DO CROSS LISTED SECURITIES IN THE FACE OF EXTREME EVENTS PRESENT ANY RISK RETURN BENEFITS FOR NEW ZEALAND INVESTORS?

A thesis presented in partial fulfilment of the requirements for the degree of Master of Business Studies in Finance at Massey University, Auckland, New Zealand

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ABSTRACT:

Many investors are looking for alternative investment options in todays market as correlations among markets have increased, causing diversification benefits once gained to be diminished.

This thesis examines what risk return benefits can be gained by investors from international diversification, especially cross listed securities, and how these benefits may enhance the risk return relationship in the face of extreme events. Extreme events being researched are Russian Ruble Crisis in 1998, September 11 2001, and Argentina Financial Crisis in 2002.

It was found that cross listed securities held within a portfolio provided diversification benefits for investors with an improvement in the risk return relationship of lower risk and higher returns. Tested under extreme events it was found that holding cross listed securities within a portfolio mitigated some of the affects demonstrated.

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INTRODUCTION

This research examines whether cross listed securities exhibit higher levels of diversification, and show any risk return benefits over single listed securities in the face of extreme events. These questions may seem obvious due to the extensive research which has been conducted concerning international diversification, and the benefits to investors and companies gained from cross listing. Nevertheless, little research has focused on these topics in relation to extreme events.

A number of studies have been undertaken that look at the effects of individual extreme events, but such studies have generally been conducted from a US perspective. The current research is conducted from a NZ perspective, and looks at the affects of three extreme events on five world markets. This will allow an overall understanding of how extreme events affect world markets, and of what factors lead to extreme events. The markets researched were chosen to give a global perspective of the events and determine whether cross listing on various stock markets would provide investors with the same risk return advantages. The three extreme events which will be covered are the Russian Ruble Crisis in 1998, September 11 and the Argentine Crisis in 2002. The Russian Ruble Crisis was selected, as it was the first crisis to follow the largest emerging market crisis; the Asian Crisis which occurred in 1997. September 11 was chosen for the fact that is differed from other extreme events due to its unexpected nature and lack of prior warning in terms of financial indicators, as is usual with financial and economic crises. The Argentine crisis was the third event to be selected, as it is the most recent crisis to occur in the Latin American market, and the region had not fully recovered from other emerging market crises.

There are several reasons why cross listing may not enhance investors risk return benefits in the face of extreme events. Firstly, diversification benefits have been stated to have been diminishing over time as markets have become more integrated through international trade, common currencies, stock markets and shared resources. With increased market integration, correlations between the markets have also increased, lowering diversification benefits. Greater diversification benefits are gained with low or negative correlations between portfolio securities. This leads to the second factor that may lower the benefits to investors during extreme events. It is expected that markets will react in the same way to an extreme event, causing market correlations to increase and reduce diversification benefits. This expectation is especially so for cross listed securities, due to cross listed securities being exposed twice to the foreign and domestic markets, instead of only to the domestic market as for single listed securities. Nevertheless, some researchers state that cross listed securities are able to mitigate the effects of extreme events through their unique structures. Finally, there is much debate about the benefits versus the costs of cross listing and what, in real terms, can be achieved through cross listing. For example, if there are so many benefits why is it that only one in ten US companies are cross listed on a foreign market?

These questions will be raised in this research, and the thesis is split into the following sections; Literature Review, Synopsis of the three extreme events, market segmentation factors, hypothesis testing, computational methods, portfolio formation and research design, formation of the data sets employed, weighting techniques and performance measures, results and conclusions.

LITERATURE REVIEW

International diversification and portfolio performance have been widely researched to attempt to establish the level of international diversification benefits that can be achieved by investors. International diversification is resultant through the addition of securities/ bonds/derivatives into a domestic portfolio, with the purpose of reducing unsystematic risk. Greater diversification benefits can be achieved if there are imperfect correlations between the securities. By adding securities which are negatively correlated to one another, it is possible to diversify risk to a level equivalent with the market risk. Unfortunately, diversification is unable to eliminate the volatility of market segmentation factors (systematic risk), which is associated with all markets. As regards international diversification, as systematic risk differs between markets, it is possible to achieve a world systematic risk level (Reilly and Brown, 2003).

Speidell and Sappenfield conducted a study in 1992 which demonstrated the benefits investors can gain through international diversification. They used the S&P 500 index to represent the domestic market and the EAFE index (Europe, Australia and Far East) to represent international securities. They found that a portfolio comprising 100% of the S&P 500, resulted in a return of 15.8%, with a risk measured by standard deviation of 17.1%; representing the return for a domestic portfolio and the portfolio risk, respectively. Combining a 10% mix from the EAFE with a 90% mix from the S&P 500, an increase in the return (to 16.1%) was achieved, and risk was reduced (to 16.8%), thereby improving the risk return relationship. The pattern of a better risk/return trade off is evident through the addition of a greater proportion of the EAFE index in the portfolio. The optimum amount of the EAFE within the portfolio

is between 30-50%. Beyond this point the benefits start to diminish, indicating that the addition of international securities into a domestic portfolio can result in diversification benefits in the form of lower risk or higher returns.

Early works of international diversification found the risk/ return benefits to be significant. For example, Grubel (1968) found large benefits for investors through international diversification. This finding was supported by Hunter and Coggin (1988), who found that international diversification reduced systematic risk to circa 56% of risk of a domestic portfolio held in the US. Solnik (1974) found that through the additional of international securities into a US domestic portfolio the portfolio risk could be significantly reduced.

Many studies state that the majority of international diversification benefits are due to favourable exchange rate movements. Eun and Resnick (1988) developed ex-ante portfolio selection strategies to realise potential diversification gains. It was found that exchange rate uncertainty affected the performance of international portfolios, but in their study they designed international portfolio selection strategies which controlled for estimation and exchange risk, outperforming a US domestic portfolio in out-of-period sample periods. Heston and Rouwenhorst (1994) examined industry versus country diversification for European shares and found that country diversification provided the best results. They also found that foreign exchange changes did not effect the conclusions, with the exception that foreign exchange movements could increase the risk of an international portfolio. Dumas and Solnik (1995) and Solnik (1974) showed that the risk of international diversification can be lowered substantially if the exchange rate is hedged away. Nevertheless, as demonstrated in

Hauser, Marcus and Yaari (1994), however, hedging foreign exchange movements reduces the diversification benefits from international investments. Nevertheless, Dunis and Levy (2001) showed that additional diversification benefits can be achieved through exotic currency hedging using a currency overlay programme.

There is significant disagreement over the existence of international diversification and the benefits that they provide to investors. Some researchers believe that as time has passed, markets have become more integrated and relationships between countries have strengthened, causing diversification benefits to diminish.

Speidell and Sappenfield (1992) have put forward four main arguments as to why diversification benefits are shrinking into today's markets. Firstly, there are an increasing number of institutional investors. This has arisen due to an increase in the variety of investment options available to investors, coupled with the ease of investing in mutual and equity funds, which provide larger, stabilised returns. This has increased the size and number of institutional investors trading in today's markets. As institutional investors become a larger proportion of the trading numbers, the number of key decision makers lowers, increasing the power and importance of the trading decisions made by such traders. In the US 70% of trading volume is currently made up of institutional investors, compared to 40% in the 1960s.

The second reason for reduced diversification benefits is indexing, which tends to bind stocks together. Indexed equity portfolios in the US exceed more than US$220 billion, representing over 50% of assets for some institutions. The problem caused by indexing is that the stocks are linked together by the common index which they form.

If one security moves in either direction the other index stocks, therefore, tend to follow, causing buying and selling decisions of larger traders to become very important. If they decide to participate within a large trade of an indexed stock, other stocks of the index are affected by this and react accordingly. Such an effect can result in the market being influenced by the behaviour of other stocks.

Thirdly, markets are increasingly being classified and treated as one as the world economies become more integrated through trade relationships, common currencies and increased tourism. These factors increase the importance of stocks on these markets and affect the value of other markets within close geographical proximately. This has recently been the experience in Europe through the introduction of the Euro.

Finally, companies have become more mutually dependent on one another as they are no longer country specific. The number of multinational companies has increased tenfold in the last ten years, causing market correlation to increase, which, in turn, decreases diversification benefits.

Iwaisako (2002) agreed that large adverse effects are more highly correlated than positive movements between stock markets; concluding that, for the US investor, the benefits originally gained from diversification are now limited to the original estimations. Fooladi and Rumsey (2002) explored the co-movements between the US market and twenty-three other markets between 1 January 1988 to 30 June 2000. They found that the correlations between the US market and these other markets did not increase over this period when measured in either US dollars or the local currency. They found, however, that the correlation between currencies had decreased over the

study period. Fooladi and Rumsey (2002) concluded, therefore, that although country and market integration has increased there is no significant reduction in the diversification benefits achieved.

Solnik, Boucrelle and Le Fur (1996) agreed with Speidell and Sappenfield (1992) that the integration of international markets has increased and that, over time, correlations are changing. This has caused the diversification benefits to decrease, especially in the face of extreme events.

As the behaviour of markets and investors has changed, these market decision makers have looked at alternative options to achieve greater returns. A common strategy is cross listing, which enables the investor to gain international diversification benefits without having the common difficulties of investing globally. Miller (1999) found that when a company announced a US listing, abnormal returns of 1.54% resulted for a firm listing from an emerging market, and 2.63% resulted for a firm listing from any other exchange. Other studies (such as that of Foerster and Karolyi, 1999) found excess returns in the weeks prior to listing, but negative excess returns of –0.14% per week during the listing period. This makes it difficult to determine whether any benefits, besides excess returns at the time of listing, are evident. Investors and companies need to evaluate the benefits from cross listing when considering their investment options in the current turbulent market.

Below is a summary of the motivations for investors and companies in regards to cross listing.

Evidence and Motivations for cross listing

There is significant evidence of benefits that can be achieved by companies and investors from cross listing. Pagano, Roell and Zechner (2002) summarised the motivations for cross listing as follows:

1. **Reducing Barriers for Foreign Investors and Creating a Larger Investor Base**

Cross listing allows companies to enter foreign markets that may have been closed in the past due to barriers to entry based on legislative, political or economical factors. Entering new foreign markets gives the company the potential to enlarge their investor base. An enlarged investor base allows for greater information sharing across markets, providing opportunities for investors to trade upon this information before prices in other markets respond to the new information. The more information shared and known about a company, the less risky it is to hold as part of a portfolio, as less speculation about the security is required. The risk for a company is measured by its beta; a beta measures the security's systematic risk compared to that of the overall market. The lower the risk, the lower the beta will be. Companies with lower betas are able to achieve lower costs of capital through lower entry barriers into foreign markets due to higher market segmentation. Factors affecting market behaviour are; transaction costs, regulation, taxes, competition, legislation and asymmetrical information. Through inconsistent market pressures and differing levels of information, informed traders of cross listed securities are able to trade on their information and gain higher returns. Merton (1987) revealed that when firms cross list, there occur opportunities for informed investors with private information to be able to trade on this information

and gain benefits from it. Lang, Lins and Miller (2003) found that cross listed securities had better information flows, resulting in higher market valuations.

2. Relying on Foreign Expertise

Companies are motivated to cross list on markets with superior expertise and knowledge. Greater expertise is gained through a higher number of analysts following a particular industry. With more analysts following an industry, the greater visibility a company in that industry will have, and a higher level of publicly available information will result. Analysts provide information about historical trading data, major decisions within the company, management, key suppliers, contractors and the future direction for the company. More analysts are allocated to industries, or companies, with high dollar values, as traders are more interested in information relating to the larger market movers. This situation is of particular interest to securities listed on smaller exchanges, as the number of analysts utilised in such markets is significantly lower than in the developed markets. Greater visibility for these companies can be achieved through listing on larger markets, such as the Nasdaq in the US or FTSE in London, which have higher analyst followings.

Baker, Nofsinger and Weaver (2002) found that international firms which listed either on the New York Stock Exchange, or on the London Stock Exchange, had a significant increase in visibility as a result of higher analyst coverage and print media in either The Wall Street Journal, or Financial Times. The results were stronger for firms listing on the New York Stock Exchange than those listing on

the London Stock Exchange. This can be partially explained by the higher costs associated with listing in New York.

3. Committing to Higher Disclosure and Corporate Governance Standards and a Lower Cost of Equity

Companies deciding to cross list on foreign exchanges often have higher disclosure requirements in foreign markets than in their home market. If a company chooses to disclose more accurate information, investors have more knowledge of the company and holding the security is less risky. Companies can benefit from greater disclosure, as they are able to obtain a lower cost of capital in the foreign market than in their domestic market.

Lang, Lins and Miller (2003) discussed why firms choose to cross list in the US and meet the higher disclosure requirements of that market. Due to the high level of legislation, the US has some of the highest levels of disclosure in the Western world. Companies with higher disclosure requirements tend to have higher market valuations. This occurs through more analyst coverage and higher accuracy in forecast earnings. It is in a company's best interest to divulge accurate and correct information, as this will benefit the company, as well as the investor. Besides higher market valuations, companies that disclose more information have access to lower costs of capital and increased cash flow as the costs and risks for investors to hold this company's security are lower. These factors will result in the security being traded more frequently. This conclusion was supported by Barry and Brown (1985), who demonstrated that investors who have a better understanding and estimation of the risk involved in holding the company's

security will be more likely invest in the security. Higher cash flows can be achieved through higher disclosure, lowering agency costs as information is already disclosed to investors. These factors all result in helping to increase the market value of the company.

Koedijk and Van Dijk (2004) tested the estimates for Cost of Capital for cross listed securities in nine different countries. They hypothesised that cross listed securities cost of capital would be different. They found that asset pricing models yielded different estimates of cost of capital. In the US, the difference was about 50 basis points lower, 80 basis points in the UK and 100 points in France. The only drawback is that only 12% of cross listed securities experienced the benefits. This is supported by Errunza and Miller (2000) who examined 126 firms from 32 countries and there results showed a decrease in cost of capital of 42%, which was achieved from US investors being able to invest in foreign markets.

4. Liquidity

A security's liquidity can be improved through cross listing due to access to larger investor bases which, in turn, broadens the shareholder base. These higher levels of trading and different market pressures help narrow the bid ask spread, improve the depth of trades and lower the trading costs for investors. Foerster and Karolyi (1999) found that fifty-three pre listed 1990 stocks listed in the US market saw average monthly trading volume double, while the spreads declined by 11% after adjusting for price, volume and trade size.

Stoll (1978) found that greater competition among markets will cause the bid ask spread to lower, as a greater following of investors is generated from the company being listed in two different markets.

Noronha, Sarin and Saundagaran (1996) found contradicting results on the bid ask spread as they examined the impact of NYSE/AMEX stocks which were cross listed on the London or Tokyo stock exchanges. They found that spreads did not narrow (as Stolls found in 1978), but they did find that following a foreign listing the depth of the quotes improved. This occurred through a greater investor base, as a result of the diversification into another market. It needs to be noted, however, that the improved depth disappeared once changes in price, volume and return variance were taken into account.

5. **Relative Mispricing**

Firms which are cross listed are able to take advantage of the overvaluation of shares traded abroad compared to that of the home market. Through inefficient information flows, shares on the foreign market can become over- or undervalued compared to the home market, and vice versa, because of differing levels of information being available in different markets. This can occur as one market can close for the night while another is just opening. Through the mispricing of securities, and incorrect information flows, investors can take advantage of the situation and achieve higher returns.

Werner and Kleidon (1996) found that when UK stocks were cross listed in the US, an increased volatility was seen when the markets opened in the US. This

result provided evidence that the US markets and securities adjusted their prices to reflect information already known in the UK, which had been revealed during the previous trading session.

6. Capitalising on Product Market Reputation

Companies selling products in foreign countries, should cross list on a market where their brand name and product are known by investors. Foreign sale success and popularity within an economy creates a competitive advantage, and the company should use this to drive competition and visibility for their stock, which will result in higher sales for the company. It is assumed that companies with high foreign sales will have a greater advantage in cross listing due to their existing visibility in foreign markets.

7. Costs of Cross Listing

Costs of listing abroad are relatively low compared to the benefits which can be gained from listing. There are a variety of listing fees, direct expenses and professional costs that need to be accounted for when listing a company; and these can vary depending on which market the company is cross listing on. US markets have the highest listing fees.

Because of the cost element, it is expected that only the larger companies will cross list, as they have the funds and the research capacity required to make cross listing a success. If we examine the New Zealand Stock Exchange; which is a small market in comparison to the likes of the US, the UK and Australia; of the top ten companies listed, eight were also cross listed on another exchange. Of a random selection of ten companies from New Zealand's Mid Cap List it was

found that only two were cross listed, indicating that only larger firms can afford to cross list.

Based on these motivations and evidence why do less than one in ten large companies in the US have a foreign listing, while in other developed markets the ratio is even lower, when it appears that many benefits exist for both the company and the investor? Doidge, Karolyi and Stulz (2004) found that foreign companies cross listed in the US had a Tobins q 16.5% higher than firms which were not cross listed. This results in cross listed companies having higher valuations, with the difference between cross listed and non listed companies being statistically significant even after controlling for firm and country characteristics.

A number of companies have chosen to cross list on a foreign market to try and stabilise their company returns due to the increased volatility of market returns and correlations during the last ten years. This has been demonstrated through five financial crises occurring within this period: Brazil, Argentina, Mexico, Russia and Asia.

Financial crises and extreme events are becoming more frequent, and cause major shocks through economies and stock markets. Financial crises normally arise from incompatible fiscal and monetary policies, weak financial institutions, fixed exchange regimes, high foreign debt, outflows of capital and loss of investor confidence.

Komulainen and Lukkarila (2003) examined the causes of thirty-one financial crises in emerging markets during the period of 1980 to 2001, through the use of twenty-

three macroeconomic factors. They found that the crises were mainly caused by traditional variables which were common across all the crises. These were high public debt, private sector liabilities, current account deficits, poor M2 to reserves ratios, foreign liabilities of banks, inflation, unemployment and overvaluation of real exchange rates. All of these factors existed within the financial crises which occurred within Russia and Argentina, and will be examined in this research.

Schwebach, Olienyk and Zumwalt (2002) found that low correlations exist between domestic and foreign securities, however at times of extreme events (especially after the Asian crisis), the correlations and volatility of the eleven foreign markets researched increased, causing diversification benefits to decrease. Meyer and Rose (2003) measured the effects of international diversification in the face of an extreme event (the Asian Crisis). They used a New Zealand-only unit trust as their base investment and added other global unit trusts to observe the impact on risk and return during the Asian Crisis. Over the six year holding period, it was found that the introduction of global investments reduced the shocks of the crisis compared to those experienced by a purely domestic option.

In view of the mixed results in regards to international diversification and cross listing, our current research considers the possibility that cross listed securities will provide greater diversification benefits in terms of risk and return in the face of extreme events over single listed securities. Due to the relationship which exists between the foreign and domestic markets, an investor can take advantage of the different market segmentation factors and gain arbitrage opportunities between the

two markets. This results in more stabilised returns and risks, especially in the face of extreme events.

Three extreme events will be researched in this paper; the Russian Ruble Crisis in 1998, the September 11 terrorist attacks in 2001 and the Argentine Financial Crisis in 2002. Below is a summary of the crises to give background on the main drivers behind them, and the effects they had on economies and stock markets.

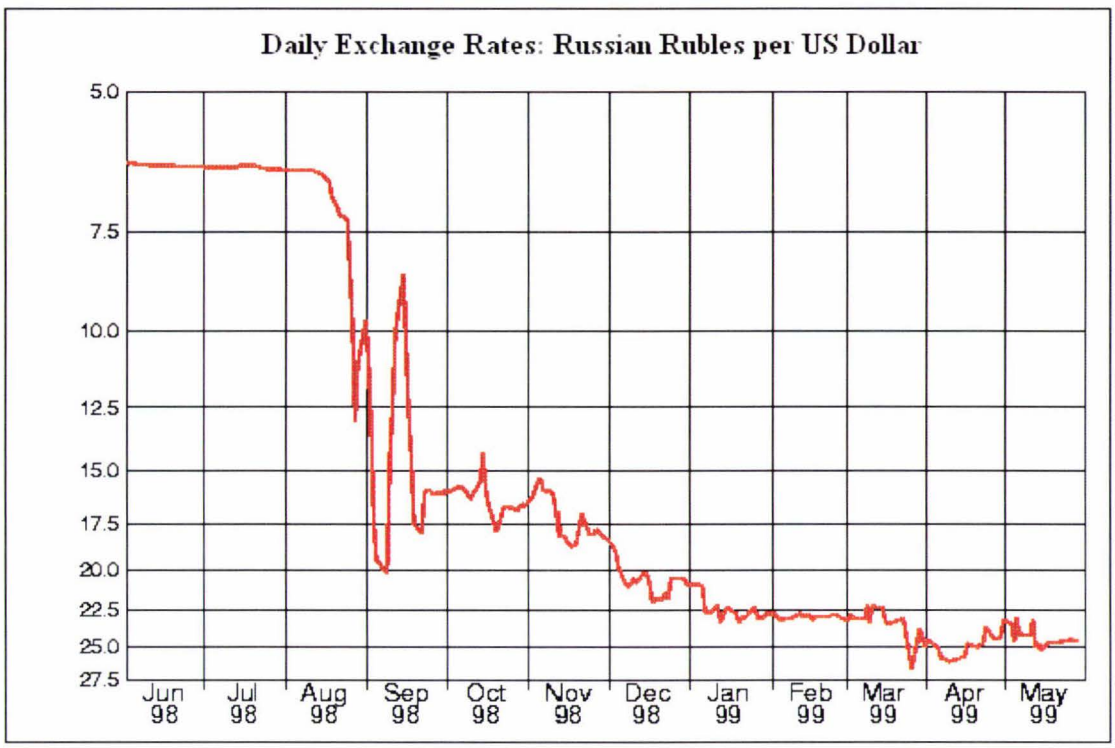
EXTREME EVENTS

Russian Ruble Crisis

The Russian economy was in disorder after the ruble was devalued on August 17, 1998.

Since 1996 the ruble was depreciated roughly at the same rate at which prices were rising within Russia. Inflation had been steadily climbing between 1996 and 1998, while at the same time the Russian ruble had been losing value. The Russian government decided that its efforts to control and maintain the value of the ruble were in vain. The bands in which the ruble moved needed to be expanded to allow for greater fluctuation. The bands were changed from 5.27-7.15 to 6.0-9.5 rubles per USD. The ruble was valued at 6.4 per USD on 14 August 1998 and on 17 August, when the bands were moved, the ruble started to fall dramatically. It was soon apparent that the lower band of 9.5 was too low, and the bands were removed on September 1, to allow the ruble to reflect its true value. On September 18 the ruble was 14.6 per USD, and at its lowest value; on September 9 1998; it fluctuated to 22.8 rubles per USD.

Figure 1: Daily exchange rates of Russian Ruble per US Dollar between June 1998 and June 1999



Sourced from University of British Columbia , Vancouver BC, Canada

The devaluation of the ruble was the first outward indication that the Russian economy was in trouble, but many other factors contributed to the downturn within the Russian economy.

One of the factors that caused an upset within the economy was a significant increase in inflation. Consumer prices rose 4.3% during each of the first seven months of 1997, rising again (by 15%) in the latter part of August, and again in September. In total prices rose over 40% for the year. The increase in inflation was partly due to the devaluation of the ruble and the fall in import prices. Imports account for about 50%

of retail sales in Russia and the devaluation in the ruble drove up import prices, which contributed to the increases in consumer prices.

The second cause was the loss of investor confidence; which had not fully recovered since the Asian Crisis in 1997; towards emerging markets and their stability. The concerns shown by investors regarding the economy, coupled with the deterioration of the Russian current account, attributed to significant outflows of cash from the economy.

In 1996 the country had a current account surplus of US$11.11 billion, which deteriorated to US$3.3 billion in 1997 due to the decrease in prices of Russia's key exports of gas and oil. The trade surplus also reduced due to the tightening economy, from US$23.1 billion to US$17.3 billion, in 1997. The trade and current accounts reduced in 1998, with the current account showing a deficit of US$1.5 billion after the first quarter of 1998.

With a weakening economy the stock market also reacted to a loss of investor confidence and the continual devaluation of the ruble, with the stock market falling over 60% between mid August and the end of 1998. The deterioration of the stock market had begun in 1997 after the Asian Crisis, but had started to show some recovery signs. By October 1998, however, stock prices had fallen by more than 82%, from their pre-Asian Crisis levels.

The many failed attempts to build infrastructure within the Russian economy by the government and financial sector were some of the main contributors to the collapse of

the Russian economy. In 1992 Russia had introduced the essential elements required to rebuild the economy, but failed to follow through with the structural changes essential to make these work. The government failed to provide the effective laws and regulations to battle tax evasion and the widespread corruption existing throughout the business and political sectors. The judiciary and the government were too weak and corrupt to enforce the existing laws, which resulted in weak points within the economy becoming overloaded. Government instability was the final straw that tipped the economy into a crisis in August 1997. President Boris Yeltsin fired Prime Minister Kirienko and ousted the government on 23 August. Yeltsin nominated Viktor Chermomyrdin to replace the Prime Minister, believing that Chermomyrdin would be the best person to turn the economy around. This appointment had to be approved by the Duma (parliament), which had already rejected Chermomyrdin twice. The system dictated that if they rejected him again the Duma would have to be re-elected. Instead of continuing with this government instability, President Yeltsin tried to save the economy by nominating Primakov, who was accepted by the Duma. This move proved to be ineffectual, however, as the financial crisis was by this time already well set in.

On 17 August the Russian government declared two important financial controls for the country, hoping they would help reshape the economy. Firstly, a rescheduling of the country's short term ruble debt. Holders of Russian treasury bills and short term bonds set to mature in 1998 and 1999 were given the opportunity to convert their securities into long term assets. The available options saw the holders suffering huge losses, however, as the new securities offered had to be held for a period of at least three years, were non-tradable and paid a below-market rate of interest. The

rescheduling was designed to relieve the government of servicing of short term foreign debt. The government in 1997 had encountered difficulty rolling over their short term debt, leading to a significant quantity of short term debt repayments falling due. Rescheduling would relieve debt and interest payments, freeing up government cash flow, with the purpose of helping urgent payments due for such things as wage arrears. Liquidity of the commercial banks became a concern, as the banks had to transfer their short term ruble debt into longer term securities. The Russian central bank lent cash to the other banks against some of their short term debt so they were able to pay debts to one another, stopping the collapse of the banking sector.

The second financial move undertaken by the government was a ninety day moratorium on payments by Russian banks and enterprises on their foreign exchange debt. This applied only to payments of the principal debt of their loans. The reasoning behind this was to provide some further relief to the commercial banks which were already struggling with their short term foreign debt. It was estimated that the banks had US$11 billion of short term forward contracts, with US$8 billion of it due on 30 June 1998 and the balance of US$3.4 billion due within the ninety day moratorium period.

After the ruble devaluation, the government sought many avenues to rescue their economy and currency. Over a ten month period there were three ruble crises. The first occurred in October 1997, the second in January 1998 and the third in May 1998. The first two were successfully resolved by the central bank. Russia required help, however, and came to an agreement with the IMF, the World Bank and Japan for assistance in May 1998, during the third ruble crisis. A package of US$22.6 billion

was agreed upon, and it was distributed throughout 1998 and 1999. The IMF quickly provided US$4.8 billion for urgent requirements. With the money given, Russia promised to put in place infrastructure to prevent a reoccurrence and defaults on foreign debt. (Russian Country Monitor Oct 1998;IMF Volume 27, 11,14,15)

September 11

September 11 2001 was a truly devastating event which has changed the Western World, especially in terms of the way business is conducted internationally. The US Patriot Act, implemented after September 11, stipulates that all foreign payments record all details of payer, payee and country of origin, and the act doesn't allow transfer of money from, or to, certain specific countries. This act has been implemented by most western countries; including New Zealand; with the purpose of stopping terrorists gaining access to large cash reserves and, thereby, helping to prevent another event like September 11 from happening.

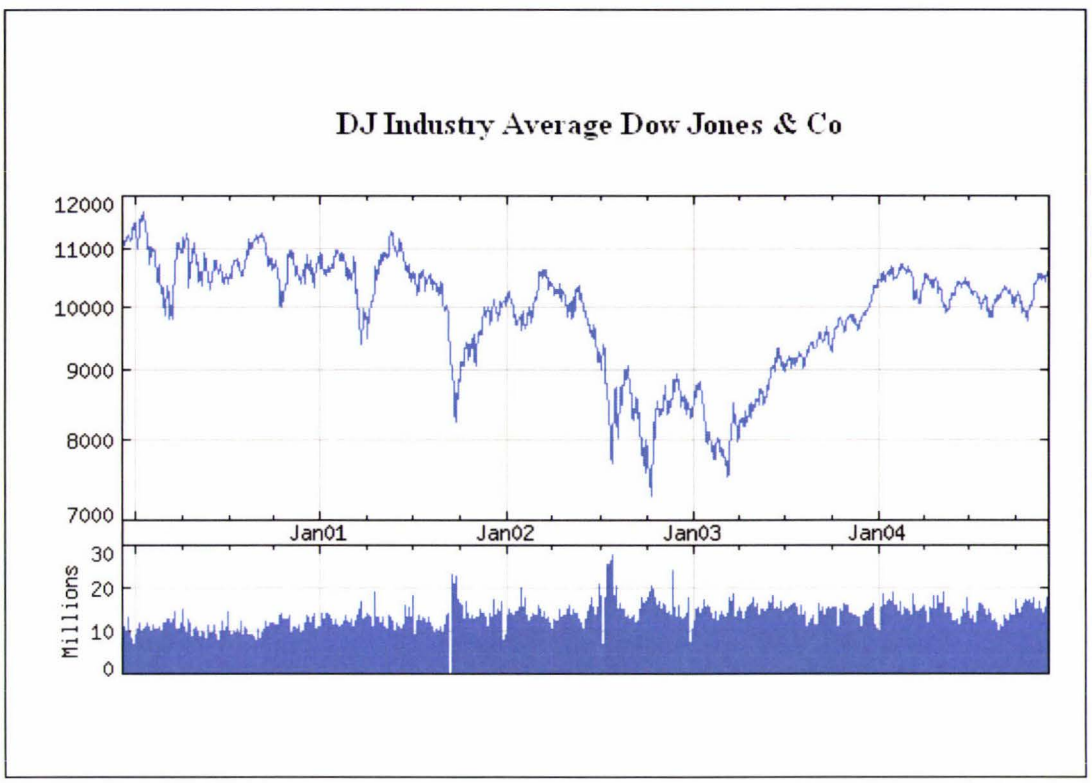
The effects of September 11 were not confined to the US economy, but have been felt all around the world. The four major effects of September 11 are centred on the following areas: financial markets; world trade; unemployment; and interest rates.

With the integration of markets, there is a greater dependence of them on one another, increasing the reaction of world stock markets to extreme events. Financial markets reacted within in a matter of hours to the event of September 11, due to the ease and speed of information. The recovery times of markets reflect the effects that September 11 had on stock markets around the world. Financial markets around the world took between two and one-hundred days for their share indices to return to pre-

September 11 levels. Helsinki was the fastest at two days, with New Zealand in the midrange taking thirty-three days, and Saudi Arabia the slowest at one-hundred days to recover, which shows the full effects that extreme events have on markets and economies around the world. Bruck (2002) suggested that stock markets recover more quickly from extreme events in today's environment than in the past, due to the integration of markets, and the level of technology used. It took the Dow Jones forty days from September 11 for their share index to return to its level pre-September 11, which was longer than for twenty countries outside the US. Figure 2 depicts the fall in value of the Dow Jones after September 11; from 10,000 to 8,200 in a short period of time. Compared to other extreme events, the Dow Jones recovered quickly. The Dow Jones took 232 days to recover from the attack on Pearl Harbour in 1941, 321 days to fully recover from the 1987 stock market crash and 134 days to recover from the US invasion of Kuwait in 1990.

Overall, Bruck (2002) found that companies after September 11 found it harder to issue stock and debt, and stocks sold at lower prices, with riskier stock requiring higher premiums.

Figure 2- Dow Jones Industry Average for the period between December 2000 and December 2004.



Sourced from: http://finance.yahoo.com/

Secondly, world trade was severely affected by September 11. Higher transaction costs were imposed on world trade due to the attacks of this new, global terrorism. World Trade was affected by heightened security measures, collapse of businesses and reduction in world trade volumes. In a simulation undertaken at a DIW conference held in Berlin, it was found that, on average, an increase of 1% in transaction costs of the total value of goods is believed to represent the effect of September 11 (Bruck,2002). An increase in transaction costs of 1% reduces international trade by circa 3%. Some industries, such as agricultural products, textiles and machinery, were the most severely affected by the increases in transactions costs, due to the ratio of value to weight. The impact of transaction costs was felt by many

countries, welfare losses ranged from US$31.16 billion in Western Europe to US$0.74 billion in Sub Saharan Africa (Bruck, 2002).

Another factor which affected the US economy was the increase in the unemployment rate. In October 2001 private payrolls had fallen by 439,000 jobs, which was one of the largest declines in fifteen years, and the unemployment rate increased to 5.4%, from 4.9% in early September 2001. This was caused by a downturn in the economy and the collapse of many businesses (FSBR Cleveland 2001).

The final major effect on the US economy was the decrease in interest rates. The Federal Reserve lowered the short term interest rate twice, first on September 17 and the second time on October 2, by a total of 100 points, to 2.5%. As at December 2001, the interest rate had fallen another 50 points to 2.0%, which is significantly lower than the 6.5% interest rate of January 2001. This was designed to allow the struggling economy to try and boost investor confidence; however it had little impact on the economy, which entered a recession in 2002. With one of the major economies in the world struggling, many countries with close connections were also strongly impacted by this event.

The Federal Reserve managed to soften the severity of the attacks on the economy. In the first few days after the attacks, they injected massive amounts of money (totalling over US$100 billion a day) into the financial markets to improve their liquidity. This was achieved through discount window loans and open market operations.

The Federal Reserve helped foreign banks by providing swap lines, suspending fees and penalties and lending money un-collateralised to help with the liquidity of the companies that had been hit hard by September 11. Three other fiscal policies were introduced to help the US economy after September 11. These consisted of tax reductions, the emergency spending bill (which was passed after the attacks) and the fiscal stimulus bill. These three moves were anticipated to inject circa US$160 billion into the economy during 2002.

Argentine Crisis

Over the last fifty years Argentina's volatile economy can be attributed to governments and leaders following a number of different policies and ideas to try and stimulate the economy. With ever-changing leadership, power was limited and never fully allowed the economy to recover from one government to the next. In the early 1990s the country was suffering from hyperinflation, with the government financing its budget deficits by issuing new currency through the central bank. The country suffered falling GDP of 1.3% per year throughout the 1980s, with inflation reaching 5000% per year and the government abandoning all policies and attempts to try and control the Argentine economy.

Table 1- Real GDP and Consumer Prices: Argentina 1994 - 2002

Real GDP and Consumer Prices: Argentina 1994 - 2002		
Year	*Real GDP (annual % change)*	*Consumer Prices (annual % change)*
1994	5.8	4.2
1995	-2.8	3.4
1996	5.5	0.2
1997	8.1	0.5
1998	3.8	0.9
1999	-3.4	-1.2
2000	-0.8	-0.9
2001	-3.7	-1.1
2002	-10 to -15	+25 to +30

Sourced from IMF World Economic Outlook (April 2002)

As shown in Table 1, the problems began in 1999 with negative GDP and a decrease in Consumer Prices. There were especially large movements forecast in 2002, which was when the country defaulted on large amounts of foreign debt, as well as a significant outflow of cash over the four year period from 1999 to 2002.

In 1991 President Carlos Menem thought it imperative to try and control inflation and achieve growth and stability within the economy. To this end he introduced a new convertibility plan, which was initiated in April of 1991 and had of four main aims. First, all monetary policies considered were based on eliminating inflation to restore business confidence. Second, to reduce budget deficits, the central bank was

prevented from printing new money. This resulted in price stability. Third, there was a deregulation of markets, an opening up the country to overseas investors and attempts to make the economy attractive for trade and privatisation in order to stimulate growth. The growth rate had been stagnant at 0% for a period of time. Finally, the central bank was made independent and a framework was created to regulate sectors, and grow their investment attractiveness by giving independent power to the Securities and Exchange Commission.

The Convertibility Plan resulted in the Peso being pegged one to one to the US dollar to stop inflation. This was enacted because during the period of hyperinflation, the majority of prices had been denominated in US dollars. As a result of the convertibility plan, the central bank was required to maintain cash reserves equal to 100% of the monetary base, the reserves being used to maintain the exchange rate at 1:1. The central bank acted like a currency board and was responsible for maintaining the exchange rate. Strict laws were placed on the central bank as to the level they financed their treasury bonds to. Argentina maintained its bank deposits in dollars, but the new law allowed for deposits to be exchanged into other currencies.

The Convertibility Plan quickly showed phenomenal results. Prices stabilised and inflation dropped rapidly to the point where it was down to a single digit by the mid 1990s. The growth rate increased to around 9% between 1991 and 1994, with a rate of 6% being maintained in 1995 after the Mexican Financial Crisis. The convertibility plan created capital inflow and, with lower entry barriers, international trade exports grew significantly. This growth in exports was one of the main drivers behind the growth experienced within the economy. A dual financial system rose from investors

being able to choose the currency in which their deposits were held. This expanded the financial sector as the majority of Argentineans decided to hold their deposits in US dollars rather than Argentine pesos. With privatisation the government generated US$16 billion in revenue over the seven years to 1998, allowing the government to grow the economy and lower the budget deficit.

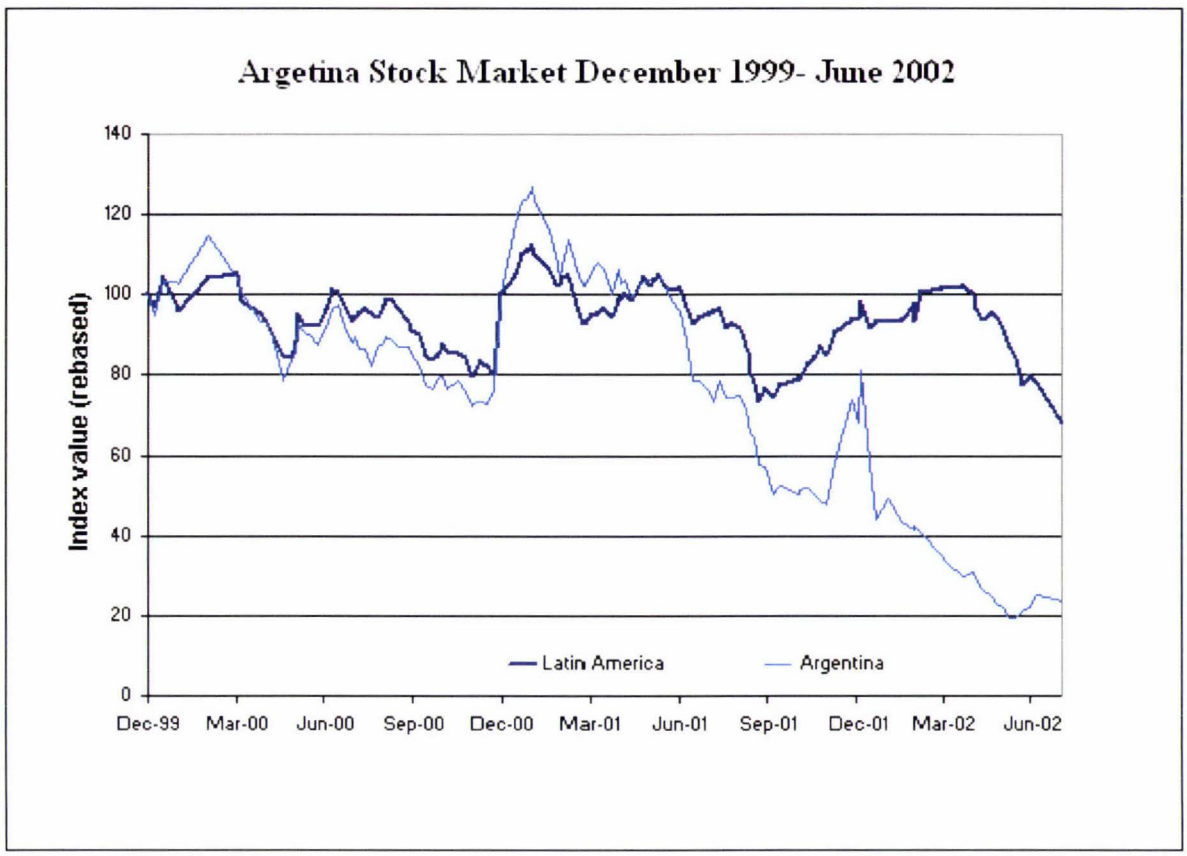
The convertibility plan restored economic stability for a number of years, but was not a long term solution. Argentina entered a recession in 1998, which lasted for four years as unemployment and poverty increased uncontrollably. The country ended up with major problems caused by a currency regime that was not linked to the economic state of the country. Pegging the peso one to one to the USD did not take into account the country's fiscal state or inflation rate.

Fixing the exchange rate to the USD solved many of Argentina's short term problems, but no measures were implemented for the long term. If Argentina had the majority of its international trade with the US it would have made sense to fix the peso 1 to 1 with the USD. Since the US only accounted for 12% of Argentina's exports, the exchange rate regime was not appropriate for Argentina's major trading partners. Argentina had the majority of its export trade with Brazil and Europe, which meant that there was more sense in pegging the peso to a basket of currencies with these major trading partners. As the peso become overvalued, Argentina was running with a trade deficit. The deficits were funded by foreign borrowings. The more the peso devalued, the harder Argentina found it to repay their foreign obligations. Argentina had a large quantity of imports, and comparatively few exports, so was not able to generate sufficient export revenue to cover the interest payments on its foreign borrowings.

Consequently, Argentina increased foreign borrowings to meet their current obligations, causing foreign debt to increase further. The government imposed tariffs to discourage imports, which had increased significantly as prices had stabilised and the demand for overseas consumer goods had grown. The convertibility plan only allowed the government to finance its deficits by two means: borrowing or increasing tax; with neither option seen as very appropriate, due to the state of the economy. Argentina decided to borrow, as the population could not support tax increases. The borrowings reached 50% of GDP in 2001.

The stock market also showed the effects of the declining economy. The stock market fluctuated and began to lose value from December 2000, with a significant decline in value in January 2000, as shown in Figure 3. The convertibility plan was abandoned in January 2002 and the Peso was devalued by 40%.

Figure 3-Latin America and Argentine Stock Indices for December 1999 to June 2002



Sourced from Latin Focus 2002

Besides the internal issues faced by Argentina, external factors were taking their toll on the economy. After the Asian and Russian crises in the late 1990s, significant increases in interest rates were imposed because investors had become more risk averse in relation to emerging markets and had withdrawn large proportions of their money from such markets. Financial institutions were also fearful of emerging markets such as Argentina and imposed higher interest rates to compensate for their perceived risk. This made it even more difficult for Argentina to repay its foreign debt. As new interest rates rose, the country went deeper into recession. At the end of 2001, Argentina's debt was 130% of its GDP.

The 1999 Brazilian Crisis severely affected Argentina, as Brazil was its main trading partner and accounted for 30% of its export market. Europe was Argentina's second largest trading partner. At the same time that the peso was devaluing, the Euro and Yen were appreciating, placing further strains on Argentina's export revenues. All of these external and internal factors led to Argentina defaulting on its foreign debt of US$141 billion in December 2001.

Argentina had been aware that the peso was overvalued, but feared that if it was devalued then the economy would return to a state of high inflation and low, or no, growth. Individuals, business and the government were holding USD dominated debt. Devaluation of the peso would have caused the financial/banking sector to collapse. Argentina hoped that the USD would depreciate, as the US had large trade deficits and any improvement in the peso may have helped the exposure Argentina had to the affects of the USD.

In January 2002, after Argentina had defaulted on its US$28 million payment in December, the convertibility plan was abandoned, and the peso was devalued by 40%. All dollar deposits and debts were converted at this rate into peso, causing the financial sector of Argentina to collapse. As the peso had the ability to float, the economic state of the country also affected the exchange rate. In 2003, after many discussions with the IMF, a rescue package was agreed upon once the Argentine economy started to show some signs of recovery. The world markets had little ability to cope with another financial crisis after the Asia, Russia and Brazilian crises, all suffered in the past five years. (IMF Report, 1999), (Maniam, Leavel & Patel, 2004)

MARKET CAPITALISATION OF MARKETS INCLUDED

In this research five markets are studied; Australia, Japan, New Zealand (NZ), South Africa (SA) and the United Kingdom (UK). Within the larger economies, more than one stock market is in existence. The stock markets chosen for this research are; the Australian Stock Exchange, the New Zealand Stock Exchange, the Johannesburg Stock Exchange for South Africa, the London Stock Exchange for the UK and the Tokyo Stock Exchange for Japan. Data has been sourced from World Federation of Exchanges

The Australian and New Zealand markets were chosen for the study due to their close relationship with one another. With NZ being a small market in comparison to other developed markets, we want to determine whether it exhibits similar, or different, behaviour to the larger markets of the UK and Japan; which are among the most common markets that companies chose to cross list on. The inclusion of the UK and Japanese markets in this study is imperative to determine whether cross listing provides any benefits to investors. South Africa was chosen as it is a market that has strong ties with other African countries. Other studies do not often include African stock markets due to their size and volatility. No US markets were added as the majority of studies conducted are from the perspective of the US investor, whereas this study is from the perspective of the NZ investor. It is difficult to establish the true effect of an extreme event on a US market as they are affected by many factors and, therefore, it is difficult to measure the effect of one event/factor in time. Background information about the markets being studied has been given to provide some history, to show market segmentation factors, the importance of these markets to the economies involved and the possible effects these markets will have on the results.

Differing levels of market segmentation lead to different market structures which, in turn, affect market behaviour and relationships between markets. This is especially so in times of extreme events. It is for this purpose that we study the behaviour and structure of these markets to determine whether market factors; including political, economic, social and technological change; have influenced the markets over the time periods being researched.

Table 2-Total Number of Companies with Shares Listed (Domestic and Foreign)

	1990	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*
Total Number of Companies													
Australia	1136	1005	1073	1107	1185	1178	1190	1219	1222	1287	1406	1410	1421
Japan	1752	1764	1768	1775	1782	1791	1833	1865	1890	1935	2096	2141	2153
NZ	245	196	167	180	187	175	170	180	182	189	203	195	199
SA	769	728	671	631	624	638	626	642	669	658	606	532	451
UK	2559	2572	2440	2412	2416	2502	2623	2513	2423	2274	2374	2332	2272

Australia and Japan were the only markets of the five being studied that saw an increase in the total number of shares listed over the thirteen year period. The other three markets decreased in size, with no set pattern of behaviour.

South Africa recorded the largest change with a reduction of 41% in the number of companies listed, followed by Australia with an increase of 25%, Japan with an increase of 23%, and NZ and the UK followed with decreases of 19% and 11%, respectively.

Australia

Over the period between 1990 and 1996 the market stayed fairly constant in terms of the number of companies listed, with a high recorded of 1190 in 1996 and a low of

1005 in 1991. From 1997, the Australia market saw steady growth of 16.5% over the five years to 2002. A growing Australian economy and its importance in global terms as regards exports, imports and currency growth were the main contributing factors to the increase in the number of companies listed.

Japan

The Japanese stock market grew steadily over the thirteen years studied, which is a reflection of the growth of the economy and the increased interaction of Japan with the Western World. Japan has built strong relationships within the computer electronics and car manufacturing industries because of their leading technology capabilities. The majority of Japanese firms cross listed were on the London Stock Exchange, with the second most popular market to cross list on being the US.

New Zealand

The New Zealand market steadily decreased over the last six years, which is attributable mainly to the privatisation of the economy that occurred in the late 1980s and early 1990s. New Zealand had its highest level of companies listed in 1990, at 245, at which time the NZ economy was very strong and consumer confidence was high. Over time, however, as the economy has tightened and growth has slowed; only the larger companies within NZ's small economy are now listed on the NZ Stock Exchange. (Kerr, Qiu & Rose, 2005)

South Africa

South Africa showed similar results to the NZ market, with the total number of companies listed decreasing over the study period. The number of companies listed

decreased in the 1990s due to the increased popularity of mergers and acquisitions. A high percentage of companies listed on the Johannesburg stock exchange are involved with gold mining, resulting in the market closely following the gold cycle.

United Kingdom

This market had the highest number of companies in 1996 with 2623, and the lowest in 2002 of 2272. Over this period the market fluctuated with no great changes. The number of companies listed has decreased, due to the growing importance of the European markets.

Table 3- Market Capitalisation of Shares of Domestic Companies (US$000,000)

Market	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*
Australia	107936	142404	133555	202014	216826	243475	311865	295766	328854	427655	372794	375598	380087
Japan	2908534	3117297	2318929	2906299	3592194	3545307	3011161	2160545	2439549	4463298	3157222	2264528	2069299
NZ	8824	14285	14680	24595	27118	31950	36879	29889	24458	27827	18490	17737	21715
SA	136869	167958	148675	215883	240026	277109	239579	211599	150670	180463	131321	84344	116544
UK	850012	986107	928393	1150557	1145290	1346641	1642582	1996225	2372738	2855351	2612230	2164716	1800658

In terms of market capitalisation, Australia, NZ and the UK have seen phenomenal increases in the values of their domestic share markets. In comparison, the Japanese and South African share markets have decreased in value between 1990 to the end of 2002.

The Australian market has steadily increased in value over the thirteen year period, with growth of 19.4% pa. Market capitalisation saw a dramatic increase as a result of privatisation, which occurred in most Commonwealth countries, such as Australia, NZ and the UK. Market capitalisation stabilised over the last three years of the study period, balancing out at around the high US$300,000s.

Japanese market capitalisation was volatile over this period. No set pattern is evident in the results, except that there was a significant reduction in 1997. This can be attributed to the Asian crisis, where Asian companies saw an average reduction of 20% in their share value. The market made a strong comeback in 1998, but by 2002 the market was half of the 1998 value.

The New Zealand share market saw an increase in value in the early 1990s due to privatisation. The main driver behind this growth was the privatisation of Telecom in 1991. The NZ economy was severely affected by the Asian crisis, through reductions in trade, tourism and foreign investment.

The value of the NZ share market is 1/95th the size of the Japanese market, and 1/83rd that of the UK market. Due to its comparatively small size the effects of world events will have a greater influence on markets such as NZ than on the larger markets.

Smaller economies have less liquidity, market depth and market breadth, as well as a smaller volume to absorb such effects. As a result, these markets take longer to recover.

The South African market, unlike the other markets, remained fairly stable over the thirteen year period. Movements noted were marginally smaller than those seen in the other markets. The value of the market at the end of 2002 was US$116,544, compared to US$136,869 in 1990, showing a decrease in value of 15%. As the number of companies listed has decreased, however, the value of each security has actually increased.

The UK showed stable growth over the nine years to the end of 1999 ($2,855,351), driven by privatisation of state-owned assets. Since 2000 market capitalisation reduced dramatically, however, it must be remembered that the market still doubled its value over the thirteen year period.

Table 4-Total Value of Share Trading (US$000,000)

Market	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*
Australia	40186	46697	45577	67792	94909	98310	146236	168999	161001	198195	226484	244463	295399
Japan	1287694	822934	476977	792977	859896	884000	938822	896055	750825	1675641	2315502	1659909	1564244
NZ	2072	3107	3276	6802	7188	8719	10139	10725	14274	13687	12315	9933	8878
SA	10469	8703	7754	10363	17631	17425	26998	44696	61837	86838	77446	69278	78392
UK	543392	553922	662991	865907	1029278	1153221	1413236	1878489	2887990	3399381	4558663	4520183	4001340

The share market has become a popular investment tool over the last ten years, which is demonstrated through the increase in the total value of share trading.

To formulate an average share price per company, the following formula was used:

Total value of shares traded / Number of companies listed

Table 5-Comparison of Average Share Price in 1990 and 2000

Market	*1990 Average Share Price*	*2000 Average Share Price*	*+/- Change*
Australia	35.38	207.88	488%
Japan	754.99	726.54	-3.80%
NZ	8.46	44.61	428%
SA	13.61	173.82	1177%
UK	212.35	1,761.15	729%

With the exception of the Japanese market; which decreased slightly in value; all of the markets saw a significant increase in the average share price.

Definitions for financial terms, refer below .[1]

[1] **Price Earnings Ratio, Return Indicators and the Inflation Rate**
Definitions:
The Price-Earnings Ratio is the ratio of price to earnings per share (market).
Price-earnings ratio
This measure shows the multiple of the earnings at which a stock sells. This is determined by dividing the current stock price by the current earnings per share (adjusted for stock splits). Earnings per share, for the P/E ratio, are determined by dividing earnings for the past twelve months by the number of common shares outstanding. A higher multiple means investors have higher expectations for future growth and have, therefore, bid up the stock's price.
Dividend yield (Stocks)
The indicated yield represents annual dividends divided by the current stock price.
Inflation
The rate at which the general level of prices for goods and services is rising

Table 6-Australian Price Earnings, Returns Indicators and Inflation Rate

	Price Earnings Ratio	*Gross Dividend Yield*	*Inflation Rate*	*Stock Performance*	*Total Return*
1996	17.7	3.6	1.5	10.1	13.7
1997	19.5	3.8	-0.2	7.5	11.7
1998	20.8	3.5	1.6	7.5	11
1999	21.1	3.2	1.8	12.1	15.3
2000	N/a	3.4	5.8	0.1	3.5
2001	25.4	3.3	3.12	6.5	9.8
2002	37	4.1	3	-11.4	-7.3

The price earnings ratio (P/E ratio) for the Australian market demonstrated the increased and improved liquidity of the market. The Australian stock market returned a positive return every year except 2002. This was a world wide problem, as the US was in a recession and many economies were struggling to return to pre-September 11 trading levels. Overall the average stock performance during this period was 4.63%.

Table 7- Japanese Price Earnings Ratio, Return Indicators and Inflation Rate

	Price Earnings Ratio	*Gross Dividend Yield*	*Inflation Rate*	*Stock Performance*	*Total Return*
1996	79.3	0.8	0.3	-6.80	-6.0
1997	37.6	1.0	2.29	-20.10	-19.1
1998	103.1	1.2	0.6	-7.50	-6.30
1999	-	0.9	-1.1	58.40	59.3
2000	85.5	1.0	-0.7	-25.50	-24.5
2001	61.4	1.3	-0.7	-19.6	-18.30
2002	-	1.4	-0.9	-18.3	-18.9

The figures for the Japanese stock market reveals that the companies listed on it have significantly higher earnings per share than those listed on the Australian market. The gross dividend yield has remained stable at a low dividend payout of circa 1% of the stock price, where the average on other markets is 4%. The stock market is the opposite of other markets, having only one positive return in 1999 of 59.3%, and otherwise negative returns occurred.

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Table 8- New Zealand's Price Earnings Ratio, Return Indicators and Inflation Rate

	Price Earnings Ratio	*Gross Dividend Yield*	*Inflation Rate*	*Stock Performance*	*Total Return*
1996	14.8	4.3	2.6	19.90	19.90
1997	15.3	4.7	0.8	2.90	2.90
1998	37.6	4.0	0.4	-3.30	-3.30
1999	16.2	3.8	0.5	17.0	17.0
2000	15.0	3.8	4.0	-9.10	-9.10
2001	13.13	4.62	1.81	16.70	16.70
2002	18.4	6.0	2.7	4.2	4.2

The New Zealand stock market reveals that over the seven year period a fairly constant P/E ratio existed; except in 1998 when the market had a P/E ratio almost double the other years of 37.6. This indicates that NZ companies have had strong revenue growth relative to their sale price. The NZ market, like other stock markets, had a gross dividend yield of circa 4.0%. On average, companies paid dividends of 6% relative to their share price in 2002.

Inflation in NZ is a lot more stable than in some of the other countries in the study, with the NZ government trying to keep inflation within a band of between 2 to 3%. The stock performance demonstrates that, unlike other markets, these changing returns move to a lesser extent than the larger markets. On average, the NZ stock market had a stock performance of 6.9%.

Table 9 –South Africa's Price Earnings Ratio, Return Indicators and Inflation Rate

	Price Earnings Ratio	*Gross Dividend Yield*	*Inflation Rate*	*Stock Performance*	*Total Return*
1996	18.7	2.5	9.2	8.90	9.4
1997	16.8	2.7	6.1	-6.80	-4.1
1998	19.4	3.3	9.0	-12.40	-9.1
1999	16.9	2.0	10.0	57.30	59.3
2000	13.5	2.6	14.8	-2.50	0.1
2001	13.29	2.87	6.62	25.40	28.27
2002	12.6	4.0	12.4	-11.2	-7.2

The South African stock market shows a relatively stable earnings to share price ratio, with a range between 12.6 and 19.4, and an average over the period of 15.88. The gross dividend, like the P/E ratio, has remained fairly constant at 2.5, with an increase to 4.0 in 2002. Stock performance has fluctuated between positive and negative returns over the period, caused by the market closely following the gold cycle.

Table 10 –The United Kingdom's Price Earnings Ratio, Return Indicators and Inflation Rate

	Price Earnings Ratio	*Gross Dividend Yield*	*Inflation Rate*	*Stock Performance*	*Total Return*
1996	16.2	3.8	2.5	11.50	15.4
1997	19.2	3.2	3.6	24.7	27.9
1998	23.3	2.8	1.8	14.50	17.30
1999	30.5	2.0	1.6	17.80	19.80
2000	23.3	2.2	2.9	-8.0	-5.8
2001	20.29	2.59	1.96	-15.40	-12.81
2002	17.7	3.6	2.8	-25.0	-21.5

The P/E ratio for the UK market shows a similar pattern to those of the other markets. Except for in 1999 (which had a high P/E ratio of 30.5), there is a comparatively stable ratio over the period. The stock performance of the market reveals good returns for the first four years, of between 11.5% and 24.7%, however, over the last three years of the study the stock market has not performed well and has produced negative returns.

Table 11-Stock Markets Importance in the National Economy (US$000,000)

	1995			*1996*			*1997*			*1998*			*1999*			*2000*			*2001*		
	GDP	*MV*	*%*	*GDP*	*MV*	*%*	*GDP*	*MV*	*%*	*GDP*	*MV*	*%*	*GDP*	*MV*	*%*	*GDP*	*MV*	*%*	*GDP*	*MV*	*%*
Australia	348.8	244.3	70.1	393	312	79	395	296	75	379	329	87	394	428	109	382	373	98	358	376	105
Japan	4394	3667	83.5	4600	3106	68	4193	2217	53	3798	2496	66	4349	4555	105	4749	3194	67	4141	2294	55
NZ	52.8	31.9	60.5	N/a	36.9		65.9	29.9	45	65.1	29.9	46	53.1	29.9	56	50.6	18.2	36	50.5	17.7	35
SA	132.9	258.6	195	126	240	190	129	212	164	N/a	N/a	N/a	131	181	138	15.9	131	104	113	84.3	75
UK	1107	1347	12.4	1151	1643	143	1288	1996	155	N/a	N/a	N/a	1440	2855	198	1418	2612	184	1423	2165	152

Gross Domestic Product (GDP) is the market value of all final goods and services produced within a country during a given time period. The higher the percentage of stock market value to GDP, the more importance the share market has for GDP, and the more influence it has within the economy. The Australian stock market had an increasing importance for GDP, as indicated by the increasing percentage.

The Japanese market had varying importance within the economy, with the percentage ranging from 53% in 1997, to a high of 105% in 1999. It is expected that the share market in Japan was of low importance to the economy in 1997, as this was the beginning of the Asian crisis and the stock markets in all Asian countries suffered. Likewise, 1999 was a year when the stock market was important, as foreign investment started to flow back into the stock market and economy.

The New Zealand stock market had the least importance on the economy of the five markets researched. This is mainly due to NZ being an exporting country which derives the majority of its income from this. The stock market, therefore, plays a less important role within the economy and makes a smaller contribution towards GDP.

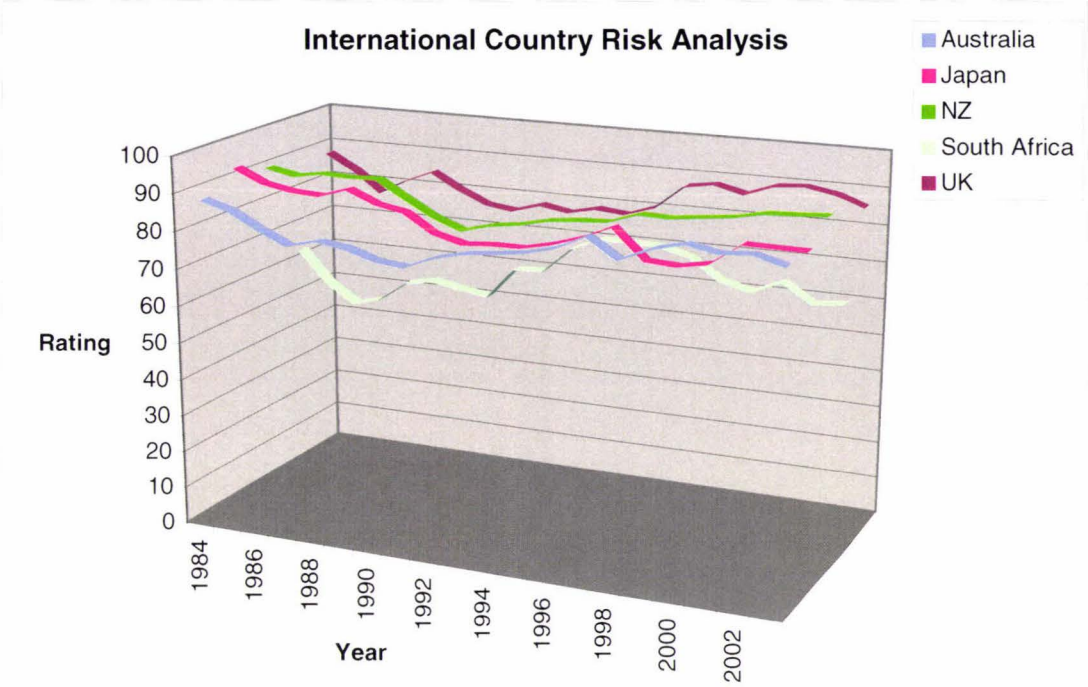
The South African stock market is very important within the South African economy, as demonstrated by the high percentage of stock market value to GDP, but has been steadily diminishing over the past two years.

The UK market produced similar results to those in South Africa, highlighting the importance of the stock market on its economy and GDP. The UK stock market is one of the largest in the world and affects a large portion of businesses and investors

within the economy. This means that the economy is heavily reliant on the stock market performing favourably.

International Country Risk

Figure 4 – International Country Risk Ratings



Sourced from THE PRS Group INC

This analysis of country risk and market segmentation used the following factors that could potentially affect market behaviour:Government Stability, Socio-economic Conditions, Investment Profile, Internal Conflict, External Conflict, Corruption, Military in Politics, Religion in Politics, Law & order, Ethnic Tensions, Democratic Accountability and Bureaucracy Quality.

Each country was given a rating out of 100, with 100 being the highest. The first five factors were given weightings of 12 as they are more influential on risk than other factors. The following six factors were given a rating of 6 and Bureaucracy Quality with a weighting of 4.

Table 12 shows country rankings from 1984 to 2003 in 12 month intervals. In 1984, Japan was the most stable country in terms of risk with a rating of 92.75. The three commonwealth economies of NZ, Australian, and UK closely followed with ratings between 87.5-89.67. South Africa was the least unstable economy with a rating of 63. This pattern continues over the 20-year period with all economies averaging above 82.5 except South Africa attaining an average rating of 63.64. The commonwealth and Japanese economies have stabilised over the last five years. With key factors; Government Stability, Socioeconomic Conditions and Investment Profile averaging a rating of 10 out of 12. There was an unstable period in late 1980's early 1990's caused by monetary and economic policy changes and privatisation within the commonwealth economies. The South African economy has been unstable over the whole 20 year period with its lowest rating of 49.33 in 1986. The South African economy has always been plagued with government instability, racial and religion tensions, corruption, unstable socio-economic conditions and conflict in many areas. The economy improved in the early 90's but has started a gradual decline in the past 5 years, as other economies have been improving. All of the problems faced within South Africa are inter related and as a whole affect the risk stability of the economy as demonstrated in the country's rating.

It is believed that market segmentation factors for the commonwealth and Japanese economies will not affect the results in this research as they are relatively stable, as shown with their ratings. However market segmentation factors in the South African economy may have a negative effect on the results. This can be attributed to the instability of the economy, making it harder for companies to achieve positive returns, therefore deterring companies from cross listing in this type of environment.

Table 12 – International Country Risk Ratings for Period 1984-2003

	1984	*1985*	*1986*	*1987*	*1988*	*1989*	*1990*	*1991*	*1992*	*1993*
Australia	87.500	85.167	81.167	77.583	79.667	78.583	76.250	75.417	78.667	80.583
Japan	92.750	89.167	87.833	87.417	89.833	86.667	85.333	80.583	78.500	79.167
NZ	89.667	88.083	89.333	89.000	89.333	84.833	80.667	77.750	79.750	80.917
SA	63.000	54.583	49.333	51.417	57.000	58.417	56.917	55.833	64.250	64.750
UK	87.750	83.417	77.750	81.833	84.917	80.667	77.333	76.333	78.583	77.333
	1994	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*
Australia	81.333	82.500	84.583	88.250	83.333	86.917	88.833	87.333	88.042	85.917
Japan	79.250	81.000	83.500	87.042	79.167	78.667	80.167	85.917	85.792	85.667
NZ	82.667	83.500	83.917	86.667	86.500	87.417	88.333	89.958	90.333	90.917
SA	71.667	75.000	74.917	74.667	72.417	67.083	65.083	68.458	63.583	64.458
UK	79.083	78.250	81.000	87.500	88.667	86.750	89.667	90.292	88.833	86.167

Price Stabilisation

As demonstrated in the graphs of average share price for a country's domestic portfolio to the equivalent cross listed portfolio, domestic share prices are relatively more stable except in the Australian market. The Australian domestic and cross listed portfolio share prices were as volatile as one another, showing that t market factors of affect all shares, and international diversification does not appear to provide any benefits in the period researched.

Another observation is that the average cross listed share price was at least double the average share price for the domestic portfolio, with the Australian market being an exception. This is expected as generally only larger international companies have resources and cash flow to benefit from cross listing. In regards to the Australian market, the average Australian cross listed share price was equivalent to the Australian domestic share price. On closer inspection the average share price was between $2-3 NZD, indicating that cross listed securities are not necessarily the largest companies as they would have higher market valuations resulting in higher share prices.

An investor would expect higher returns with increased price volatility as demonstrated by the cross listed securities, on the flip side, greater opportunities exist for informed traders with greater price movement therefore they are able to trade on private information and realise higher returns.

Figure 5 –Price Volatility of Australian Share Prices versus Australian Cross Listed Share Prices

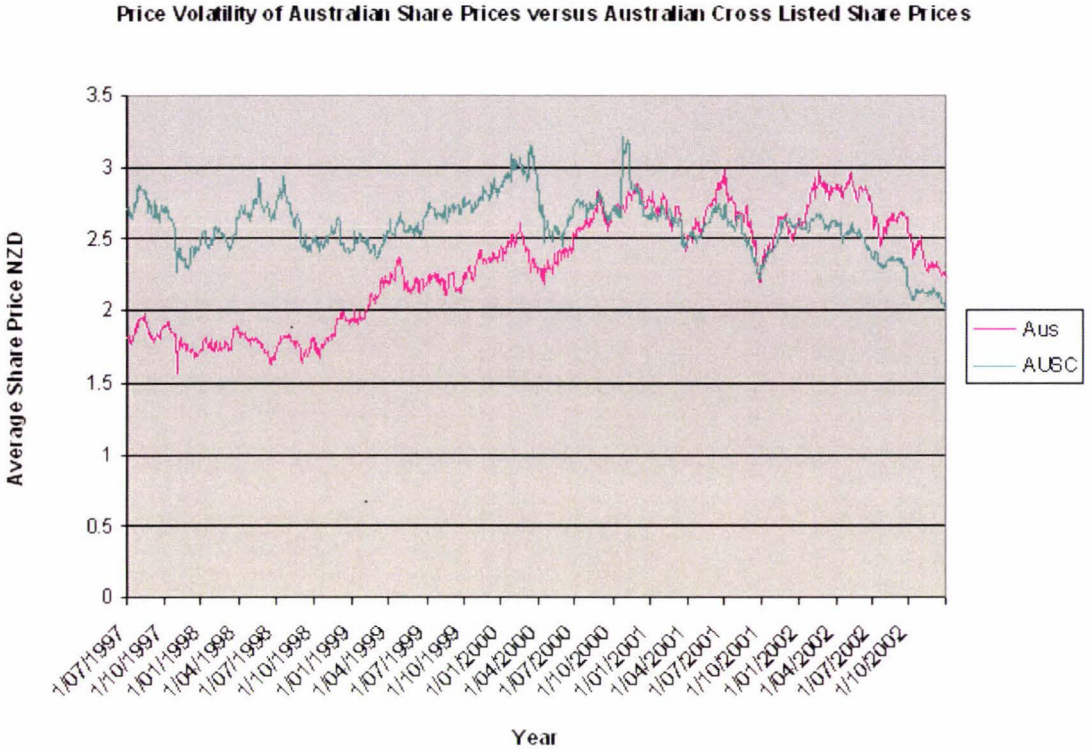


Figure 6 - Price Volatility of Japanese Share Prices versus Japanese Cross Listed Share Prices

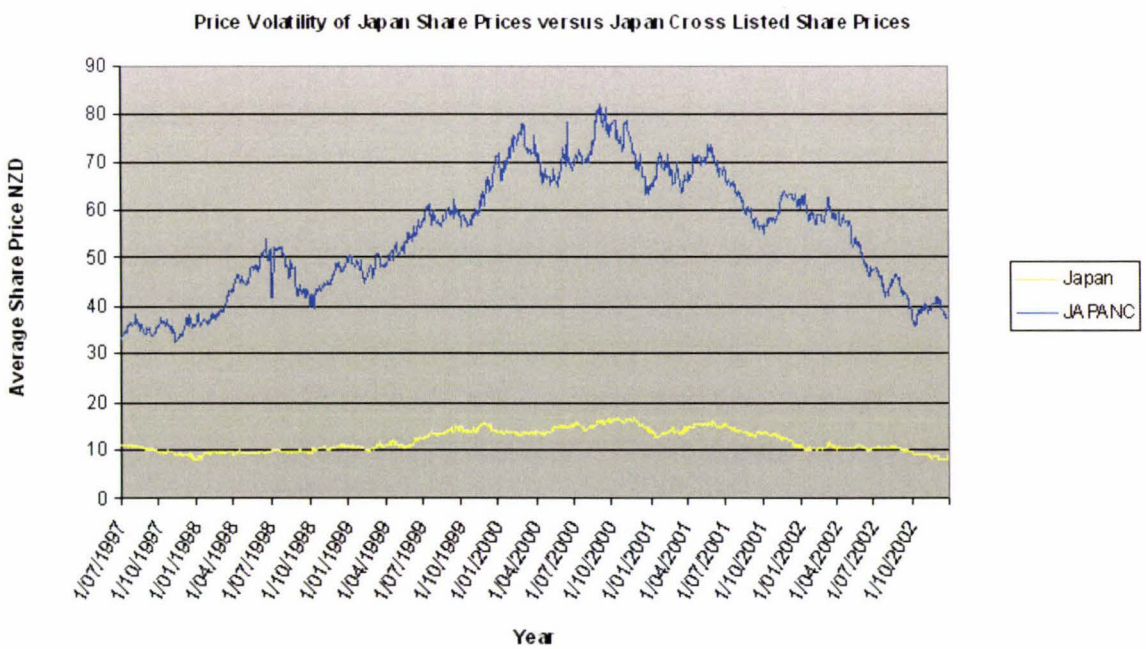


Figure 7 – Price Volatility of UK Share Prices Versus UK Cross Listed Share Prices

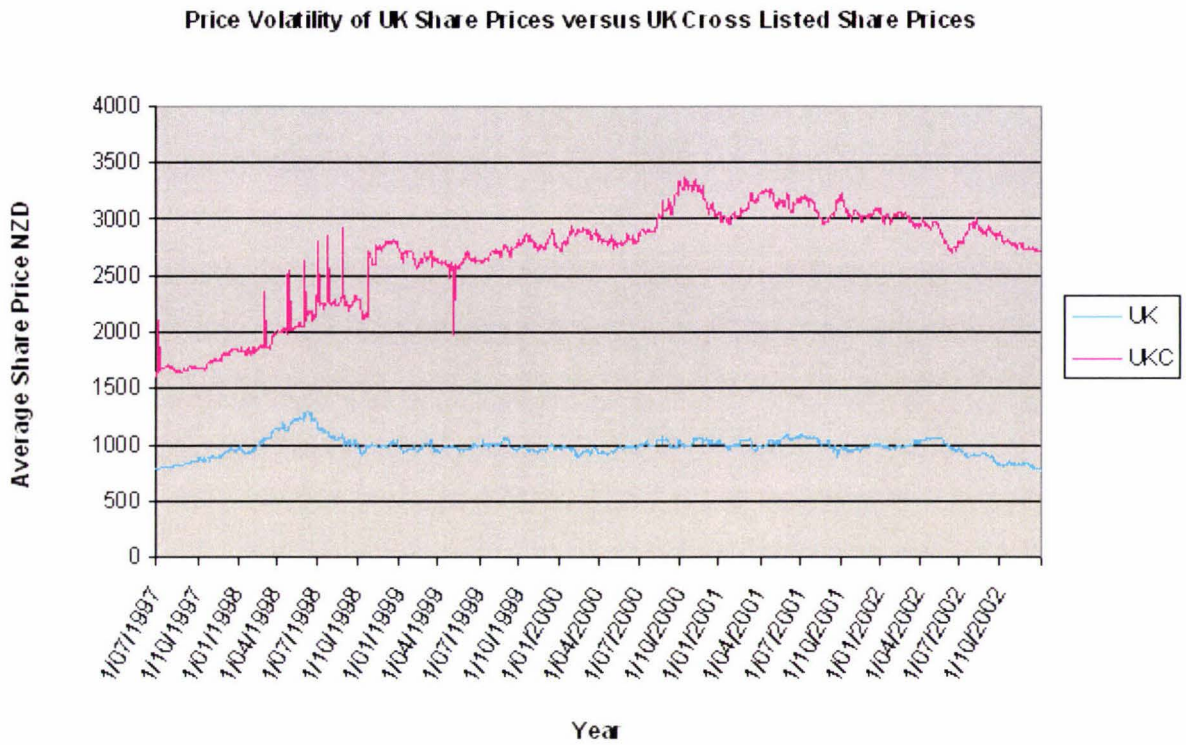


Figure 8 - Price Volatility of South Africa Share Prices Versus South Africa Cross Listed Share Prices

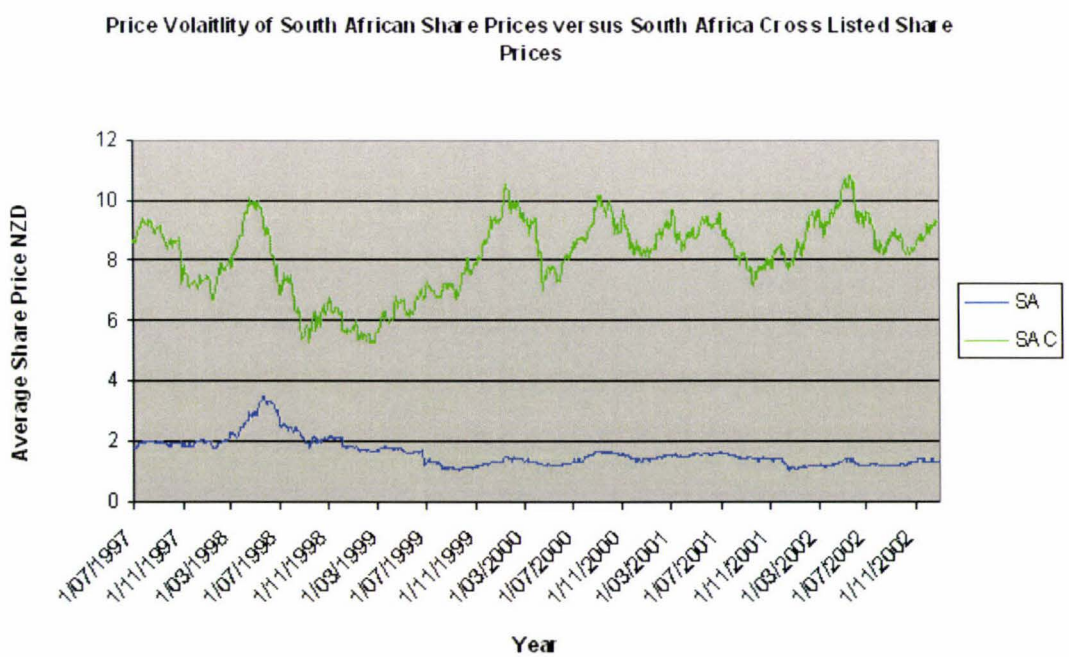
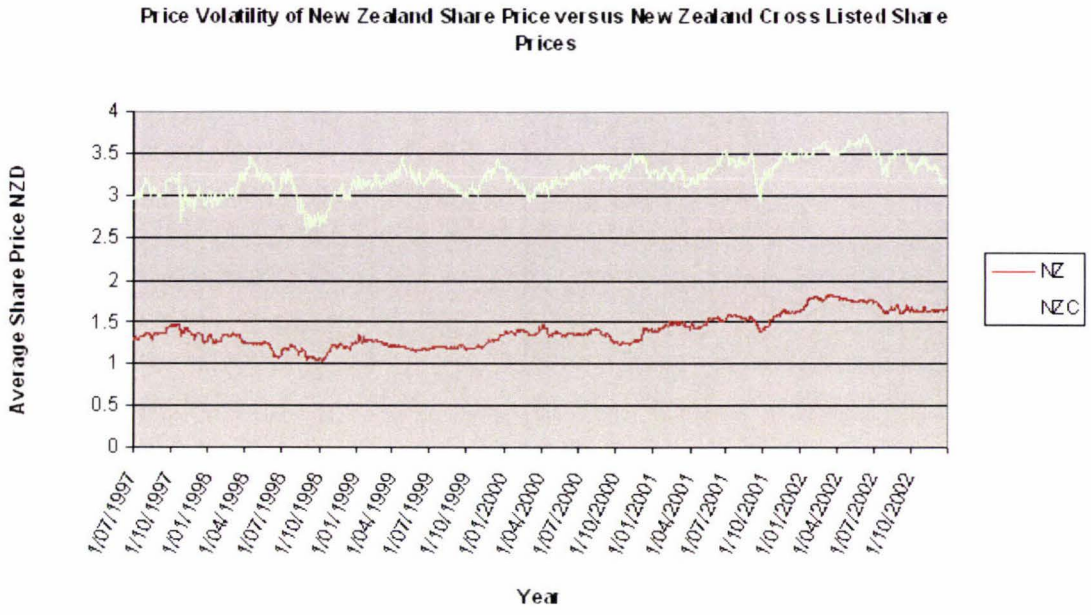


Figure 9 - Price Volatility of New Zealand Share Prices Versus New Zealand Cross Listed Share Prices



HYPOHTHESIS TESTING

This study considers whether cross listed securities exhibit risk return benefits over singly listed securities in the face of extreme events, in terms of their risk return relationship.

There are two main questions that arise from the above topic. The first question to be asked is: Do cross listed securities show any benefits over singly listed securities in times of stability? There have been a number of papers which have focused on whether cross listing provides any benefits. As discussed earlier, there are great benefits for companies in cross listing in terms of achieving lower costs of capital, larger investor bases, enhanced information flows and opportunities for investors to trade upon arbitrage pricing. Research shows benefits for the investor in terms of excess returns at the time of listing, but these returns fade over time. It is important to consider the degree of potential benefits available to the investor when deciding whether to invest in cross listed securities. If there are any benefits available to the investor through holding cross listed securities within their portfolios, do these benefits help with their long term strategy of outperforming markets, especially during financial and world crises such as the Russian Ruble crisis in 1998 and September 11? During these extreme events, stock markets and currencies are among the first instruments to react. It is widely accepted that through holding international securities, diversification benefits are achieved through a lowering of systematic risk. This results in lower portfolio risk and higher returns for investors. As markets have become more integrated in recent years, however, higher correlations exist between markets and the level of diversification benefits able to be achieved in today's

environment has decreased, especially in the case of cross listed securities. What happens to these diversification benefits during extreme events?

The final question concerns the weighting model used to select the security weightings within the portfolios. A number of research papers have looked into this issue and, as a result, four different weighting schemes and techniques have been used. These can be critiqued to determine the accuracy of the schemes and their results as a whole. Refer Appendix A for full description of hypothesis.

The following hypotheses will be tested in this thesis.

Hypothesis 1: Can risk/return benefits be achieved in a portfolio formation by the introduction of cross listed securities**?**

Hypothesis 2: With the addition of cross listed securities into a portfolio, which market shows the highest benefits for an investor in terms of the risk return tradeoff relationship?

Hypothesis 3: Do Portfolios containing cross listed securities show any benefits over a base singly listed portfolio during the three extreme events being tested?

Hypothesis 4: Which portfolio outperforms the single and multi indices in terms of risk and return?

Single Index = New Zealand Morgan Stanley Capital Index (NZMSCI).

Multi Index = World Morgan Stanley Capital Index (WMSCI).

Hypothesis 5: Which weighting model yields a better risk return trade off for the portfolios, as measured by the Treynor/Sharpe and Jensen Measures?

COMPUTATIONAL METHODS

Modern Portfolio Theory (MPT) is a computational method to determine efficient portfolios based on Markowitz theory from his original paper in 1952. Prior to the 1960s the finance world had discussed risk, but no specific measure was commonly used to assess it. Markowitz developed portfolio measures for risk and return and showed that variance was an important measure for risk. From this he derived a formula to model risk. The Markowitz theory expands on the idea that, through diversification, risk can be reduced and greater returns can be achieved. The Markowitz theory is based on several assumptions:

1. Investors consider each investment alternative as being represented by a probability distribution of expected returns over some holding period.
2. Investors maximise one period's expected utility, and their utility curves demonstrates diminishing marginal utility of wealth.
3. Investors eliminate the risk of the portfolio on the basis of the variability of expected returns.
4. Investors base decisions solely on expected return and risk, so their utility curves are a function of expected return, and their expected variance (or standard deviation) of returns only.
5. For a given level of risk investors prefer higher returns to lower returns, and for a given level of expected returns investors prefer less risk to more risk.

The last assumption is the most important, showing that investors want higher returns for lower risk if available, but will otherwise accept lower returns for less risk. (Brown & Reilly, 2003)

Modern Portfolio Theory allows portfolio managers and investors to quantify risk and return and rank portfolio performances on these measures. The main assumption for MPT is that stock returns are normally distributed, meaning that the stock return can be fully described by its mean and variance. This assumption has been accepted in our current research.

Mean returns are normally discussed in relation to standard deviations (SD), not in relation to variance, as it is returns squared, although this is a term not commonly used by investors. In this research SD will be used as the measure of risk. The portfolio is to be measured from a NZ perspective to see if there are any benefits to investment in foreign markets and in cross listed securities. The majority of NZ investors only invest locally, as the NZ market has averaged returns of over 7% in the last five years, and it is easy to invest in one's local market. Investing overseas becomes complicated for the average investor, as financial factors such as exchange rates and international risk are introduced. It is a common in all world markets that a large percentage of investors will only invest in their domestic market. The portfolio performance measures require a risk free rate, which is to be measured by the 90 day bank bill rate in NZ.

PORTFOLIO FORMATION AND RESEARCH DESIGN

The portfolios are formed using the Markowitz mean variance portfolio criteria to create efficient portfolios for the period from 1 July 1997 to 31 December 2002. This period is broken up into two separate periods, the first from 1 July 1997 to 30 June 1998 and the second from 1 July 1998 to 31 December 2002. The first period is the ex ante period, which will be used as the basis for the formation and weightings of the portfolios. The second period, the ex-post period, will be used to evaluate the portfolios' performance. The second period is divided up into nine non-overlapping sub-periods; each period having a duration of six months. Nine periods begin from the following dates: 01/07/1998; 01/01/1999; 01/07/1999; 01/01/2000; 01/07/2000; 01/01/2001; 01/07/2001; 01/01/2002; and 01/07/2002. This has been done to capture the performances of the portfolios pre, during and post the three extreme events being studied. The Russian Ruble crisis occurred in Period 1 and 2 (from 01/07/1998 to 31/06/1999), September 11 is held to cover the period of 01/07/2001-31/12/2001 and the Argentina crisis is held to cover the period from 01/01/2002 to 31/12/2002. The two year period in between the Russia crisis and September 11 will be used as a stable period for the markets being studied, and used to compare performances to *normal trading patterns*.

The portfolios' performances during the extreme events are expected to decrease in terms of return and increase in terms of risk, due to the greater volatility of the markets. A portfolio of singly listed securities from five different markets will be used as the base portfolio (benchmark) to determine whether the addition of cross listed securities to this base portfolio improves a portfolio's return/risk tradeoff. This

portfolio will be called the Base Portfolio. The five international markets that are to be used in this portfolio are Australia, Japan, the UK, South Africa and NZ. Firstly, cross listed securities from Australia will be added to this base portfolio. This portfolio will be known as Base +1 (+1 market), and so forth, until cross listed securities from all five markets have been added to the base portfolio. In total there are six portfolios: Base; Base +1 (+ 1 market of cross listed securities); Base + 2 (+ 2 markets); .....Base + 5. The goal of adding cross listed securities is to improve the return/risk trade off for the investor.

To increase the realism of this research, assumptions have been made that there are no short sales, or investments in risk free assets. The assumption for no short selling is to increase the practicality of the methods undertaken, as the normal investor would not short sell assets. Only knowledgeable and experienced investors would undertake this sort of financial technique. In addition, short selling is not permitted within NZ.

Investing in a risk free asset is the logical investment alternative during an extreme event, as return is guaranteed at a certain rate with no risk involved. This is opposed to the point of this research, which is to determine whether extreme events change return and risk benefits for investors.

Minimum and maximum investment weight constraints have been implemented to ensure that all securities are included within the portfolio. The minimum weight applied in this research is 3%, and the maximum weight is 65%. A maximum weight has been included to prevent heavy investment in one market, which could skew the

overall results of the portfolio. The minimum and maximum weights are common constraints implemented by portfolio managers.

The calculation of portfolio weights is determined by different methods, controlling for estimation errors from the ex ante period being applied to the ex post period.

In this research four portfolio weighting methods are to be used to ensure that the optimum weights are used within the portfolios to achieve accurate results. The four methods are the Equally Weighted Portfolio (EQWP), the Minimum Variance Portfolio (MVP), the Certainty Equivalence Tangency Portfolio (CETP) and the Bayes-Stein (Bayes) method.

EQWP consists of putting an equal proportion of each security into the portfolio, which is based upon the assumption that all securities have the same potential to perform well in the future, and ignores past performances. This strategy is classified as a naïve strategy by Eun and Resnick (1988), as it tries to duplicate some of the potential gains from international diversification.

MVP uses minimum variance weights from the ex ante period and applies them to the ex post period. It is believed the MVP is less susceptible to measurement error, as MVP only depends upon a covariance matrix of the ex ante period, which is considered stable over time. Estimated covariances are more stable than returns over any given period of time (Jorion 1986).

CETP computes weights of the ex post tangency portfolio and uses them as the ex ante weights. This approach subtracts the risk premium (risk free rate) from expected

returns. CETP is a strategy which produces a portfolio based on optimal weights for the ex-ante period, and applies these to the ex post period. This strategy is considered the worst of those considered here, as does not control for estimation risk in any way.

The Bayes Shrinkage estimator is used to calculate the expected returns vector. The estimator uses historical returns as a special case within an expected maximisation utility frame work to estimate the expected returns. The Bayes method effectively shrinks each asset's mean return towards a common value in order to predict future means.

FORMATION OF DATASETS EMPLOYED

For this research, closing daily prices and exchange rates were obtained for the period from 01/07/1997 to 31/12/2002 to give sufficient pre and post periods for the extreme events being tested. Closing daily stock prices were attained from Datastream and the exchange rates were attained from the University of British Columbia Sauder School of Business Pacific Exchange Rate Service (via the internet). The five markets that are to be included in this research are New Zealand, Australia, the United Kingdom, South Africa and Japan, for reasons previously explained. The original list complied of cross listed securities were obtained from the markets' home exchange websites.
A total of eighteen cross listed securities were found from the New Zealand top fifty companies. Of these, five were cross listed after the beginning date of our dataset, two of the eighteen had incomplete historical stock prices for the period being studied and were also excluded, therefore leaving a total of eleven securities that meet the study criteria.

For Australia, a total of fifty-three cross listed securities were found; twelve of these cross listed after the 01/07/1997. Eleven had incomplete daily stock prices and therefore were also excluded, leaving a total of thirty cross listed securities from the Australia market.

In Japan a number of stock markets could have been chosen, but the Tokyo stock exchange was selected because of the high number of cross listed securities listed on its main board. One hundred and thirty-eight cross listed securities were listed on the main board. Of these, twenty-seven were listed after 1997, data could not be found

due to name differences between the Japanese name and the European equivalent for forty-seven securities, and ten stocks had incomplete data, leaving a total of fifty-four that meet the criteria.

The London Stock Exchange was chosen as the stock market to represent the UK because of its high number of cross listed securities and its large volume of daily trading. In a lot of countries cross listed securities are not traded on a daily basis, due to the lack of investors in the foreign country constantly following the market. On the London Stock Exchange a total of two hundred stocks were available. Of these, forty-two listed after 1997 and twenty-three had incomplete data, giving 135 eligible for the study.

South Africa had a total of sixty-two cross listed securities. Of these, eighteen were cross listed after 1997 and five had missing data, leaving forty eligible for the study. The sample of cross listed securities, therefore, consisted of NZ (11), Australia (30), Japan (54), the UK (135) and South Africa (40).

From this sample, twenty cross listed securities from each market were randomly selected, except for NZ where all eleven were chosen due to the small sample size. The randomly selected stocks were reviewed to ensure that all major industries were covered and that no heavy weighting existed in any particular industry. A few stocks were eliminated and others randomly reselected to allow for an even spread of cross listed securities across industries.

From the sample of ninety-one cross listed securities (twenty from four markets and eleven from New Zealand), a comparative list of singly listed securities was chosen by matching industry classes with the selected cross listed securities to form the base portfolio. Single listed securities also had to meet certain criteria to be selected. They had to be listed before 01/07/1997, the home market that they were listed on had to be the location of their main business operation and a full stock price history had to be available.

After the selection of the cross listed securities and a comparative selection of single listed securities were obtained, the stock prices were converted into NZD at the spot rate for the same day as the closing stock price data had been obtained for.

From this point the following steps were used to create efficient mean variance portfolios, using the four different weighting methods previously explained. The portfolios were constructed using Microsoft Excel. The methods below were used to construct the base portfolio of single listed securities from their home markets. As cross listed securities were added to the base portfolio the portfolios were recalculated.

Daily stock prices from each market were equally weighted to form a daily mean price per market, which was used to represent the performance of the whole market for that period. Equal weights for stocks were used, as each stock within the twenty chosen has an equal probability of obtaining a positive or a negative return.

The base portfolio was made up of five assets; that is, twenty stocks from each market averaged to form one price (five markets = five assets).

The second step was the calculation of the daily returns for each market (change in price from one day to the next), thus representing the growth or decline in the stock price value.

$$\text{Return} = \gamma_1 - \gamma_0 / \gamma_0 \qquad (1)$$

where γ_1 is stock price in period 1 and γ_0 is the initial stock price.

The returns are utilised to calculate covariance matrices for the six month holding periods. Covariance is a measure of the degree to which assets move together. The Covariance/ Variance matrix is symmetrical and is calculated as follows:

Covariance/ Variance Matrix

$\sigma AA \ \sigma AB \ \sigma AC$

$\sigma BA \ \sigma BB \ \sigma BC$

$\sigma CA \ \sigma CB \ \sigma CC$

A simple matrix of three rows and three columns will be used. An element's position within a matrix is referred firstly by row, and then by column. The covariance of the assets are utilised later in the study to calculate portfolio returns and standard deviations.

The expected returns, variance and standard deviations are calculated for the ex ante period.

The expected return for the ex ante period is calculated as the weighted arithmetic average return, which represents the most probable return given the possible price fluctuations. The expected return is calculated by the weighting of the markets' security value by the total portfolio value. As daily data was used in this research, however, equal weights were utilised. This is a common practice within the finance industry.

Variance is a measure of the dispersion of the random variability of returns. It equals the expected value of the squared deviation from the mean. Standard deviation is the square root of variance (Bodie, Kane and Marcus, 1999).

The calculations for expected return and variance are explained later, under portfolio returns and variance. The following calculations describe the four different weighting methods utilised within this paper. The first one looked at is the construction of an equally weighted portfolio.

Equally Weighted Portfolio

The equally weighted portfolio is very simple. The total number of assets is summed and then divided by one hundred, giving the percentage of weighting in each asset.

$$W = 100/N \qquad (2)$$

where N = number of assets.

Under this portfolio weighting it is assumed that each asset has the same opportunity to have either a positive, or a negative, return.

Minimum Variance Portfolio

This portfolio is for the risk adverse investor as it will have the lowest variance for the stock being utilised.

Firstly, a matrix of covariances needs to be constructed to allow for the calculation of the ex-ante weights to applied to the ex post data. The ex ante period is for one year, from 1/7/1997 to 31/6/1998. The covariance matrix is then inverted by using the Minverse function. The inverted matrix (X^{-1}) is the original matrix multiplied by itself. The columns of the inverted matrix are then summed; which is the same as summing the rows. The weights for each asset are determined by dividing the sum of that assets column by the sum of the total assets.

Certainty Equivalent Tangency Portfolio

The formation of weights for the CETP is the same for the MVP up to the point where the inversion of the covariance matrix has been completed. The expected returns for assets for the ex-ante period are calculated as demonstrated above. From the ex-ante expected returns, the risk free rate is subtracted, leaving what is called excess returns, or the risk premium.

$$\text{Excess Return} = E(R\rho) - RFR \qquad (3)$$

where RFR = the risk free rate.

The risk free rate used in this research is the 90-day bank bill rate. The next step is to multiply the inverse matrix array against the risk premiums of the assets. The weights

are calculated in the same way as for MVP, the sum of all the columns are totalled, and the individual asset sums are divided by the total sum of the columns.

Bayes Stein Shrinkage

The BST framework has been taken as described in Izan, Jalleh and Ong (1991), sourced from Jorion (1986).

Both of these papers used the BST framework to show that an investors optimal portfolio choice should be based on the predictive density function of future rates of return (R) and, under a particular informative prior for the vector of expected returns, is multivariate normal with a mean given by:

$$R = (1-\psi)\gamma_1 + \psi_1\gamma_0 \qquad (4)$$

where R is the vector of future returns, y_0 is the average mean for the portfolio, y_1 is vector for the ex post mean returns, 1 is the vector of ones and w is the shrinkage factor.

By using an estimator factor such as w, the mean is shrunk towards a common value, reducing the overall estimation risk.

ψ is obtained from the following formula:

$$\psi = (N+2)(T-1)/\ (N+2)(T-1)+ (y_1-y_0 1)'T\Sigma^{-1}(T-N-2)(y_1-y_0 1) \qquad (5)$$

where N = the number of assets, T= the number of observations and Σ^{-}= the Covariance/ Variance Matrix.

Now that the weights have been determined for the portfolio, the portfolio return and risk can be calculated. The first step is the construction of expected returns for the portfolio. The portfolio returns are based on a six month holding period so that the periods pre, during and post the extreme events can be evaluated on their risk/return relationship.

The expected return is the weight of an asset multiplied by the expected return of that asset over the holding period. The expected returns for the assets were based on geometric calculations rather than arithmetic. Geometric returns are a better measure of long term asset returns over long performance time periods, as the geometric measure is based on a compounding system, whereas the arithmetic measure uses the opening and closing stock prices without taking time periods into account (Reilly and Brown, 2000).

$$\text{Expected Return} = E(Rp) = \sum_{I=1}^{N} [\psi i * E(Ri)] \qquad (6)$$

where $E(Ri)$= the expected return on asset 1 and ψi = the weighting of the asset.

Portfolio Variance is not as simple to calculate as the return, as the covariance between all securities needs to be taken into account. The variance for a portfolio is calculated as follows:

$$\text{Variance} = \text{Var}(Rp) = \sum_{I=1}^{N} \sum_{j=1}^{N} \psi_i * \psi_j * \sigma ij \qquad (7)$$

For example, for a two asset portfolio there are three terms (consisting of two variances and one covariance), and with a three asset portfolio there are six terms (consisting of three variances and three covariances).

Portfolio return and variance have been calculated for the holding periods. A common measure is required to be able to determine which portfolio performed the best, based on the risk/return relationship. The coefficient variation will be used for general comparison of the portfolios. Coefficient Variation measures the relative variability, indicating the level of risk per unit of return. Three portfolio performance measures will be used in the final stages of the calculations in order to rank the portfolios. The three measures will be the Treynor, Sharpe and Jensen measures.

The Treynor measure represents the portfolio's return per unit of risk. The higher the Treynor measure, the higher the return for the portfolio. Treynor utilises beta, which is a measure of systematic risk.

$$\text{Treynor} = T = \frac{E(Rp) - RFR}{\beta} \qquad (8)$$

where E(Ri) = the expected return of portfolio, RFR= the risk free rate and β = the portfolio beta.

The Sharpe ratio is a standard performance measure, and is defined as the ratio of the portfolio expected return in excess of the risk free rate, over the portfolio standard deviation. The Sharpe ratio measures the total risk, compared to Treynor which measures only systematic risk.

Sharpe ratio = S = (E (Rp)-RFR)/ SD (P) (9)

where SD = the portfolio standard deviation.

Jensen Alpha is similar to that of the Treynor measure as it measures systematic risk, but a different beta and risk free rate is required for each period. A positive Jensen Alpha indicates superior performance, while a negative alpha demonstrates inferior performance.

Jensen Alpha = α = E (Rp) - [RFR - βp (E (Rm)-RFR)] (10)

where E(Rm) = the expected return of the market.

A final comparison of the results is made to the NZ MSCI single index and an equally weighted multi index compiled from MSCI markets from the five markets studied. Geometric returns were calculated for the six month holding periods and compared to the geometric returns achieved by the portfolios. (Reilly & Brown, 2003)

The single index and multi indices give us benchmarks to be able to compare whether cross listed securities added to a portfolio not only under- or out- perform a base portfolio of single listed securities, but also whether the portfolios outperform the home market of NZ (represented by the single index) or the world markets as indicated by the multi index. A world index is important as it will show the effects of the extreme events being measured on a global basis, instead of an individual country basis.

RESULTS

The portfolios used to obtain the results have been formed using the BST Weighting technique, to determine the weights of the portfolios. BST was used over the other weighting techniques because it provides more accurate estimations of the out of sample expected returns than does MVP (Gorman and Jorgensen, 2002). For Hypothesis 5, the four different weighting techniques were utilised to measure the accuracy of the techniques compared to one another.

Hypothesis 1 - Are risk return benefits achieved in a portfolio by the introduction of cross listed securities?

With the introduction of the selected cross listed securities into our study portfolio the results obtained as regards this hypothesis are varied. In terms of return, 66% of the results show that the use of cross listed securities resulted in higher returns being achieved than for the base portfolio. As regards risk, 100% of the results show that the cross listed securities offered a lower risk option to investors than did the alternative base portfolio. To gain a greater understanding of the results, the risk and return benefits need to be discussed together, as the relationship between them is mutually exclusive. In terms of risk and return, the base portfolio was outperformed by the other portfolios in all nine periods being studied, indicating that the introduction of cross listed securities does provide benefits to the investor. Consequently, the null hypothesis, that all portfolios have the same return and risk, is rejected. Table 12 shows the six portfolios and their relative return/risk over the nine periods from 1/7/1998 to 31/12/2002, as well as the coefficient variation (CV). The CV represents each unit of return and the level of risk associated with it. The lower the CV, the greater the return/risk benefits are to the investor.

Table 13 - Comparison of the return and risk for the portfolios, demonstrating the benefits of the addition of cross listed securities into a portfolio.

		Base		*Base +1*		*Base +2*	*Base +3*		*Base +4*		*Base +5*		
			CV		*CV*		*CV*		*CV*		*CV*		*CV*
01-Jul-98	***Return***	0.0973		0.1740		0.2004		0.0867		0.1304		0.1964	
	Risk	17.748%	1.8241	6.520%	0.3748	7.482%	0.3733	14.232%	1.6416	32.085%	2.4600	8.898%	0.4530
01-Jan-99	***Return***	-0.1346		0.0178		0.0053		-0.0021		0.0278		0.0682	
	Risk	11.166%	-0.8294	3.901%	2.1870	3.468%	6.5393	4.825%	-23.4859	5.398%	1.9442	5.100%	0.7475
01-Jul-99	***Return***	0.3307		0.3118		0.3319		0.3356		0.2721		0.2993	
	Risk	11.183%	0.3382	6.183%	0.1983	7.007%	0.2111	9.794%	0.2918	7.269%	0.2671	7.595%	0.2538
01-Jan-00	***Return***	-0.0175		-0.0201		-0.0256		-0.0837		0.0028		-0.0048	
	Risk	13.442%	-7.6950	4.416%	- 2.2001	4.545%	-1.7772	11.668%	- 1.3932	5.297%	19.1416	5.808%	-12.0457
01-Jul-00	***Return***	0.0504		0.1286		0.1282		0.0235		0.1377		0.1419	
	Risk	12.551%	2.4895	4.453%	0.3463	4.305%	0.3358	8.475%	3.6008	5.650%	0.4103	5.539%	0.3904
01-Jan-01	***Return***	0.2745		0.2059		0.2125		0.2039		0.2020		0.1863	
	Risk	21.344%	0.7775	6.508%	0.3161	6.583%	0.3097	7.872%	0.3860	7.653%	0.3788	7.698%	0.4131
01-Jul-01	***Return***	-0.1096		-0.0612		-0.0357		0.0365		-0.1385		-0.0791	
	Risk	24.052%	-2.1955	9.253%	- 1.5108	9.897%	-2.7744	13.821%	3.7839	10.434%	- 0.7534	11.173%	- 1.4130
01-Jan-02	***Return***	0.0962		0.0785		0.0851		0.0165		0.0761		0.0674	
	Risk	12.062%	1.2544	5.076%	0.6463	5.214%	0.6129	11.020%	6.6948	5.689%	0.7476	5.999%	0.8903
01-Jul-02	***Return***	-0.0519		-0.1472		-0.1458		-0.1645		-0.1351		-0.1763	
	Risk	24.056%	-4.6379	6.402%	- 0.4348	6.846%	-0.4695	13.212%	- 0.8034	8.979%	- 0.6644	9.593%	- 0.5441

The base portfolio was outperformed by the alternative portfolios in all periods. This finding supports the hypothesis that the addition of cross listed securities produces greater return/risk benefits to an investor compared to a portfolio of single listed securities. The base portfolio performed worst in terms of its risk/return in five of the nine periods, and second lowest in the other four periods. Cross listed securities are able to provide greater diversification benefits to investors, as they are exposed to the systematic risk of both the foreign and domestic markets. As the systematic risk differs from market to market, if investors diversify on an international basis they can realise to the world systematic risk level. Cross listed securities allow for greater imperfect correlations among the securities in the portfolio, lowering the covariance and risk associated with holding the portfolio (Reilly and Brown, 2003).

Only in one time period did Portfolio Base + 5 perform the best in terms of its return/risk relationship compared to the other portfolios. The question to be considered here is: what is the optimum number of cross listed securities to be added to a portfolio to generate the best return/risk benefits?

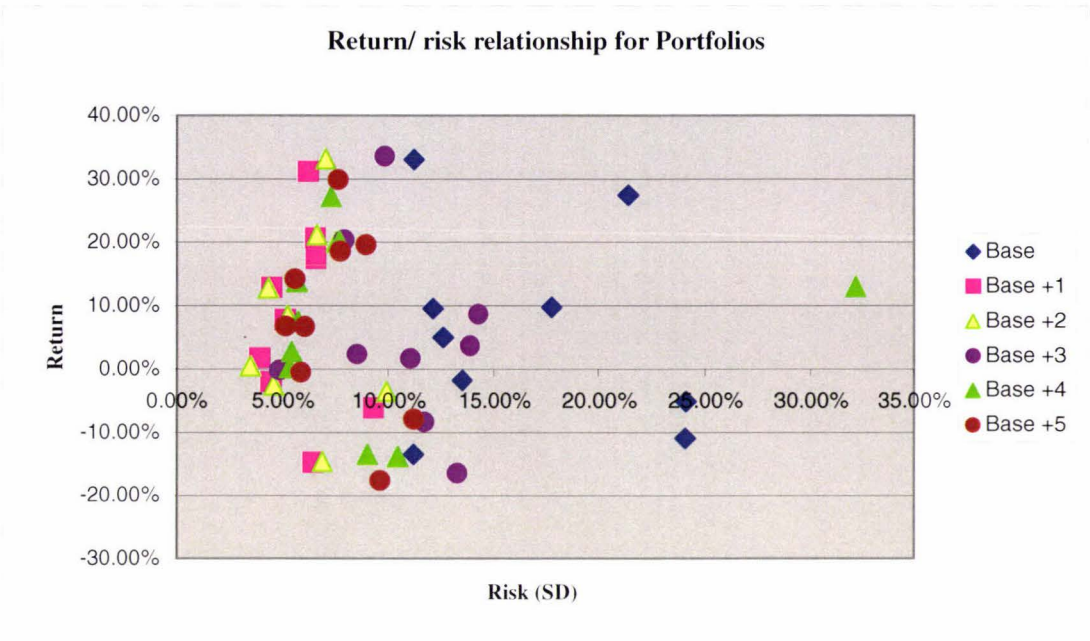
From the results gained in this research, Base +2 has shown superior performance in terms of the best return risk benefits, with it being ranked with the best performance in four out of the nine time periods and having the second highest performance in three of the other time periods. Base + 1 has shown stable performance, but the other portfolios have mixed results to their performance, as shown below in Table 13, which ranks the portfolios from 1 to 6, with 1 being the highest and 6 the lowest.

Table 14 - Ranking of the portfolios in terms of risk and return.

	Base	*Base +1*	*Base +2*	*Base +3*	*Base +4*	*Base +5*
01-Jul-98	5	2	1	4	6	3
01-Jan-99	5	3	4	6	2	1
01-Jul-99	6	1	2	5	4	3
01-Jan-00	6	3	4	5	1	2
01-Jul-00	5	2	1	3	6	4
01-Jan-01	6	2	1	4	3	5
01-Jul-01	6	3	2	1	5	4
01-Jan-02	5	2	1	6	3	4
01-Jul-02	6	1	2	4	3	5
Average	5.5	2.1	2.0	4.2	3.7	3.4

The results produce no clear patterns on the optimum number of cross listed securities required to achieve the best results, except that from the research conducted Base +2 achieved the most optimum outcome, closely followed by Base + 1, with average rankings of 2.0 and 2.1, respectively. Beyond Base + 2, the benefits achieved from the addition of more cross listed securities began to diminish. The Base Portfolio performed the worse, with an average ranking of 5.5. This is significantly higher than the other portfolios, showing that the inclusion of cross listed securities in portfolios provides substantial benefits to investors.

Figure 10-Risk Return relationship for Portfolios



This graph represents the return/risk relationships for the different portfolios. Base + 2 represents the best return/risk relationship for the investor, depicted in the graph with the portfolio having high returns without bearing higher risk to achieve this. The base portfolio managed similar returns to Base + 2, but at significantly higher risk levels for the investor.

Hypothesis 2 - With the addition of cross listed securities which market showed the highest return risk benefits to the investor over the base portfolio?

To determine which market provided the greatest level of benefits, the base portfolio of single listed securities was taken, and cross listed securities were added separately from the five markets.

The addition of Australian cross listed securities provided the best diversification benefits with an average return of 8.43% and a risk of 5.68% over the time period studied. In comparison, the base portfolio had a lower return of 5.95%, but the risk level associated with it was 16.4%, which was almost 9% higher than the Australian cross listed portfolio. In all nine periods the base portfolio was outperformed by the alternative portfolios of cross listed securities as shown in Table 14 below, which ranks the portfolios based on CV.

This demonstrates that the addition of cross listed securities from any market would provide benefits, as in Hypothesis 1.

Table 15-Ranking of Portfolio Performances

	Base	*Aus*	*Jap*	*UK*	*SA*	*NZ*
01-Jul-98	5	6	2	4	3	1
01-Jan-99	6	1	4	5	3	2
01-Jul-99	5	6	3	1	4	2
01-Jan-00	6	1	5	4	2	3
01-Jul-00	5	6	1	3	2	4
01-Jan-01	6	3	2	1	4	5
01-Jul-01	6	1	2	3	5	4
01-Jan-02	5	6	2	1	3	4
01-Jul-02	2	1	4	6	3	5
Average	5.1	3.4	2.8	3.1	3.2	3.3

The Australian market performed the best in four of the nine time periods due to the negative relationship shown, which was created with the addition of Australian cross listed securities. The Australian market moved in opposite directions to the base and other portfolios, as shown in its ranking of either best or worse performer in the different time periods. This negative correlation can be a double-edged sword. When other markets had positive returns the Australian market had negative returns. Therefore, it is imperative to choose cross listed securities on a market negatively correlated to your home market to be able to achieve the best results. In Period 4, the Australian market had a positive return of 31.2%, where three other markets had negative returns and South Africa had a marginally positive return. Similar results were achieved in Period 9.

The Australian market is highly influenced by mining production, which acts as a catalyst to the economy's growth. As a result, the Australian market follows mining industry trends rather than global influences. This explains why the Australian market has a negative correlation to the other markets. Mining in Australia accounts for circa 6.5% of GDP, and Australia is the leading producer of bauxite, diamonds, ilmenite, uranium, zinc, lead and silver. The mineral industry accounts for about 60% of export earnings, confirming the large influence it has on the Australian economy (http://www.mbendi.co.za/indy/ming/au/au/p0005.htm).

The Japanese and NZ markets also gave a high level of diversification, with average returns of 8.22% and 7.76%, respectively; both for acceptable levels of risk. All markets outperformed the base portfolio, the addition of cross listed securities from

any market providing benefits to the investor. Therefore, the null hypothesis that all markets will provide the same risk and return benefits is rejected.

Investors assume that the addition of cross listed securities from larger markets will provide greater diversification benefits than can be achieved by smaller markets such as NZ or South Africa. The results achieved in this research do not support this theory, as the UK has performed the lowest of all the cross listed portfolios, with an average return of 7.89% and a risk level of 21.01%, which is only marginally better than the results of the base portfolio. The main motivations for companies to cross list on foreign markets are an enlarged investor base, greater visibility and more analyst coverage. These motivations lead to companies being able to achieve lower costs of capital and, therefore, larger markets are more attractive. From an investor's perspective there are no added benefits in choosing a larger or smaller market, except that with larger markets cross listed securities will be traded more often, allowing for more asymmetrical information opportunities. This factor could affect an investor's selection of markets, and is an area of research that has yet to be undertaken.

Table 16 – The Risk/Return Relationship for markets researched

		Base		*Aus*		*Jap*		*UK*		*SA*		*NZ*	
			CV		*CV*		*CV*		*CV*		*CV*		*CV*
1-Jul-98	***Return***	9.73%		-7.64%		19.67%		18.16%		13.48%		19.03%	
	Risk	17.75%	1.824	4.83%	-0.633	8.02%	0.407	10.00%	0.55	6.93%	0.51	7.00%	0.368
1-Jan-99	***Return***	-13.46%		17.40%		1.53%		1.51%		3.33%		5.93%	
	Risk	11.17%	-0.829	6.52%	0.375	3.90%	2.549	3.96%	2.628	5.55%	1.67	5.12%	0.863
1-Jul-99	***Return***	33.07%		1.78%		32.45%		31.26%		26.99%		29.60%	
	Risk	11.18%	0.338	3.90%	2.187	7.67%	0.237	6.61%	0.211	6.91%	0.26	6.33%	0.214
1-Jan-00	***Return***	-1.75%		31.18%		-2.12%		-1.66%		0.41%		-0.33%	
	Risk	13.44%	-7.695	6.18%	0.198	5.20%	-2.452	4.78%	-2.873	5.27%	12.8	4.99%	-15.165
1-Jul-00	***Return***	5.04%		-2.01%		13.12%		13.55%		14.62%		14.65%	
	Risk	12.55%	2.49	4.42%	-2.2	4.54%	0.346	5.30%	0.391	5.14%	0.35	5.30%	0.362
1-Jan-01	***Return***	27.45%		12.86%		20.84%		20.79%		19.97%		19.00%	
	Risk	21.34%	0.777	4.45%	0.346	6.97%	0.335	6.49%	0.312	7.63%	0.38	7.84%	0.413
1-Jul-01	***Return***	-10.96%		20.59%		-4.80%		-6.57%		-14.03%		-8.66%	
	Risk	24.05%	-2.195	6.51%	0.316	10.59%	-2.209	9.22%	-1.403	10.34%	-0.74	10.63%	-1.227
1-Jan-02	***Return***	9.62%		-6.12%		8.19%		8.41%		7.85%		7.36%	
	Risk	12.06%	1.254	9.25%	-1.511	5.56%	0.679	5.59%	0.664	5.78%	0.74	5.82%	0.79
1-Jul-02	***Return***	-5.19%		7.85%		-14.92%		-14.41%		-13.68%		-16.78%	
	Risk	24.06%	-4.638	5.08%	0.646	11.33%	-0.759	137.18%	-9.52	7.79%	-0.57	8.24%	-0.491
	Average Return	5.95%		8.43%		8.22%		7.89%		6.55%		7.76%	
	Average Risk	16.40%		5.68%		7.09%		21.01%		6.82%		6.81%	

Hypothesis 3 - Do portfolios containing cross listed securities show any benefits during the three extreme events over single listed securities?

The three extreme events tested were the Russian Ruble crisis, September 11 and the Argentine Financial Crisis, as described earlier. The time periods studied for the Russian Ruble Crisis were from the beginning of 1/7/1999 to 31/6/1999, covering all major reactions within this crisis as the ruble was devalued in August 1998 and two times after that, in January and May 1999.

For September 11, a time period of six months from 1/7/2001 to 31/12/2001 was chosen, as this covers the initial event and the following recovery periods of the markets.

Argentina has had an unstable economy since 1998, but it wasn't until the Peso was set to float, the convertibility plan was scrapped and Argentina defaulted on foreign debt in late 2001 and January 2002 that the main financial crisis occurred. For study purposes, the Argentine Crisis will be measured from 1/1/2002 to the end of 2002, as the default on foreign debt was the first outside trigger to the beginning of the crisis.

Many events which have occurred in world history could be classified as extreme. In this research, extreme has been classified as any event that has caused economic, financial and/or political unsettlement within an economy that can be measured by the behaviour of the domestic and worldwide stock markets. The stock market will act as a proxy to reflect the effects of the crisis on economies. The Russian Ruble and the Argentine Crises have been classified as financial and economic events. Their main drivers were related either to rigid currency regimes, weak economic control, or

inappropriate financial structures. September 11 is a true extreme event as it was completely unexpected and markets had no pre-warning of the event.

Normally, prior to a crisis there are some warnings through economic indicators such as inflation or exchange rates, giving some indication to the state of the economy. As to what degree of trouble the economy is in is normally well guarded by the government until a point at which it can no longer be controlled internally.

With the extreme events being researched it was found that, during these events, the return/risk benefits decreased for investors as markets become more volatile. This resulted in negative returns, high risk, or both as a result of the increased uncertainty within the market. Although cross listing absorbed some of the effects, it is apparent that diversification benefits are lost during extreme events as correlations between markets increase. Although markets tend to react and behave in a similar way to one another, it is the degree to which these reactions differ that reflects how strong a country's involvement is with another country or countries.

Firstly, the results for the overall portfolios will be discussed and compared to the results achieved for a stable period from 1/7/1999 to 1/7/2001 (two years). We will then determine whether the behaviour of portfolios is the same during all three extreme events.

Overall, the portfolio demonstrating the best return and risk benefits was Base + 2, with an average return of 8.40% and SD of 6.15%. This result was closely followed by Base + 1, with an average return of 7.65% and SD of 5.86% (as shown in the

conclusions drawn regarding Hypothesis 1). After considering these two portfolios, the return/risk benefits start to decrease, with Base + 5 having an average return of 7.71%, but with risk of nearly 2% higher at 7.49%. The base portfolio performed the worst, with an average return of 5.95%, but with considerably higher risk of SD of 16.4%.

Our point of interest with these results is whether the extreme events caused any difference in portfolio return and risk compared to a stable period. During the stable period it was found that the return risk benefits were significantly higher than during the three extreme events. During extreme events the uncertainty within the market is reflected through greater volatility of returns, resulting in higher portfolio risk and lower returns. The base portfolio had a return of 15.95% and a SD of 14.63% during the stable period, compared to the average return over the three extreme events of -2% and an average SD of 16.4%. During the extreme events the Base portfolio only achieved 30% of the returns achieved in a stable period, and at a higher level of risk. This demonstrates that the inclusion of extreme events has severe effects on portfolio performance. This pattern is evident for all six portfolios, with the CVs during the stable period being at least half of the CV calculated for the total holding period. All portfolios in the stable period had an average return in excess of 15%, whereas the average return for the whole holding period was 6.86%. The Base + 4 Portfolio showed the greatest change, with a CV of 0.4109 during the stable period, and a CV of 1.5326 for the whole holding period.

Overall, the extreme events had significant effects on portfolio performance, with negative returns, high risk, or both occurring during an extreme event. In terms of risk

and return the base portfolio reacted most poorly during the extreme events. Base + 2 and Base + 1 feared best during the extreme events, with positive returns of 2.2% and 1.2% respectively, and with risk only increasing slightly. In comparison to the stable period these two portfolios, at similar levels of risk, achieved returns of 15.7% and 16.2%, respectively. This provides further evidence of the effect that extreme events have on portfolio performance. The alternative portfolios reacted similarly, with either low or negative returns for higher levels of risk during extreme events and significantly lower returns of circa 10-15% when compared to the returns realised in the stable period. This indicates that, during extreme events, holding any equity portfolio is risky and lower returns for higher risk will be achieved. There is evidence that holding portfolios with cross listed securities does absorb some of the effects of the events.

Looking at the extreme events individually, the Russian Ruble Crisis was measured over two time periods. In Period 1 quite high returns were achieved with acceptable risk for the portfolios, but in Period 2 the results were completely different, with low or negative returns. This suggests that there was a definite change in the markets between Period 1 and Period 2. Although in Period 1 the ruble was devalued and Russia defaulted on its foreign debts, the onflow of the effects from the crisis did not hit markets around the world straight away. A significant proportion of the debt defaulted on originated from the markets being studied. These markets were expecting payment and, coupled with declining exports to Russia, the economies involved did not feel the effects of the crisis until six months after the original event, when their own economies tightened because of lower world activity.

In Period 1, Base + 1 and Base + 2 had CV's of 0.3733 and 0.3741, respectively, in comparison to the base portfolio's CV of 1.8. This provides evidence that the addition of cross listing improved the return/risk benefits for the investor during the beginning of the crisis.

Period 2 is a completely different situation, with low or negative results being achieved, and the base portfolio exhibiting less favourable performance with a return of-13.46% and a standard deviation of 11.17%. Cross listed portfolios averaged a return of 2.3%, with significantly less risk than the base portfolio at 4.5%.

Over both periods during the Russian crisis, the optimally performing portfolio was Base + 5 with stable return and risk, with an averaged CV of 0.5289 for both periods. The portfolios ranked in order from best to worst during the Russian crisis are:

Base + 5; Base + 2; Base +1; Base + 4; Base + 3; with the Base portfolio last. This confirms that all the portfolios which included cross listed securities achieved better risk/return benefits than the base portfolio of single listed securities during the Russian Ruble crisis. Although cross listed securities are exposed to two markets; the foreign and domestic markets; the diversification benefits shown earlier allow them to mitigate some of the effects of extreme events, as diversified portfolios have more stable returns.

The September 11 results are quite different to those of the Russian Ruble crisis. It is obvious from the results that a serious adverse reaction to September 11 was resultant in the markets behaviour. Five of the portfolios had negative returns, and the associated risk over this period was higher than the average risk for all the extreme events. As negative returns were resultant, CV is not an appropriate measure.

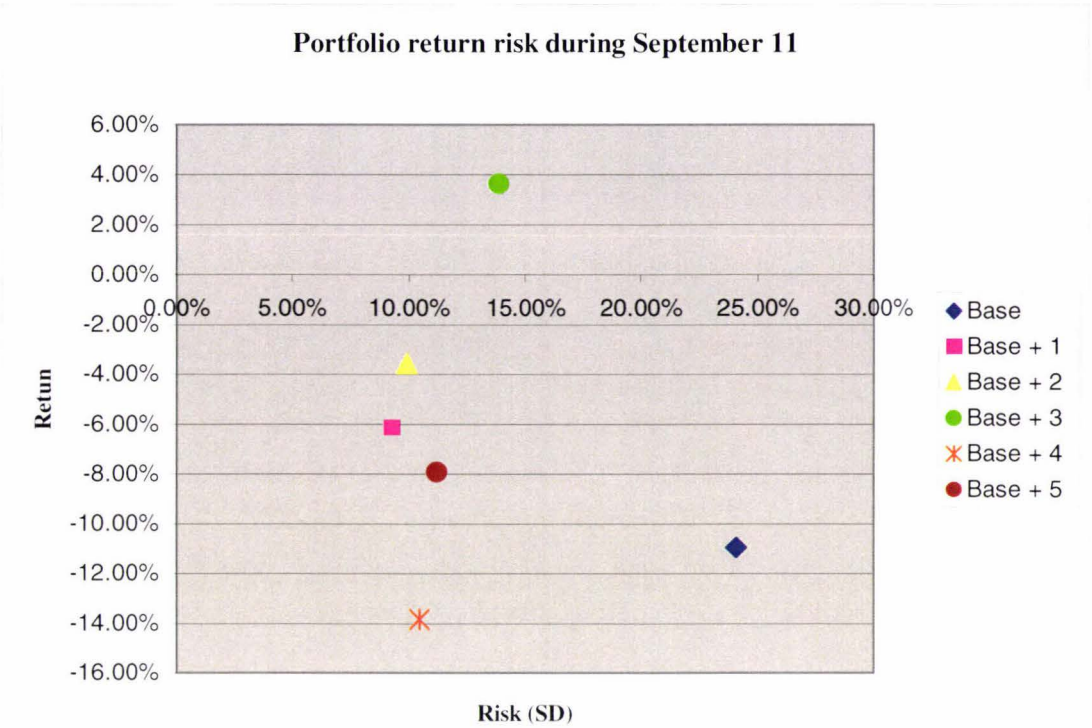
Base + 3 was the only portfolio to achieve a positive return at 3.65%, but the risk measured by the standard deviation of 13.8% is higher than the rate that an investor would expect to bear in order to achieve a positive return.

Figure 11 below depicts the return/risk for the portfolios. It is obvious that the markets reacted strongly to this event, with low returns and high risk. The Base portfolio is an outlier in the bottom right corner, signifying high risk for low returns. The base portfolio feared the worst again with a negative return of –10.95% and the highest risk of 24.05%.

On average, the cross listed securities portfolios had a negative return of –5.54%, providing evidence that all markets reacted strongly to this event but recovered after the initial shock.

The ranking of the portfolio performance for September 11 is:
Base + 3; Base + 2; Base + 1; Base + 5; Base + 4; and Base. Confirming that holding cross listed securities during September 11, was a better investment solution than single listed securities as shown with base portfolio having the lowest portfolio performance.

Figure 11- Portfolio risk/return during September 11



Results for the Argentine Crisis are very similar to those of the Russian Ruble Crisis. Two different patterns of results emerged from the two time periods. In Period 1, lower than normal returns were achieved for acceptable risk. The Base + 2 Portfolio had a CV of 0.61 resulting from a return of 8.5% and SD of 5.1% In Period 2, however, all portfolios had negative returns for significantly higher levels of risk. The Base portfolio had the highest risk, with a SD of 24.06%, and a negative return of -5%. The other five portfolios had negative returns ranging from –13.51% to –17.63%, for a lower risk of around 9.5%. The same reasoning exists here as with the Russian Crisis; that holding equity securities during extreme events is not the most favourable investment solution. In this instance, the Base Portfolio was the only portfolio to give the investor a positive return averaged over the two periods, but with high associated risk of 18.06%. Neither scenario is appealing to the investor: i.e. high

risk for low returns, or low risk for negative returns. Our analysis suggests that, during the Argentine Crisis, holding cross listed securities did not provide any benefits to the investor.

From the three extreme events studied, it is obvious that all the markets reacted in a similar way to an extreme event, which in turn affects the return risk benefits achieved by investors. During extreme events, either low or negative returns are achieved, or the risk becomes unstable and increases significantly. The results support the theory that holding a portfolio which includes cross listed securities mitigates some of the effects, but no solution has been found to change the overall reaction and behaviour of the markets studied here. All of the markets have reacted similarly, but it is only the magnitude of these reactions that highlights how strong a relationship these markets have with the originating economy through such ties as export/imports, foreign borrowing and political agendas.

Table 17 – Comparison of Average Risk/Return for Extreme Events

		Base	*CV*	*Base +1*	*CV*	*Base +2*	*CV*	*Base +3*	*CV*	*Base +4*	*CV*	*Base +5*	*CV*
Whole Portfolio	Average Return	5.950%		7.645%		8.404%		5.028%		6.392%		7.710%	
	Average Risk	16.400%	2.7563	5.857%	0.7661	6.150%	0.7318	10.547%	2.0977	9.828%	1.5375	7.489%	0.9713
Stable Period	Average Return	15.953%		15.655%		16.176%		11.983%		15.365%		15.567%	
	Average Risk	14.630%	0.9171	5.390%	0.3443	5.610%	0.3468	9.452%	0.7888	6.467%	0.4209	6.660%	0.4278
Extreme Events	Average Return	-2.052%		1.237%		2.187%		-0.537%		-0.787%		0.153%	
	Average Risk	17.817%	- 8.6827	6.230%	5.0364	6.581%	3.0091	11.422%	- 21.2700	12.517%	-15.9047	8.153%	53.1833
Russian Ruble Crisis	Average Return	-1.867%		9.590%		10.287%		4.232%		7.910%		13.233%	
	Average Risk	14.457%	- 7.7434	5.211%	0.5434	5.475%	0.5322	9.529%	2.2517	18.742%	2.3694	6.999%	0.5289
Sep-11	Average Return	-10.955%		-6.124%		-3.567%		3.652%		-13.848%		-7.907%	
	Average Risk	24.052%	- 2.1955	9.253%	- 1.5109	9.897%	- 2.7746	13.821%	3.7845	10.434%	- 0.7535	11.173%	- 1.4131
Argentina Crisis	Average Return	2.214%		-3.434%		-3.037%		-7.400%		-2.952%		-5.447%	
	Average Risk	18.059%	8.1567	5.739%	- 1.6712	6.030%	- 1.9855	12.116%	- 1.6373	7.334%	- 2.4844	7.796%	- 1.4312

Hypothesis 4 - Which portfolio outperforms single and multi indices in terms of risk and return?

All portfolios outperformed the NZ single index, which had an overall return for the period of 2.3% per annum. The portfolios had returns ranging from 5.03% to 8.40%. It is expected that the portfolios would outperform the NZ index, as all the portfolios are internationally diversified and able to achieve higher returns through diversification of unsystematic risk. The Base + 2 Portfolio; which showed superior performance under the other hypotheses; performed the best with an average return of 8.4%. Even the Base Portfolio; consisting of international securities; produced an average return double that of the NZ index, at 5.95%. These findings provided evidence that there are benefits to investors in international investment, as greater returns can be achieved.

None of the portfolios outperformed the multi index which averaged a return of 9.82% per annum. The difference in returns from the single index, compared to the multi index, show that higher returns can be achieved by investing in foreign markets. On closer observation of the multi index; over a six month basis; large variances in returns are noted, ranging from a negative return of –41.68% in one period to a positive return of 68.83% in another. Although investing in foreign markets will allow the investor to achieve greater returns, more risk is involved as greater volatility of returns is present.

In comparison, the single index returns are relatively more stable, ranging from -27.49% to 33.23%. Even though some volatility is still present, and except for a few exceptions, the returns generally range in a band of 20%.

The single and multi indices showed a tendency to move in the same direction in seven out of nine periods, confirming that world markets tend to move and react in similar patterns to one another. Differences in movement of the single index compared to the multi index can be explained by the magnitude of the involvement of the home country within the world markets. For example, for the event of September 11, which occurred in period 01/07/2001 to 31/12/2001, the multi index had a negative return of –41.68% and the NZ index had a low positive return of 2.23%. This depicts the effects on a global basis on the world indices, while NZ was protected to a point due to its being a smaller economy and the trading relationship with the US being relatively small.

Risk in this instance was measured by beta, using covariance (stock price, market index)/variance (market index) methodology. The NZ MSCI index was used as the market proxy because the portfolios are being examined from a NZ investor's perspective. From the betas calculated, great diversity is found, with two portfolios having negative betas and the other four portfolios having betas of less than 1, which indicates that they are less volatile than the home market of NZ.

The base portfolio had the lowest beta, demonstrating that this portfolio has the lowest systematic risk of the market portfolios. This is in line with the hypothesis that the base portfolio will have less variability of returns due to the effect of macroeconomic factors being less extreme, as the portfolio is only exposed to home country factors. Cross listed securities, by comparison have increased risk from the foreign market as well as from the home market.

Table 18- Portfolio Risk and Return in comparison to single and multi indices

		Base	*Base +1*	*Base +2*	*Base +3*	*Base +4*	*Base +5*	*NZIndex*	*Multi Index*
01-Jul-98	***Return***	9.73%	17.40%	20.04%	8.67%	13.04%	19.64%	-5.49%	-26.57%
01-Jan-99	***Return***	-13.46%	1.78%	0.53%	-0.21%	2.78%	6.82%	15.57%	68.63%
01-Jul-99	***Return***	33.07%	31.18%	33.19%	33.56%	27.21%	29.93%	15.98%	51.04%
01-Jan-00	***Return***	-1.75%	-2.01%	-2.56%	-8.37%	0.28%	-0.48%	-14.14%	-10.35%
01-Jul-00	***Return***	5.04%	12.86%	12.82%	2.35%	13.77%	14.19%	-27.49%	7.27%
01-Jan-01	***Return***	27.45%	20.59%	21.25%	20.39%	20.20%	18.63%	33.23%	31.15%
01-Jul-01	***Return***	-10.96%	-6.12%	-3.57%	3.65%	-13.85%	-7.91%	2.23%	-41.68%
01-Jan-02	***Return***	9.62%	7.85%	8.51%	1.65%	7.61%	6.74%	3.18%	11.73%
01-Jul-02	***Return***	-5.19%	-14.72%	-14.58%	-16.45%	-13.51%	-17.63%	-2.33%	-2.81%
	Overall return	5.95%	7.65%	8.40%	5.03%	6.39%	7.77%	2.30%	9.82%
	Portfolio Beta	0.2713	0.3890	0.4069	-2.5243	-0.8352	0.9030	1.00	

The Base + 3 portfolio has the highest beta at –2.5, indicating that this portfolio is twice as volatile as the market, and is negatively related to it.

Hypothesis 5 - What weighting technique yields a better risk as measured by Treynor, Sharpe and Jensen?

Different weighting schemes have been used to ensure that the results achieved are accurate and able to be compared with one another. The four different weighting techniques utilised were explained earlier in the paper.

Overall, there are no clear results as to which method produced the best results, as the most optimum weighting scheme differs for each portfolio. CETP was, however, most commonly found to be the best method for three portfolios. From the results it can be concluded that the EQWP method achieved the lowest portfolio performance for all the portfolios. Therefore, the null hypothesis should be rejected, as all weighting techniques have produced different results.

For the base portfolio, all three measures drew the same conclusion that CETP was the best method, with MVP second, BST third and EQWP last. All three portfolio performance measures were positive for MVP, CETP and BST, indicating that these weighting methods produced positive portfolio performance. In comparison, the EQWP method had negative portfolio measures, revealing that the levels of portfolio risk were unacceptable in comparison to the returns achieved. This finding results from having equal weightings of stocks, where it is actually more sensible to give greater weighting to stocks which have a better performance history. The Base + 1 portfolio had the same results as the base portfolio, excepting that the performance measures were higher. This finding confirmed that the Base +1 portfolio outperformed the base portfolio, as was established in earlier sections of the results.

Similar results were found for the Base + 2 Portfolio, excepting that BST was considered to be a slightly better measure than MVP based upon the performance measures. All performance measures confirm the weighting methods in this order: CETP >BST > MVP > EQWP.

Closer examination of the results reveals that CETP, BST and MVP have measures that are very close, being only marginally different. Therefore, any of the three weighting methods could be used to achieve the optimum weights for the portfolio.
The Base + 3 and Base + 4 Portfolios had mixed results, with no clear method to be used found. No explanation can be given for this result, except that the results for CEPT, MVP and BST are very close and, therefore, any of the methods could be used to determine the weights within a portfolio. The Base + 5 Portfolio had BST as the most optimum weighting method, with all three measures ranking it number one compared to the other methods. As three methods; CETP, MVP and BST; had similar measures, employing any of the three methods would give optimum results for this portfolio.

Table 19- Weighting Techniques and portfolio performance measures

	Base				*Base + 1*				*Base + 2*				*Base + 3*			
	EQW	***MVP***	***CETP***	***BST***	***EQW***	***MVP***	***CETP***	***BST***	***EQW***	***MVP***	***CETP***	***BST***	***EQW***	***MVP***	***CETP***	***BST***
Treynor	-0.1189	0.0753	0.0761	0.0072	-0.0750	0.0661	0.0672	0.0505	-0.1277	0.0669	0.0814	0.0669	23.6703	-0.0111	-0.0113	0.0026
Sharpe	-0.0045	0.0028	0.0029	0.0003	-0.0048	0.0578	0.0576	0.0586	-0.0097	0.0611	0.0653	0.0615	0.0047	2.1457	2.2236	1.0215
Jensen	-0.0061	0.0666	0.0669	0.0411	0.0091	0.0640	0.0644	0.0579	0.0200	0.0992	0.1386	0.1327	23.6703	0.6955	0.6957	0.6546
Treynor	4	2	1	3	4	2	1	3	4	3	1	2	1	4	3	2
Sharpe	4	2	1	3	4	2	3	1	4	3	1	2	4	2	1	3
Jensen	4	2	1	3	4	2	1	3	4	3	1	2	1	3	2	4

	Base + 4				*Base + 5*			
	EQW	***MVP***	***CETP***	***BST***	***EQW***	***MVP***	***CETP***	***BST***
Treynor	0.0403	-0.0085	-0.0087	-0.0085	-0.0389	0.0115	0.0119	0.0231
Sharpe	-0.0028	0.0957	0.0899	0.0899	-0.0031	0.0702	0.0700	0.0745
Jensen	0.6302	0.6709	0.6711	0.6709	0.0937	0.2215	0.2218	0.2319
Treynor	1	2	4	3	4	3	2	1
Sharpe	4	1	3	2	4	2	3	1
Jensen	4	3	1	2	4	3	2	1

The Treynor measure represents the portfolio return per unit of risk, so the higher the T value, the higher the return. The Base + 2 portfolio had the highest T values of 0.0814 for CETP, closely followed by the Base portfolio with 0.0753 for MVP and 0.0761 for CETP, with the Base + 1 portfolio achieving similar results. Other portfolios had low T values, indicating that the returns per unit of risk were lower. The Treynor measure uses beta, which is based on systematic risk, whereas other measures such as Sharpe account for the total risk of a portfolio. The base portfolio had a low beta, as expected, as the portfolio should be less affected by market factors as it is only exposed to one market instead of two, as is the case with the cross listed securities.

The Sharpe ratio uses standard deviation as a measure for total risk, and it measures excess returns achieved over and above the risk free rate. The highest Sharpe ratio was achieved by the Base + 3 Portfolio with 2.22 for CETP and 2.15 for MVP, indicating that this portfolio had the highest excess returns in relation to the level of risk. Other portfolios had Sharpe ratios ranging from quite low levels (0.003, Base) to higher levels (0.096, Base + 4). This is in line with predictions, as the Base Portfolio was expected to generate the lowest excess returns in relation to risk. It was also expected, however, that the Base + 5 Portfolio would generate the highest results, which is not evident here. This finding demonstrates that the benefits of adding cross listed securities to a portfolio do not increase proportionally to the number of securities added. Consequently, after adding a certain number of cross listed securities to a portfolio, no additional benefits will be obtained. The question then is; how many securities is the optimum number to be added to a portfolio? In this instance, the Base + 2 Portfolio produced the best return/risk relationship for the investor, indicating that

having 30% of the securities in a portfolio being cross listed securities was the optimum percentage for the markets and time periods studied.

The Jensen Measure, otherwise commonly known as Jensen's alpha, measures the average return of a portfolio over and above the predicted CAPM given data and average market return. The Jensen measure provides a more accurate measure of portfolio performance as a different risk free rate and beta is calculated for each period, instead of an average across the whole time period as used in the Sharpe and Treynor measures. A positive alpha indicates superior performance and increases the ability of a portfolio manager to identify undervalued stocks.

The Base + 3 and Base +4 Portfolios had the highest alpha measures at circa 0.68, with the other portfolios ranging from 0.07 to 0.2. The Jensen method measures systematic risk as in the Treynor ratio, but the difference in portfolio performances is due to the average beta utilised in the Treynor methodology. In Table 19 we present a breakdown of beta per period. This demonstrates the magnitude of the change in beta over the study period, which is expected due to the inclusion of the three extreme events

.Table 20- Portfolio Betas

	Base	*Base + 1*	*Base + 2*	*Base + 3*	*Base + 4*	*Base + 5*
01-Jul-98	2.619	2.624	2.788	2.099	2.113	2.118
01-Jan-99	0.240	0.240	0.215	-0.017	-3.018	-3.015
01-Jul-99	2.676	2.674	2.848	-1.980	-0.003	-0.003
01-Jan-00	0.654	0.660	0.516	-0.604	-0.532	-0.001
01-Jul-00	-0.931	-0.938	-0.814	-10.494	-10.473	-0.014
01-Jan-01	0.429	0.424	0.506	7.382	7.398	7.398
01-Jul-01	3.101	3.113	3.379	1.606	1.636	1.649
01-Jan-02	-5.474	-5.477	-5.899	-16.090	-0.003	-0.003
01-Jul-02	0.182	0.181	0.124	-4.620	-4.634	-0.002

CONCLUSION

This research looks at whether cross listed securities provide diversification benefits to investors, especially in the face of extreme events, in comparison to single listed securities. From the results gained we provide evidence that diversification benefits are found by adding cross listed securities to a base portfolio, in terms of improving the return/risk benefits for investors. No percentage was found for the optimal proportion of cross listed securities within a portfolio, instead an optimal range from 18-30% was shown to produce the greatest benefits to investors. This is demonstrated through the performance of the Base +2 and Base +1 Portfolios. The addition of Australian cross listed securities provides the best benefits to the investor. This is due to the finding that the Australian cross listed portfolio negatively related to the other portfolios, because of its close links to the mining industry. Nevertheless, the addition of cross listed securities from any market will improve the return/risk benefits to the investor, as found in this research. It was found that extreme events severely affect portfolio performance in terms of low returns and high levels of risk. This is expected, however, due to the increased uncertainty and volatility present within the market during an extreme event.

Holding cross listed securities mitigates some of these effects of extreme event as demonstrated during the Russia Ruble Crisis and September 11. But in regards to the Argentine Crisis, no benefits were found from holding a cross listed portfolio over a base portfolio.

All portfolios outperformed the NZ single listed index, which was expected as all the portfolios contained international securities, and gain benefits from international

diversification, but none of the portfolios outperformed the multi index. This finding confirms that, although investing in international securities may be riskier than investing locally, greater returns can be achieved.

The results for the weighting techniques showed that using CETP, MVP, or BST will provide the optimum weights for portfolios, with all three portfolio measures showing there little difference in results. Three of six portfolios ranked CETP as the most optimal, but the results provided evidence that EQWP was the lowest ranked method and gave less favourable results from the portfolio measures utilised.

Further extensions of this research that could enhance the results, or provide further evidence of what was found are as follows. First the use of ex ante weights applied to the ex post periods. Although it is believed that this increases the practicality of the research, what if increased volatility or turbulence was evident during the ex ante period, resulting in non-optimum weights. This can be resolved with the use of more than one ex ante period, this was considered in this research but the data history was not sufficient to go back further than 01/07/1997. Another factor in relation to weights and formation of portfolios, is the use of maximum and minimum weights. Although this ensures that all securities are utilised, maybe the optimum results are not found as in the real world if a security was not performing well would not be held within the portfolio.

Interesting extensions to this research would be to apply it to the US market and determine if the US provides the same benefits of cross listing as demonstrated here. As the US is denominated by many factors it is hard to determine the true benefits of one factor such as cross listing, but the US is among the largest developed market for

cross listed securities. Finally the application of this research on other extreme events to gain a better understanding of the behaviour exhibited during extreme events and how it affects the market in regards to their long term performance and how investors can minimise the affects on their portfolio returns.

APPENDIX A HYPOTHESIS TESTING

Hypothesis 1: Can risk/return benefits be achieved in a portfolio formation by the introduction of cross listed securities?

Ho: Rp(B) = Rp(1) = Rp (2) = Rp(3) = Rp(4) = Rp(5)

All portfolio returns are equal to each other.

Ha: Rp(B) < Rp(1) < Rp (2) < Rp(3) < Rp(4) < Rp(5)

Base + 5 will have higher returns than Base + 4, Base + 3, Base + 2, Base + 1, Base.

Ho: σ (B) = σ (1) = σ (2) = σ (3) = σ (4) = σ (5)

All portfolios will have risk Standard Deviations (SD) equal to each other.

Ha: σ (B) > σ (1) > σ (2) > σ (3) > σ (4) > σ (5)

Base + 5 will have lower risk than Base + 4, Base + 3, Base + 2, Base + 1, Base

Hypothesis 2: With the addition of cross listed securities into a portfolio, which market shows the highest benefits for an investor in terms of the risk return tradeoff relationship?

Ho: Rp(Aus) = Rp(Jap) = Rp(UK) = Rp(SA) = Rp(NZ)

All markets will have equal portfolio returns.

Ha: Rp(Aus) ≠Rp(Jap) ≠ Rp(UK) ≠ Rp(SA) ≠ Rp(NZ)

All markets will not have equal market returns.

Ho: σ (Aus) = σ (Jap) = σ (UK) = σ (SA) = σ (NZ)

All markets will have equal risk.

Ha: (σAus) ≠σ (Jap) ≠ σ (UK) ≠ σ (SA) ≠σ (NZ)

All markets will not have equal risk.

Hypothesis 3: Do Portfolios containing cross listed securities show any benefits over a base singly listed portfolio during the three extreme events being tested?

Ho: Rp(B) = Rp(1) = Rp (2) = Rp(3) = Rp(4) = Rp(5)

All portfolio returns are equal to another.

Ha: Rp(B) < Rp(1) < Rp (2) < Rp(3) < Rp(4) < Rp(5)

Base + 5 will have higher returns than Base + 4, Base + 3, Base + 2, Base + 1, Base.

Ho: σ (B) = σ (1) = σ (2) = σ (3) = σ (4) = σ (5)

All portfolios will have risk (SD) equal to another.

Ha: σ (B) > σ (1) > σ (2) > σ (3) > σ (4) > σ (5)

Base + 5 will have lower risk than Base + 4, Base + 3, Base + 2, Base + 1, Base

Hypothesis 4: Which portfolio outperforms the single and multi indices in terms of risk and return?

Single Index = New Zealand Morgan Stanley Capital Index (NZMSCI).

Multi Index = World Morgan Stanley Capital Index (WMSCI).

Ho: Rp(B) = Rp(1) = Rp (2) = Rp(3) = Rp(4) = Rp(5) = R(NZMSCI)

All portfolios will have a return equal to the return of single index NZMSCI.

Ha: R(NZMSCI) < Rp(B) < Rp(1) < Rp (2) < Rp(3) < Rp(4) < Rp(5)

Base + 5 will have higher returns than Base + 4, Base + 3, Base + 2, Base + 1, Base over single index. NZMSCI

Ho: β (B) = β (1) = β (2) = β (3) = β (4) = β (5) = β (NZMSCI)

All portfolios will have risk equal to the risk of single index NZMSCI.

Ha: β (NZMSCI) <β (B) < β (1) < β (2) < β (3) < β (4) < β (5)

Base + 5 will have lower risk than Base + 4, Base + 3, Base + 2, Base + 1, Base

Ho: Rp(B) = Rp(1) = Rp (2) = Rp(3) = Rp(4) = Rp(5) = R(WMSCI)

All portfolios will have a return equal to the return of the multi index WMSCI.

Ha: R(WMSCI) < Rp(B) < Rp(1) < Rp (2) < Rp(3) < Rp(4) < Rp(5)

Base + 5 will have higher returns than Base + 4, Base + 3, Base + 2, Base + 1, Base over multi index WMSCI

Ho: β (B) = β (1) = β (2) = β (3) = β (4) = β (5) = β (WMSCI)

All portfolios will have risk equal to the risk of multi index WMSCI.

Ha: β (NZMSCI) <β (B) < β (1) < β (2) < β (3) < β (4) < β (5)

Base + 5 will have lower risk than Base + 4, Base + 3, Base + 2, Base + 1, Base than multi index WMSCI

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Hypothesis 5: Which weighting model yields a better risk return trade off for the portfolios, as measured by the Treynor/Sharpe and Jensen Measures?

Ho: EQWP = MVP = CETP = Bayes

All weighting schemes are equal to one another.

Ha: EQWP < CETP <MVP < Bayes

Bayes will be higher than MVP, which will be higher than CETP, which will be higher than EQWP.

Ho: T (B) = T (B) = T (1) = T (2) = T (3) = T (4) = T (5)

The Treynor ratios for the portfolios will be equal.

Ha: T (B) < T (B) < T (1) < T (2) < T (3) < T (4) < T (5)

The Treynor ratio for portfolio Base + 5 will be higher than Base + 4, Base + 3 .....base.

Ho: (B) = S (B) = S (1) = S (2) = S (3) = S (4) = S (5)

The Sharpe ratios for the portfolios will be equal.

Ha: SR(B) <S (B) < S (1) < S (2) < S (3) < S (4) < S (5)

The Sharpe ratio for Base + 5 will be higher than Base + 4, Base + 3 .....base.

Ho: α (B) = α (B) = α (1) = α (2) = α (3) = α (4) = α (5)

The Jensen Alpha for the portfolios will be equal.

Ha: α (B) < α (B) < α (1) < α (2) < α (3) < α (4) < α (5)

The Jensen Alpha for Base + 5 will be higher than Base + 4, Base + 3 .....base.

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