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Delta Factors

Understanding Investment Performance Behaviour

Glossary

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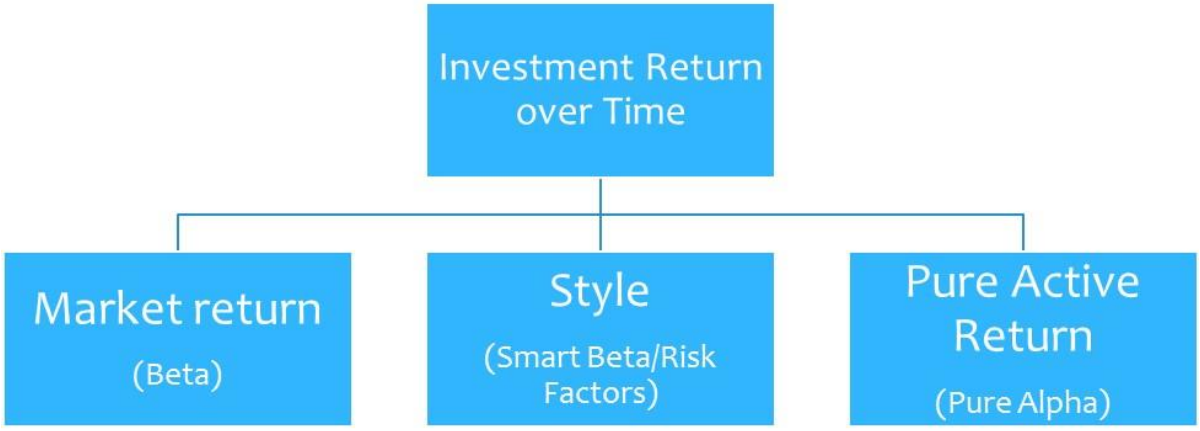
Table of Contents

Background

Delta Research & Advisory specialises in advanced quantitative analysis of investment performance. This paper provides brief description of some of the terms and analysis used in Delta Factors. The results to the Delta Factors' mathematical models are via time series charts with the goal of providing insights to the performance behaviour of individual managed funds.

Analysis is conducted using the following framework,



Both the Market Return and Style of a managed fund's performance is systematic in nature and can be purchased relatively cheaply. When investing in an actively managed fund with expectations of manager skill that produces "outperformance", that skill should be used to not only outperform the market but any systematic style-bias that may be employed. This skill is what is called "pure alpha".

Delta Factors produces analysis that provides the following specific insights to performance behaviour across the following areas…

- Skill … **Alpha**
- Market exposure … **Beta** … e.g. MSCI Australia, MSCI World, Barclays Global Agg, Bloomberg Ausbond Composite
- Style exposures … **Smart Beta or Risk factors** … e.g. Value, Size, Momentum, High Yield
- % or Level of systematic risk … whether to market, style, or both … R-Squared

Using this information over time, it is possible to assess a manager's skill, whether "true to label", and the relative level of active management, and how that manager's performance has behaved during different market and economic conditions.

Asset Class Benchmarks used

The following chart shows the major categories and applicable benchmark indices used to conduct all managed fund analysis:

Global Equities	Australian Equities	Global Debt	Australian Debt	Emerging Markets
Market >MSCI World	Market >MSCI Australia	Market >Barclays Global Aggregate	Market >Bloomberg Ausbond Composite 0+	Market >MSCI EM
Styles/Factors >MSCI World Value >MSCI World Growth >MSCI World Large >MSCI World Small >MSCI World Momentum	Styles/Factors >MSCI Aust Value >MSCI Aust Growth >MSCI Aust Small >MSCI Aust Large	Styles/Factors >Barclays Global High Yield	Styles/Factors >Citi Ausbig AAA >Citi Ausbig BBB	Styles/Factors >MSCI EM Value >MSCI EM Growth >MSC EM Small >MSCI EM Large

For Global Equities, Global Debt and Emerging Markets analysis, the currency will be Australian dollars when available with sufficient history, otherwise US Dollars may be used if a strategy has a longer performance timeframe. The goal is to understand exposures to various risk factors, potential for skill, and the various contributions to total portfolio risk.

All time series analysis is conducted on return risk premiums meaning cash returns are subtracted from both portfolio and market returns. Australian cash returns are represented by the Bloomberg Ausbond Bank index and for US analysis, cash returns used are from the IA SBBI US 30 Day TBill TR USD index.

Please note, multi-asset class strategies are firstly analysed using the market returns from the above major asset classes in a Multi-Asset and therefore MultiFactor mathematical model.

Methodology

Analysis is performed using monthly returns for strategies that are older than 3 years (daily or weekly may be used for funds less than 3 years). Time series charts are presented as rolling averages; typically 36 months.

All Delta Factors outputs are based on the Multiple Regression analysis using the following formulae.

CAPM Analysis

$$R_p - R_f = \alpha + \beta.(R_m - R_f) + \varepsilon$$

Equity Analysis

$$R_p - R_f = \alpha + \beta.(R_m - R_f) + \beta_{vmg}.(\text{Value Factor}) + \beta_{smb}.(\text{Size Factor}) + \beta_{mom}.(\text{Momentum Factor}) + \varepsilon$$

Bond Analysis

$$R_p - R_f = \alpha + \beta.(R_m - R_f) + \beta_{HY}.(\text{Credit or High Yield Factor}) + \varepsilon$$

- R_p is the monthly portfolio return
- R_f is monthly Risk-free rate (e.g. Bloomberg Ausbond Bank index)
- α is Alpha which represents the additional average return after removing systematic risks (model dependent)
- β is the market exposure (differs between asset classes)
- R_m is the market return (differs between asset classes)
- β_{vmg} is the portfolio exposure to the Value factor
- β_{smb} is the portfolio exposure to the Size factor
- β_{mom} is the portfolio exposure to the Momentum factor
- β_{HY} is the portfolio exposure to the Credit or High Yield factor
- Value Factor is MSCI Value minus MSCI Growth
- Size Factor is MSCI Small minus MSCI Large
- Momentum Factor is MSCI World Momentum minus MSCI World GR
- Credit or High Yield Factor is Barclays Global high Yield minus Barclays Global Aggregate or Citi Ausbig BBB minus Citi Ausbig AAA
- ε is the error term that relates to the volatility of each model's Alpha

Glossary

Following are brief descriptions of some of the factors and measures used in Delta Factors.

Single Market Factors

CAPM Alpha

A measure of performance on a risk-adjusted basis. Alpha takes the volatility (price risk) of a managed fund and compares its risk-adjusted performance to a benchmark index (e.g. MSCI Australia). The excess return of the fund relative to the return of the benchmark index is a fund's alpha.

CAPM Alpha, provides us with a fair comparison of manager performance. The results can help us determine whether the manager added value on a single benchmark risk-adjusted basis.

CAPM Beta

A measure of the volatility, or systematic risk, of a portfolio in comparison to the benchmark (e.g. MSCI Australia) as a whole.

A beta of 1 indicates that the portfolio's returns move with the benchmark. A beta of less than 1 means that the portfolio will be less volatile than the benchmark. A beta of greater than 1 indicates that the portfolio will be more volatile than the benchmark. For example, if a portfolio's beta is 1.2, it's theoretically 20% more volatile than the benchmark.

CAPM R-Squared or CAPM R2

A statistical measure that represents the percentage of a fund or security's movements that can be explained by movements in a single benchmark index. For Australian equities, the benchmark is MSCI Australia.

R-squared values range from 0 to 1. An R-squared of 1 means that all movements of a security are completely explained by movements in the index. A high R-squared (between 0.85 and 1.00) indicates the fund's performance patterns have been in line with the index. A fund with a low R-squared (0.7 or less) doesn't act much like the index and has high level of idiosyncratic risk (i.e. non-systematic or non-market risk).

Equity Specific Risk Factors

(3 Factor) 3F Alpha

Similar to CAPM Alpha in that it takes the volatility (price risk) of a managed fund and compares its risk-adjusted performance to a benchmark index (e.g. S&P/ASX 200 TR) plus value style and size style risk adjustments.

The excess return of the fund relative to the return of the benchmark index, plus style, plus size risk exposures is a fund's 3 Factor alpha. It is a tougher test of skill than CAPM Alpha that only compares to a single factor, i.e. the benchmark

(3 Factor) 3F Beta

In theory, the 3 Factor Beta should be approximately the same as CAPM Beta because it is "independent" or uncorrelated to Value and Size risk factors. The reality is that because there is small correlation between value, size and beta, the 3-Factor Beta may differ very slightly to CAPM Beta.

(3 Factor) 3F Value

This is the beta or exposure with respect to MSCI Value minus MSCI Growth indices for the applicable equity asset class benchmark. For example, if the asset class is Australian Shares then the Value Factor is calculated by subtracting MSCI Australia Growth GR from MSCI Australia Value GR.

When this risk factor shows a positive result it suggests the portfolio's performance behaviour is biased towards MSCI Value Index and when negative, it suggests the portfolio performance behaviour is more like the MSCI Growth.

MSCI Value indices rank companies according to Price to Book, 12 months forward PE Ratio, and Dividend Yield

MSCI Growth Indices rank companies according to Long-term forward earnings per share (EPS) growth rate, Short-term forward EPS growth rate, Current internal growth rate, Long-term historical EPS growth trend, and Long-term historical sales per share growth trend.

(3 Factor) 3F Size

This is the beta or exposure with respect to MSCI Small Companies minus MSCI Large Companies indices for the applicable equity asset class benchmark. For example, if the asset class is Australian Shares then the Size Factor is calculated by subtracting MSCI Australia Large GR from MSCI Australia Small GR.

When this risk factor shows a positive result it suggests the portfolio's performance behaviour is biased towards MSCI Small Companies Index and when negative, it suggests the portfolio performance behaviour is more like the MSCI Large Companies index.

(4 Factor) 4F Momentum

This factor is only applied for global equities strategies and is the exposure to the MSCI World Momentum minus MSCI World (or ACWI) indices.

When this factor shows a positive result it suggests the portfolio's performance is biased towards Momentum. MSCI Momentum indices are constructed with emphasis on stocks with high price momentum (i.e. strongest recent performers).

3 (or 4) Factor 3F (or 4F) R-Squared

A statistical measure that represents the percentage of a fund or security's movements that can be explained by movements in the 3 (or 4) factors that include the benchmark (e.g. S&P/ASX 200 or MSCI World depending on the asset class), and systematic style risks (e.g. Value, Size, or Momentum factors).

Because of the greater amount of information in the 3 factor model, the 3 (or 4) Factor R-Squared will always be higher compared to CAPM R-Squared.

Bond Specific Risk Factors

Multifactor analysis conducted on bond fund returns use 2 factors only…the market (typically dominated by duration or interest rate risk) and credit risk.

(2 Factor) 2F Alpha

Similar to CAPM Alpha in that it takes the volatility (price risk) of a managed fund and compares its risk-adjusted performance to a benchmark index (e.g. Barclays Global Agg) plus credit risk exposures (Barclays Global High Yield).

The excess return of the fund relative to the return of the benchmark index, plus style exposures is a bond fund's 2 Factor alpha. It is a tougher test of skill than CAPM Alpha that only compares to a single factor, i.e. the benchmark, which is typically dominated by duration risk.

(2 Factor) 2F Beta

In theory, the 2 Factor Beta should be approximately the same as CAPM Beta because it is "independent" or uncorrelated to Credit risk factors. The reality is that because there is sometimes stronger correlations between duration and credit risks, the 2-Factor Beta may differ very slightly to CAPM Beta.

The first factor, as used in CAPM, is represented by the market. The market factor for Australian bonds is represented by the Bloomberg Ausbond Composite (previously the UBS Composite) and the global bond market is represented by Barclays Global Aggregate index.

(2 Factor) 2F HY

This is the relative exposure to credit risk by the fund. For global bonds the difference between Barclays Global High Yield (below investment grade) and Barclays Global Aggregate (investment grade) is used.

For Australian bonds, it is the difference between Citi AusBig BBB and Citi AusBig AAA. This credit spread is used due to the smaller high yield market in Australia and lack of non-investment grade indices.

(2 Factor R-Squared) or 2F R2

A statistical measure that represents the percentage of a fund or security's movements that can be explained by movements in both the broader bond market benchmark risk and credit risk.

2 Factor R-Squared is a measure of the proportion of systematic risk used in a managed fund's strategy.

Because of the greater amount of information in the 2 factor model, the 2 Factor R-Squared will always be higher compared to CAPM R-Squared.

Additional Risk Measures

Idiosyncratic Risk

If the R-squared of a mathematical model captures the amount of risk or return movement, then the difference between 1 (or 100%) and the R-Squared value represents the amount of a fund's risk that is due to non-systematic factors (whether market or style risk factors).

The idiosyncratic risk of a strategy relates to the amount of risk that is used to generate alpha and is a result of the strategy's use of market timing or security selection that differs from the model's benchmarks.

A fund who truly is "benchmark agnostic" is expected to have a high level of idiosyncratic risk although what value is regarded as high will depend on the strategy and asset class.

Global Bonds Risk, Global Shares Risk, Australian Bonds Risk, Australian Shares Risk

These measures represent the amount of total portfolio risk that can be explained by the risk of the respective asset class. For example, the Global Bonds Risk measure (represented by the benchmark being Barclays Global Aggregate) is the proportion of portfolio risk that can be explained by the Barclays Global Aggregate index.

Similarly with Australian Shares (represented by S&P/ASX 200 TR), Global Shares (MSCI World), and Australian bonds (Bloomberg Ausbond Composite 0+).

VMG

This is the amount of total portfolio risk that is due to the Value style bias as represented by MSCI World Value minus MSCI World Growth benchmarks.

A strategy that is reliant upon a passive value or growth bias in its equities strategy will have a significant proportion of its performance volatility explained by this risk factor.

SMB

This is the amount of total portfolio risk that is due to the Size style bias as represented by MSCI World Small minus MSCI World Large benchmarks.

A strategy that is reliant upon a passive size bias, either small cap or large cap, in its equities strategy will have a significant proportion of its performance volatility explained by this risk factor.