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RESEARCH PAPER

PRODUCTS (TAKING STOCK)

It's all about the way you build it!

By Michael Price, Dir. Investment Process/Quant Services, ING Investment Management

A market-weighted approach has been the traditional way of constructing international equity portfolios – often because this is the type of benchmark index against which fund managers are measured. But is this the best approach? Building market cap-weighted portfolios is not the mantra of all active, large cap equity managers. This paper examines an alternative construct for an international equities portfolio that encapsulates potentially greater investment returns and a better way of assessing portfolio performance.

Audio & slides available at PortfolioConstruction.com.au

In Australia, the majority of active managers take the index weighting of a company into account when constructing portfolios. This paper examines the objective implicit in this approach, looking at the characteristics of a good index and comparing them with the characteristics of a portfolio designed to meet what should be the objectives of a typical investor. It reminds us of some identified market inefficiencies that allow outperformance of a market cap-weighted index, and finally examines how an equally-weighted portfolio would be expected to perform compared with a portfolio with weights based on market capitalisation.

What are the characteristics of a good index? Bailey (1992) argues an index should be:

- unambiguous (transparent);
- investable (enough liquidity to be invested in by most participants);
- measurable (not able to be manipulated);
- appropriate (representative of the market);
- reflective of current knowledge; and,
- specified in advance (so it can be replicated).

Some of these objectives are in conflict. In order to be representative of the entire market, an index would need to include many securities that are too small to be investable. Rules that enable transparency may make an index open to manipulation or able to be easily outperformed. Another major problem is one of omission – none of these objectives are related to performance. The aim is not to maximise returns or to manage risk.

Conversely, portfolio construction is primarily about managing the trade-off between risk and return. An optimal portfolio is one that maximises returns for a given level of risk, or optimises the trade-off between return and risk.

It is reasonably well agreed how return is be measured (although there may be some dispute as to which assets give the greatest expected return).

Risk on the other hand, is less clear. Is risk about losing money, or is it related to underperforming peers or benchmarks? Should risk be defined as volatility, tracking error, neither or both? Is it is about absolute or relative performance?

A recent study by Layard (2006) asked Harvard students to choose between a world where they earned $50,000 a year while their peers earned half that, and a world where they earned $100,000 a year but their peers earned more than double that. The majority chose the first scenario – that is, they were happy to be poorer in absolute terms, provided their relative position improved. Perhaps this is one reason why many managers keep a close watch on the benchmark and/or competitors.

However, if the aim is to maximise wealth, the answer should be clear – relative performance does not matter. If the portfolio objective relates to maximising wealth, risk is not relative and should not be defined in terms of benchmarks or competitors.

This is not simply an academic argument. Take the example of an active international equities manager considering whether to add the emerging markets index to a portfolio, based on the assumptions outlined in Figure 1. Active Stock Position is the return on the active positions within the original portfolio against the MSCI World Index. These assumptions are the same as having an expected value add of 1.5% with a tracking error of 3% (and hence an information ratio of 0.5). Correlation assumptions are shown in Figure 2 (overpage).

Figure 1: Example portfolio – assumptions

	RETURN (%)	VOLATILITY (%)
MSCI WORLD INDEX	10.0	12.0
EMERGING MKTS INDEX	15.0	17.0
ACTIVE STOCK POSITIONS	1.5	3.0

Note: Volatility = Std Deviation. *Source: ING Investment Management*

The impact on each of the main outcomes of introducing emerging markets into the portfolio is quite different (Figure 3). The impact on expected return is linear, with return increasing as the allocation to emerging markets increases. However, the impact on expected volatility is concave, with the diversification benefits of introducing an emerging markets exposure initially reducing the volatility of the portfolio, before the additional volatility of the emerging markets allocation starts to take effect. Finally, the impact on expected tracking error is more exponential, with no significant impact either upwards or downwards as an emerging markets allocation is introduced, but rising more sharply at higher allocations. Figure 4 shows the impact on the information ratio and Sharpe ratio. Again, the result is non-linear.

Because the impact of an emerging markets allocation varies so significantly, the choice of objective will have a significant impact on the optimal allocation. There are a number of investment objectives a manager could have in deciding the allocation to emerging markets, including:

- maximising return;
- minimising volatility;
- maximising return without increasing volatility;
- maximising return without increasing tracking error;
- maximising the information ratio; or
- maximising the Sharpe ratio (excess return over cash divided by volatility).

Figure 5 extracts portfolios that meet these possible objectives, highlighting that:

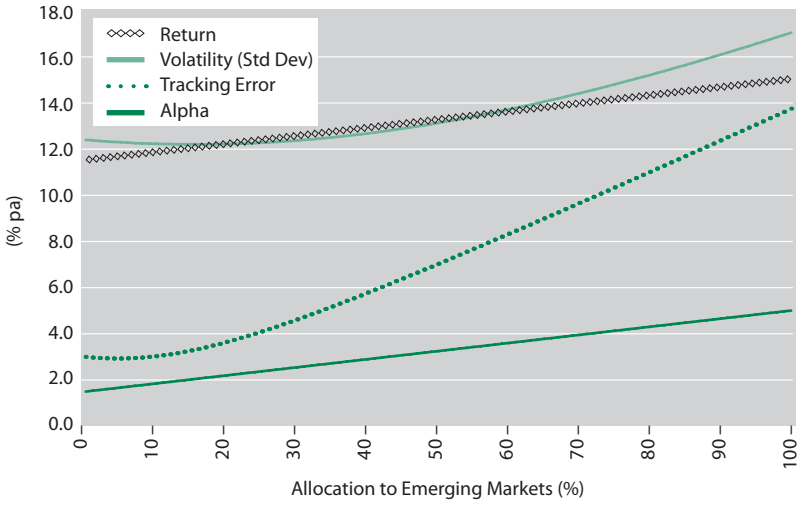
- it is possible to increase the expected return by 1.1% without increasing expected volatility, however, tracking error increases to 4.7% (E);
- it is only possible to increase the expected return by 0.3% without increasing expected tracking error, and volatility decreases (B);
- the portfolio with the highest expected information ratio has the third lowest expected return (C);
- the portfolio with the highest expected Sharpe ratio has the second lowest expected information ratio (F);
- a manager aiming to increase return without increasing tracking error would choose Portfolio B (expected return 11.8% per annum), while a manager trying to increase return without increasing volatility would choose Portfolio E (expected return 12.6% per annum) – that is, the tracking error-aware manager underperforms by 0.8% per annum; and,
- similarly, a manager aiming to maximise the information ratio would choose Portfolio C (expected return of 12.0% per annum), while a manager trying to maximise the Sharpe ratio would choose Portfolio F (expected return of 13.5% per

Figure 2: Example portfolio – asset class correlation matrix

	MSCI WORLD INDEX	EMERGING MARKETS INDEX	ACTIVE STOCK POSITIONS
MSCI WORLD INDEX	1.00	0.60	0.00
EMERGING MARKETS INDEX	0.60	1.00	0.00
ACTIVE STOCK POSITIONS	0.00	0.00	1.00

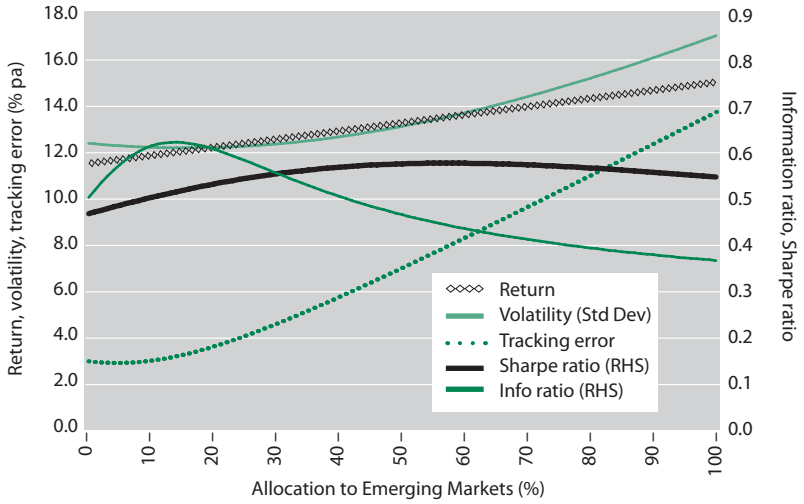
Source: ING Investment Management (Quantitative Services Team)

Figure 3: Impact of adding emerging markets to the example portfolio



Source: ING Investment Management (Quantitative Services Team)

Figure 4: Impact of adding emerging markets to the example portfolio



Source: ING Investment Management (Quantitative Services Team)

annum) – that is, the tracking error-aware manager underperforms by 1.5% per annum.

It can be seen that the tracking error-aware manager will choose a portfolio that can be expected to give a lower return than a manager would choose if simply trying to maximise wealth at a given level of volatility. In other words, being tracking error-aware adds an additional constraint, usually leading to lower returns.

Increasing returns

The previous analysis highlights the deficiencies of using an inappropriate risk measure. However, it does not examine the possibility of improving returns.

There is now a reasonable body of research suggesting markets are not efficient. Two of the more established anomalies are the value effect and small cap effect. For example, Fama and French (1996) showed that companies with a low Price to Book ratio consistently outperform those with a higher valuation. This can also be demonstrated using other valuation measures such as P/E or dividend yield. Fama and French also showed that, on average, smaller companies outperform in the long run – the so-called small cap effect.

Building a portfolio

The analysis above highlights several ways in which an investor can do better than holding a portfolio that is based on index weights, namely by:

- rejecting tracking error as an appropriate measure of risk;
- taking advantage of the value effect, and
- taking advantage of the small cap effect.

So how does an equally-weighted portfolio perform against these criteria?

Volatility

By rejecting tracking-error as an appropriate measure of risk for a wealth-maximising investor, equally-weighted portfolios remove a constraint that can lead to sub-optimal portfolio construction. An equally-weighted approach also minimises the residual volatility, or random noise, present in a portfolio after allowing for factor exposures. ING's research suggests that, on average, the residual volatility is reduced by 10% for an equally-weighted portfolio compared with a market cap-weighted portfolio.[1]

The value effect

Given the same set of securities, a market cap-weighted portfolio will have an overweighting to overvalued companies compared to an equally-weighted portfolio, because as a company gets more overvalued, a market cap-weighted portfolio will by definition have a higher weighting to it. Meanwhile, the weighting will remain constant in an equally-weighted portfolio. This can have a substantial impact on return. For example, Hsu and Campollo (2006) showed that a portfolio weighted by fundamental factors outperformed the market cap-weighted MSCI Index by 3.5% per annum over the 20 years from 1984 to 2004.

According to ING's research, an equally-weighted portfolio comprised of the constituents of the S&P/ASX 100 Index would have outperformed a market cap-weighted approach by 0.7% per annum over the 10 years 1995 to 2005.[1]

The small cap effect

Again, by definition, given the same set of securities, an equally-weighted portfolio will have a small-cap/mid-cap bias compared to a market cap-weighted portfolio, as the equally-weighted portfolio has equal exposure to all companies, whereas the market cap-weighted portfolio must have a lower exposure to smaller companies. This additional exposure to the small cap effect for the equally-weighted portfolio can be expected to lead to increased returns. For example, over the ten years from 1995 to 2005, the MSCI Small Cap Index outperformed the standard MSCI Index by 3.7% per annum on average.[1]

Figure 5: Portfolios that meet possible risk, return and efficiency objectives

PORTFOLIO OBJECTIVE		CORE INT'L EQUITY WEIGHT (%)	EMERGING MARKETS WEIGHT (%)	EXPECTED RETURN (%PA)	EXPECTED VOLATILITY (%PA)	EXPECTED TRACKING ERROR (%PA)	EXPECTED INFORMATION RATIO	EXPECTED SHARPE RATIO
EXAMPLE PORTFOLIO	A	100	0	11.5	12.37	3.0	0.500	0.465
MAXIMUM RETURN, 3% TE	B	91	9	11.8	12.21	3.0	0.606	0.497
MAXIMUM INFORMATION RATIO	C	86	14	12.0	12.18	3.2	0.619	0.512
MINIMUM VOLATILITY	D	84	16	12.0	12.18	3.3	0.617	0.517
MAX RETURN, 12.37% VOLATILITY	E	69	31	12.6	12.37	4.7	0.546	0.553
MAXIMUM SHARPE RATIO	F	43	57	13.5	13.52	8.0	0.440	0.574
MAXIMUM RETURN	G	0	100	15.0	17.00	13.6	0.368	0.544

Notes: TE = Tracking Error. Volatility = Standard Deviation.

Source: ING Investment Management (Quantitative Services Team)

Sharpe ratio investing

There are additional implications of rejecting tracking error as an appropriate measure of risk and information ratio as the measure for assessing managers, and replacing these with volatility and Sharpe ratio.

Active positions that are expected to reduce volatility but not add to returns would usually be rejected as inappropriate, because while they reduce expected volatility, they also increase expected tracking error. As the expected value add is zero, the information co-efficient is also zero and would be expected to lower the overall information ratio of the portfolio (assuming it was positive in the first place).

However, lowering volatility without impacting return leads to an increase in the expected Sharpe ratio of the portfolio. Even better would be a position that both reduces volatility and adds value to the portfolio. Value investing could be expected to fit into this category, as value stocks not only generally (Fama and French 1996) outperform but also tend to have a beta or volatility of lower than the rest of the market.

This means that portfolios that may be rejected as low skill by traditional measures such as tracking error may actually score quite highly for Sharpe ratio and should be preferred by a wealth-maximising investor.

Conclusion

An investor aiming to maximise wealth should not be interested in seeing skill demonstrated, or information ratios. Instead, interest should be focused on maximising returns for a given level of risk. Currently, most portfolios are constructed taking into account index weights. However, index-based portfolios are not designed to manage volatility or maximise returns. On the other hand, building a portfolio that focuses on risk-adjusted wealth maximisation offers a superior proposition. A simple example of this is an equally-weighted portfolio as it:

- rejects tracking error as an appropriate measure of risk for wealth-maximising investors;
- reduces residual volatility;
- takes advantage of the value effect;
- takes advantage of the small cap effect, and,
- can increase the expected Sharpe Ratio.

Rejection of market-cap weighted indices as a money management convention continues. This is clearly evidenced by the proliferation of new product offerings based on concentrated portfolios, hedge fund and absolute return strategies. There is a strong foundation for all investors aiming to maximise wealth to embrace the simplicity of an equally-weighted portfolio methodology.

ENDNOTES

1. ING Investment Management, Quantitative Services team.

Bailey, J.V. , 1992, "Are Manager Universes Acceptable Performance Benchmarks?", *Journal of Portfolio Management*, Spring.

Layard, P.R.G., *Happiness: Lessons from a New Science*, Penguin Books, 2005.

Fama, E.F. and K.R. French, 1996, "Multifactor Explanations of Asset Pricing Anomalies", *Journal of Finance*, March.

Hsu, J.C. and C. Campollo, 2006, "New Frontiers in Index Investing", *Journal of Indexes,* Jan/Feb.

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