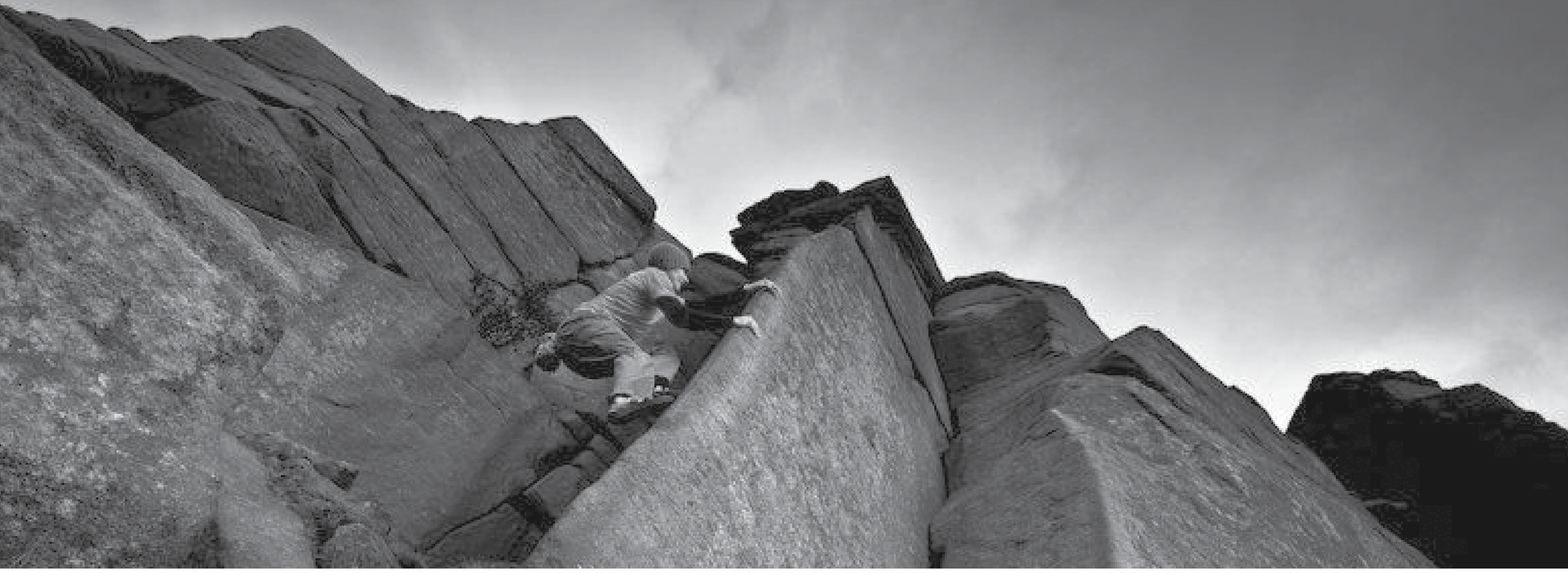

Strong Foundations Have Equal Footings

White Paper

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Market Vectors Australia Equal Weight Index

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MARKET VECTORS® INDICES

1. Executive Summary

The Market Vectors Australia Equal Weight Index is a total return Australian equities index developed by Market Vectors Index Solutions (MVIS). The index codes are in Appendix 4.

This index produces a stronger foundation for long term portfolios than market capitalisation indices through combining equal weight diversification with the unique index construction methodology of MVIS.

MVIS indices are specifically designed to underlie exchange traded funds (ETFs), so incorporate appropriate liquidity and diversification considerations. As a result, MVIS tailor made indices have advantages over traditional indices which were designed to be used as economic indicators and not as the basis for financial products. The result is that an ETF based on a MVIS index can hold all of the securities in the index in its portfolio and does not have to resort to substitutions and approximations.

Constructing investment portfolios is a process of trading-off risk for return. The Sharpe Ratio for the Market Vectors Australia Equal Weight Index shows that it performs well in making this trade-off producing:

- higher returns, outperforming the S&P/ASX 200 Accumulation Index ('S&P/ASX 200') in nine out of the last twelve years;
- without an excessive increase in volatility.

Our research also shows three significant structural advantages this index has over those commonly used for Australian equities portfolios:

- three times more diversified than the ASX/S&P 200;
- liquidity benefits; and
- purity of exposure.

Equal weighting results in a substantially reduced exposure to large cap securities and a significant increase in exposure to smaller cap stocks. An equal weight index therefore performs well in Australia which has one of the most concentrated equity markets in the world with the top 10 companies making up more than 50% of the top 200 securities by market capitalisation. An equal weight index is more diversified and less concentrated than a market capitalisation index both at the security and sector level.

Our research also shows that turnover in an equal weight portfolio is within the generally accepted ranges, dispelling one of the common fears with equal weight indices.

2. Designing Indices That Are Tailor Made For Financial Products

MVIS indices are specifically designed to underlie ETFs through a passive investment portfolio construction methodology that incorporates both liquidity and diversification. As a result, MVIS's tailor made indices have advantages over traditional indices which were designed to be used as economic indicators and not as the basis for financial products.

Traditional indices include a large number of components across small, mid and large capitalisation stocks. Liquidity isn't a necessary factor for inclusion in such an index, which is primarily used for reporting the performance of a market or market sector.

A traditional index is not ideal for underpinning financial products such as ETFs because its components are not necessarily liquid. Moreover, the performance of a few large capitalisation companies may dominate the performance of such an index, as is the case in Australia where the big banks and big miners dominate the performance of the S&P/ASX 200.

MVIS tailor made indices have broad securities coverage but liquidity is maintained by including only companies that are regularly traded. Since an ETF can only be as liquid as the underlying index, liquidity is one of MVIS most crucial considerations in its index design. The result is that an ETF based on a MVIS index can directly hold all the securities in the index within the ETF's own portfolio and does not have to resort to substitutions and approximations.

Better diversification can come through capping the weight of stocks to a certain value or by using an equal weighting. This overcomes concentration problems or the bias toward large capitalisation stocks that can impair traditional indices.

3. Investment Returns and Sharpe Ratios

The trade-off of return against risk is known as Modern Portfolio Theory[1]. The principle is that diversifying your portfolio improves this trade-off. The 1990 Nobel Prize for Economics went to Harry Markowitz[2] for his work developing this theory starting in 1952[3] but as Markowitz himself has always pointed out, the value of diversifying was known long before this. Thousands of years earlier Ecclesiastes 11:2 told us

> But divide your investments among many
> places, for you do not know what risks might
> lie ahead.[4]

The analysis that derives from this theory is to measure the investment returns, measure the risk in the form of the volatility of returns and to use these measures to calculate Sharpe Ratios to evaluate the trade-off between the two.

Empirically, the Market Vectors Australia Equal Weight Index has had higher returns than the standard benchmark, the S&P/ASX 200 Accumulation Index. The data is as follows

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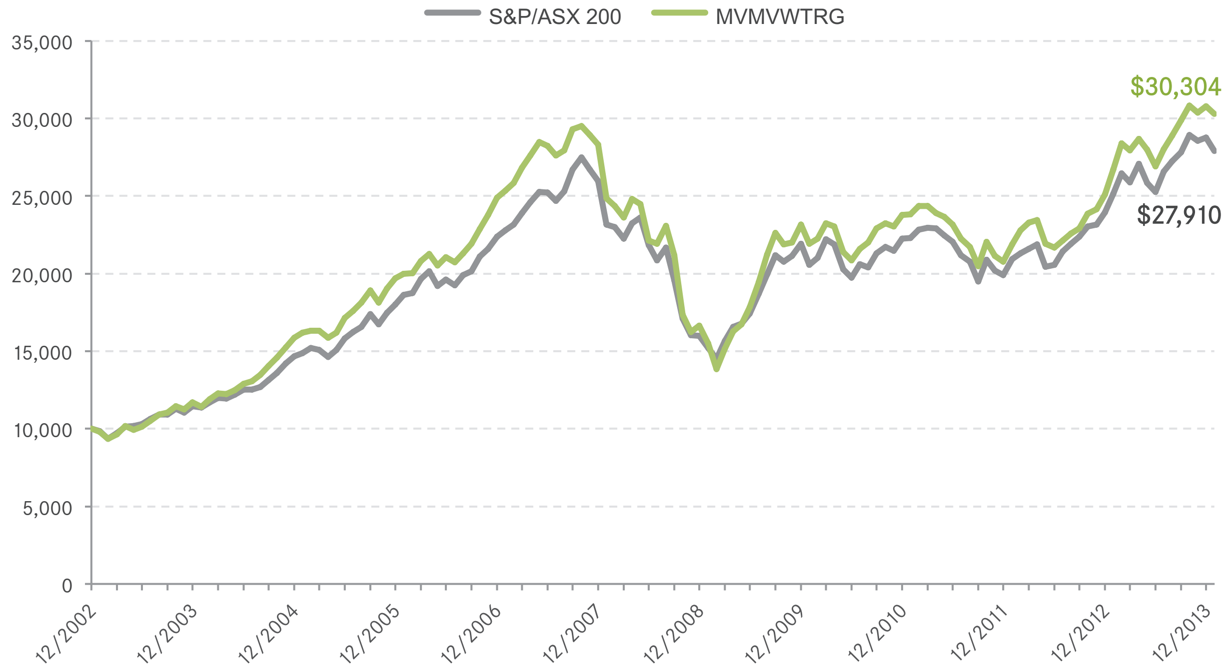
[1] Modern Portfolio Theory is a scientific approach to investment choice that seeks to maximise investment return relative to the amount of risk taken. It is the first formal statement of the trade-off between return and risk. Under this Theory, whatever the appetite for risk, diversification will be a fundamental ingredient in any portfolio construction.
[2] The prize was shared with two other people.
[3] Markowitz's first formal statement of the theory was in *The Journal of Finance*. Full citations of all reference material are in the References.
[4] This is the New Living Translation which is easy to interpret. The King James Version has the more poetic but more obscure *Give a portion to seven, and also to eight; for thou knowest not what evil shall be upon the earth*. We wouldn't go so far as to say that failing to diversify is evil. It is just risky.

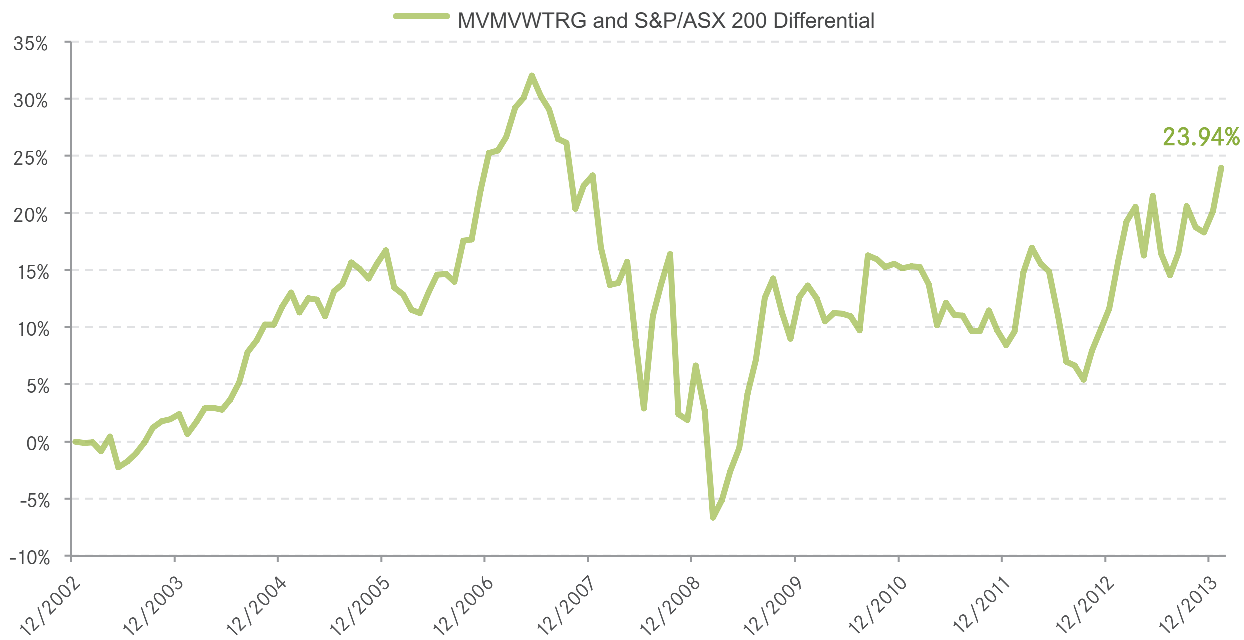
Hypothetical growth of a $10,000 investment: January 2003 to January 2014



Source: Market Vectors Index Solutions (MVIS), FactSet as at 31 January 2014

The outperformance is 23.94% of the starting point with the Market Vectors Australia Equal Weight Index outperforming in nine out of the last twelve years. To give some scale to this, the cumulative absolute difference between the two indices is presented in the following graph.

Cumulative absolute difference: January 2003 to January 2014



Source: Market Vectors Index Solutions (MVIS), FactSet as at 31 January 2014

3.1 The Theory Supporting the Outperformance

Lajbcygier, Chen and Dempsey, working out of the CSIRO-Monash Superannuation Research Cluster, tested United States data for the years 1962 to 2009. They used United States data because this was the largest reliable time series available.

Their objective was to test the claims of an indexing methodology known as fundamental indexing. This methodology has been developed and promoted by Research Affiliates so it is often branded 'RAFI'. For comparison purposes they tested an equal weighting methodology as well.

Fundamental indexing is promoted as being superior to market capitalisation because it uses better measures of the size of the company. Market capitalisation is based on traded prices so is distorted when the market misprices. Fundamental indexing uses data such as book value, revenue, cash flow, dividends, sales and employee numbers to get a less-distorted size-based weighting. The resulting index is said to therefore be less susceptible to extreme market phases such as bubbles.

The CSIRO authors tested this hypothesis using the Fama-French three factor model and the Henriksson-Merton market timing model.

The Fama-French three factor model breaks a portfolio's return into three components: 1) the return generated by the market as a whole; 2) extra return generated by small stocks relative to large stocks; and 3) extra return generated by high book-to-market stocks relative to low book-to-market stocks. The third factor is taken to be that so called "value" stocks outperform other stocks.

The Henriksson-Merton market timing model similarly identifies the extent to which a portfolio has benefited from timing the market. That is, getting more from periods when the market is going up and losing less when the market is going down.

The authors conclude that equal weighting was the "highest performing" of the methodologies tested.[5]

Through regression analysis[6] using first the Fama-French model then the Henriksson-Merton model the authors determine the extent to which each index's return is the result of the factors in those models.

They find that fundamental indexing's outperformance of market capitalisation is attributable to its greater exposure to smaller stocks and value stocks but is not to any extent attributable to market timing.

In contrast they find that equal weighting benefits from market timing as well as from the greater exposure to smaller stocks and value stocks.

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[5] at 7

[6] Regression analysis is a statistical technique of fitting an algebraic function to the sample data. From the function that fits the sample best, conclusions are drawn of the contribution that each of the variables in the function makes to the production of the data.

There are others who have looked at the reasons that market capitalisation underperforms other methods. Hsu[7] shows that even "with very mild price inefficiency in the market"[8] market capitalisation portfolios will underperform otherwise similar non-market-capitalisation portfolios. The underpriced stocks in a market capitalisation portfolio will have smaller capitalisation than their true value warrants. On the other hand, overpriced stocks will have a larger capitalisation than their true value warrants. That is, you will be underweight in underpriced stocks and overweight in overpriced stocks.

A restatement of this theory that is often argued is as follows. As a stock price overshoots its true value, market capitalisation funds buy more of the overpriced stocks. As a stock price overshoots a correction, market capitalisation funds sell more of the underpriced stocks.

Arnott, Hsu[9], Kalesnik and Tindall empirically test alternative capitalisation methodologies. They run the data on a number of non-market-capitalisation weightings and find that "many"[10] outperform market capitalisation. They then run 'upside down' strategies where they use the exact opposite of the ideas in the original tests. The surprising outcome is that these strategies also outperform market capitalisation. They then run data for a "blindfold monkey throwing darts"[11] and again find better performance than market capitalisation. The authors reason, consistent with the CSIRO authors above, that market capitalisation does poorly in relation to most methodologies because it has less exposure to small and value stocks.

3.2 Sharpe Ratios

The Sharpe Ratio combines a return measure with a volatility measure to quantify the relationship between the two.[12] It provides a measure of risk-adjusted performance.

We calculated 12-month Sharpe Ratios starting with the period ended December 2003 and continuing up to the period ended January 2014. We did this for the Market Vectors Australia Equal Weight Index and for the S&P/ASX 200. In each case we did the ratio of the index relative to the RBA cash rate. The results are provided in Appendix 1.

There are 122 data points. In 79 instances the Market Vectors Australia Equal Weight Index ratio is higher. The S&P/ASX 200 ratio is higher in only 43 instances.

At the data point where Market Vectors Australia Equal Weight Index ratio has its biggest gap over the S&P/ASX 200 ratio, the excess is 2.44. The biggest gap the S&P/ASX 200 ratio ever has over the Market Vectors Index is 0.66.

The interpretation of the Market Vectors Australia Equal Weight Index having higher Sharpe Ratios than the S&P/ASX 200 is that there is a better risk/return trade-off. That is, the better return identified above is not the result of greater risk-taking. Equal weight delivers better returns without excessive risk.

[7] Chief Investment Officer at Research Affiliates and one of the pioneers of fundamental indexing
[8] at 2
[9] the same Hsu just cited
[10] at 1
[11] ibid; a colourful name for randomly weighted portfolios
[12] The Sharpe Ratio takes the excess return against a relevant benchmark and divides it by the standard deviation of the return.

Comparing both indices to the cash rate is measuring the value of investing in equities rather than cash. It shows that both indices are much better than cash, but that the Market Vectors Australia Equal Weight Index is better than the S&P/ASX 200 over the period measured.

4. Equal Weight Structural Advantage #1: Better Diversification

A way of interpreting the above Sharpe Ratios is that the Market Vectors Australia Equal Weight Index provides better diversification than the market capitalisation index.

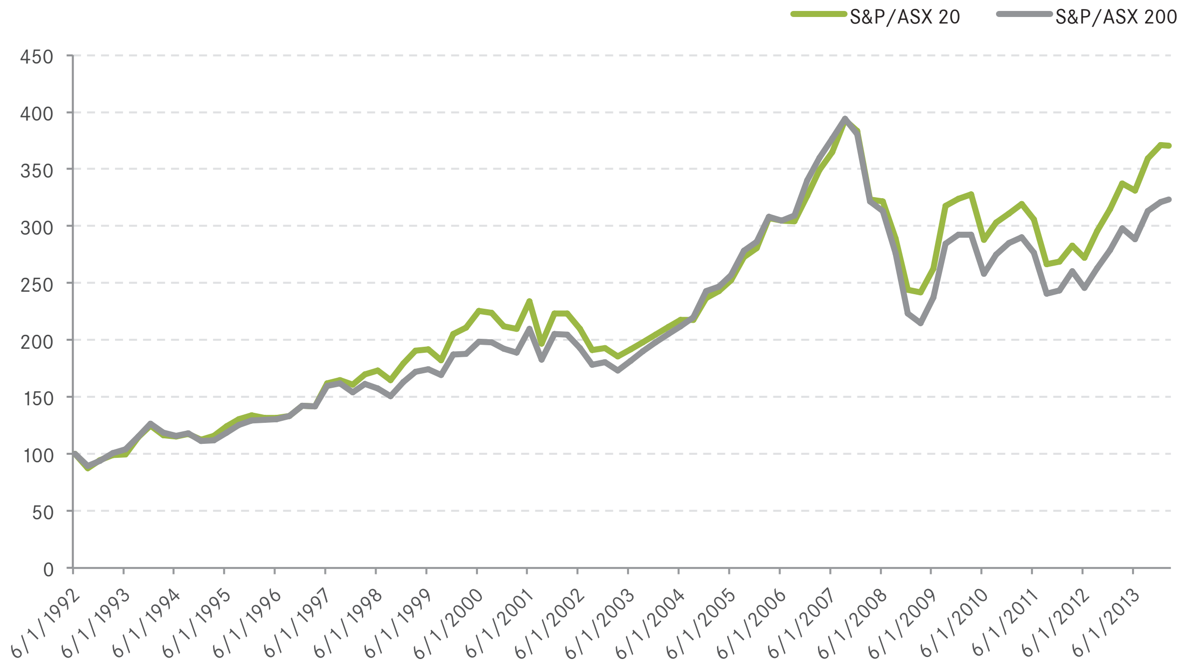
Diversification is a challenge in the Australian market because it is so concentrated. The five largest companies constitute approximately 40% of the top 200. The ten largest in excess of 50%. To make things worse, four of the five largest are banks that are relatively correlated to each other in terms of performance.

Top 10 Securities	S&P/ASX 200 Weightings
Commonwealth Bank	9.13%
BHP Billiton	8.95%
Westpac	7.32%
ANZ	6.33%
National Australia Bank	5.95%
Telstra	4.88%
Wesfarmers	3.66%
Woolworths	3.26%
CSL	2.61%
Rio Tinto	2.18%
Total	**54.27%**

Source: Bloomberg as at 31 January 2014

Looking at the numbers it occurred to us that the following graph would be interesting.

S&P/ASX 20 versus S&P/ASX 200



Source: Bloomberg

In over a decade there has been little difference between the S&P/ASX 200 and the S&P/ASX 20 Index. The correlation is 97.2%.[13] There are 180 stocks not doing much work.

It turns out that the Australian market is one of the most concentrated among developed markets.[14]

US: S&P 500 (500)	
Apple Inc	2.84%
Exxon Mobil Corp	2.52%
Google Inc	2.05%
Microsoft Corp	1.75%
Johnson & Johnson	1.56%
General Electric Co	1.55%
Wells Fargo & Co	1.34%
Chevron Corp	1.33%
Procter & Gamble Co	1.28%
JP Morgan Chase & Co	1.28%
Total	**19.05%**

UK: FTSE 100 (100)	
HSBC Hldgs	6.94%
BP	5.51%
Royal Dutch Shell A	4.92%
GlaxoSmithKline	4.76%
Vodafone Group	3.87%
British American Tobacco	3.60%
Royal Dutch Shell B	3.38%
AstraZeneca PLC	2.98%
Diageo PLC	2.77%
Rio Tinto PLC	2.51%
Total	**41.24%**

Australia: S&P ASX 200 (200)	
BHP	9.25%
CBA	9.04%
Westpac	7.81%
ANZ	6.66%
NAB	6.12%
Telstra	4.72%
Wesfarmers	3.69%
Woolworths	3.40%
CSL	2.64%
Rio Tinto	2.19%
Total	**55.52%**

[13] Source: Bloomberg for period 30 June 1992 to 17 February 2014, quarterly.
[14] Source: Bloomberg as at 28 February 2014

Canada: S&P TSX (60)	
Royal Bank of Canada ORD	8.08%
Toronto Dominion ORD	7.18%
Bank of Nova Scotia	6.01%
Suncor Energy Inc	4.37%
Canadian Nat'l Railway Co	3.97%
Valeant Pharmaceuticals Int	3.80%
Bank of Montreal ORD	3.59%
Canadian Natural Res Ltd	3.15%
Enbridge Inc	3.10%
Manulife Financial Corp	3.09%
Total	**46.34%**

Japan: Nikkei 225 (225)	
Fast Retailing Co Ltd	9.27%
Softbank Corp	6.08%
Fanuc Corp	4.67%
KDDI Corp	3.28%
Kyocera Corp	2.43%
Honda Motor Co Ltd	1.93%
Astellas Pharma Inc	1.74%
Toyota Electron Ltd	1.54%
Toyota Motor Corp	1.54%
Daikin Industries Ltd	1.54%
Total	**34.02%**

For readers who like mathematics we have calculated a Herfindahl Index[15], a measure of concentration, for the S&P/ASX 200 to be 396[16]. The counterpart for the Market Vectors Australia Equal Weight Index is 132[17]. By this measure the Market Vectors Australia Equal Weight Index is only one-third as concentrated as the S&P/ASX 200. In other words, the Market Vectors Australia Equal Weight Index is three times more diversified than the S&P/ASX 200.

4.1 A Mathematical Proof that Equal Weighting Gives the Best Diversification

We sharpened our technical tools to demonstrate the best way to diversify a portfolio. The formal mathematical steps are set out in Appendix 2 so that they can be avoided by those with a distaste for this sort of detail.

In Appendix 2 you will find a formal proof that equal weight is the portfolio construction approach that gives the best diversification for the long term. Not just better than market capitalisation, but the best possible diversification among any portfolio construction strategy.

4.2 The Capital Asset Pricing Model Does Not Contradict Equal Weight

This finding contradicts claims made in the literature on indices. You will see the claim that the Capital Asset Pricing Model provides the theoretical justification for using market capitalisation in portfolios.[18] This is a logical fallacy that Aristotle called petitio principii, which would translate as "assuming the initial point".[19]

The Capital Asset Pricing Model is an extension of Modern Portfolio Theory discussed above. It is a theoretical formula for determining the appropriate price of an asset. It does this by calculating the required rate of return to compensate for the risk the asset carries beyond the standard market risk. This additional risk is said to be the risk that cannot be diversified away.

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[15] A Herfindahl Index is a measure of how concentrated a distribution is. It is often used for 'share of pie' exercises like the relative market shares for a particular product or portfolio weightings. The calculation is the sum of the squares of each stock's weighting, with the weightings expressed as a percentage multiplied by 100.
[16] As at 15 March 2014
[17] For an equal weight portfolio the Herfindahl Index will only change when the number of stocks in the portfolio changes.
[18] See for example Velvadapu, S&P Indices Research and Design and ETF.com (1).
[19] In his work on deductive reasoning, Analytica Priora translated as "Prior Analytics".

The Model therefore requires a measure for market risk. In its standard form it assumes market capitalisation is the most appropriate way of measuring market risk. This is an input of the model, not an output.

If you use the Model in this form to price an asset to be added to a portfolio in proportion to its market capitalisation, the mathematical inevitability is that the Model will treat this asset as having no risk beyond market risk and will therefore treat the effectiveness of the diversification as being unchanged. If you price an asset being added to a portfolio on a different basis, the mathematical inevitability is that the Model will treat this asset as having some risk beyond market risk. But this is just petitio principii. Mathematical expressions will always agree with their own assumptions.

If you did a version of the Capital Asset Pricing Model that assumed that an equal weight portfolio was the proxy for market risk then you would get the opposite result. Adding an asset on a market capitalisation basis would be seen as increasing risk while adding an asset on an equal weight basis would not.

The proper understanding of the Capital Asset Pricing Model is that it does not produce conclusions about risk and diversification. It requires this to be input.

4.3 The Efficient Markets Hypothesis Does Not Contradict Equal Weight

The same error is made in relation to the Efficient Markets Hypothesis. The argument goes that a portfolio that is not based on market capitalisation cannot outperform a portfolio that is, because the market is efficient and there are no informational advantages to be had. Again, this is petitio principii.

This argument assumes that market capitalisation is what you would acquire if you had no information about which stocks are going to outperform. Again, a theory cannot be used to prove its own assumptions.

In promoting an equal weight index we are not arguing any informational advantage in respect of individual stock prices. We are not claiming to know something about the future of individual stock prices that the rest of the market does not know.

The argument can be turned around. A market capitalisation index implies that current capitalisation is an indicator of future performance. A fundamental index implies that current data indicates future performance. The efficient markets hypothesis would hold both of these assertions to be false. The efficient markets hypothesis principle that the future cannot be known is an argument in favour of equal weighting.

4.4 Good Theory Works from First Principles

There is a broader point here. Market capitalisation is given a status that has not been justified by investment theory.

Market capitalisation was developed as a better way of presenting economic data about the stock market. When Charles Dow first published the *Dow Jones Industrial Average* in 1896 he based his allocation on relative prices[20]. Over time indices were thought to produce a better economic snapshot if larger companies were given more weight. This development was about statistical significance, not about investment theory.

Market capitalisation took hold in indices in the 1950s, two decades before passive funds took off. Investment theory did not play a role in the adoption of market capitalisation for statistical purposes.

The first passive funds used the existing indices because that was what was available. There was no bottom-up theoretical justification because there was no choice.

In a debate about the best portfolio weightings from an investor's point of view, the choice should be justified from first principles, as we are doing in this paper. We invite proponents of market capitalisation to also do so. Our search of the literature has not turned up anyone who has undertaken this exercise.

4.5 The Number of Securities in a Portfolio

The other parameter we have investigated in order to explain diversification is the effect of the number of stocks in a portfolio.

In the landmark research in this area Elton and Gruber develop a mathematical relationship between the number of stocks in a portfolio and the amount of diversification achieved.

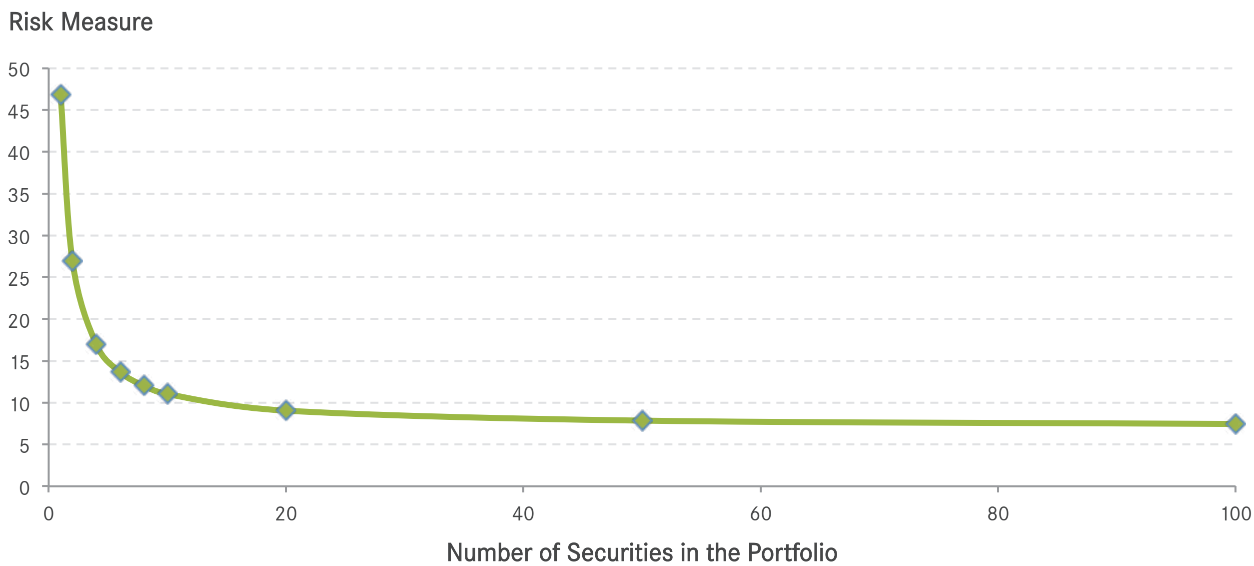
Using New York Stock Exchange data these authors determine a maximum risk score of 46.811 where the investor holds just one stock, and a minimum risk score of 7.070 where maximum diversification is achieved.[21] The exact meaning of these numbers is not the focus of the research. Rather it is the way this risk measure changes as the number of stocks in the portfolio changes. The outcomes are dramatic. Most diversification is achieved at low securities numbers. As the size of the portfolio gets larger, the increase in diversification per additional stock is surprisingly small.

[20] That is, higher priced stocks were given higher weightings than lower priced stocks. The Dow Jones Index continues to use this approach to this day, receiving a lot of criticism for doing so.
[21] Table 8, 425

We present the data points published in their paper in the following graph[22]

Source: Market Vectors Index Solutions (MVIS), Elton and Gruber

To focus better on the lower end, the following graph only includes the data points up to 100 securities[23]



Source: Market Vectors Index Solutions (MVIS), Elton and Gruber

In both graphs it is striking how little value there is in having a large number of securities rather than a medium number. In other words, it is striking how quickly you can achieve almost all of the diversification you are ever going to achieve.[24]

In analysing the Market Vectors Australia Equal Weight Index, we draw out two relevant data points. The Australian market is familiar with index funds containing 200 stocks. Elton and

[22] ibid
[23] ibid
[24] A similar result of a "rapidly decreasing asymptotic function" was also found in Evans and Archer at 767. The authors' data is not however as detailed as Elton and Gruber. The same can be said about Fisher and Lorie.

Gruber tell us the risk measure for 200 stocks is 7.256 so 84.5% of the risk of a single stock portfolio is diversified away, when the maximum that can be diversified away is 84.9%[25]. The other data point we are interested in, for reasons explained below, is 75 stocks. Elton and Gruber do not provide this data point but using a straight line interpolation[26] between their data points of 50 and 100 gives a risk measure of 7.654 so 83.6% of the risk of a single stock portfolio is diversified away.

With 200 stocks there is 99.53% of maximum diversification achieved. With 75 stocks there is 99.47% is achieved. If you round to one less decimal place the two numbers become the same. The additional 125 stocks provide only an immaterial reduction in risk. Having 200 stocks in a portfolio is an unnecessary complication. In the next two sections we look at advantages that come from excluding the irrelevant stocks from the portfolio.

5. Equal Weight Structural Advantage #2: Liquidity Benefits

5.1 Ease of Implementation

The biggest criticism of equal weight indices is that they cannot be easily implemented as a portfolio because of the difficulty in acquiring enough of the smaller capitalisation stocks. MVIS designs all of its indices to be easy to implement. MVIS uses various liquidity screens in constructing and rebalancing its indices. Many indices target a number of stocks whereas MVIS targets an appropriate level of liquidity.

As a result of the liquidity screens and other filters[27], the Market Vectors Australia Equal Weight Index contains only 76 stocks.[28] The analysis in the previous section showed that a portfolio with this number of stocks is just as well diversified as a portfolio with 200 stocks.

5.2 No Discount for Illiquid Stocks

A portfolio of 76 stocks is able to exclude illiquid stocks that a portfolio of 200 stocks needs to include. There is therefore a profoundly reduced risk of loss through illiquidity.

Many researchers have attempted to quantify the extent to which the market discounts the price of illiquid stocks, including Tabak, Damodaran, Dyl and Jiang and Ma and MacNamara. While there is no simple answer to the valuation question, there is consensus that the discount is material. Illiquid stocks carry the risk that a sale will be at a significant discount to the true value of the stock.

5.3 Lower Spreads with Liquid Stocks

ETFs are bought and sold through an exchange such as the ASX. While the market is open, a market maker continually provides a bid and offer[29] for investors to trade against. The market maker hedges their exposure to the inventory they have to hold to be able to do this. An

[25] ibid
[26] The data set is not a straight line but for these values it is close enough to use this simple method.
[27] A description of the process is included in Appendix 3.
[28] As at 15 March 2014. This number could vary slightly each time the index rebalances.
[29] Always reflecting the net asset value of the fund.

additional role of the market maker is to create and redeem large baskets of securities on behalf of the ETF in an efficient manner.

A consequence of excluding illiquid stocks from the portfolio and of not having too many stocks in the portfolio is that the market maker's job is made easier. This flows on to investors through reduced bid/offer spreads[30] because the market maker has less cost and less risk to cover.

6. Equal Weight Structural Advantage #3: Pure-Play Exposure

In today's globalised economies, company revenues and assets are no longer primarily derived from the country where a company is incorporated. Having a tailor made index allows for better targeting of relevant companies. In addition to companies incorporated in Australia and listed on the ASX, the Market Vectors Australia Equal Weight Index also includes companies that are incorporated outside of Australia but are listed on the ASX, if they generate at least 50 percent of their revenues in Australia.

As a consequence companies such as Singapore Telecom and ResMed can be found in the index, identified as offshore components. Both companies are incorporated outside Australia, in Singapore and the United States respectively, both companies have ASX listings and both companies generate more than 50 percent of their revenues in Australia.

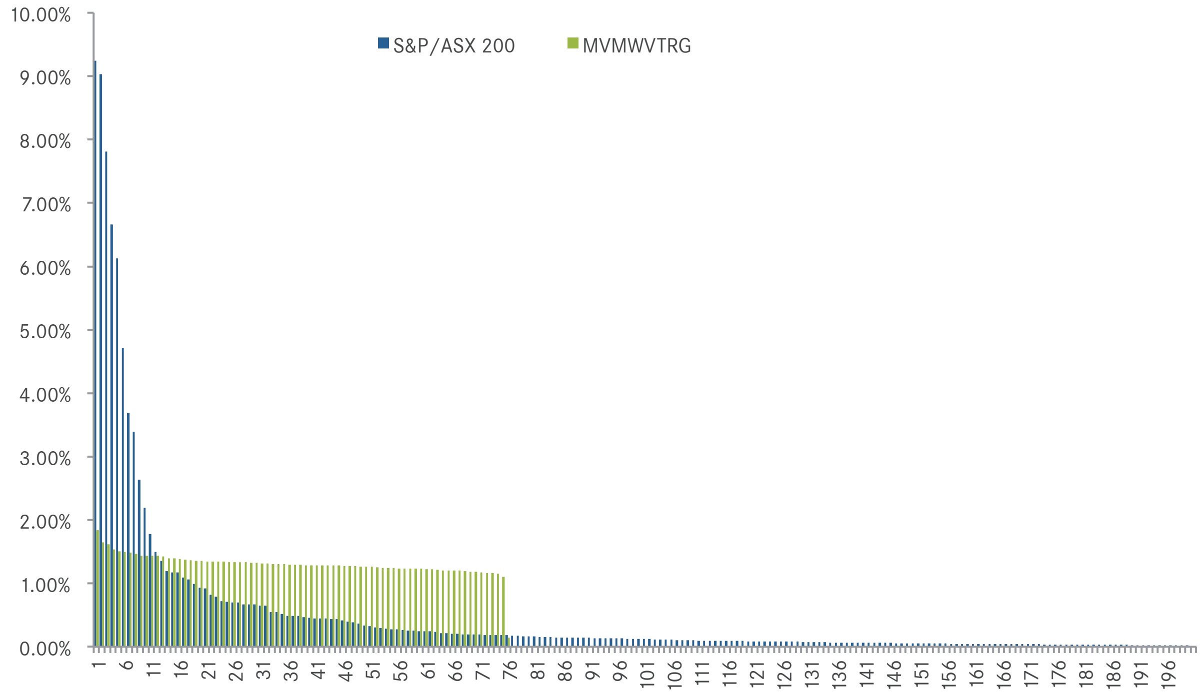
However, companies such as Twenty-First Century Fox, Fletcher Building, Henderson Group and Oil Search which all have a listing in Australia but are incorporated outside of Australia, are not included in the index because they don't meet the criteria.

7. Capitalisation Allocations

An equal weighted index by definition has a much lower allocation to large capitalisation stocks than a market capitalisation index. This results in a significant in allocation to mid-capitalisation stocks.

[30] Relative to a portfolio that is otherwise similar but includes illiquid stocks. There are other factors that influence the spreads.

Hypothetical growth of a $10,000 investment: January 2003 to January 2014



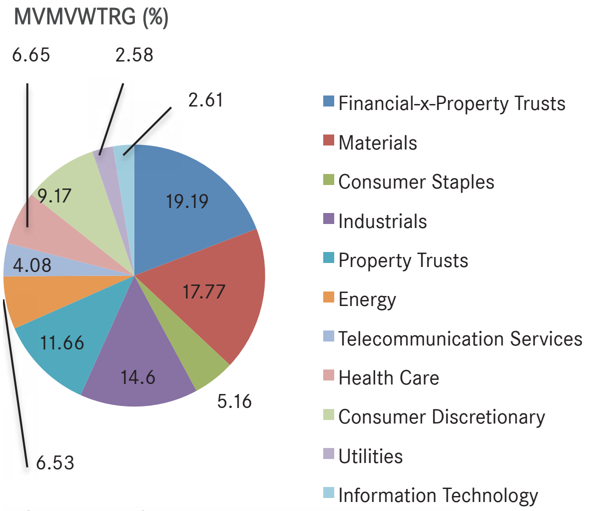
Source: Market Vectors Index Solutions (MVIS)

This is not just significantly different to traditional indices, it is significantly different to traditional active fund managers.

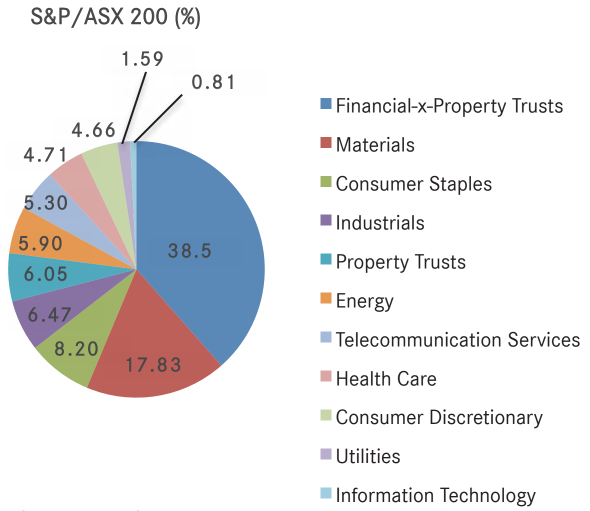
8. Sector Allocations

The following charts show the sector allocations for both the Market Vectors Australia Equal Weight Index and the S&P/ASX 200. The Market Vectors Australia Equal Weight Index has a reduced, but still substantial, allocation to financial services. In the Australian market financial services dominate the market capitalisation portfolio. Equal weighting reduces this sector concentration risk.

MV Australia Equal Weight Index Sector Breakdown vs. S&P/ASX 200



Source: FactSet as at 31 January 2014



Source: FactSet as at 31 January 2014

9. Turnover

It is often said, even by proponents of equal weight portfolios, that they have higher turnover than market capitalisation portfolios.

This myth perhaps derives from the data Standard & Poors provided about their indices when they first investigated the equal weighting idea. They stated the average annual turnover of the S&P 500 EWI to be 28.1% whereas its market capitalisation equivalent index was 2.8%.[31]

Turnover is a function of index design. Major determinants are the criteria that have to be met for a stock not currently in the index to enter the index and the criteria for a stock currently in the index to be excluded. The criteria can be set so that they are easy to trigger causing a high number of stocks to enter and exit the index at each review. Alternatively, the criteria can be set to be hard to trigger causing very few stocks to enter or exit the index. This aspect of index design is a trade-off against other design objectives.

The very low turnover for the Standard & Poors market capitalisation index is largely a result of the choices made in this aspect of the index's design. This is an extreme outcome rather than a typical outcome. The comparison to their equal weight index cannot be taken at face value.

Standard & Poors themselves say that index turnover is typically in the range 15% to 30%.[32]

There has been one live review date for the Market Vectors Australia Equal Weight Index since it was launched. The turnover statistic for that rebalance was 5.55%. We therefore estimate the annual turnover to be 25%. This is within the range provided by Standard & Poors above. It should be considered 'average' rather than 'high' for a passive fund. Like all passive funds, a fund using this index would have a much lower turnover than an actively managed fund.

[31] S&P Indices Research and Design at 7
[32] ibid

10. References

Cristina Amado and Timo Teräsvirta, “Modelling Changes in the Unconditional Variance of a Long Stock Return Series”, May 2011, cefup.fep.up.pt/uploads/ECO%20Seminars/2011/CristinaAmado_14_Oct.pdf

Torben G. Andersen, Tim Bollerslev, Francis X> Diebold and Heiko Ebens, “The Distribution of Stock Return Volatility”, 14 September 2000, *Journal of Financial Economics*, Vol. 61, 43

Jonathan Burton, “The Problem With All Things Being Equal: Equal-Weight Indexing May Be Getting More Attention From Investors Than the Strategy Deserves”, online.wsj.com/news/articles/SB10001424127887324162304578304164051191422

Robert D. Arnott, Jason Hsu and Philip Moore, “Fundamental Indexation”, *Financial Analysts Journal*, March/April 2005, Vol. 61, No. 2, 83

Robert D. Arnott, Jason Hsu, Vitali Kalesnik and Phil Tindall, “The Surprising Alpha From Malkiel’s Monkey and Upside-Down Strategies”, Summer 2013, The Journal of Portfolio Management, Vol. 39, No. 4, 1

Robert D. Arnott, Vitali Kalesnik and Craig Scholl, “Beyond Cap Weight: The Empirical Evidence for a Diversified Beta”, *Journal of Indexes*, January/February 2010, 16

Aswath Damodaran, “Marketability and Value: Measuring the Illiquidity Discount”, May 2005, Stern School of Business, www.stern.nyu.edu/~adamodar/pdfiles/papers/liquidity.pdf

Srikant Dash and Keith Loggie, “Equal Weight Indexing: Five Years Later”, ETF.com, www.etf.com/sections/research/4022-equal-weight-indexing-five-years-later.html

Edward A. Dyl and George J. Jiang, “Valuing Illiquid Common Stock”, July 2007, University of Arizona, www.u.arizona.edu/~gjiang/Valuing%20illiquid%20stock.pdf

Edwin J. Elton and Martin J. Gruber, “Risk Reduction and Portfolio Size: An Analytical Solution”, *The Journal of Business*, October 1977, Vol. 50. Issue 4, 415-437

Robert F. Engle and Andrew J. Patton, “What Good is a Volatility Model?”, *Quantitative Finance*, 2001, Vol. 1, 237

ETF.com (1), “The Evolution of Equal Weighting”, 14 December 2014, *Journal of Indexes*, www.etf.com/publications/journalofindexes/joi-articles/8534-the-evolution-of-equal-weighting.html?showall=&fullart=1&start=11

ETF.com (2), “The Weight Debate”, 14 December 2014, *Journal of Indexes*, http://www.etf.com/publications/journalofindexes/joi-articles/8535-the-weight-debate.html

John C. Evans and Stephen H. Archer, “Diversification and the Reduction of Dispersion: An Empirical Analysis”, *The Journal of Finance*, December 1968, Vol. 23, No. 5, 761

Eugene Fama and Kenneth French, “Multifactor Explanations of Asset Pricing Anomalies”, Journal of Finance, 1996, Vil. 51, 55

Rick Ferri, “No Free Lunch from Equal Weight S&P 500”, 29 April 2013, http://www.forbes.com/sites/rickferri/2013/04/29/no-free-lunch-from-equal-weight-sp-500/

Rick Ferri, “The Extra Risks of Equal Weight”, 4 March 2014, http://www.etf.com/sections/index-investors-corner/21418-ferri-the-extra-risks-of-equal-weighting.html?fullart=1&start=2

Lawrence Fisher and James H. Lorie, “Some Studies of Variability of Returns on Investments in Common Stocks”, *The Journal of Business*, April 1970, Vol. 43, No. 2, 99

Kenneth R. French, G. William Schwert and Robert F. Stambaugh, “Expected Stock Returns and Volatility”, *Journal of Financial Economics*, 1987, Vol. 19, 3

Marie-Hélène Grouard, Sébastian Lévy and Catherine Lubochinsky, “Stock Market Volatility: From Empirical Data to Their Interpretation”, June 2003, Banque de France, www.banque-france.fr/fileadmin/user_upload/banque_de_france/publications/Revue_de_la_stabilite_financiere/etud2_0603.pdf

Roy D. Henriksson and Robert C. Merton, “On Market Timing and Investment Performance”, Journal of Business, 1981, Vol. 54, 513

Jason Hsu, “Cap-Weighted Portfolios Are Sub-Optimal Portfolios”, (2006), *Journal of Investment Management*, Volume 4, No. 3, 1

Paul Lajbcygier, Doris Chen and Michael Dempsey, CSIRO-Monash Superannuation Research Cluster, 28 November 2013, australiancentre.com.au/sites/default/files/superannuation-cluster/cp4wp1-is-fundamental-indexation-able-to-time-the-market-evidence-from-the-dow-jones-industrial-average.pdf

Cindy W, Ma and Andrew MacNamara, “The Price of Illiquidity: Valuation Approaches Across Asset Classes”, 1 December 2009, Houlihan Lokey, www.hl.com/email/pdf/hl_price_of_illiquidity.pdf

Edward F. McQuarrie, “Fundamentally Indexed or Fundamentally Misconceived: Locating the Source of RAFI Outperformance”, Journal of Investing, 2008, Vol. 17, Issue 4, 29

Harry Markowitz, "Portfolio Selection", *The Journal of Finance*, March 1952, Vol. 7, No. 1, 77–91

S&P Capital IQ, “Understanding the Impact of an Equally Weighted Portfolio”, 29 April 2013, ETF Trends and Ideas, us.spindices.com/.../20130430-sp-capiq-equal-weight-content.pdf

S&P Indices Research and Design, “Equal Weight Indexing: Seven Years Later”, July 2010, S&P Indices Research and Design

David Tabak, “A CAPM-BASED Approach to Calculating Illiquidity Discounts”, 11 November 2002, Nera Consulting, www.nera.com/67_4833.htm

Pradeep Velvadapu, “The Russell Equal Weight Indexes: An Enhancement To Equal Weight Methodology” *Russell Research*, October 2010

Liyu Zeng and Frank Luo, “10 Years Later: Where in the World is Equal Weight Indexing Now?”, April 2013, S&P Dow Jones Indices, papers.ssrn.com/sol3/papers.cfm?abstract_id=2257481

11. Appendix 1 – Sharpe Ratios

We calculated 12-month Sharpe Ratios starting with the period ended December 2003 and continuing up to the period ended January 2014. We did this for the Market Vectors Australia Equal Weight Index and, for comparison, the S&P/ASX 200 Accumulation Index. In each case we did the ratio of the index relative to the RBA cash rate.

The results are:

Period Ending	MVMVWTR	S&P/ASX 200
JAN-03 to DEC-03	1.11	1.01
FEB-03 to JAN-04	1.04	1.13
MAR-03 to FEB-04	2.41	2.89
APR-03 to MAR-04	2.42	2.72
MAY-03 to APR-04	1.76	1.99
JUN-03 to MAY-04	2.63	2.31
JUL-03 to JUN-04	2.83	2.54
AUG-03 to JUL-04	2.51	2.02
SEP-03 to AUG-04	2.43	1.74
OCT-03 to SEP-04	2.86	2.40
NOV-03 to OCT-04	2.87	2.38
DEC-03 to NOV-04	4.39	4.03
JAN-04 to DEC-04	4.39	4.01
FEB-04 to JAN-05	7.71	5.27
MAR-04 to FEB-05	6.55	5.12
APR-04 to MAR-05	5.02	3.63
MAY-04 to APR-05	3.40	2.38
JUN-04 to MAY-05	3.46	2.54
JUL-04 to JUN-05	3.52	2.70
AUG-04 to JUL-05	3.79	3.18
SEP-04 to AUG-05	3.76	3.36
OCT-04 to SEP-05	3.77	3.41
NOV-04 to OCT-05	1.93	1.81
NOV-06 to OCT-07	3.11	3.77
DEC-06 to NOV-07	1.91	2.17
JAN-07 to DEC-07	0.89	1.10
FEB-07 to JAN-08	-0.56	-0.33
MAR-07 to FEB-08	-0.81	-0.50
APR-07 to MAR-08	-1.29	-0.95
MAY-07 to APR-08	-1.11	-0.83
JUN-07 to MAY-08	-1.42	-0.91

Period Ending	MVMVWTR	S&P/ASX 200
DEC-04 to NOV-05	1.96	1.80
JAN-05 to DEC-05	1.91	1.79
FEB-05 to JAN-06	1.84	2.02
MAR-05 to FEB-06	1.73	1.80
APR-05 to MAR-06	2.21	2.52
MAY-05 to APR-06	3.39	3.97
JUN-05 to MAY-06	2.05	2.01
JUL-05 to JUN-06	1.82	1.77
AUG-05 to JUL-06	1.22	1.20
SEP-05 to AUG-06	1.20	1.32
OCT-05 to SEP-06	1.07	0.99
NOV-05 to OCT-06	2.46	2.19
DEC-05 to NOV-06	2.40	1.98
JAN-06 to DEC-06	2.49	2.03
FEB-06 to JAN-07	2.50	1.83
MAR-06 to FEB-07	2.83	1.98
APR-06 to MAR-07	2.84	1.87
MAY-06 to APR-07	2.91	1.89
JUN-06 to MAY-07	5.97	4.86
JUL-06 to JUN-07	4.33	3.91
AUG-06 to JUL-07	3.90	3.66
SEP-06 to AUG-07	3.57	3.54
OCT-06 to SEP-07	3.70	3.89
MAR-09 to FEB-10	3.51	3.01
APR-09 to MAR-10	3.25	2.92
MAY-09 to APR-10	2.44	2.15
JUN-09 to MAY-10	1.33	1.04
JUL-09 to JUN-10	0.71	0.56
AUG-09 to JUL-10	0.44	0.40
SEP-09 to AUG-10	-0.01	-0.12
OCT-09 to SEP-10	-0.20	-0.24

Period Ending	MVMVWTR	S&P/ASX 200
JUL-07 to JUN-08	-1.70	-1.26
AUG-07 to JUL-08	-1.64	-1.37
SEP-07 to AUG-08	-1.37	-1.26
OCT-07 to SEP-08	-1.98	-1.97
NOV-07 to OCT-08	-2.13	-2.40
DEC-07 to NOV-08	-2.24	-2.49
JAN-08 to DEC-08	-2.03	-2.36
FEB-08 to JAN-09	-1.98	-2.30
MAR-08 to FEB-09	-2.13	-2.45
APR-08 to MAR-09	-1.56	-1.70
MAY-08 to APR-09	-1.45	-1.62
JUN-08 to MAY-09	-1.32	-1.61
JUL-08 to JUN-09	-0.85	-1.17
AUG-08 to JUL-09	-0.53	-0.64
SEP-08 to AUG-09	-0.39	-0.52
OCT-08 to SEP-09	0.10	0.21
NOV-08 to OCT-09	0.96	1.04
DEC-08 to NOV-09	1.46	1.87
JAN-09 to DEC-09	1.61	2.26
FEB-09 to JAN-10	1.78	2.04
JUL-11 to JUN-12	-0.71	-0.79
AUG-11 to JUL-12	-0.33	-0.21
SEP-11 to AUG-12	-0.02	0.09
OCT-11 to SEP-12	0.61	0.87
NOV-11 to OCT-12	0.36	0.58
DEC-11 to NOV-12	0.98	1.10
JAN-12 to DEC-12	1.66	1.70
FEB-12 to JAN-13	1.71	1.70
MAR-12 to FEB-13	1.84	1.99
APR-12 to MAR-13	1.40	1.50

Period Ending	MVMVWTR	S&P/ASX 200
NOV-09 to OCT-10	0.15	0.03
DEC-09 to NOV-10	0.02	-0.19
JAN-10 to DEC-10	-0.14	-0.20
FEB-10 to JAN-11	0.38	0.32
MAR-10 to FEB-11	0.44	0.33
APR-10 to MAR-11	0.01	-0.10
MAY-10 to APR-11	-0.07	-0.00
JUN-10 to MAY-11	0.83	0.75
JUL-10 to JUN-11	0.91	0.89
AUG-10 to JUL-11	-0.19	-0.24
SEP-10 to AUG-11	-0.74	-0.33
OCT-10 to SEP-11	-1.83	-1.47
NOV-10 to OCT-11	-0.83	-0.72
DEC-10 to NOV-11	-1.05	-0.89
JAN-11 to DEC-11	-1.49	-1.35
FEB-11 to JAN-12	-0.97	-0.86
MAR-11 to FEB-12	-0.80	-0.89
APR-11 to MAR-12	-0.64	-0.84
MAY-11 to APR-12	-0.47	-0.70
JUN-11 to MAY-12	-0.78	-0.96
MAY-12 to APR-13	1.61	1.78
JUN-12 to MAY-13	2.59	2.34
JUL-12 to JUN-13	1.95	1.83
AUG-12 to JUL-13	2.14	1.89
SEP-12 to AUG-13	2.27	1.94
OCT-12 to SEP-13	2.48	1.95
NOV-12 to OCT-13	2.40	2.03
DEC-12 to NOV-13	2.01	1.78
JAN-13 to DEC-13	1.77	1.53
FEB-13 to JAN-14	1.02	0.72

12. Appendix 2 – A Mathematical Investigation of Diversification

12.1 Formal Proof That Equal Weighting Gives the Best Diversification

You diversify in order to reduce volatility. To identify the best way to diversify we developed the following model.

A portfolio consists of n stocks with the following variances, representing the volatility of each stock

$$\sigma_1^2, \sigma_2^2, \dots, \sigma_n^2$$

The stocks are held in weights

$$p_1, p_2, \ldots, p_n$$

where

$$\sum_{1}^{n} \mathrm{p} = 100\% \text{ and } \mathrm{p} \neq 0 \text{ or } 100\%$$

For the moment we assume that the variances are not dependent on each other.[33] This will be revisited at the end of the analysis. Using this assumption Markowitz[34] tells us that the variance of the portfolio is given by the function

$$F = \sigma_1^2 p_1^2 + \cdots + \sigma_n^2 p_n^2$$

We are seeking values of p that will minimise this equation and so minimise the variance of the portfolio. To do this we use a Lagrange multiplier.[35]

We add to the function F, a constant λ, called the 'Lagrange Multiplier', multiplied by the constraint noted above, which is a constant equal to 1. That is we derive a new function

$$F + \lambda \sum_{1}^{n} p$$

or

$$\sigma_1^2 p_1^2 + \cdots + \sigma_n^2 p_n^2 + \lambda \sum_{1}^{n} p$$

This function has n variables of the form p_1 to p_n. There are therefore n derivatives, one with respect to each variable. They are of the form

$$2\sigma_k^2 p_k + \lambda \quad for\ k = 1, \ldots, n$$

It is a principle of calculus that if a minimum exists it will be where each of these derivatives equals zero. Solving

$$2\sigma_k^2 p_k + \lambda = 0 \quad for\ k = 1, \ldots, n$$

gives

$$p_k = \frac{-\lambda}{2\sigma_k^2} \qquad for\ k = 1, \ldots, n$$

[33] Dependence in statistics means that there is some synchronisation between the parameters. If one moves the others will also move. In the converse, parameters are independent if one can move without the others moving. If there is dependence between the variances the mathematical expression becomes unwieldy. There would be n x (n-1) additional terms for each of the covariances. Within those terms variables are multiplied together. We have looked at applying calculus to this more complex expression but it is a dead end.

[34] op cit

[35] This is a mathematical technique for maximising or minimising equations with multiple variables over a constrained range. It was developed by Joseph Louis Lagrange.

We now have a formula that can tell us the optimal weight of each security in the portfolio where the objective is to minimise the portfolio variance.

If we know the future variances of each security we can apply this formula to determine the optimal weights. The λ is an unknown constant but the constraint that the weights sum to 100% allows a unique set of solutions to be found.

The unsurprising observation is that the weight for a particular security is inversely proportional to the variance of the security. The more variant the security is, the less you should hold of it.

The practical problem with this is that we do not know the future variances of securities. Past performance is no indication of future performance. Even stronger is the proposition that past variance is no indication of future variance. As variance is a description of the shape of the future performance, it cannot be more predictable than the performance itself.

Having reviewed the academic work on the subject, Engle and Patton present what they call "stylized facts" about predicting the volatility of financial asset prices.[36] The first lesson to draw form their work is that, at best, only vague statements can be made about future volatility. The most concrete of their principles is that, over the long run, variance reverts to a mean.[37] The implication they draw from this is that "current information has no effect on the long run forecast".[38]

Provided we are using the derived weightings in this analysis for long term portfolio construction, we can adopt this mean reversion principle. In mathematical terms

$$\sigma_1^2 = \sigma_2^2 = \dots = \sigma_n^2$$

If we call this mean that the variances are reverting to m, then the formula for the optimal weightings above becomes

$$p_k = \frac{-\lambda}{2m} \qquad for\ k = 1, \dots, n$$

That is, the optimal weights are all equal to the same constant. In other words, the optimal weighting is equal weighting.

To extend this conclusion to the real market we have to revisit the assumption that we made.

We assumed that the variances in the real market are not dependent on each other. We have adopted the Engle and Patton observation that over the long term the variances revert to a mean. At that mean the variances are no longer moving so there are not in any sense dependent on each other. The assumption holds.

We have therefore shown that an equal weight portfolio has the lowest variance. In other words, an equal weight portfolio has the lowest possible volatility and therefore the best possible diversification.

36 @ 238
37 @ 239
38 ibid

This concludes the formal proof that equal weighting gives the best diversification for long term portfolio construction.

With modern computing power it is opportune to combine formal mathematics with the hands on generation of actual numbers. In the next section we describe how to demonstrate this result in a Monte Carlo Simulation. This is a simple exercise in Microsoft Excel recommended for those who like to see numbers in action.

12.2 Monte Carlo Simulation

A Monte Carlo Simulation[39] of the mathematical result reached above is simple to perform in Microsoft Excel. This simulation demonstrates that an equal weight portfolio has lower portfolio variance than any other distribution of weightings. We use a portfolio of 100 securities in the simulation.

In a spreadsheet we start by inserting a heading *Random Numbers* in cell B1 and a heading *Totals* in A2. In each of cells B3 to B102 we insert the formula =*RAND().* In cell B2 we insert the formula =*SUM(B3:B102).*

In cell C1 we insert the next heading, *Random Weights*. In cell C3 we insert the formula *=B3/B2*. This is then copied into cells C4 to C102 inclusive. This creates a random set of numbers that sum to 100%. We insert a *SUM* function in cell C2 to ensure that we get this total and that we haven't made a mistake. We will keep an eye on this cell throughout the simulation to ensure that this condition continues to be met. The numbers we have created in C3 to C102 meet the conditions to be our set of *ps*. That is, to be the weights of the 100 securities in the portfolio.

In cell D1 we insert the next heading, *Proxy for Portfolio Variance*. In cell D3 we insert the formula *=POWER(C3,-2).* This formula is copied into cells D4 to D102. In cell D2 we sum cells D4 to D102. Cell D2 now shows a measure of the portfolio variance using column C as input weights.

This is not the usual measure of portfolio variance. The portfolio variance formula from above, but using the mean reversion m for the variance of each security, would be

$$m(p_1^2 + \cdots + p_n^2)$$

In the simulation we remove the constant *m*, which is unknown. As we are going to compare two numbers to see which is bigger, removing this constant from both calculations does not affect the comparison.

In cells E1 and F1 we insert headings *Equal Weights* and *Proxy for Portfolio Variance* respectively. In cells E3 to E102 we enter 1%. In cell E2 we sum these cells giving an answer of

[39] A Monte Carlo Simulation is a method of working with equations by running the equation a very large number of times using different random inputs each time. By observing the range of outputs, an understanding is developed of how the equation performs. This is a powerful method when formal mathematical operations cannot take the understanding of the equation any further. It is also instructive in this situation to replicate the outcome of the formal operations.

100%. This represents the proportions if the securities were equally weighted. This will be used as the comparison in the simulation.

In cell F3 we insert the formula *=POWER(E3,-2).* This formula is copied into cells F4 to F102. In cell F2 we sum cells F4 to F102. Cell D2 now shows the equivalent measure of portfolio variance to cell D2 but using equal weights in F2 for comparison to the random weights in D2.

The top part of the spreadsheet is in this form

	Random Numbers	*Random Weights*	*Proxy for Portfolio Variance*	*Equal Weights*	*Proxy for Portfolio Variance*
Totals	50.80106515	100%	2,743,494,432	100%	1,000,000
	0.6885625	1.36%	5,443	1%	10,000
	0.191202198	0.38%	70,593	1%	10,000
	0.895840998	1.76%	3,216	1%	10,000
	0.083636764	0.16%	368,936	1%	10,000
	0.216198527	0.43%	55,213	1%	10,000
	0.755428723	1.49%	4,522	1%	10,000
	0.368189401	0.72%	19,037	1%	10,000
	0.53033854	1.04%	9,176	1%	10,000
	0.369383297	0.73%	18,914	1%	10,000
	0.673119283	1.33%	5,696	1%	10,000
	0.826679155	1.63%	3,776	1%	10,000
	0.824518285	1.62%	3,796	1%	10,000
	0.329648069	0.65%	23,749	1%	10,000
	0.919444958	1.81%	3,053	1%	10,000

The null hypothesis[40] for the simulation is whether there is a set of random weights that will produce a lower proxy for the portfolio variance in cell D2 than the proxy for the portfolio variance of an equal weight portfolio shown in cell F2.

	Random Numbers	*Random Weights*	*Proxy for Portfolio Variance*	*Equal Weights*	*Proxy for Portfolio Variance*
Totals	50.80106515	100%	2,743,494,432	100%	1,000,000
	0.6885625	1.36%	5,443	1%	10,000
	0.191202198	0.38%	70,593	1%	10,000
	0.895840998	1.76%	3,216	1%	10,000
	0.083636764	0.16%	368,936	1%	10,000

Can D2 be less than F2?

In Excel the numbers generated by *=RAND()* are replaced by hitting the F9 key. Each time you hit F9 you run a new simulation. With this spreadsheet, hit F9 as many times as you can. Each time observing whether the number in cell D2 ever drops below the number in F2. The conclusion is that it never does. It never comes very close.

In place of the random numbers, guesses at better models for diversification can be input into cells C3 to C102, provided they add up to 100%. Try as many as you can imagine. No better solutions than equal weight can be found.

The null hypothesis that there is a set of weights that will produce a lower proxy for portfolio variance than equal weights is therefore rejected. Equal weights produce the lowest variance.

[40] In formal statistics the null hypothesis is the statement that you set out to disprove. There are two possible outcomes. The first is that the data is sufficiently convincing to disprove the null hypothesis. In that case you have proved the opposite of the null hypothesis. The second outcome is that the data is not sufficiently convincing to disprove the null hypothesis. In that case you have neither proved nor disproved anything.

13. Appendix 3 – Market Vectors Index Solutions Methodology

13.1 Index Construction

There are four key steps involved in constructing the Index:

1. Index Universe
2. Investable Index Universe
3. Index Constituents
4. Weighting the Constituents Equally

13.2 Index Universe

To be included in the Index Universe for the Market Vectors Australia Equal Weight Index a security must meet the following assessment:

- Have a full market capitalisation exceeding USD50 million.
- Be a local company incorporated in Australia with an ASX listing or be an offshore company incorporated outside of Australia with an ASX listing but generate at least 50.00% of their revenues (or – where applicable – have at least 50% of their assets) in Australia.

13.3 Investable Index Universe

When MVIS develops and maintains indices, their key focus is on investability. Stringent rules are applied when screening potential Index components in respect of liquidity. Reviews are carried out every 3 months.

Each Index component is assessed based on the following investability criteria (depending on whether the component is an existing component of the Index or is being assessed as a new component for inclusion in the Index):

Investability criteria	Existing components	New components
Non-trading days over last 3 months:	< 10 non-trading days; **AND**	< 10 non-trading days; **AND**
Free-float:	≥ 5%; **AND**	≥10%; **AND**
Market Capitalisation (total):	> US$75 million; **AND**	> US$150 million;
3-month average-daily-trading volume:	**EITHER:** at least US$600,000 at the current review or at one of the previous two reviews;	**PLUS:** at least US$1 million at this review and also at the previous two reviews;
Shares traded per month over the last 6 months:	**OR:** at least 200,000 at the current review or at one of the previous two reviews.	**AND:** at least 250,000 at this review and also at the previous two reviews.

Existing components that fail to meet the above criteria will be excluded from an Index. New components must meet the above criteria before they are included in an Index.

13.4 Index Constituents

Determining the index constituents involves applying target coverage criteria and applying the review process. These concepts are explained below.

Target coverage: At least 90.00% of the free-float market capitalisation of the investable universe with at least 25 securities.

Review procedure:

1. All securities in the investable universe are sorted in terms of Free-float market capitalisation in descending order.
2. Securities covering the top 85.00% of the free-float market capitalisation of the investable universe qualify for selection.
3. Existing components between the 85^{th} and 100^{th} percentiles also qualify for inclusion in the Index.
4. If the coverage is still below 90.00% or the number of securities in the Index is still below 25, then the largest remaining securities are selected until coverage of at least 90.00% is reached and the number of securities equals at least 25.

Index reviews for the Market Vectors Australia Equal Weight Index are currently carried out on a quarterly basis. The reviews are currently based on the (adjusted) closing data on the last business day in February, May, August and November. The underlying Index data is announced on the second Friday in March, June, September and December (quarter-end month). Changes to the Index are typically implemented (rebalancing) on the third Friday of each quarter-end month. MVIS may change the above timings without prior notice at its discretion. Refer to the section 'Transparency' below for details of how to access the most up to date index guide.

13.5 Equal Weighting

The equal weighting of each index component is calculated by dividing 100% by the number of index constituents. For example if there are 50 constituents in the index then each constituent will have a weight of 2%.

13.6 Example of equal weighting (based on the quarterly review conducted Q4/2013)

At the quarter 4 review conducted during December 2013 there were 76 constituents in the Index each with a weight of 1.32%. The following table demonstrates how the equal weighting regime adopted by MVIS in constructing the Index operates by comparing the weightings of the largest 10 and smallest 5 components of the Index based on Free-float market capitalisation versus the Market Vectors Australia Equal Weight Index.

	Largest 10 components	% weight by Free-float MCap	% weight in MVMVWTRG
1.	COMMONWEALTH BANK OF AUSTRALIA	11.09%	1.32%
2.	BHP BILLITON LTD	10.73%	1.32%
3.	WESTPAC BANKING CORPORATION	8.86%	1.32%
4.	AUSTRALIA AND NZ BANKING GROUP	7.72%	1.32%
5.	NATIONAL AUSTRALIA BANK LTD	7.13%	1.32%
6.	TELSTRA CORPORATION LTD	5.74%	1.32%
7.	WESFARMERS LTD	4.13%	1.32%
8.	WOOLWORTHS LTD	3.77%	1.32%
9.	CSL LTD ORD	2.82%	1.32%
10.	RIO TINTO LTD	2.51%	1.32%
	Smallest 5 components		
73.	TPG TELECOM LTD ORD	0.12%	1.32%
74.	SEVEN WEST MEDIA LTD	0.12%	1.32%
75.	DAVID JONES LTD	0.12%	1.32%
76.	RECALL HOLDINGS LTD	0.11%	1.32%
77.	UGL LTD ORD	0.09%	1.32%

13.7 Transparency

MVIS aims to provide the best possible transparency so that interested parties have access to all relevant information. You can register free of charge at www.marketvectorindices.com to access a copy of the Market Vectors Global Equity Index Guide containing up-to-date Index rules, full methodology details and selection and review processes. Registration also enables you to access information on current Index values (15 minutes delayed), constituent weightings and other statistical information.

14. Appendix 4 – Index Codes

	Price	Total Return Net	Total Return Gross
ISIN:	DE000SLA6PR2	DE000SLA6NR7	DE000SLA6GR1
Sedol:	BG7ZM14	BG7ZM03	BG7ZLZ1
WKN:	SLA6PR	SLA6NR	SLA6GR
Bloomberg:	MVMVW	MVMVWTR	MVMVWTRG
Reuters:	.MVMVW	.MVMVWTR	.MVMVWTRG
Telekurs:	CH23174300	CH23174299	CH23174292

15. Important Information – Disclaimer

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