

Reducing Equity Portfolio Risk through Country Diversification

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Equity investors have the potential to reduce their portfolio risk and enhance their returns by diversifying their investments across a range of countries. In this article I use three countries, Singapore, Taiwan and Japan to show how investors could benefit from country diversification. In particular, I use specific equity indices, the MSCI Singapore Free Index, the MSCI Taiwan Index, and the Nikkei 225 Index¹, to represent equity investments in these countries. I have chosen these indices, because SGX offers futures contracts on these indices, making it easier for investors to gain exposure to these markets².

Setting the Scene

Both the MSCI Singapore Free Index and MSCI Taiwan Index

date back to December 1987. I have therefore used monthly data from December 1987 to June 2004 in this analysis³. *Figure 1: Performance of the Three Indices (Monthly Data)* charts the performance of these indices over the period in question. As the chart shows, there were three regional stock market crashes that had a detrimental impact on these markets; the Tokyo Crash of January 1990, the Asian Flu of October 1997 and the NASDAQ Rash of April 2000. As a result, there are effectively four periods that should be considered separately:

Period 1 : December 1987 to December 1989

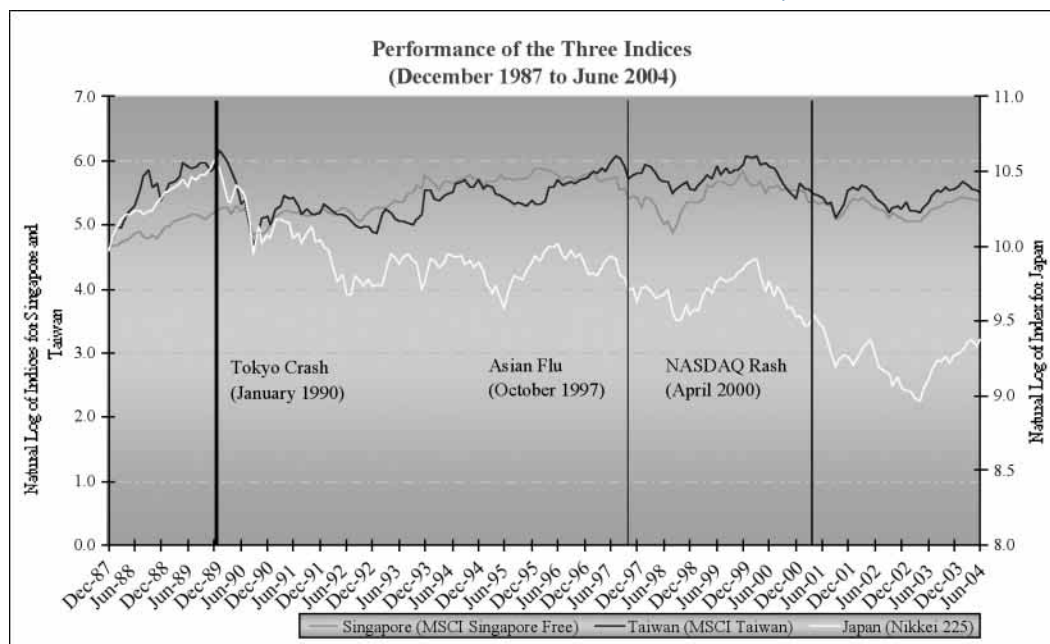
Period 2 : February 1990 to September 1997

Period 3 : November 1997 to March 2000

Period 4 : May 2000 to June 2004



Figure 1: Performance of the Three Indices (Monthly Data)



¹ The MSCI indices are compiled by Morgan Stanley Capital International Inc.

² As discussed later, investing in index futures can provide an easier means of investing in indices, than by investing in the constituent index stocks. However, futures are derivative instruments, and as with all investments, there are risks associated with investing in these products. You should consult your own financial adviser to find out about these risks, and to ascertain whether such investments are appropriate to your specific circumstances.

³ I used monthly data, to avoid biases that could be introduced from autocorrelation between daily or weekly returns. For this analysis, I have used data in local currency, to avoid introducing any bias due to exchange rates, and have taken the natural log of these indices, since it is easier to compare natural logs than actual levels.

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I analysed the relationships between these indices by calculating the correlation coefficients of their monthly returns for each time period⁴. Variables that have high correlation coefficients (close to one) offer less opportunities for diversification of risk, whilst variables that have very low correlation (correlation coefficients close to zero) or negative correlation offer better opportunities to diversify risk. The results for each period are shown in *Table 1: Correlation Coefficients*.

As can be seen from *Table 1*, correlation coefficients for the different pair-wise combinations of all three indices were fairly low for Period 1 and Period 2. This implies that there were good opportunities for risk diversification by investing in these three markets.

During Period 3 and Period 4, the correlation between Singapore and Taiwan increased markedly to 0.5676 and 0.6204 respectively. This implies that the opportunities for risk diversification by investing in both markets may have fallen. However, since the two markets were not perfectly positively correlated (which would be the case if their correlation coefficient was one), there still could have been opportunities to reduce risk and enhance returns by investing in both markets.

The correlation coefficients for Japan and Singapore were actually lower in Period 3 and Period 4 than they were in the first two periods, implying that opportunities for diversification increased slightly. In Period 4 they were relatively low, at 0.3736, indicating that there should have been substantial opportunities to enhance portfolio returns and reduce risk by investing in both markets.

Table 1: Correlation Coefficients

Period 1	Singapore	Japan	Taiwan
Singapore	1		
Japan	0.4247	1	
Taiwan	-0.1595	0.1634	1

Period 2	Singapore	Japan	Taiwan
Singapore	1		
Japan	0.4446	1	
Taiwan	0.4398	0.2936	1

Period 3	Singapore	Japan	Taiwan
Singapore	1		
Japan	0.3728	1	
Taiwan	0.5676	0.4984	1

Period 4	Singapore	Japan	Taiwan
Singapore	1		
Japan	0.3736	1	
Taiwan	0.6204	0.3649	1

The correlation coefficients for Japan and Taiwan have been fairly variable over the four periods. However, the correlation between the two markets was still relatively low, at 0.3649, in Period 4. This implies that there should have been significant benefits from diversification by investing in both markets.

Implications for Portfolio Optimisation

In order to illustrate how investors can benefit from potential diversification opportunities, I used the risk and return measures for each index during Period 4. I compared them to those that could be achieved on the efficient frontier⁵ that would have been obtained by investing in different combinations of all three indices⁶.

Table 2: Risk and Return Measures for Individual Markets in Period 4 shows how each market performed by themselves. These returns are what investors would have achieved if they had not diversified across any of the other markets, but had only invested in one of these markets.

Table 2: Risk and Return Measures for Individual Markets in Period 4

	Singapore	Japan	Taiwan
Return	-0.05%	-9.60%	-9.72%
Risk	21.12%	19.56%	32.05%

Figure 2: The Efficient Frontier shows how each individual market performed relative to an optimised portfolio (the efficient frontier) containing different weights of the individual indices. As can be seen from the chart, despite having the highest return of the three markets, investors who only invested in Singapore could have reduced their risk, and improved their returns by including Japan and Taiwan in their portfolio. Similarly, investors who singled out Taiwan could have fared substantially better in terms of both risk and return if they had included allocations to Singapore and Japan in their portfolio. Investors who focused solely on Japan achieved results that were very close to the efficient frontier. However, they could have moved up the curve, thereby increasing returns and reducing risk, by including some combinations of equity allocations to Singapore and Taiwan.

Thus, it can be concluded that in the given example, investors could, in general, have fared better by investing in all three markets, rather than focusing solely on one of them.

⁴ I calculated monthly returns by finding the first difference of the log values of adjacent monthly index values.

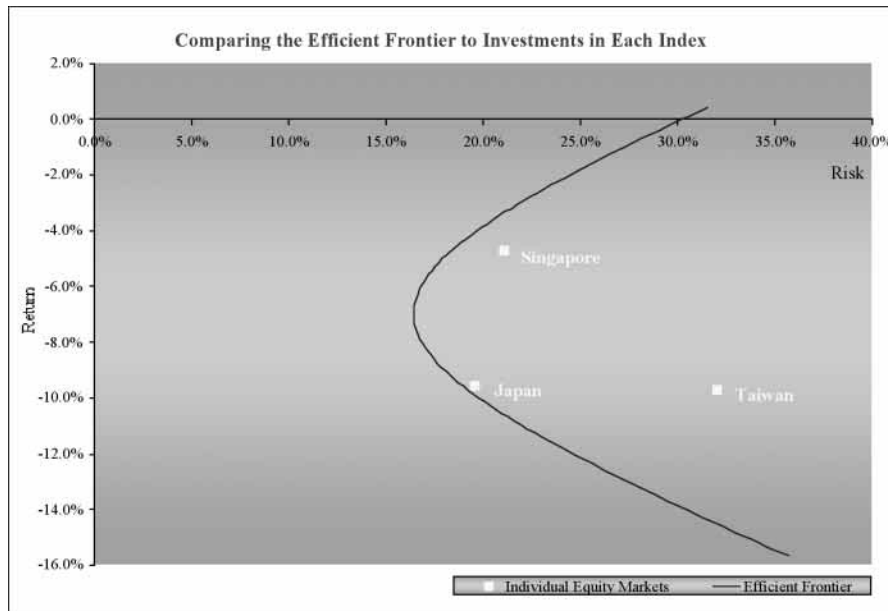
⁵ In the interests of brevity, details of econometric calculations have been omitted from this article. Please contact me if you would like further details (brindha@fitzbiz.com.au). The efficient frontier was charted using software developed by Michael Kishinevsky.

⁶ This example is used for illustrative purposes only. It is based on historical data and should not be taken as a prediction of future performance.



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Figure 2: The Efficient Frontier



The Benefits of Using Index Futures

I have described the benefits of investing across equity markets in Singapore, Japan and Taiwan, specifically using the MSCI Singapore Free Index, the Nikkei 225 Index and the MSCI Taiwan Index. However, this may not be easy from a practical perspective.

This is because the indices each include a large number of stocks. Thus continually replicating these indices by purchasing the underlying stocks, in the appropriate weights, would be a costly and time consuming exercise. In addition, investors trying to do this are likely to incur significant transaction costs.

Using index futures can provide a convenient way of overcoming some of these issues⁷. They are generally highly liquid, involve small bid-offer spreads, usually incur low transaction costs, and require small investment outlays.

Summary

As I have shown in this analysis, investors have the potential to reduce their portfolio risk and enhance their portfolio returns by diversifying their equity investments across a number of countries. In the example used here, portfolio performance is improved by investing in Singapore, Taiwan and Japan. However, investing in all the constituent stocks of an index, using the comparable index weights, in order to replicate the behaviour of the index, has many difficulties associated with it. Investors can overcome many of these using index futures.

SGX offers index futures based on the three indices that I have discussed in this article. They offer the SiMSCI Futures contracts, based on the MSCI Singapore Free Index, the SGX Nikkei 225 Index Futures contracts, based on the Nikkei 225, and the SGX MSCI Taiwan Index Futures contracts, based on the MSCI Taiwan Index.

⁷ Futures are derivative instruments, and as with all investments, there are risks associated with investing in these products. You should consult your own financial adviser to find out about these risks, and to ascertain whether such investments are appropriate to your specific circumstances.