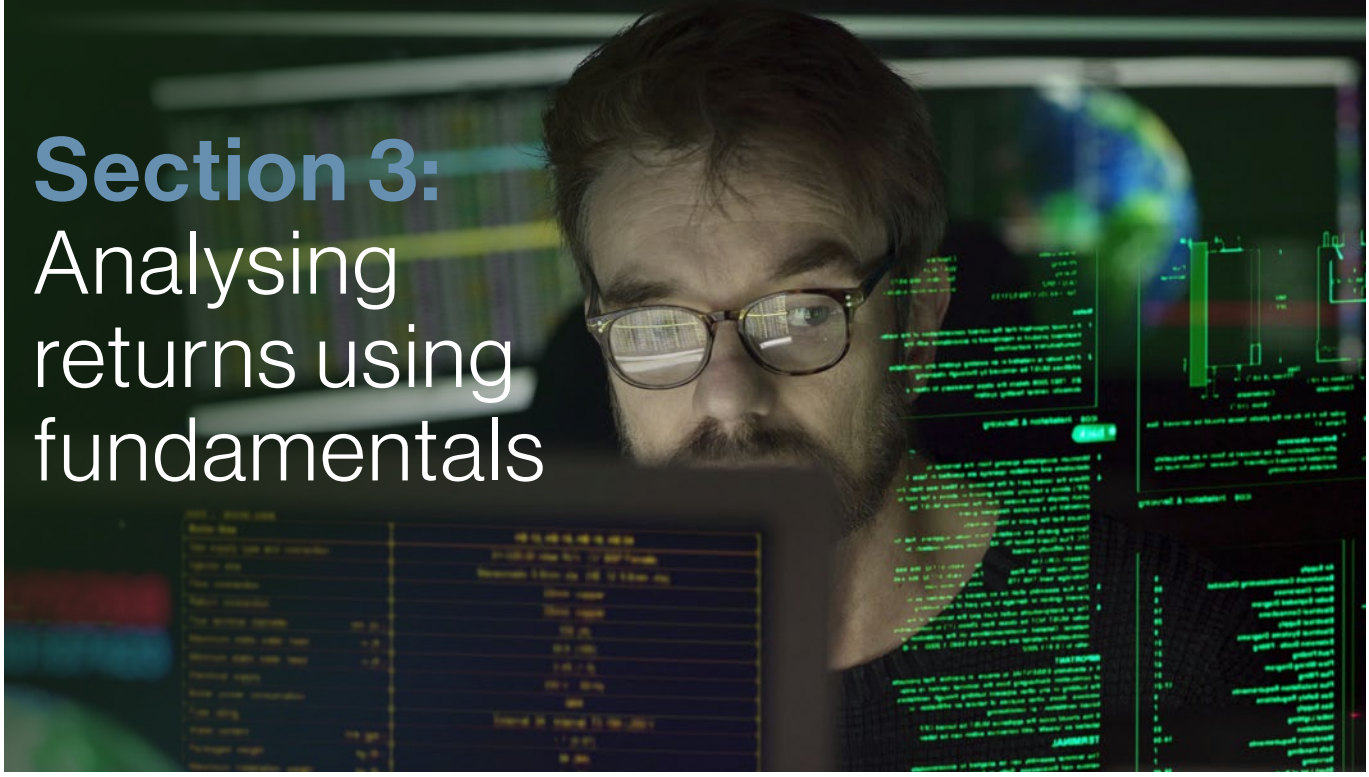
Some asset managers make an explicit forecast of intrinsic value as part of their investment process. In this case these estimates of intrinsic value could form the basis of the analysis. This should enable meaningful communication between an asset owner and asset manager about how the asset manager views the current portfolio and how its actions are improving the portfolio's future return prospects as its views on the holdings', and potential holdings', intrinsic values change over time.

An asset owner performing this analysis on several asset managers' products should use generic measures of intrinsic value to enable comparisons to be made across the products as well as any asset manager specific measures. Using generic measures means differences in results could be reconciled against the asset managers' investment approaches. They could also be catalysts for further engagement and a deepening of understanding of the asset manager's decisions; or they may raise questions that might indicate a change in underlying strategy – which could be an improvement or otherwise.

In the example analysis that follows, changes in book value and sales are used as a proxy for the change in intrinsic value in order to test the framework.

[2] We are ignoring the nuance that the news of the higher reported earnings doesn't mean the intrinsic value has increased, only that the market's perception of intrinsic value is now higher after it has more information about the most recent earnings.


"Some asset managers make an explicit forecast of intrinsic value as part of their investment process. In this case these estimates of intrinsic value could form the basis of the analysis. This should enable more meaningful communication between an asset owner and asset manager over time."



Section 3: Analysing returns using fundamentals

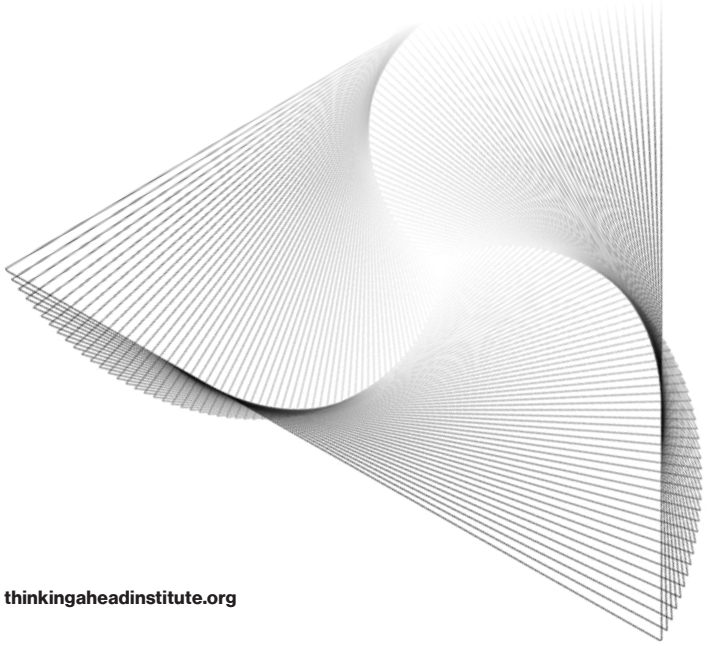
In this section we will derive the relationship between a fund's returns and the change in fundamentals due to asset manager activity, the change due to underlying fundamental growth and the change in valuation multiple (determined by the market) while accounting for any trading that occurs within the measurement period.

We break down returns as follows:

$$R_{t,Portfolio} = R_{t,Activity} + R_{t,Growth} + R_{t,Multiple} + R_{t,Intra\text{-}period}$$

First, we will describe the three main terms – $R_{t,Activity}$, $R_{t,Growth}$, $R_{t,Multiple}$ – that will explain the majority of a fund's performance and provide the most insight into how the strategy employed by an asset manager generates its returns.

We will then explain the additional term – $R_{t,Intra\text{-}period}$ – as the return arising from trading within the measurement period. The magnitude of this term may indicate if the frequency of measurement (daily, weekly, monthly) is too low given the level of trading within the strategy.



The three main components of portfolio returns

To begin we consider the drivers of portfolio returns that arise due to changes to, or convergence of current prices towards, intrinsic value. As described, suitable proxies for intrinsic value may include fundamentals that represent cash flows or asset values. Monitoring how these fundamentals change in a portfolio over time allows a portfolio's returns to be attributed into the following components:

1 **Trading activity** – the change (increase or decrease) in the underlying fundamental quantity arising from the sales and purchases of securities or assets by the asset manager

2 **Underlying growth** – the increase (decrease) in the underlying fundamental quantity due to the underlying asset's (or company's) performance and the distribution of proceeds from those assets

3 **Multiple expansion** – the increase (decrease) in the market value of the portfolio that is unrelated to any change in the fundamentals. This is equivalent to an increase (decrease) in a portfolio's price-to-fundamental ratio.

To monitor these over time we must observe the changes periodically. Depending on the level of activity in the portfolio, time scales of days, weeks, months or quarters may be suitable. Practically, we expect most analysis to be undertaken monthly at first, with shorter measurement periods used as required. For calculation purposes, the measurement period is separated into two parts: a holding period and an instantaneous trading period. These are shown in **figure 1**. These two periods capture changes in portfolio value due to different underlying causes: trading decisions of the asset manager and the changes in the underlying assets themselves.

1 Holding period

The holding period is the time between the start of the measurement period and the start of the trading period. During the holding period it is assumed there is no trading in the portfolio and the change in the fundamental quantity is due to changes in the underlying assets. The portfolio's total value will change due to the change in its fundamentals and the valuation multiple.

During this time any dividends (in an equity portfolio) or other cash flows may be received.

2 Trading period

In the instantaneous trading period at the end of the measurement period the old portfolio is traded to the new portfolio. This occurs when securities are bought and sold. When this happens the portfolio's fundamentals change due to changes in the portfolio's holdings.

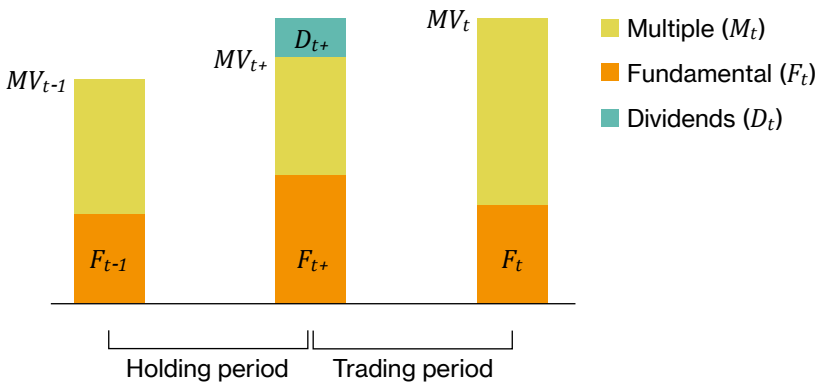
If the measurement period were monthly, then the trading period would occur at the close of markets at the end of the month. If a strategy trades during the month then this assumption may be unsuitable, and a shorter measurement period may be needed. In the case of a daily measurement period the trading period would be at the close of markets each day.

During the trading period any dividends (or other cash flows) received in the holding period are either distributed or reinvested in the portfolio. If dividends are retained in cash, this is viewed as a reinvestment and a change in portfolio weights. Further detail on the treatment of dividends is found in **Section 7**.

Figure 1 shows how we can measure the evolution of a portfolio through time by applying these ideas to the changes in the different components of the portfolio. Notice how, during the holding period, the underlying assets previously selected by the asset manager grew their fundamentals and paid a dividend to the portfolio, generating positive returns. During trading the figure shows the asset manager decided to reinvest the dividends (and likely changed some portfolio holdings) with the result that the fundamentals declined as the new holdings were relatively more expensively valued compared to the previous holdings.

"During the trading period any dividends (or other cash flows) received in the holding period are either distributed or reinvested in the portfolio."

Figure 1 – **Measuring the changes in different parts of the portfolio**



Where $MV_t = F_t \cdot M_t$ and the subscript indicates the time. The time $t\text{-}1$ is the start of the measurement period (and the end of the previous period) and $t+$ and t are the end of the current period. There is no practical difference in time between $t+$ and t, it is assumed the trading period is effectively instantaneous. After trading, the portfolio formed at time t is the same portfolio used at the beginning of the next period.

When there is no trading during the holding period this framework results in the portfolio's return over the period being separated into the following components:

$$R_{t,Portfolio} = R_{t,Activity} + R_{t,Growth} + R_{t,Multiple}$$

where R_t is the logarithmic return of measurement period t.

The return components are defined as:

$$R_{t,Activity} = ln\left(\frac{F_t}{F_{t+}}\right) - ln\left(\frac{MV_t}{MV_{t+}}\right)$$

$$R_{t,Growth} = ln\left(\frac{F_{t+}}{F_{t-1}}\right) + ln\left(1 + \frac{D_{t+}}{F_{t+} \cdot M_{t+}}\right)$$

$$R_{t,Multiple} = ln\left(\frac{M_t}{M_{t-1}}\right)$$

Using this breakdown, we can evaluate how each contributes to the portfolio's return during the measurement period. The derivation of this result can be found in **Section 7**.

Calculation requirements

To calculate the return components over a given measurement period the following information is required for each asset in the portfolio at the start and end of the measurement period:

1. Portfolio weight
2. Fundamental-to-price
3. Dividends or other payments received
4. Price or total returns

This data is relatively standard information that asset managers and asset owners are used to processing and handling.

The calculations required to calculate the return components are shown in **Section 7**.

This methodology **1** makes an assumption that all trading happens at the end of a measurement period and **2** requires a measurement period frequency to be selected[3]. The potential influence of these choices grows as the measurement period increases because more activity is likely to take place within the measurement period rather than at its end.

For a low turnover strategy, data at each month end is likely to be sufficient although it will, naturally, not capture the impact of (the low) intra-month activity within the portfolio. However, for higher turnover strategies, using higher frequency data (possibly daily) may be required.

Trading and other activity within the measurement period

When there is activity within the measurement period the buy-and-hold assumption implicit in the holding period is no longer true. This means the portfolio's return will no longer equal the sum of the calculated components. While some strategies only trade periodically the vast majority do not (indeed irregular and unpredictable timing of trading activity is often viewed as a positive) which means intra-period activity is inevitable. To address this, we add an extra term to the analysis as follows:

$$R_{t,Portfolio} = R_{t,Activity} + R_{t,Growth} + R_{t,Multiple} + R_{t,Intra\text{-}period}$$

Where $R_{t,Intra\text{-}period}$ is the additional return arising from changes to the portfolio that are not detected at the measurement frequency.

As $R_{t,Portfolio}$, $R_{t,Activity}$, $R_{t,Growth}$ and $R_{t,Multiple}$ are known $R_{t,Intra\text{-}period}$ can be calculated as the difference between these terms.

Longer measurement periods are likely to generate larger values of $R_{t,Intra\text{-}period}$ and daily data is likely to minimise it (unless the strategy is an intra-day short-term strategy). In this case, the weights-based methodology described in this paper should be replaced with a trade-level version. That said, the applicability of this framework, premised on the concept of prices converging to an intrinsic value, to assessing an intra-day strategy is questionable.

[3] Irregular measurement periods can be analysed using this framework and are, in some ways are a simplification of the general process we describe but are more data intensive and complicated to process.

An attribution framework for tracking sources of return over time

The single period attribution framework can be extended by summing the individual components through time. This follows from the attribution framework being based on log returns and their mathematical properties.

The attribution of a portfolio's returns over time T can be stated as follows:

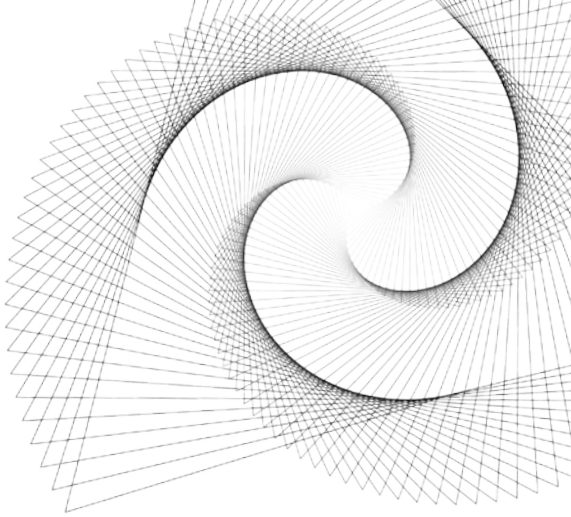
$$R_{T,Portfolio} = \sum_{T} R_{t,Activity} + \sum_{T} R_{t,Growth} + \sum_{T} R_{t,Multiple} + \sum_{T} R_{t,Intra-period}$$

Applying this framework to a strategy's returns over time allows us to observe how each component influences the outcomes over different time horizons. In the short-term it is likely that $R_{Multiple}$ is the biggest influence on returns but at longer horizons (across multiple measurement periods) the returns arising from trading the portfolio and the underlying performance of the assets are more likely to determine the returns of the strategy. It naturally follows that an asset owner (and asset manager) are then able to better discount the impact of returns not controlled by the asset manager (ie the $R_{Multiple}$) from the evaluation of asset managers' short-term returns.

By separating returns in this way an asset owner and asset manager can engage on the controllable investment decisions, and the resulting outcomes, to build a meaningful dialogue about the investment strategy, its long-term prospects and whether it is profiting from return sources that are likely to persist in the future. Conversely, if recent strong performance has been due to changes in the portfolio's valuation, the strong performance could even be a cause for concern. And, if recent poor performance is from a decline in valuation but the asset manager has continued to own assets with strong fundamental growth and has been trading to incrementally increase the intrinsic value of the portfolio, then it suggests the poor short-term performance is not a major cause for concern.

We are confident that asset owners and asset managers would agree that they want to focus on the meaningful aspects of a strategy and not be distracted by short-term market noise. We think that this framework is a valuable aid to help further this ambition and should be part of every investor's (asset owner or asset manager) analytical toolkit.

Section 4: Interpreting each return component



With this framework we can observe how an asset manager's actions contribute to positive or negative outcomes for different components of the portfolio's return.

Table 1 outlines some simple examples of the types of change that will lead to each of the different return components being positive or negative. For example, strategies that aim to sell expensive assets and buy cheaper assets should be expected to show positive $R_{Activity}$, while those that aim to own assets that have above average growth in underlying fundamentals should be expected to show positive R_{Growth}.

However, many actual investment strategies are more complex than the simple cases outlined in **table 1**. The following examples are investment strategies that can be profitable if executed effectively but involve return trade-offs or more complicated interactions between the three return components:

1 **Buying expensive assets** – the premise of buying assets that are already highly valued is that the asset will be able to grow its underlying fundamentals (eg earnings or cash flow) faster than is reflected in the current price. If a strategy successfully buys assets that appear expensive but where future growth is actually undervalued then we expect the act of buying the relatively expensive asset (appearing as a negative $R_{Activity}$) will be offset by increased underlying growth (R_{Growth}) in the future. However, if the underlying growth does not meet the market's expectations then the valuation multiple is expected to contract (negative $R_{Multiple}$). If the asset manager is successful at selecting high growth assets then the average valuation multiple may remain steady while the positive R_{Growth} more than offsets the negative $R_{Activity}$. Conversely, if the asset manager overpays for the future growth the R_{Growth} will not offset the $R_{Activity}$.

2 **Buying assets with falling fundamentals** – this strategy would be expected to have a negative underlying growth rate in its fundamentals, either in absolute or relative terms. For this to be an effective strategy the asset manager must believe that the assets will be able to deliver less bad outcomes than the current price suggests. In this case, we expect a positive $R_{Activity}$ to offset the negative R_{Growth} that will be realised over time.

Table 1 – **Conditions resulting in positive or negative returns**

Return type	Positive	Negative
Activity	Selling $10 of assets with $3 of underlying fundamental (eg book value) to buy $10 of assets with $5 of fundamental (eg book value)	Selling $10 of assets with $5 of underlying fundamental (eg book value) to buy $10 of assets with $3 of fundamental (eg book value)
Growth	The portfolio comprises assets that collectively increase the amount of fundamental (eg book value) in the portfolio during the holding period or distribute cash (pay dividends)	Asset impairment results in fundamental write-downs for some assets in the portfolio, and a reduction in the fundamental for the total portfolio during the holding period
Multiple	The portfolio's valuation multiple (eg price-to-book) expands due to the market assigning increased future fundamental growth rates, or reduced discount rates, to the portfolio's assets	The portfolio's valuation multiple (eg price-to-book) contracts due to the market assigning decreased future fundamental growth rates, or higher discount rates, to the portfolio's assets

3 Buying assets based on non-fundamental-based information – how this type of strategy would appear in this framework is less certain. However, we believe that this framework will aid understanding of the underlying causes as to why such a strategy works. For example, if a momentum strategy works because the market under-reacts to changes in fundamentals then we would expect to see positive R_{Growth} arising from positive underlying growth in portfolio fundamentals as companies deliver positive earnings growth. However, the strategy might have negative $R_{Activity}$ due to the portfolio, on average, selling relatively cheap assets (poor price returns making the asset cheaper) and purchasing expensive assets (strong price returns making the asset relatively more expensive).

In general, this fundamental framework is less applicable to this type of strategy. To effectively use this framework to monitor such a strategy an asset owner and asset manager need to carefully establish the expectations for how the strategy generates returns and how best to monitor this over time.

In summary, where an investment strategy is premised on an investor buying undervalued assets which then exhibit above average fundamental growth, we expect the strategy would show reasonably persistent positive $R_{Activity}$ and R_{Growth} over time, reflecting those aspects controlled by the investor. For some strategies the activity and growth effects are expected to be somewhat offsetting, but if the strategy is effective the net return will be positive. In contrast, $R_{Multiple}$ is largely outside the asset manager's control[4] and will be driven by market sentiment and the market's pricing of risk in both the short-term and long-term.

Applying this framework to value and growth factors

In a recent paper exploring the performance of the value factor Arnott et al (2019) uses a return decomposition that is extremely similar to this framework[5]. They attribute the returns of value and growth strategies into components of "Revaluation Alpha", "Profitability" and "Migration". These are equivalent to the three components used in this paper. In this terminology Revaluation Alpha is the Multiple return, Profitability is the Growth return and Migration is the Activity return.

Table 2 shows part of a table from the paper rewritten to be consistent with the labelling used in this paper. From the table we can observe a number of features of the investment strategies. We observe the growth strategies have above average R_{Growth} and significantly higher R_{Growth} than their value counterparts. Conversely, the value strategies show higher $R_{Activity}$ values. This makes sense given our understanding of the strategies and how this framework should be interpreted.

Over this time period the contribution to returns from $R_{Multiple}$ is somewhat muted, however, other time periods shown in the original table demonstrate that it can meaningfully contribute to the success or otherwise of a strategy.

We view it as a positive that others believe applying this type of framework is useful to understanding the drivers of a strategy's returns. We also believe that this demonstrates how the returns of two archetypal investment strategies (value and growth) are represented in this framework that is consistent with the descriptions previously set out.

Table 2 – **Return decomposition, US, July 1963 – June 2007**

Size	Valuation	Returns (% pa)			
		Activity	Growth	Multiple	Total
Large	Growth	-7.0	15.2	1.2	9.3
	Neutral	-0.5	10.7	1.0	11.1
	Value	5.4	6.4	1.4	13.2
Small	Growth	-10.8	17.9	1.2	8.4
	Neutral	4.0	9.1	1.3	14.4
	Value	15.3	0.3	1.3	16.8

Source: Research Affiliates, "Reports of Value's Death May Be Greatly Exaggerated" (https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3488748)
Part of Table 3 in the original paper

[4] Some strategies are predicated on assets being revalued by the market such that the returns are expected to come from multiple expansion of induvial assets. However, while this is true for individual assets, at the level of the portfolio we observe the valuation changes much less. In this framework it is the change in portfolio valuation that is reflected in the multiple return. For a strategy that buys assets that are "too cheap", the return from buying low and selling high would be firstly attributed to the activity return, unless the valuation of the whole portfolio were to increase.

[5] Mathematically the two approaches are equivalent; the derivations differ resulting in slightly different underlying terms.

Section 5: Using the framework to compare buy-and-hold and rebalanced portfolios

To test this framework on the simplest example we compare the results from analysing a buy-and-hold strategy and a strategy that is rebalanced each quarter, where both strategies are comprised of the same stocks, using book value and sales as fundamentals. The only difference in the two portfolios will be due to the difference in weights arising from the performance of the stocks over time and the trading activity in the rebalanced strategy. While this is undoubtably a contrived example it demonstrates that the framework can distinguish the different drivers of returns without the distraction of other interactions and effects.

This analysis uses 200 US stocks and covers the 20-year period from 1995 to 2015. The selection of the stocks used in this analysis introduces numerous biases (for example, survivorship bias) into the results in terms of the performance itself but in this case we are not interested in evaluating the efficacy of an investment strategy, rather we are interested in assessing the efficacy of the attribution methodology. As such, we aim to minimise the differences between the two strategies along the dimensions measured by the framework – valuation multiple ($R_{Multiple}$), growth rate (R_{Growth}) and trading activity ($R_{Activity}$) – that arise from changes external to the strategies themselves such as stocks being delisted or M&A activity.

The 200 stocks in both strategies begin equally weighted with 0.5% of the portfolio invested in each stock. The weights in the buy-and-hold portfolio will change over time as stocks that outperform (underperform) the average stock will increase (decrease) in weight. The weights in the equally weighted portfolio will be reset to equal weight at the end of each quarter.

Our expectations are that the buy-and-hold strategy will not show returns due to trading activity ($R_{Activity}$) because there is no trading in the strategy. In contrast, we expect the equal weighted strategy will show trading activity returns from the regular rebalancing inherent in the strategy. We expect the contributions from organic and multiple effects to be similar, but not the same, as although the same stocks are included in both strategies the weights of each stock will be different.

The results, shown in **table 3**, are as expected, the buy-and-hold strategy has no return from the Activity component while the Quarterly rebalance strategy does. As the two strategies are comprised of the same stocks it is reassuring to see similar patterns in the returns from the Growth and Multiple effects. However, the difference in stock weightings has resulted in a relatively large different in the level of the Growth return between the two strategies. Over the period both strategies benefited from the growth in fundamentals (book value and sales) of the underlying stocks and an increase in valuations. While the performance of the two strategies was similar over the whole period, we can observe that the buy-and-hold strategy had stronger returns due to higher growth and rising valuations. In contrast, the Quarterly-rebalance strategy's return from activity offset its lower returns from growth and valuation change.

"While the performance of the two strategies was similar over the whole period, we can observe that the buy-and-hold strategy had stronger returns due to higher growth and rising valuations."

Table 3 – **Return contributions**

Strategy	Fundamental	Ln Returns (% pa)			
		Activity	Growth	Multiple	Total
Buy-and-hold	Book value	0.00	10.05	3.38	13.43
Quarterly rebalance	Book value	6.52	5.64	0.97	13.13
Buy-and-hold	Sales	0.00	8.88	4.56	13.43
Quarterly rebalance	Sales	4.57	5.82	2.74	13.13

Source: Thinking Ahead Institute, FactSet

It is informative to observe how these return contributions changed over time. **Figure 2** shows the breakdown of cumulative log returns for each strategy using book value and sales as proxies for intrinsic value. It shows how both strategies have benefited from multiple expansion over the whole period as well as increasing sales and book value.

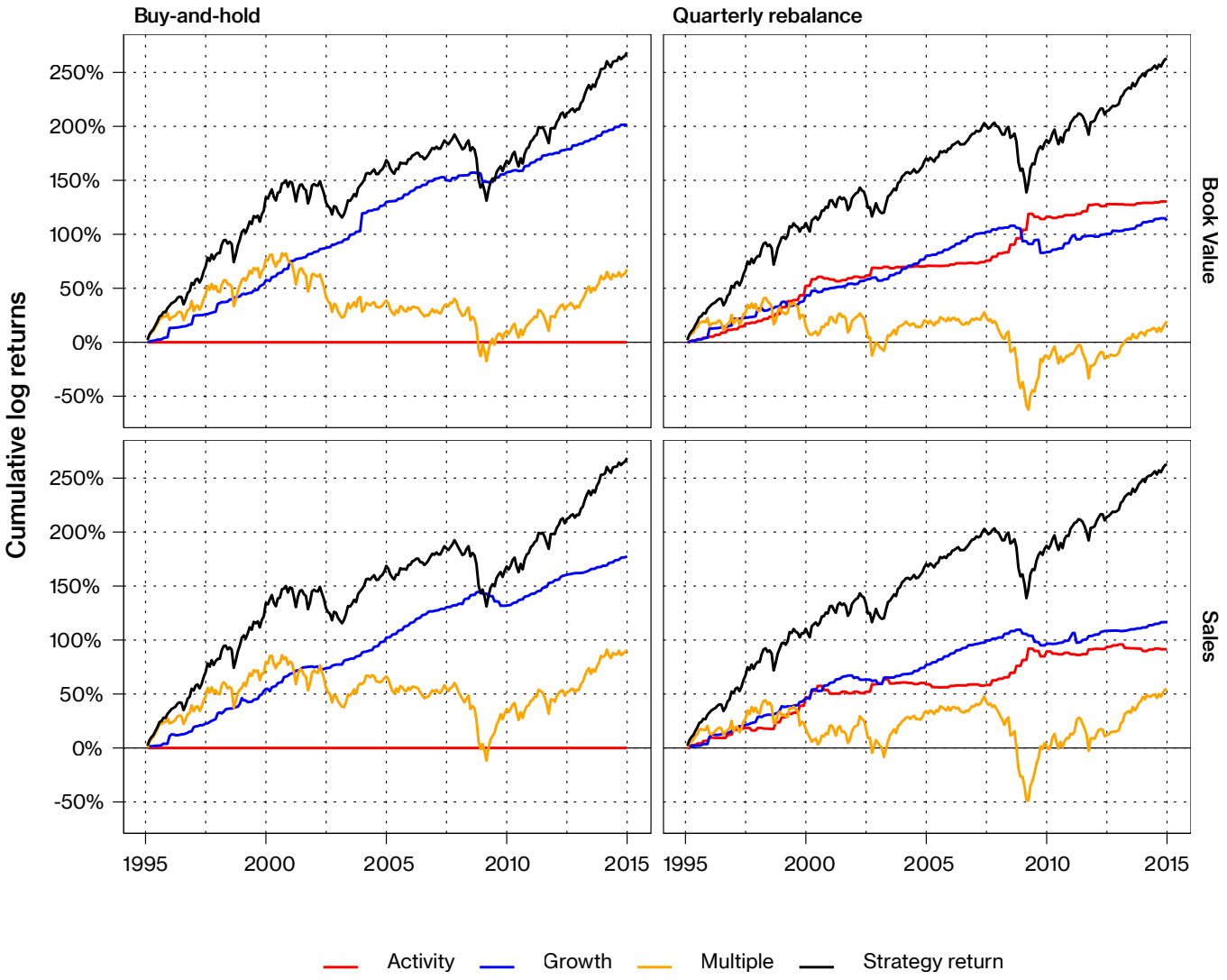
Returns of a long-only equity investment strategy are typically assessed relative to a benchmark rather than in absolute terms. To show how the framework can be applied to measure relative returns **figure 3** shows the results of the Quarterly-rebalanced strategy relative to the buy-and-hold strategy.

"Applying this framework to these two strategies has demonstrated it is able to correctly separate and attribute returns from activity in the portfolio, underlying asset growth and changes in valuation."

Figure 3 (on the next page) clearly shows how the three effects contributed to the relative outperformance of the Quarterly-rebalance strategy. The Activity return shows how rebalancing the portfolio back to equal weights was a positive contributor to returns. In contrast the Growth return was negative overall which suggests that the rebalancing process resulted in a portfolio that, on average, allocated more capital to slower growing companies. While the Multiple return was also negative overall it shows the most cyclical performance with multi-year periods where it was either a positive or negative for returns.

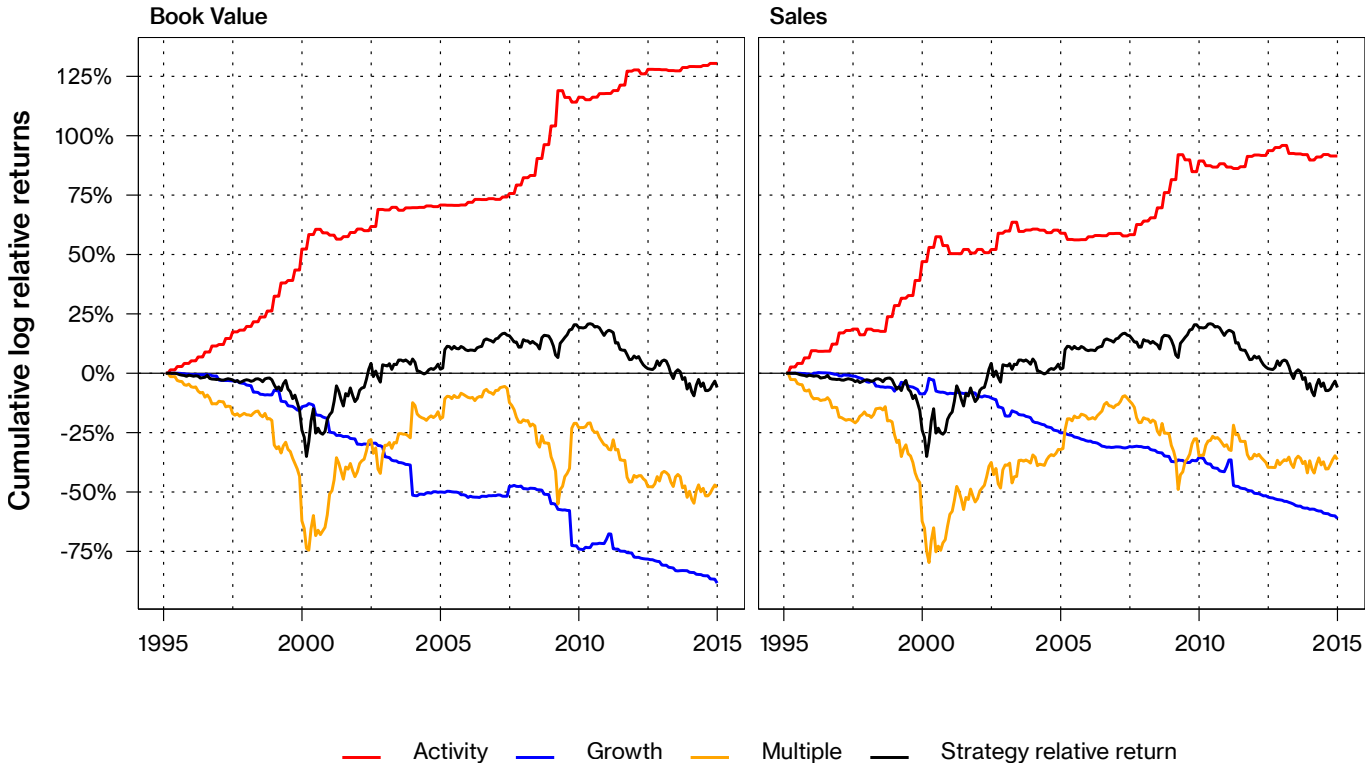
Applying this framework to these two strategies has demonstrated it is able to correctly separate and attribute returns from activity in the portfolio, underlying asset growth and changes in valuation. In this case, clearly recognising that the main difference between the two strategies was the rebalancing of the portfolio and this was detected through the difference in the return attributed to the activity component.

Figure 2 – **Separating return components by fundamental**

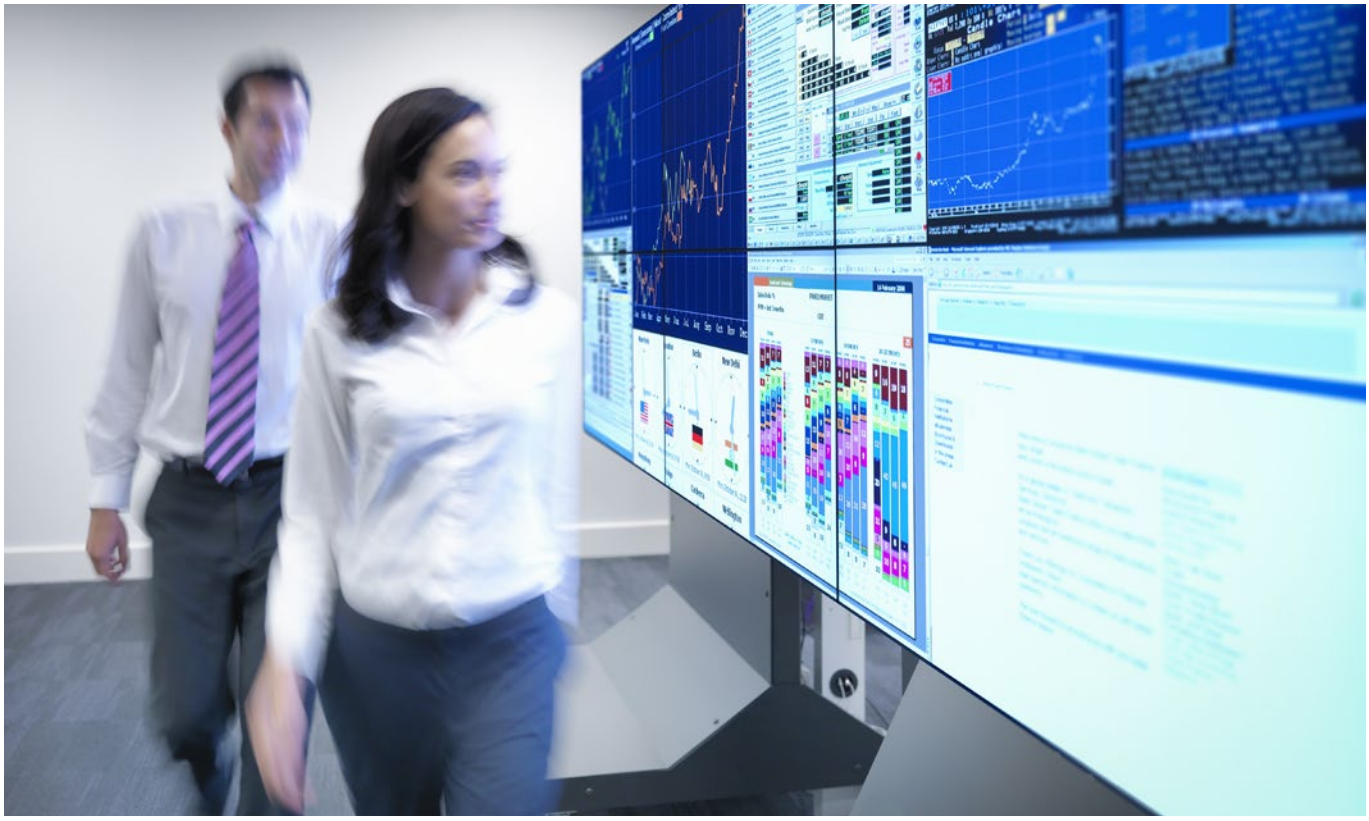


Source: Thinking Ahead Institute, FactSet

Figure 3 – **Contributions to relative return**



Source: Thinking Ahead Institute, FactSet



Section 6: Conclusions

The proposed framework is a broadly applicable approach to separating a strategy's returns into returns due to growth in the intrinsic value of the portfolio and returns due to changes in market sentiment. An asset manager can control (either through direct action or previous asset selection) the change in a portfolio's intrinsic value but market sentiment is generally outside an asset manager's control.

By using this framework to decompose returns an asset owner and asset manager can engage on the investment decisions taken by the asset manager, and the resulting outcomes, to build a meaningful dialogue about the investment strategy and whether it is profiting from return sources that are likely to persist in the future.

This framework is able to allocate returns between the current decisions of the asset manager (trading activity), consequences of past decisions (underlying growth) and the impact of broader market sentiment (multiple returns) over time with reference to a suitable proxy of the portfolio's intrinsic value or other attribute of interest.

Having described how the framework might treat different investment strategies we have seen the results of a very similar analysis on value and growth strategies that is consistent with our expectations. The framework has been used to compare a buy-and-hold with an equally weighted strategy to evaluate these strategies over time. It was able to identify the activity in the equally weighted strategy as the key differences between them and that this return component was an important aspect of its performance relative to the buy-and-hold strategy.

We believe this framework provides a relatively new and comprehensive approach to evaluating the returns of an investment strategy. Contrary to established approaches this framework captures the influence of different aspects of asset manager decision making over time (the investment process) rather than the more traditional focus on the performance of individual assets at a point in time.

Having established this applicability of the framework to asses and monitor a strategy over time further work is likely required to test its application to a broad range of strategies, asset classes, and which fundamental metrics or underlying asset attributes are the most informative.

In addition, it seems clear to us that this approach could be applied to ESG related data. In this case it would show how an asset manager's decisions and the changes in the underlying assets affected the ESG profile of the strategy over time. For example, showing if an equity portfolio's decarbonisation is due to declining emission of its constituents or holdings with high emissions being replaced with low emission companies.

"We believe this framework provides a relatively new and comprehensive approach to evaluating the returns of an investment strategy. Contrary to established approaches this framework captures the influence of different aspects of asset manager decision making over time..."

Section 7: Supporting materials

Separating the portfolio return into its components

Starting with the following relationship we show that the portfolio's return can be separated into the proposed components.

We start with the idea that the market value (MV) of a portfolio at time t is the product of a fundamental quantity (F) and a valuation ratio (MV/F).

$$MV_t = F_t \frac{MV_t}{F_t} = F_t \cdot M_t$$

It follows the log return of the portfolio during the period between $t\text{-}1$ and t can be written as:

$$R_{t,Portfolio} = \ln\left(\frac{MV_t}{MV_{t-1}}\right)$$

In the case of the portfolio shown in **figure 1**, the log return of the portfolio during period t can also be expressed as:

$$R_{t,Portfolio} = ln\left(\frac{MV_t}{MV_{t+} + D_{t+}}\right) + \ln\left(\frac{MV_{t+} + D_{t+}}{MV_{t-1}}\right)$$

It is useful to define the dividend return in terms of the change in portfolio market value based on the following:

$$MV_t = MV_{t+} + D_{t+}$$

$$MV_t = MV_{t+} \cdot \left(1 + \frac{D_{t+}}{MV_{t+}}\right)$$

$$\left(1 + \frac{D_{t+}}{MV_{t+}}\right) = \frac{MV_t}{MV_{t+}}$$

This relationship between MV_t, MV_{t+} and D_{t+} is based on dividends being fully reinvested into the portfolio. If dividends were distributed or only partially reinvested this relationship would change.

Substituting these equations for the market values and rearranging gives:

$$R_{t,Portfolio} = ln\left(\frac{MV_t}{MV_{t+} \cdot \left(1 + \frac{D_{t+}}{MV_{t+}}\right)}\right) + ln\left(\frac{MV_{t+} \cdot \left(1 + \frac{D_{t+}}{MV_{t+}}\right)}{MV_{t-1}}\right)$$

This can be rewritten more simply in the following form:

$$R_{t,Portfolio} = ln\left(\frac{MV_t}{MV_{t+}}\right) - ln\left(1 + \frac{D_{t+}}{MV_{t+}}\right) + ln\left(\frac{MV_{t+}}{MV_{t-1}}\right) + ln\left(1 + \frac{D_{t+}}{MV_{t+}}\right)$$

Expanding the MV terms in their underlying fundamental and multiple components this becomes:

$$R_{t,Portfolio} = ln\left(\frac{F_t}{F_{t+}}\right) + ln\left(\frac{F_{t+}}{F_{t-1}}\right) + ln\left(\frac{M_t}{M_{t-1}}\right) + ln\left(1 + \frac{D_{t+}}{F_{t+} \cdot M_{t+}}\right) - ln\left(\frac{MV_t}{MV_{t+}}\right)$$

Grouping the terms based on the sub-periods (holding and trading) gives:

$$R_{t,Portfolio} = ln\left(\frac{M_t}{M_{t-1}}\right) + \left[ln\left(\frac{F_{t+}}{F_{t-1}}\right) + ln\left(1 + \frac{D_{t+}}{F_{t+} \cdot M_{t+}}\right)\right] + \left[ln\left(\frac{F_t}{F_{t+}}\right) - ln\left(\frac{MV_t}{MV_{t+}}\right)\right]$$

From which we can define the three return components as:

$$R_{t,Activity} = ln\left(\frac{F_t}{F_{t+}}\right) - ln\left(\frac{MV_t}{MV_{t+}}\right)$$

$$R_{t,Growth} = ln\left(\frac{F_{t+}}{F_{t-1}}\right) + ln\left(1 + \frac{D_{t+}}{F_{t+} \cdot M_{t+}}\right)$$

$$R_{t,Multiple} = ln\left(\frac{M_t}{M_{t-1}}\right)$$

These three return components represent the returns from the asset managers activity (noting that the second term removes any return credit from reinvesting dividends pro rata across the portfolio or investing net flows pro rata across the portfolio), from the growth of portfolio fundamentals and the dividends received during the holding period and the change in portfolio multiple such that:

$$R_{t,Portfolio} = R_{t,Activity} + R_{t,Growth} + R_{t,Multiple}$$

The log return of an investment strategy over time T is therefore:

$$R_{T,Portfolio} = \sum_{T} R_{t,Portfolio}$$

Which can be more conveniently expressed as:

$$R_{T,Portfolio} = \sum_{T} R_{t,Activity} + \sum_{T} R_{t,Growth} + \sum_{T} R_{t,Multiple}$$

In principle, the components of the fundamentals and valuation multiple could be further broken down to explore the evolution of subcomponents over time due to trading period activity and holding period activity.

An example of this for an equity portfolio could be the separation of the fundamental quantity of earnings into profit margin and sales (see Livermore et al (2018) for an example of this). In other asset classes this type of sub-division may be more or less relevant.

Cash and dividend reinvestment

The framework treats a cash holding as another asset in the portfolio. In the context of an equity portfolio a cash position will normally make no contribution to the portfolio's fundamentals. A possible exception to this is if the fundamental being analysed is book value. Cash can be regarded as having a book-to-market ratio of 1, and this is consistent with the treatment of cash within other stocks in the portfolio. For consistency with other metrics we suggest treating an explicit cash position as having no contribution to the portfolio's book value.

When dividends are received, they are reinvested into the portfolio. If the asset manager invests the dividends pro rata across the portfolio's holdings the $R_{t,Activity}$ does not change, this is also true of any net flow where additional purchases or sales are done pro rata with the existing portfolio. If the dividends are held in cash within the portfolio a negative $R_{t,Activity}$ will be recognised. This is consistent with the asset manager reducing the portfolio's per dollar exposure to the fundamental being assessed and therefore what we expect.

Any change in portfolio weights that result in a net change in fundamental will result in a positive or negative $R_{t,Activity}$ depending on the trades done. This includes using dividend reinvestments to change the portfolio weights. Again, this behaviour is consistent with intuition.

Calculating the returns using a portfolio's end-of-period holdings

Fund reporting often provides portfolio weights on a periodic basis, for example month-end holdings. This section demonstrates how that information, along with information on the underlying holdings, can be used to calculate the return components of the framework.

The following naming conventions are used, following the labelling of **figure 1**.

$w_{t,i}$ is the weight of stock i at time t

$r_{t,i}$ is the price return of stock i during the period t-1 to t

$y_{t,i}$ is the fundamental-to-price (yield) of stock i at time t

$d_{t,i}$ is the dividend yield of stock i during the period t-1 to t.

For a single stock:

$$d_t = \frac{\sum_{t-1}^{t} dividend\ paid}{price_{t-1}}$$

Using a stock return that includes reinvestment of dividends may be appropriate if a strategy reinvests the dividends into the shares of the company that issued the dividend (rather than reinvesting the proceeds across the entire portfolio). In this case the dividend term $d_{t,i} = 0$, and $MV_t = MV_{t-1} \cdot \sum_i w_{t-1,i} \cdot R_{t,i}$ simplify the calculations for the return components.

In practice the simpler calculations may be preferred with any mismatch in returns being absorbed into the $R_{t,Intra\text{-}period}$ term.

Each portfolio-level variable used in the prior sections can be calculated, when dividends are reinvested, as follows:

$$F_{t-1} = MV_{t-1} \sum_i w_{t-1,i} \cdot y_{t-1,i}$$

$$F_{t+} = MV_{t-1} \sum_i w_{t-1,i} \cdot R_{t,i} \cdot y_{t,i}$$

$$F_t = MV_t \sum_i w_{t,i} \cdot y_{t,i}$$

$$\frac{1}{M_{t-1}} = \sum_i w_{t-1,i} \cdot y_{t-1,i}$$

$$\frac{1}{M_t} = \sum_i w_{t,i} \cdot y_{t,i}$$

Where $R_{t,i}=1+r_{t,i}$

Substituting these into the portfolio level equations gives:

$$R_{t,Activity} = ln\left(\frac{\left(\sum_i \ w_{t-1,i} \cdot R_{t,i} + \sum_i \ w_{t-1,i} \cdot d_{t,i}\right) \cdot \sum_i \ w_{t,i} \cdot y_{t,i}}{\sum_i \ w_{t-1,i} \cdot R_{t,i} \cdot y_{t,i}}\right) - ln\left(\frac{MV_t}{MV_{t-1} \cdot \sum_i \ w_{t-1,i} \cdot R_{t,i}}\right)$$

$$R_{t,Growth} = ln\left(\frac{\sum_i \ w_{t-1,i} \cdot R_{t,i} \cdot y_{t,i}}{\sum_i \ w_{t-1,i} \cdot y_{t-1,i}}\right) + ln\left(1 + \frac{\sum_i \ w_{t-1,i} \cdot d_{t,i}}{\sum_i \ w_{t-1,i} \cdot R_{t,i}}\right)$$

$$R_{t,Multiple} = ln\left(\frac{\sum_i \ w_{t-1,i} \cdot y_{t-1,i}}{\sum_i \ w_{t,i} \cdot y_{t,i}}\right)$$

While the MV_t term in the second term of $R_{t,Activity}$ could be further expanded we find that using the portfolio's market values allows for net flows to be handled easily as well as accounting for the reinvestment of dividends.

Incorporating fees, costs and frictions that affect returns

A fund or separate account is subject to other sources of return (usually negative) beyond the investment returns of the portfolio. While costs are an example of a negative effect on fund returns, undertakings such as stock lending may increase the fund's returns relative to the returns of the underlying portfolio. To account for these effects, a fund level attribution would be as follows:

$$R_{t,Fund} = R_{t,Portfolio} + Costs_t + R_{t,Residual}$$

Where $R_{t,Portfolio}$ and $R_{t,Fund}$ are the returns of the portfolio and actual returns of the fund during the period.

Transaction costs

Transaction costs negatively affect a portfolio's return. We believe these are best incorporated directly by using portfolio values that are net of all transaction costs. However, if this is not possible, or impractical, they should be included in an additional transaction costs term.

Management fees and other costs

A fund or separate account is subject to costs such as management fees, as well as other costs associated with administering pooled funds or segregated accounts. These costs, typically found in fund expenses, would often include items such as custody fees and audit fees in addition to the management fee. These costs reduce the returns of a fund relative to the performance of its underlying holdings and are an important consideration for asset owners when selecting which fund (or funds) to invest in.

These costs can be incorporated into this framework through the additional term – $Costs_t$.

Where $Costs_t$ is the contribution to log returns arising from these costs during period t.

Other frictions and differences in returns

We include a final residual term ($R_{t,Residual}$) to act as a catch-all for any impacts on return that have been missed in the previous steps. Ideally this term would be small in any completed analysis. If this term is large then further investigation is required. Including this term completes the attribution build up from the individual positions to the fund returns. The additional term $R_{t,Residual}$ can be calculated as follows:

$$R_{t,Residual} = R_{t,Fund} - \left(R_{t,Portfolio} + Costs_{t,}\right)$$

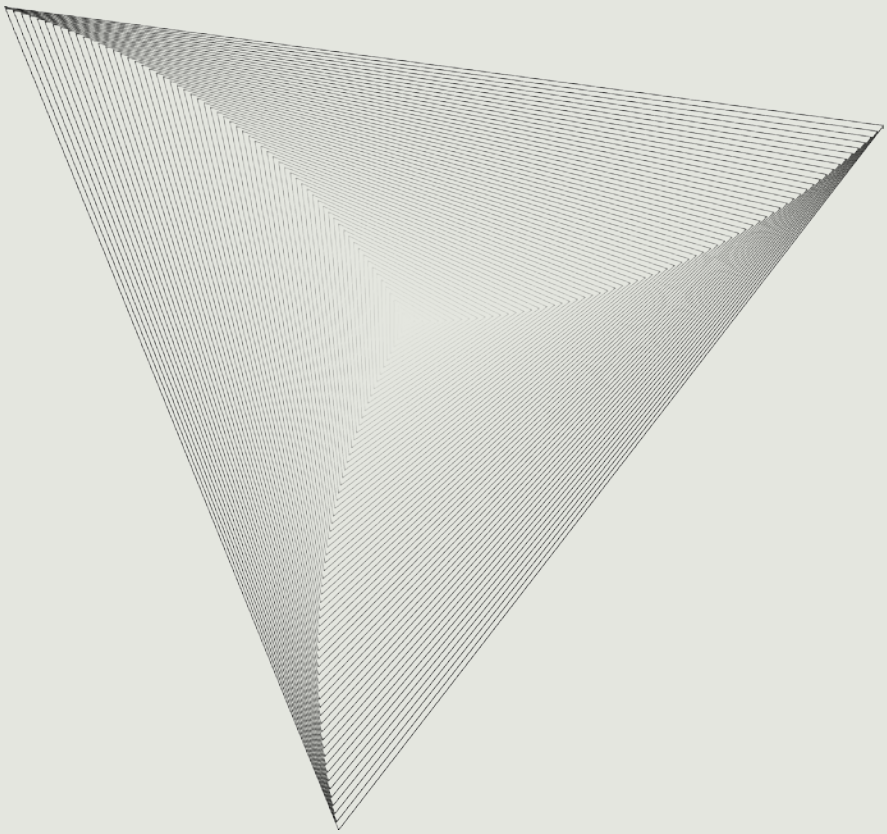
If $Costs_t$ is not explicitly stated then costs and other impacts on returns between the portfolio itself and the fund (or account) are combined into the $R_{t,Residual}$ term.

References

Philip U. Straehl and Roger G. Ibbotson. The long-run drivers of stock returns: Total payouts and the real economy. Financial Analysts Journal, 73(3):32–52, August 2017.

Jesse Livermore, Chris Meredith, and Patrick O'Shaughnessy. Factors from Scratch: A look back, and forward, at how, when, and why factors work. O'Shaughnessy Asset Management, May 2018.

Arnott, R.D., Harvey, C.R., Kalesnik, V., Linnainmaa, J.T., 2019. Reports of Value's Death May Be Greatly Exaggerated. SSRN Journal. https://doi.org/10.2139/ssrn.3488748



Limitations of reliance

Limitations of reliance – Thinking Ahead Group 2.0

This document has been written by members of the Thinking Ahead Group 2.0. Their role is to identify and develop new investment thinking and opportunities not naturally covered under mainstream research. They seek to encourage new ways of seeing the investment environment in ways that add value to our clients. The contents of individual documents are therefore more likely to be the opinions of the respective authors rather than representing the formal view of the firm.

Limitations of reliance – Willis Towers Watson

Willis Towers Watson has prepared this material for general information purposes only and it should not be considered a substitute for specific professional advice. In particular, its contents are not intended by Willis Towers Watson to be construed as the provision of investment, legal, accounting, tax or other professional advice or recommendations of any kind, or to form the basis of any decision to do or to refrain from doing anything. As such, this material should not be relied upon for investment or other financial decisions and no such decisions should be taken on the basis of its contents without seeking specific advice.

This material is based on information available to Willis Towers Watson at the date of this material and takes no account of subsequent developments after that date. In preparing this material we have relied upon data supplied to us by third parties. Whilst reasonable care has been taken to gauge the reliability of this data, we provide no guarantee as to the accuracy or completeness of this data and Willis Towers Watson and its affiliates and their respective directors, officers and employees accept no responsibility and will not be liable for any errors or misrepresentations in the data made by any third party.

This material may not be reproduced or distributed to any other party, whether in whole or in part, without Willis Towers Watson's prior written permission, except as may be required by law. In the absence of our express written agreement to the contrary, Willis Towers Watson and its affiliates and their respective directors, officers and employees accept no responsibility and will not be liable for any consequences howsoever arising from any use of or reliance on this material or the opinions we have expressed.

Contact details

Tim Hodgson
+44 1737 284822
tim.hodgson@willistowerswatson.com

James Price
+44 207 170 2560
james.c.price@willistowerswatson.com

The Thinking Ahead Institute

About the Thinking Ahead Institute

Mobilising capital for a sustainable future.

Since establishment in 2015, over 65 investment organisations have collaborated to bring this vision to light through designing fit-for-purpose investment strategies; better organisational effectiveness and strengthened stakeholder legitimacy.

Led by Tim Hodgson, Roger Urwin and Marisa Hall, our global not-for-profit research and innovation hub connects our members from around the investment world to harnesses the power of collective thought leadership and bring these ideas to life. Our members – totalling over 50 investment organisations around the world with collective responsibility for over US$12trillion – influence the research agenda and participate in working groups and events and have access to proprietary tools and a unique research library.

Join the Thinking Ahead Institute

We seek collaboration with like-minded organisations to achieve our vision, so for more information about us please contact:

Paul Deane-Williams
+44 (0)7734 342139
paul.deane-williams@willistowerswatson.com

About the Thinking Ahead Institute

The Thinking Ahead Institute seeks to bring together the world's major investment organisations to mobilise capital for a sustainable future. Arising out of Willis Towers Watson's Thinking Ahead Group, formed in 2002 by Tim Hodgson and Roger Urwin, the Institute was established in January 2015 as a global not-for-profit research and innovation group comprising asset owners, investment managers and service providers. Currently it has over 50 members with combined responsibility for over US$12trn.

thinkingaheadinstitute.org

Thinking Ahead Institute
Willis Towers Watson