AN ANALYSIS OF THE GAINS FROM ASIA-PACIFIC PORTFOLIO DIVERSIFICATION : AN INDONESIAN PERSPECTIVE

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Abstract

This study examines the level of gains for Indonesian investors who diversify their portfolios into Asia-Pacific stock markets compared to purely domestic diversification. The study covers the national stock markets of Australia, Hongkong, India, Japan, Malaysia, New Zealand, Philippines, Singapore, South Korea, Taiwan, and Thailand over the period 1990-1994 and 1992-1994.

The two overlapping periods were chosen because there was an improved performance of both the Indonesian market and the Asia-Pacific markets for the latter period, in terms of both increased return and reduced risk. Potential gains from Asia-Pacific diversification are shown to exist for the period 1990-1994. In contrast, the period 1992-1994 indicates that the Indonesian investors cannot significantly benefit from the Asia-Pacific diversification.

Thus this study indicates that the Indonesian investors should diversify their portfolios within the Indonesian stock market instead of diversifying into Asia-Pacific portfolios.

Acknowledgments

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Dedication

I owe my wife - *Maulidati* - and children - *Agesha*, *Isti*, and *Aji* - a huge debt of gratitude for their patience and understanding during the 3 years of studying in New Zealand.

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CHAPTER 1

INTRODUCTION

Spreading risk, through diversifying into several investments, is a common-sense approach for risk averse investors. Markowitz[1] , the pioneer of diversification, found that covariance is an important factor in reducing the total risk of investment. He stated that "it is necessary to avoid investing in securities with high covariances among themselves. We should diversify across industries with different economic characteristics, have lower covariances than firms within an industry "(*p.89*).

In the search for securities that have low covariances or correlation, increasing attention has been devoted by individual equity investors, pension fund managers, and portfolio managers, not only to diversifying across industries, but also across countries. Much research has been conducted into international diversification since 1968. Notable among these researchers were Grubel[2], Levy and Sarnat[3], Solnik[4] and Eun and Resnick[5]. They have proven that diversifying across countries can generate higher benefits than simply investing in diversified domestic portfolios. But their research was based solely on developed country data and perspectives.

Additionally, a few researchers have tried to investigate the gains of international diversification from the perspective of emerging market investors with data being taken from among these capital markets. In fact, there has been no prior published study of international diversification benefits from the Indonesian perspective, in particular into Asia-Pacific countries.

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[1] Markowitz, H.M. (1952). Portfolio Selection. Journal of Finance, 7(1), 71-91.
[2] Grubel, H.G. (1968,December). Internationally Diversified Portfolios: Welfare Gains and Capital Flows. American Economic Review, 1299-1314.
[3] Levy, H.,& Samat,M. (1970,September). International Diversification of Investment Portfolios. American Economic Review, 668-675.
[4] Solnik, B. (1974,July-August). Why Not Diversify Internationally? Financial Analysts Journal, 20, 48-54.
[5] Eun, C.S.,& Resnick,B.G.(1994,January). International Diversification of Investment Portfolios: U.S. and Japanese Perspectives. Management Science, 40(1), 140-161.

1.1. The Statement of problem

For an overall analysis of the investor viewpoint, the study examines the gains for Indonesian investors who diversify their portfolios into Asia-Pacific markets compared to purely domestic diversification.

Indonesia is one of the developing countries that has been undergoing a remarkable development, particularly the development of the Indonesian capital markets. In a short time the numbers of listed companies on the Jakarta Stock Exchange (JSX) have increased rapidly. In 1988 the number of listed companies was 24, this increased to 124 companies in 1990, and at the end of 1994, there were 224 companies listed on the Jakarta Stock Exchange. An example of this remarkable development is that trading volume rose of 23,666 percent, from 121.9 million rupiah in 1988 to 28,970.8 million rupiah in 1990. In 1993 trading volume was 77,454.1 million rupiah.

This growth has not been matched by the JSX index's performance recently however. The JSX index was 588.77 points at the end of 1993 and decreased to 452.57 points at the end of 1994. On account of the unstable condition of the market, many Indonesian investors invest their money in foreign countries, especially in the Singapore Stock Exchange where a number of companies now have majority Indonesian ownership[6].

This trend to offshore investment is being watched closely by the Indonesian government and the players on the Indonesian stock market. Despite the fact that capital flows have been deregulated in Indonesia, capital outflows are viewed negatively by the Indonesian government with the government actively trying to

[6] Darudoyo, H., & Sayekti, S. (1995,Agustus). Mengapa mereka gencar diversifikasi di Singapore? Warta Ekonomi, 15, 13-15.

attract foreign capital for national development. On account of this the Jakarta Stock Exchange is actively trying to arouse more local interest in equities thus continuing to fulfil its mission of raising money for Indonesian economic growth.

International diversification is also viewed as an attempt to find an alternative investment for the Indonesian investor, based on offshore business opportunities. In the last three of years the rate of return and risk of ASEAN stock markets were better than for the Indonesian market (table 1). Moreover, The Indonesian currency (Rupiah) has depreciated at an annual rate of 7.33 percent and 5.77 percent against the Singaporean dollar and the Malaysian ringgit respectively over the period 1992 - 1994. The inflation rate for Indonesia was 9.24% in 1994.

Table 1: Return and Risk of ASEAN stock markets (Period 1992-1994)

Countries	Return (%)	Std.Dev (%)	Return to risk ratio
Indonesia	36.4	7.5	4.85
Malaysia	122.7	9.6	12.78
Philippines	86.5	10.8	8.01
Singapore	92.4	8.1	11.41
Thailand	153.7	8.5	18.08

Source: Warta Ekonomi, 1995.

Table 2: Inflation rate of ASEAN countries

Countries	1992	1993	1994
Indonesia	4.94	9.77	9.24
Malaysia	4.60	3.70	4.00
Philippines	8.90	7.60	4.50
Singapore	2.30	2.40	4.00
Thailand	4.10	3.40	4.30

Source: Nota Keuangan RAPBN 1995/1996.

1.2. The statement of the subproblems

The first subproblem of the study is to examine the return and risk from the Indonesian equity market as well as the Asia-Pacific markets during the period of 1990-1994 inclusive. The study also evaluates the effect of exchange rate movements on the performance of Asia-Pacific stock markets from the viewpoint of Indonesian investors. The second subproblem is to determine the efficient frontier and the optimal portfolios in both markets. The third subproblem is to examine the gains achievable from Asia-Pacific portfolio diversification thus comparing the performance of the Indonesian stock market with the Asia-Pacific stock markets.

1.3. Hypothesis

The following thesis question was examined from the Indonesian investor perspective and subjected to hypothesis testing: Are the diversification gains from Asia-Pacific portfolios better than those of the Indonesian market portfolio over the periods 1990-1994 and 1992-1994?

To test the hypothesis, the study utilises the reward-to-variability index designed by William Sharpe[7]. A positive value of the Sharpe ratio differential indicates that the Indonesian investor can potentially gain from Asia-Pacific diversification. Mathematically this index is difined as follows:

$$\Delta S = S_{af} - S_{ind}$$

where,

S_{af} = the Sharpe Ratio of Asia-Pacific diversified portfolios

S_{ind}= the Sharpe Ratio of Indonesian diversified portfolios

[7] Sharpe, W.F. (1994, Fall). The Sharpe Ratio. The Journal of Portfolio Management, 49-58.

1.4. Limitations

The study uses two different indices for analysing the gains of diversification. Individual indices were used to examine the performance of the Indonesian capital market, but it was not for the Asia-Pacifc markets. In this case, the study uses market indices to represent the Asia-Pacific markets. Even though many researchers have used market indices in conducting their research, these indices may not entirely reflect the performance of the national stock markets under study, because the indices do not represent all the publicly listed stocks in the respective markets.

1.5. The definitions of terms

To provide clarification of the terms used in this study, the following definitions are explained:

Gain is measured by the Sharpe ratio differential, a positive value indicates that Indonesian investors can potentially gain from Asia-Pacific diversification.

Asia-Pacific portfolio is a combination of stock investments from the Asia-Pacific region for those countries with a reliable source of data from 1990.

Efficient portfolios are defined those which have a higher return for a given level of risk as measured by standard deviation or lower risk for the same level of return.

Individual indices are the stock indices of securities actively traded on the Jakarta Stock Exchange as reported in the JSX monthly statistics.

Market indices are the Asia-Pacific stock market indices as reported in the Far Eastern Economic Review.

Unadjusted return is stock return measured in local currencies.

Adjusted return is stock return measured in Indonesian unit currency, Rupiah.

1.6. The importance of the study

In general, the study will provide further insight into international diversification from an emerging market perspective. Specifically, the importance of the study is to address the issue of Indonesian investors who diversify their portfolios abroad, by examining the current performance of the Indonesian capital market and Asia-Pacific markets.

1.7. Organisation of the study

This research study is split into five chapters. This first chapter has been an introduction that comprises of the statement of the problem and their subproblems, the research hypothesis, limitation, the definitions of terms, and the importance of the study. The reviews of the related literature are presented in the second chapter. The third chapter deals with the methodology used in portfolio selection, including the procedure for selection, and the calculation of the return. The fourth chapter analyses the empirical results. Finally, the fifth chapter details the conclusions which can be drawn from this research report.

LITERATURE REVIEW

2.1. Introduction

This chapter reviews the development of portfolio diversification from its pioneer, Markowitz, viz a viz development of international diversification. The first of 3 parts reviews the Markowitz concept of mean-variance-criterion. The second discusses the Homogeneous Programming method. Finally, the chapter presents a review of the previous studies that have been undertaken on the benefits of international diversification, either under the fixed exchange rate system or under the flexible exchange rate system.

2.2. Markowitz Portfolio Selection

The Markowitz portfolio selection was developed as an extension of the expected utility model, which asserts that a rational investor would seek out a portfolio that maximises the expected utility, under conditions of uncertainty. Each individual is faced with an alternative between investment and consumption repeatedly in the future.

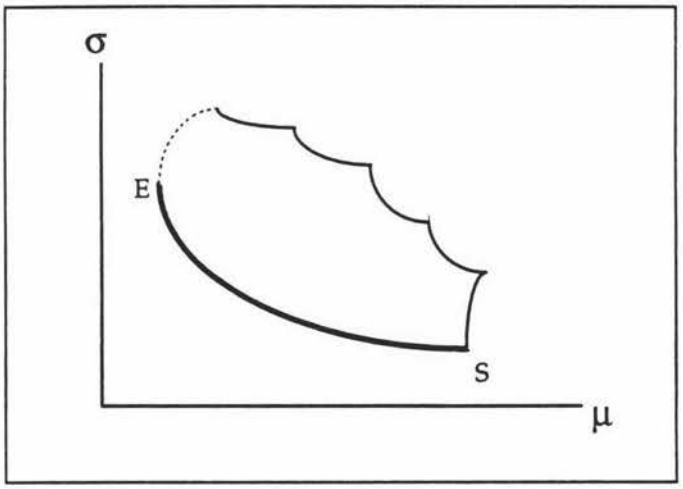
The Markowitz model determines the optimal investments for an investor by considering the mean and variance as measures of return and risk for all obtainable investments. It can be illustrated by the following example, given n securities being considered for investment. All portfolios will have:

$$\text{mean} = E(R) = \sum_{i=1}^{n} w_i x_i \quad (1) \quad \text{,and} \quad \text{variance} = \sigma^2 = \sum_{i=1}^{n} \sum_{j=1}^{n} x_i x_j c_{ij} \quad (2)$$

Where w_i is the percentage of funds invested in the i^{th} security, x_i is the expected return, c_{ij} is the covariance between the i^{th} and the j^{th} securities.

Rational investors will choose from those portfolios which dominate all inferior portfolios, because they offer the largest expected return for a given amount of risk, or the smallest risk for a given expected return. These portfolios are called the efficient set by Markowitz[8] and are depicted by the solid line which starts from point E in figure 1. Markowitz[9] places variance or standard deviation on the vertical axis and return on the horizontal, whereas the current practice is to reverse the axes. The figure below conforms to the Markowitz approach, however all other similar figures in this thesis conform to the current practice.

Figure 1: Obtainable portfolios with Efficient Set



Furthermore, Markowitz[10] stated that "the proper choices among efficient portfolios depends on the willingness and ability of the investor to assume risk.

[8] Markowitz, Op.cit, 71-91.
[9] For detail see Markowitz, H.M. (1987). Mean Variance Analysis in Portfolio Choice and Capital Markets, Massachusetts: Basil Blackwell, Inc, 178-179.
[10] Markowitz, H.M. (1991). Portfolio Selection: Efficient Diversification of Investments. (2nd ed.). Massachusetts: Basil Blackwell, Inc.

If safety is of extreme importance, likely return must be sacrificed to decrease uncertainty. If a greater degree of uncertainty can be borne, a greater level of likely return can be obtained"(*p.6*). This is the idea of diversification that has laid the foundations of Modern Portfolio Theory. Thus the phenomenon of diversification has been born to lead to a better allocation of the investment dollar.

The rationale for diversifying portfolios can be mathematically illustrated as follows:

$$E(R_p) = w_i x_i + w_j x_j \quad (3)$$

$$\sigma^2(R_p) = w_i^2\sigma_i^2 + w_j^2\sigma_j^2 + 2(w_i)(w_j)Cov_{ij} \quad (4)$$

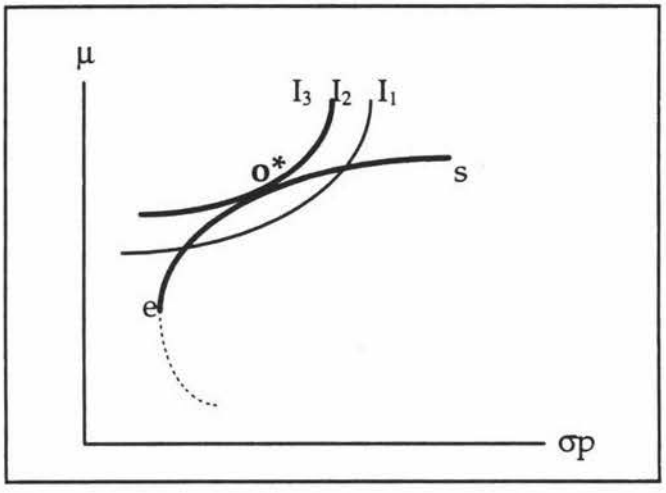
Suppose there are two securities, i and j. Each security has the same return and variance, that is 6% and 10% respectively. Covariance of return i and j is 0.07. Let us suppose 50% of funds are invested in each security. Thus the expected return and variance of portfolio are follows:

$$\begin{aligned} E(R_p) &= (.5)(.06) + (.5)(.06) \\ &= .06 \\ \sigma^2(R_p) &= (.5)^2(.1) + (.5)^2(.1) + 2(.5)(.5)(.07) \\ &= .085 \text{ or } 8.5\% \end{aligned}$$

This illustration shows the important point stressed by Markowitz in his 1952 notable paper, that is, the role of portfolio diversification in reducing risk (variance). The above example shows us that the expected return is still the same (6%) but the variance of this diversified portfolio (8.5%) is less than variance i and variance j, 10%.

However, the Markowitz model does not determine the exact preferences of every individual. It merely provides a set of efficient portfolios that have the highest return for a given level of risk. Indifference curve analysis is utilised to select the desired portfolio that best suits an individual investor's preferences. In this case, the optimal portfolio for each investor is found at the point of tangency between the indifference curve and the efficient frontier[11]. The optimal portfolio occurs at point o* in figure 2. Investors with different utility preferences toward risk will hold different optimal portfolios.

Figure 2: Markowitz Efficient Frontier.



The problem of portfolio selection can be statistically solved by the Quadratic programming method. The method uses the maximisation of an objective function subject to constraints[12]. It is specified by:

$$\text{Maximise } Z = \lambda \sum_{i=1}^{n} e_i x_i - \sum_{i=1}^{n} \sum_{j=1}^{n} x_i x_j c_{ij} \quad \text{for all } \lambda,\ 0 \leq \lambda \leq \infty \qquad (5)$$

[11] Witt, S.F.& Dobbins, R. (1979-80). Markowitz Contribution to Portfolio Theory. Managerial Finance, 5(1), 3-17.
[12] Wallingford, E.A. (1967). A Survey and Comparison of Portfolio Selection Models. Journal of Financial & Quantitative Analysis, 2, 85-106.

$$\text{Subject to: } \sum_{i=1}^{n} = 1$$

$$x_i \geq 0 \text{ for all } i = (1,2,...n)$$

where: $x_i x_j$ = the proportion invested in the i^{th} and the j^{th} securities respectively
e_i = the expected return i^{th}
c_{ij} = the covariance between the ith and the j^{th} securities.

2.3. The Homogenous Programming Method

There have been many attempts to overcome the shortcomings of the Markowitz quadratic programming method, i.e. it does not specify an exact solution and is not practicable. Sharpe[13], Lintner[14], Moeseke[15], and Elton et.al[16] provide the alternative models to simplify the optimal portfolio selection. Sharpe, Lintner, and Elton et.al. simplify the problem by using a single market index. Moeseke eliminates the need to use a complex calculation by adapting the minimax rule to normally distributed returns.

Sharpe and Lintner's model approaches the portfolio selection with particular emphasis on the determination of the prices of securities in a competitive market, it can be stated as a positive theory. Meanwhile, the Markowitz and Moeseke model are a normative theory that deal the normal behaviour of investors in relation to an investor's risk preference.

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[13] Sharpe, W.F. (1964, September). Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk. Journal of Finance, 425-442.
[14] Lintner, J. (1965, December). Security Prices, Risk and Maximal Gains from Diversification. Journal of Finance, 587-615.
[15] Moeseke, P.v. (1965). Stochastic Linear Programming. Yale Economic Essays, 1, 197-253.
[16] Elton, E.J. et.al. (1976, December). Simple Criteria for Optimal Portfolio Selection. Journal of Finance, 11(5), 1341-1357.

Sharpe and Lintner consider that the prices of securities can rise and fall due to market or company factors. Market relative factors stem from external events and company related factors are unique to particular securities. The former is known as systematic risk, it cannot be reduced by diversification. The latter is known as unsystematic risk that can be diversified away.

In light of the Markowitz model, Moeseke[17] stated that "the set of efficient decision is broad and the criterion clearly leaves further choice among efficient decision to one's relative valuation of risk versus return" (*p.207*). As an alternative, Moeseke proposes the truncated-minimax criterion to determine the efficient portfolios.

The truncated-minimax criterion assumes that the outcome distributions are normally distributed. Therefore, it characterises the expected return and risk by its first and second moment. The truncated minimax criterion is formulated as follows:

$$\phi f(x) = Ef(x) - m\sigma f(x) \qquad (6)$$

where,

$Ef(x)$ = the expected return on x

$\sigma f(x)$ = the standard deviation of returns for x

m = the risk preference parameter

Moeseke introduced a risk preference parameter, m, in terms of return and standard deviation in his formula. It can be interpreted as both a confidence limit and also as an investor attitude toward risk. For instance, the value of risk preference varies among investors. The value of risk preference less than zero

[17] Moeseke, P.v., Op.cit.

represents a risk lover. On the other hand, the value greater than zero represents a risk avertor. While, if m = 0 the investor is risk neutral and will simply choose the investment with the highest expected return.

The investor will be able to determine the optimal portfolio after constructing the set of efficient portfolios. From the duality theorem of homogeneous programming, the dual solution gives the marginal return to the investment dollar. An optimal portfolio can then be determined where the marginal return is equal to the marginal cost. In this instance, Moeseke formulated an optimal portfolio as follows,

$$\lambda = \phi(x^* \mid m) = cx^* - m\sigma x^* \qquad (7)$$

where λ measures the marginal return to the investor using criterion ϕ. A single point solution can be determined for the portfolio selection problem.

The homogeneous programming method has an interesting application of measuring the risk preference parameter, m. At the optimal point , the risk preference also reflects the reward-to-variability index, $-m = cx^*/\sigma x^*$. In this case, investor attitudes can be linked to the hypothesis of the research study. The relationship is as follows: the risk preference of the Asia-Pacific market is higher than the Indonesian one ($m_{af} \geq m_{ind}$), when the gains from Asia-Pacific diversification is superior to that of the Indonesian market diversification. In other words, an Indonesian investor is less conservative in investing on the Indonesian stock market than investing on the Asia-Pacific market.

Furthermore, if Moeseke's risk preference m is measured by including interest rate[18] in the nominator [-m=(Rj-Rf)÷σ], the risk preference is similar to the original Sharpe ratio[19], SHP = (Rj-Rf)÷σ. In this case, the ratio shows the expected differential return per unit of risk associated with the differential return. In addition, Levy and Sarnat[20] defined the ratio as the price or premium which investors place on the risk associated with their investments. Therefore, the Moeseke risk preference is the optimality concept in another way.

The homogeneous programming method uses an iterative process, under the truncated criterion, to select the set of efficient portfolios. The iteration selects a succession of more appropriate portfolios at each iteration. An optimal combination of securities will be found, when a security that is already part of a portfolio is selected for a second time. The method varies the level of risk preference to generate the efficient frontier, then the appropriate interest rate can be derived for a particular portfolio by the duality theorem of homogenous programming. Any solution occurs when the primal (maximisation problem) equals the dual (minimisation problem). The dual (λ) is the marginal return to the investment dollar.

The homogeneous programming method can also be formulated in matrix notation as follows,

$$\text{max: } \phi(x) = cx - m\,(x\,V\,x)^{1/2} \qquad (8)$$

$$\text{subject to } ux \leq 1 \quad \text{and} \quad x_i \geq 0$$

[18] Green, N.G. (1993). A Test of Historical and Shrinkage Estimates of Expected Returns in International Portfolio Selection. Unpublished master thesis, Massey University, Palmerston North, New Zealand.
[19] Sharpe, W.F. (1966). Mutual Fund Performance. Journal of Business, 39, 119-138.
[20] Levy, H., & Sarnat, M. (1984). Portfolio and Investment Selection: Theory and Practice. London: Prentice Hall.

where,

c = expected return per dollar invested in security i

x = proportion of budget (set at unity) invested in security i

m = the risk preference parameter

V = variance-covariance matrix of yields

u = unit vector of 1's with n securities.

2.4. International Diversification

Since Markowitz launched his idea about the benefit of diversification, some researchers have tried to extend the concept of diversification by examining the gains from diversifying into international portfolios. Notable studies are marked by two exchange rate systems, the fixed exchange rate system that was established prior to 1973 and the flexible exchange rate or floating exchange rate system. Studies under exchange rate regime were undertaken by Grubel, Levy and Sarnat, and Solnik.

The period of the Fixed Exchange Rate System

Grubel[21] presented the first article on international portfolio in 1968. Grubel found that the international portfolio diversification generates a new kind of world welfare gain from international economic relations. These gains differ in nature from those traditional gains of trade and international factor movements.

[21] Grubel, H. (1968, December). International Diversified Portfolios: Welfare Gains and Capital Flows. American Economic Review, 58, 1299-1314.

Grubel's study was constructed by using the monthly historical returns of common stocks in 11 major stock markets of the world (USA, Canada, United Kingdom, West Germany, France, Italy, Belgium, Netherlands, Japan, Australia, and South Africa). This study covers the period January 1959 to December 1966. Grubel used the geometric mean of 95 monthly rates to compute the monthly average return based on the share price index in each country under study. He utilised the quadratic programming method to determine the portfolio selection.

The following table shows the results of Grubel's study from investing in international markets during the period January 1959-December 1966. The returns range from 16.54 percent for Japan to 1.09 percent for Belgium. In other word, an investor could have a 16.54 percent return by investing in Japan, if the investor prefers the maximised result. Alternatively, an investor could minimise his or her risk in single investment strategies by putting the money entirely into Australia with 34.87 percent standard deviation.

Table 3: Rates of Return and Risk from Investing in Foreign Capital Market Averages,1959-1966

Countries	Return (% per annum)	Risk (σ)
USA	7.54	47.26
Canada	5.95	41.19
United Kingdom	9.59	65.28
West Germany	7.32	94.69
France	4.27	49.60
Italy	8.12	103.33
Belgium	1.09	37.56
Netherlands	5.14	86.34
Japan	16.54	92.52
Australia	9.44	34.87
South Africa	8.47	61.92

Source: Grubel, 1968

However, the Grubel study offers more attractive results to the investor who wants to take into account the diversification concept in foreign markets. Table 4 indicates this offering as investigated by Grubel.

The result shows the important role of international diversification to reduce risk. Diversification among the assets from the eight countries have obviously performed better than investments in any single country. For example, consider a single country consisting of Moody's industrial average of common stocks in United States market. The U.S investor would have an average return of 7.54 percent for a risk of 47.26. In contrast, a combination of assets in portfolio seven would offer a higher return of 9.2 percent for a lower risk of 22.8.

Table 4: Efficient Internationally Diversified Portfolios

	Percentage of Portfolio Invested in country portfolio Number							
Country	1	2	3	4	5	6	7	8
United States						12.3	12.8	12.5
Canada							14.0	15.9
United Kingdom		2.4	6.3	11.9	12.0	10.7	8.4	7.6
West Germany								
France								
Italy								2.7
Belgium					0.2	1.7	1.7	1.5
Netherlands								
Japan	100.0	97.6	74.9	32.1	30.8	17.0	8.5	7.0
Australia			18.9	42.6	43.1	42.6	39.0	37.3
South Africa				13.4	13.8	15.7	15.6	15.4
Portfolio Return	16.5	16.4	14.7	11.6	11.5	10.3	9.2	8.8
Portfolio Risk	92.6	90.6	71.0	37.1	36.3	27.4	22.8	22.1

Source: Grubel, 1968

Levy and Sarnat[22] investigated the gains from international diversification for 28 countries for the period 1951-1967. The countries were divided into six groups

[22] Levy, M., & Samat, M. (1970, September). International Diversification of Investment Portfolios. American Economic Review, 60 , 668-675.

used as a comparison from the U.S investor viewpoint. This study used arithmetic averages in calculating the share indices of common stocks for each country and utilised the Sharpe-Lintner capital market line to determine the optimal portfolios. Levy and Sarnat found that the U.S domestic return was 12.1 percent and the standard deviation was also 12.1 percent.

Table 5 provides the optimal portfolios for each of the selected groups from the U.S investor viewpoint. The Levy and Sarnat study proved that the U.S investor can achieve gains by international portfolio diversification by including all the 28 countries under study. The U.S investor would have the same rate of return, but with a lower risk. For instance, the risk reduction was 4.1 percent.

Table 5: Mean Rates of Return and Standard Deviations of Optimal Portfolios for a 5 percent Interest Rate.

Countries	Return (%)	Risk (σ)
Developing countries	5.0	26.5
Common market	15.5	25.0
Western Europe	15.5	23.5
High Income countries	13.0	12.5
All 28 countries	12.0	8.0

Source: Levy and Sarnat, 1970

The highlight of their study was the low correlation of developing countries to the high income countries and high positive correlations of the five common market countries. Although the developing countries have the lowest performance of return, the inclusion of these countries would move the efficient set up. For instance, Levy and Sarnat recommended that it is only when the American investor diversifies his or her portfolio to include such countries as

Japan and regional areas such as South America and Asia that a significant improvement in his or her portfolio results occurs (p.673).

Solnik[23] examined the effectiveness of diversification to reduce the risk of the portfolio and the number of securities needed to obtain a reasonable diversification. Solnik's study is viewed from domestic diversification (the U.S investor) and international diversification (the European investors). The European investors are representative by the seven major European stock market of the United Kingdom, Germany, France, Switzerland, Italy, Belgium, and the Netherlands.

Table 6: the minimum risk obtained for each country under Solnik's study.

Countries	Minimum risk (%)
United States	27.00
United Kingdom	34.50
France	32.67
Germany	43.80
Italy	38.00
Belgium	19.00
Netherlands	24.10
Switzerland	44.00
International	11.70

Source: Solnik, 1974

Table 6 above shows the result of Solnik's study. Solnik took a database of weekly price movement on NYSE stocks and 300 European stocks for the period 1966-1971. Solnik randomly constructed portfolios of selected securities for each of the stock markets, starting from one stock and going to sixty-five stocks. The variance is then calculated from the portfolios constructed,

[23] Solnik, B. (1974, July-August). Why Not Diversify Internationally? Financial Analysist Journal, 20, 48-54.

averaging them for each size group. Solnik discovered that with the increased number of stocks in the portfolio, the risk of the portfolio decreased. It decreased sharply at first from one to ten stocks and then decreased more gently as additional holdings were introduced.

Moreover, Solnik found that international diversification was more attractive than purely domestic diversification. Solnik[24] pointed out that an internationally well-diversified portfolio would be one-tenth as risky as a typical security and half as risky as a well-diversified portfolio of U.S stocks, with the same number of holdings.

The next stage of Solnik's study was to show the effect of exchange rate movements. By incorporating the exchange rate risk, the study discovered that the risk of a portfolio unhedged against exchange rate movements is larger than for a hedged portfolio. Although the study found that the effect of exchange risk is very small, the international portfolio risk-reduction is still substantial. The same result was detected by Joy et al.[25]

The Period of the Floating Exchange Rate System

Various studies have been conducted to reassess the benefit of international diversification after the new exchange rate system established in 1973. Under the floating exchange rate system, the exchange rate is now an asset price. An investor has therefore to take into account the portion of volatility in a portfolio's return caused by uncertainty in foreign exchange rate movements.

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[24] Solnik, B. Op.cit, p.51
[25] Joy, M., Panton, D., Reilly, F., & Martin, S. (1976, March). Comovements of Major International Equity Markets. The Financial Review, 1-20.

Eun and Resnick[26] undertook an empirical investigation of the impact of exchange rate fluctuations upon international portfolio diversification. The study covered the period of January 1973 to December 1982 and took a database of monthly stock market indices from fifteen major countries[27]. The benefits of international diversification is viewed from the viewpoint of fifteen national investors using their own numeraire currencies.

In analysing the results, the study found that the effect of exchange rate movements varied among the countries under study. The contribution of currency factors were positive for the German, Japanese, Singaporean, and Swiss stock markets, while the performance results of the Australian, Italian, Spanish, Swedish, and UK markets were diminished. However, the study still discovered that substantial gains existed from international diversification for the every national investor.

The study also found that the risk of national stock markets increased when the exchange rate adjustments were included. This reflects the volatile behaviour of exchange rates during the observation period.

Another Eun and Resnick's study[28] in international diversification used weekly data of seven countries for the period of 1980-1985. The study found that exchange rate returns are more volatile than the stock market returns by about fifty percent. Furthermore, the study discovered that the exchange rate movements had affected the risk of foreign investment in two ways, that is, through its own variance and through its positive covariances with the local

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[26] Eun, C.S., & Resnick, B.G. (1985, Summer). Currency Factor in International Portfolio Diversification. Columbia Journal of World Business, 45-53.

[27] These countries are Australia, Belgium, Canada, France, Germany, Hong Kong, Italy, Japan, Netherlands, Singapore, Spain, Sweden, Switzerland, UK, and USA.

[28] Eun, C.S., & Resnick, B.G. (1988, March). Exchange Rate Uncertainty, Forward Contracts, and International Portfolio Selection. The Journal of Finance, 43(1), 197-215.

stock market returns. This indicated that the exchange rate movements reinforced the stock market movements. The implication was that a large portion of exchange rate risk would remain non-diversifiable in a multicurrency diversification. For instance, Eun and Resnick suggest that hedging strategies are an important factor for the U.S investor to increase the gains from international diversification substantially.

Adler and Simon[29] compared the exchange rate risk exposure during the period 1976-1979 and 1980-1982. The study found that the exposure to exchange rate risk was substantially higher in the period 1980-1982 and the gains from international diversification had decreased. This finding was supported by Raymond and Weil's study[30]. By comparing the Grubel and Fadner's correlation coefficients from the fixed exchange rate system, Raymond and Weil found that under flexible exchange rates international diversification benefits still exist, but not to the extent as would have been the case had exchange rates been pegged.

A study by Madura[31] considered various country perspectives in international diversification. Using quarterly stock indices for the period of January 1974 to January 1988, the study proved that the gains from international diversification still do exist. Meric and Meric[32] also found that diversification across countries is better than across industries.

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[29] Adler, M., & Simon, D. (January 1986). Exchange Rate Suprise in International Portfolios. Journal of Financial Management, 44-52.
[30] Raymond, A.J., & Weil, G. (1989, Autumn). Diversification Benefits and Exchange-Rate Changes. Journal of Business Finance & Accounting, 16(4), 455-465.
[31] Madura, J. (1992). Benefits from International Diversification: Across Time and Country Perspectives. Managerial Finance, 18(2), 1-5.
[32] Meric, I., & Meric, G. (1989). Potential Gains from International Portfolio Diversification and Inter-Temporal Stability and Seasonality in International Stock Market Relationships. Journal of Banking and Finance, 627-640.

2.5. Summary

Chapter two reviewed two important literatures in the theory of portfolio selection and then discussed the gains from international diversification. Markowitz is the pioneer of Modern Portfolio Theory who laid down the concept of diversification. The fundamental point of diversification is that the riskiness of a security should not only be measured by the variance of the security, but also by the covariance. Moeseke has on the other hand simplified the process of selecting efficient and optimal portfolios. By using the homogeneous programming method, one can determine an exact solution for portfolio selection. The chapter went on to discuss the benefits of diversification into the international market place. The review of various studies has shown that international diversification was a superior strategy to single market investment, particularly at the time of a fixed exchange rate system.

DATA AND METHODOLOGY

3.1. Introduction

Analysing the gains from Asia-Pacific stock markets compared to the Indonesian stock market, the data bases of these markets have been gathered for the period of five years. The data for this study uses market indices for Asia-Pacific stock market and individual indices for the Indonesian stock market. In this case, the Indonesian companies selected are representative of the publicly listed companies on the Jakarta Stock Exchange.

This chapter deals with the methodology used to create portfolio selection, including the procedure of selection, and the calculation of the return on the Indonesian stock market and the Asia-Pacific stock market. Furthermore, the iterative process of the homogenous programming method for examining the optimal portfolios is also described.

3.2. Data

Data Sources

The study is carried out with the monthly returns in the Indonesian stock market and Asia-Pacific stock markets. The Indonesian stock market data consists of month end prices, cash dividends, stock dividends, stock bonus, and stock splits for 124 securities actively traded on the Jakarta Stock Exchange. The Asia-Pacific data consists of month end market indices, exchange rates, and dividend yields.

The Indonesian data is compiled from various issues of the journal of Info Pasar Modal (Indonesia), Kompas and the Jakarta Stock Exchange monthly

statistics. The market indices for the Asia-Pacific data are obtained from Telerate and Smith New Court as reported in the Far Eastern Economical Review[33]. The exchange rate data is obtained from the International Financial Statistics published by the International Monetary Fund.

Table 7 : The list of data sources

Data	Sources
Base indices of individual stocks	BAPEPAM, "the Indonesia capital market supervisory agency"
Stock prices/market indices	The Journal of Informasi Pasar Modal Kompas The Jakarta Stock Exchange monthly statistics The Far Eastern Economic Review Datastream, Finance Department file,Massey University
Dividend/dividend yield	The Journal of Informasi pasar Modal The Jakarta Stock Exchange Statistics The Australian Stock Exchange IGFS, "Institute of Global Financial Studies" Emerging Stock Markets Factbook
Dividend and capital gain taxes	Euromoney Handbook Indosuez Asia Investment Services Research
Exchange rates	IMF, "International Financial Statistics"
Indonesia 90 day interest rate	Datastream, Finance Department file, Massey University

Period Considered

The period of observation was divided into two periods, the period October 1990 to December 1994 and the period January 1992 to December 1994. Two period analyses are based upon two considerations; major developments on the Indonesian capital market in 1989 and market condition in 1991.

[33] The Far Eastern Economic Review is actually a weekly issue. The study uses the end of month issue to make the same period of data with the Indonesia capital market data.

Firstly, major developments on the Indonesian capital market have been marked by a series of market deregulations since 1988. In December 1988 the Indonesian government announced a package designed to accelerate economic development by fostering the Indonesia capital markets and in September 1989 the government permitted foreign investors to participate in up to 49% of the listed shares in the market.

The effect of the regulations was positive for the development of the Indonesian capital markets. As noted in Table 8, the companies listed on the Jakarta Stock Exchange increased drastically during two years, from 51 companies in 1989 to 124 companies at the end of the 1990[34]. There were 226 companies publicly listed on the Jakarta Stock Exchange in 1994.

Table 8: The Highlight of development of the Jakarta Stock Exchange.

Year	Number of companies listed	Trading volume (Rp.million)	Stock price index (at year end)
1980	6	22.8	103.50
1981	9	30.1	100.30
1982	14	50.7	95.00
1983	19	40.4	80.40
1984	24	8.7	63.50
1985	24	13.1	66.50
1986	24	7.4	69.70
1987	24	21.1	82.60
1988	24	121.9	305.10
1989	51	4,127.5	359.40
1990	124	28,970.8	457.80
1991	138	24,179.1	247.40
1992	153	30,207.2	274.40
1993	172	77,454.1	588.80

Sources: Badan Pelaksana Pasar Modal and Statistik Pasar Modal Indonesia

[34] Statistik Ekonomi Keuangan Indonesia. (1991, January). Bank Indonesia, Jakarta.

Table 8 shows the development of the Jakarta Stock Exchange, with little improvement occurring prior to 1990. However from 1990 to 1993 the trading volume shown in Rp. million has more than kept-pace with the increase in the number of companies listed. Therefore, the period 1990 is considered most important in the development of the Indonesian capital market history. It was also considered that the number of 51 listed companies was neither sufficient nor representative of investment on the Indonesian stock market currently. Therefore, this study chooses the period of 1990 as a starting point.

The second period, January 1992 - December 1994, was chosen due to the bear market that occurred on the Indonesian stock market in 1991. The Indonesian stock market dropped sharply in 1991 (see Table 8). The JSX composite index was 457.80 point at the end of 1990 and decreased to 247.40 point at the end of 1991. In other words, the market lost 40,78 percent during the year. According to the Emerging Stocks Markets Factbook report[35], the Indonesian stock market performance was the third worst in the world in 1991.

The Asia-Pacific Countries Included in the Study

Table 9 provides the Asia-Pacific countries and their respective stock exchange indices. There are 11 countries included in this international study. The stock indices and exchange rates for the selected countries were obtained from various issues of the Far Eastern Economic Review and International Financial Statistics respectively.

[35] International Finance Corporation. (1992). Emerging Stocks Markets Factbook, p.49.

Table 9: Asia-Pacific countries and the sources of the indices

Countries	Sources of the indices
Australia	The All ordinaries index
Hongkong	Hongkong Hang Seng index
India	Bombay BSE sensitive index
Japan	Nikkei Stock Exchange
Malaysia	KLSE Composite index
New Zealand	NZSE gross index
Philippines	Manila Composite index
Singapore	Singapore Strait Times index
South Korea	Seoul Composite index
Taiwan	Taipei Weighted index
Thailand	Bangkok SET index

Sources: The Far Eastern Economic Review

3.3. Methodology

This study uses the Homogenous Programming Method as proposed by Moeseke to determine the selection of an investment portfolio for the Indonesian and Asia-Pacific stock markets. The performances of the selected portfolios are subsequently compared by using the Sharpe ratio.

Minitab for windows, Release 10.5 Xtra and Microsoft's Excel spreadsheet program were used to calculate monthly returns (arithmetic mean), standard deviations, correlation coefficients, covariance matrices, coefficients of variation and all other repetitive calculations. A costume built application software[36] was used to determine the efficient frontier and optimal portfolios.

The procedure of selection

Firstly, this study includes 124 companies from 17 industrial groups listed on the Jakarta Stock Exchange. All of these companies have been publicly traded on the Jakarta Stock Exchange since 1990.

[36] the program was designed by Martin Young, Senior Lecturer of Finance Department, Massey University - New Zealand.

Secondly, the study evaluates the performance of individual stocks on the Jakarta Stock Exchange, based on their performance in their industrial groups. The lowest coefficient of variation and liquidity were deemed to be an important criteria in the selection process. In other words, the study employs the coefficient of variation in selecting the stocks and takes into account the stock activities in the market as a measure of liquidity.

The process of selecting is as follows; a stock will be chosen if it has positive rate of return (mean), the lowest rank according to the coefficient of variation and is liquid. The study determines the frequency (how often the stock trades in the market) as a liquidity indicator. The stock will be categorised as illiquid if its average frequency of trade is less than 5 days per month during the period of study. The illiquid stock will, then, be ignored and the proceeding ranked stock will be included in the designed portfolio as representative of their industries.

In light of liquidity, Harvey[37] and Bekaert[38] have included this factor in selecting their portfolios. Harvey determined frequency, trading volume, and market value as the basis of liquidity on selecting stocks. Meanwhile, Bekaert used a turnover measure, that is, value traded divided by market capitalisation.

The Return on the Indonesian stock market

The one-period individual stock rate of return is defined as follows:

$$R_{jt} = [(Index_t - Index_{t-1}) \div Index_{t-1}] + d(1-T) \qquad (9)$$

[37] Champbell, R. Harvey., (1995, January). The Risk Exposure of Emerging Equity Markets. The World bank Economic Review, 9(1),19-50.
[38] Bekaert, R.H., (1995, January). Market Integration and Investment Barries in Emerging Equity Markets. The World Bank Economic Review, 9(1), 75-107.

where,

R_{jt} = rate of return of the individual stock at the end of period t

$Index_t$ = rupiah amount of the individual stock index at the end of period t

$Index_{t-1}$ = rupiah amount of the individual stock index at the beginning of period t

d = dividend yield, dividends are reinvested in the index on the ex-dividend date

T = tax

This study uses the individual stock price indices calculated by the Jakarta Stock Exchange. The indices are based on the method used by the Indonesian capital market supervisory agency, according to the decree No. 544/PM.4/1991. The general expression of the indexes is as follows:

When t>1 : $\mathbf{Index_t = P_t \div P_b \times 100}$ (10)

when t=1 : $\mathbf{Index_t = 100,\ P_b = P_t}$ (11)

where,

$Index_t$ = individual index at the end of period t

P_b = base price of the index; when t=1 (the first issue of stock), the first issue price equals the base price

P_t = the closing price for the stock in period t

Adjusted base price (P_b)

1. Adjusted base price for bonus stocks, stock dividends, or new issues;

$$\mathbf{P_b = [P_b \div (n + m)] \times n} \quad (12)$$

2. Adjusted base price for stock splits;

$$P_b = P_b \div m \quad (13)$$

3. Adjusted base price for right issues;

$$P_b = [(n \times CRP)+(m \times EP)] \div (n+m) \times Index_{t-1} \quad (14)$$

4. The adjustment described above are used to calculate the individual indexes excluding the gain from cash dividend and tax. To include cash dividend and tax, the individual index is calculated by using formula (9) above;

5. A cancellation of stocks would be treated as a negative new issue. Stocks created by the conversion of other securities are treated as new issues;

where,

$Index_t$ = individual index at the end of period t

$Index_{t-1}$= individual index at the beginning

P_t = stock price at the end of period t

P_b = base price

P_b = adjusted base price

n = number of individual stock listings in the Jakarta Stock Exchange

m = number of individual new stock s

CRP = cum right price[39]

EP = exercise price

[39] Cum right price means that the rights are still attached to the head years.

The Return on the Asia-Pacific market

The return on the Asia-Pacific market from the Indonesian perspective is actually the combination of two returns; returns from holding the Asia-Pacific stocks and returns from holding their currencies. The steps used to find this return are as follows:

First step

The one-period market rate of return from holding the Asia-Pacific stocks is defined as follows:

$$\mathbf{R_{st} = [(Index_t - Index_{t-1}) \div Index_{t-1}] + 1/12D(1-T)} \qquad (15)$$

where,

R_{st} = rate of return of the stock market at the end of period t

$Index_t$ = rupiah (Indonesian currency) amount of the stock market index at the end of period t

$Index_{t-1}$ = rupiah amount of the stock market index at the beginning of period t

1/12D = the average of dividend yield on the Asia-Pacific country index

T = tax

The formula for calculating New Zealand's market rate of return is, specifically, carried out as follow: $\mathbf{R_{st} = (Index_t - Index_{t-1}) \div Index_{t-1}}$. This study uses a simplied formula for the New Zealand market, as the New Zealand Stock Exchange produces an index with includes dividend returns known as the NZSE Gross Index.

Second step

Since the exchange rates in the historical data from International Financial Statistics are all quoted against the US dollar, an adjustment of all the database from Asia-Pacific market is required to develop the returns for the Asia-Pacific

markets. Therefore, a database of exchange rates has to be converted into , a database of exchange rates has to be converted into Indonesian currency unit (Rupiah).

The converted exchange rates are employed to calculate the return from holding the Asia-Pacific currency (R_e) defined as follow

$$R_e = (R_c - R_{c-1}) \div R_{c-1} \quad (16)$$

where,

R_c = the converted exchange rate at the end of the period

R_{c-1} = the converted exchange rate at the beginning of the period.

Third step

The monthly return to the Indonesian investor who invests in the foreign stocks is, R_t, is given by:

$$R_t = (1 + R_{st})(1 + R_e) - 1 \quad (17)$$

The values for R_t are employed for the calculation of returns (means) and Risks (standard deviation).

The Optimal portfolio and the Measure of Performance

The homogeneous programming method is employed to determine the efficient frontier and optimal portfolio, for both the Indonesian stock market and the

Asia-Pacific market. The method uses an iteration process to select the optimal portfolio under the truncated minimax criterion. The end of the process is where the efficient frontier passes through the risk preference axis.

To determine the efficient sets, the study varies the risk preference **m** from an initial value of 0.1 increasing **m** by a step of 0.1 on each run. This is done up to the point where the value of λ becomes negative. The value of **m** therefore has a confidence limit interpretation. For example, **m** = 1.645 is the same as comparing the competing distributions at the 95% confidence interval.

According to the duality theorem of homogeneous programming, an optimal portfolio is found when the marginal revenue equals the marginal cost (interest rate in the capital market). Regarding this criterion, this study uses the 90 day interest rate of the Bank of Indonesia in determining the marginal cost and therefore an optimal portfolio. During the period under study, the average of the 90 day interest rate was 12.864 percent per annum or 1.072 percent per month. This interest rate has already included a 15 percent tax rate reduction. Therefore, a 1.072 percent interest rate is used as a value of λ to determine the optimal portfolio.

The following algorithm is the iterative processes drawn from Young[40]:
Iteration one:

evaluate $\phi(x) = cx - m(xVx)^{1/2}$ for $x_i = 1$ $c = 1,2,...n$
select the security with the highest value.

Iteration two:

[40] Young, M. (1985). Portfolio Selection by Homogeneous Programming. Unpublished master thesis, Massey University, New Zealand, pp.28-31.

differentiate ϕx_i with respect to $x_i = 1,2,...n$

$\delta\phi/\delta x_i = \phi(x_i) = c_i - (m\Sigma\sigma_{ij}x_{ij}) \div (x^tVx^t)^{1/2}$

where xt is the final matrix from previous iteration.

Evaluate $\phi(xi)$ at xt, and select the stock with the highest value, then

calculate $\lambda = \{[\gamma U^{-1}q] \pm [(\gamma U^{-1}q)^2 - (qU^{-1})(\gamma U^{-1}\gamma - m^2)]^{1/2}\} \div (qU^{-1}q)$

where,

$$\gamma = \begin{bmatrix} c^t \\ \bar{c}^t \end{bmatrix} \quad \text{and} \quad U = \begin{bmatrix} x^tVx^t & x^tV\bar{x}^t \\ \bar{x}^tVx^t & \bar{x}^tV\bar{x}^t \end{bmatrix}$$

As λ is a minimisation problem, the lower of the roots is appropriate one, and then the portion by $w = SU^{-1}(\gamma - q)$, where S is the normalised factor. Once we know what qualities for the portfolio, a find solution can be obtained as follows:

$\lambda = \{(cV^{-1}p) \pm [(cV^{-1}p)^2 - (pV^{-1}p)(cV^{-1}c - m^2)^{1/2}]\} \div (pV^{-1}p)$

where: p is a vector of 1's ,and

c is the vector of means for the securities selected

The final λ is inserted into $x = SV^{-1}(c - p)$

In conformity with the objectives of this thesis research, the performance of the Asia-Pacific markets and the Indonesian stock market are examined by using the Sharpe ratio[41]. The Sharpe ratio for Asia-Pacific (S_{af}) and the Indonesian market (S_{ind}) are defined as follows:

$$S_{af} = D_{af} \div \sigma_{af}$$

and

$$S_{ind} = D_{ind} \div \sigma_{ind}$$

[41] Sharpe, W.F.(1994, Fall). Op.cit, 49-58.

where

D_{af} = the excess return on the Asia-Pacific portfolio

D_{ind} = the excess return on the Indonesian portfolio

σ_{af} = the standard deviation of the optimal portfolio for the Asia-Pacific markets

σ_{ind} = the standard deviation of the optimal portfolio for the Indonesian market.

Finally, the gains from the Asia-Pacific portfolio diversification can be evaluated by the Sharpe ratio differential:

$$\Delta S = S_{af} - S_{ind}$$

3.4. Summary

The chapter began with the data sources and period considered to investigate the performance of the Indonesian stock market and the Asia-Pacific market. The period used in the study was divided into two periods; October 1990 - December 1994 and January 1992 - December 1994.

The process of selection has been explained for individual stocks on the Jakarta Stock Exchange. The coefficient of variation and liquidity aspect were used to determine the individual stock ranking in each industry group. An outline of the procedures used to calculate return has been summarised, both for the return on the Indonesian stock market and the return on the Asia-Pacific markets.

ANALYSIS AND RESULTS

This chapter deals with the methodological framework delineated in Chapter 3 to analyse and discuss the empirical result of the study. The chapter is divided into four parts. Firstly, it examines performance of the individual stocks on the Indonesian stock market as well as the Asia-Pacific stock markets. The next part discusses the efficient set generated by varying the risk preference parameter. Then, the study utilises the homogeneous programming method to determine the optimal portfolio and examine its composition. Finally, a comparative examination is undertaken to analysis the gains from Asia-Pacific diversification.

4.1. Returns and Risks of individual stocks on the Indonesian stock market

The study follows the procedure of selection delineated in the methodology to choose the desired portfolio. The criteria are that the stock has a positive return, the lowest coefficient of variation, and is liquid. There are 124 stocks from 17 industrial groups included in this study. The 17 industries are Banking, Pharmaceutical Products, Insurance, Cement, Food and Beverages, Garment and Apparel products, Automotive, Property, Hotel, Tobacco, Textile, Paper, Electronics, Ceramic and Plastics, Metal and Cable, Trading and Chain store, and Animal feeds.

After applying the procedure of selection, the study includes 11 industries in the selected group for the period October 1990- December 1994 data and 14 industries for the period January 1992- December 1994. The detailed results are as follows:

Six of 17 industrial groups are illiquid for the period of 1990-1994. The illiquid industries are Insurance, Garment, Automotive, Electronics, Metal and Cable, and Pharmaceutical products. Eight industries are represented by the first ranking in their groups. Two industries are represented by the second ranking and 1 industry is represented by a fourth ranking.

Furthermore, 3 of 17 industrial groups (Electronics, Pharmaceutical products, and Insurance) are illiquid for the period of 1992-1994. Eight industries are represented by the first ranking, 4 industries by the second ranking, and 1 industry by a third and fourth ranking. Appendix 1 represents the detail of the performance of the individual stocks on the Indonesian stock market.

Table 10 provides returns, risks, and coefficient of variations of the selected group of companies on the Indonesian stock market. The monthly returns range from 1.21 percent for the Indah Kiat stock to 3.34 for the Sampoerna stock. Standard deviations , on the other hand, range from 11.58 percent for Hero Supermarket to 25.69 percent for Hadtex. Over the period 1990-94, the returns of all of the selected individual stocks outperform the Indonesian stock market, as measured by the JSX index. The average return of the selected group of company is 1.95% per month compared to 0.01% for the Indonesian market, if annualised the 11 stocks' average return is 23.4%, compared to 0.12% for the Indonesian market.

In contrast, not one of the selected stocks has outperformed the Indonesian market, in term of risk. Table 10 shows that the average standard deviation of the 11 stocks is 15.73% compared to 7.6% for the Indonesian market.

Therefore, these results indicates that the benefit of diversification comes in terms of reduced portfolio risk, not in terms of increased portfolio return. Over the period 1990-94, the performance of the Indonesian stock market is marked by mostly negative returns for individual stocks and a lack of liquidity (see Appendix 1 for the details).

Table 10 : Returns, Standard deviation, and Coefficient of Variations of the Indonesian stock market, period 1990-1994.

	Industries	Companies	Return (per month)	Std.Dev	Coefficient of Variation
1	Banking	Bank Bali	0.0196	0.1292	6.5808
2	Cement	Indocement	0.0182	0.1344	7.3692
3	Food and Beverages	Mayora	0.0293	0.1176	4.0190
4	Property	Duta Anggada R	0.0165	0.2216	13.4396
5	Hotel	Jakarta Int'l Hotel	0.0074	0.1306	17.5909
6	Tobacco	H.M Sampoerna	0.0334	0.1647	4.9237
7	Textile	Hadtex	0.0146	0.2569	17.5876
8	Paper	Indah Kiat	0.0121	0.1557	12.8324
9	Ceramics	Trias Sentosa	0.0230	0.1459	6.3504
10	Trading & Chain	Hero S	0.0148	0.1158	7.8188
11	Store Animal feed	CP Prima	0.0260	0.1581	6.0743
		Average	0.0195	0.1573	
		Indonesian market (JSX index)	0.0001	0.0760	531.0585

It is worth noting from Table 11 that the performance of the Indonesian stock market for the period 1992-1994 is far better than for the first period under study, 1990-94. For the second period, the monthly returns range from 1.01 percent for United Tractor to 7.89 percent for Sampoerna, while the standard deviations range from 5.83 percent for Charoen to 26.90 percent for Hadtex. Over the second period, the Indonesian market's return is 1.91% per month, compared to only 0.01% for the period 1990-94. Moreover, the Indonesian market's risk, as measured by standard deviation, is only 6.95% for the second period compared to 7.6 percent for the period of 1990-94. A substantial

improvement in performance for the Indonesian market occurs between two periods under question.

Over the period 1992-94, the Indonesian market outperforms 2 of the 14 individual selected stocks, either in terms of their average return or in terms of risk reduction. These stocks are United Tractor and Jaya PS, with the average return of 1.01% and 1.13% respectively, compared to 1.91% for the Indonesian market's return. On the other hand, 1 of the 14 stocks, Charoen, has a lower standard deviation than the Indonesian market.

Table 11: Returns, Standard deviation, and Coefficient of Variations of the Indonesian stock market, period 1992-1994.

	Industries	Companies	Return (per month)	Std.Dev	Coefficient of Variation
1	Banking	Bank Bali	0.0433	0.1374	3.1695
2	Cement	Indocement	0.0281	0.1249	4.4490
3	Food and Beverages	Mayora	0.0420	0.1333	3.1765
4	Garment	Mayatexdian	0.0345	0.2631	7.6181
5	Automotive	United Tractor	0.0101	0.1322	13.0403
6	Property	Pakuwon Jati	0.0273	0.1739	6.3729
7	Hotel	Jakarta Int'l Hotel	0.0244	0.1288	5.2822
8	Tobacco	H.M Sampoerna	0.0789	0.1341	1.6988
9	Textile	Hadtex	0.0288	0.2690	9.3385
10	Paper	Indah Kiat	0.0370	0.1336	3.6088
11	Ceramics	Trias Sentosa	0.0512	0.1495	2.9220
12	Metal	Jaya PS	0.0113	0.1446	12.8019
13	Trading & Chain Store	Soedarpo	0.0251	0.1795	7.1504
14	Animal feed	Charoen	0.0282	0.0583	2.0713
		Average	0.0336	0.1544	
		Indonesian market (JSX index)	0.0191	0.0695	3.6428

4.2. Returns and Risks of Asia-Pacific stock markets

In examining the returns and risks of the Asia-Pacific markets, the study calculates the monthly rate of returns for unadjusted data (in local currencies) and adjusted data (in Indonesian rupiah). The results are presented in Table 12 and 13 to show the effect of exchange rate movements.

Table 12 presents the findings of returns and risks for the period October 1990 - December 1994. The Asia-Pacific stock markets have various return and risk characteristics. Measured in local currencies, the returns range from -0.16 percent for Japan to 2.89 percent for India. The standard deviations, on the other hand, range from 4.57 percent for Australia to 14.43 percent for Philippines. It is evident from Table 12 that Hongkong, India, Philippines, and Taiwan are characterised by high return and high risk, while Australia is characterised by low return and risk. The Japanese market is the only market with a negative return for the period 1990-1994.

Table 12: Monthly Returns and Standard Deviations of Asia-Pacific stock markets Period October 1990 - December 1994

	Countries	Unadjusted Return	Std.Dev	Adjusted Return	Std.Dev
1	Australia	0.0055	0.0457	0.0092	0.0510
2	Hongkong	0.0259	0.0978	0.0293	0.0983
3	India	0.0289	0.1113	0.0217	0.1179
4	Japan	-0.0016	0.0714	0.0087	0.0850
5	Malaysia	0.0141	0.0660	0.0186	0.0696
6	New Zealand	0.0124	0.0550	0.0162	0.0613
7	Philippines	0.0261	0.1443	0.0306	0.1392
8	Singapore	0.0149	0.0671	0.0221	0.0709
9	South Korea	0.0139	0.0654	0.0153	0.0664
10	Taiwan	0.0221	0.1339	0.0263	0.1364
11	Thailand	0.0084	0.0793	0.0118	0.0796
	Indonesia (JSX Index)	0.0001	0.0760	0.0001	0.0760

It is apparent from Table 12 that the returns for the Asia-Pacific markets (with the exception of India's return) increase when returns are converted into Indonesian rupiah. The highest effect of exchange rate conversion is the Japanese monthly return which increases from -0.16% to 0.87%, an increase of 1.03%. Therefore, the Indonesian investor receives a positive return from the

exchange rate movements. In the case of India, the Indian rupee is the only currency that depreciates against the Indonesian rupiah. Consequently, India's adjusted return decreases.

The Australian, Malaysian, New Zealand, Singaporean, and South Korean markets outperform the Indonesian market, in term of return as well as risk. Meanwhile, Indonesia outperforms Hongkong, India, Japan, Philippines, Taiwan, as well as Thailand, in term of risk.

Table 13 presents the return and risk of the Asia-Pacific markets for the period 1992-1994. Measured in local currencies, the returns range from -0.18 percent for Japan to 2.81 percent for Philippines, while the standard deviations range from 4.03 percent for Australia to 12.08 for India. Furthermore, the returns range from 0.79 percent for Australia to 3.35 percent for Philippines when converted into Indonesian rupiah.

Table 13: Returns and Standard Deviations of Asia-Pacific stock market
Period January 1992 - December 1994

	Countries	Unadjusted Return	Std.Dev	Adjusted Return	Std.Dev
1	Australia	0.0049	0.0403	0.0079	0.0476
2	Hongkong	0.0252	0.1112	0.0281	0.1115
3	India	0.0279	0.1208	0.0261	0.1277
4	Japan	-0.0018	0.0770	0.0089	0.0908
5	Malaysia	0.0172	0.0629	0.0222	0.0665
6	New Zealand	0.0147	0.0566	0.0215	0.0619
7	Philippines	0.0281	0.0881	0.0335	0.0856
8	Singapore	0.0126	0.0549	0.0188	0.0576
9	South Korea	0.0169	0.0689	0.0185	0.0702
10	Taiwan	0.0154	0.0804	0.0177	0.0839
11	Thailand	0.0120	0.0661	0.0151	0.0650
	Indonesia (JSX index)	0.0191	0.0695	0.0191	0.0695

Over the period 1990-1994, the returns for Asia-Pacific markets outperform the Indonesian market . The only exception is the Japanese market, the unadjusted return for Japan is negative. In this case, the Indonesian market has performed better than the Japanese market when rate of return is measured in the local currency.

For the period 1992 - 1994, the Indonesian market shows a much better performance than for the period 1990 - 1994. Table 13 indicates the improvement on the Indonesian performance by outperforming Japan and Taiwan, in term of return and risk, and also outperforming Australia, Singapore, South Korea, and Thailand, in term of return.

It is noteworthy that the Japanese market, as measured in Yen, still shows negative return for the period 1992-1994, that is, -0.18% with 7.7% standard deviation. The performance of the Japanese market over the period 1992-1994 is worse than over the period 1990-1994. Yet, the Indonesian investor receives more benefit from the exchange rate movements of the Japanese Yen. The Japanese return increases to 1.07% when converted into Indonesian rupiah. This indicates the continuing appreciation of the Japanese currency against the Indonesian currency.

Fluctuating exchange rates are indeed found to increase the potential gains for the Philippines and Thai markets as well as making them less risky. The evidence can be seen from Table 12 and 13, where the Philippines and Thai adjusted standard deviations are lower than unadjusted one. Meanwhile, the other markets show an increase in risk after adjustment for exchange rates.

4.3. The Efficient Frontiers

The efficient frontier for the Indonesian stock market is generated by varying the risk preference, m . The result in Table 14 suggests that an Indonesian investor should, over the period 1990-1994, invest his or her portfolio in Mayora, Duta, Sampoerna, Bank Bali, Trias as well as Prima stocks. The result also indicates that the higher the risk, the greater the proportion of Mayora and Sampoerna stocks are included in the portfolio.

Table 14: Portfolios on the Efficient Frontiers of Individual stocks

Period October 1990 - December 1994					
m	**λ**	**Return**	**Risk**	**Companies**	**Proportion %**
0.3	0.061	0.0258	0.0838	Mayora, Sampoerna, Bali, Trias, Duta, Prima	(39, 17, 15, 10, 10, 9)
0.2	0.934	0.0279	0.0930	Mayora, Sampoerna, Prima, Trias, Duta, Bali	(45, 20, 18, 7, 5, 5)
0.1	1.961	0.0305	0.1093	Mayora, Sampoerna, Prima	(49, 40, 11)
Period January 1992 - December 1994					
m	**λ**	**Return**	**Risk**	**Companies**	**Proportion %**
0.7	0.197	0.0472	0.0646	Charoen, Sampoerna, Trias	(60, 35, 5)
0.6	0.866	0.0505	0.0697	Charoen, Sampoerna, Trias	(53, 41, 6)
0.5	1.610	0.0566	0.0811	Sampoerna, Charoen, Trias	(52, 40, 8)
0.4	2.595	0.0752	0.1232	Sampoerna, Trias	(87, 13)
0.3	3.871	0.0789	0.1341	Sampoerna	(100)
0.2	5.212	0.0789	0.1341	Sampoerna	(100)
0.1	6.553	0.0789	0.1341	Sampoerna	(100)

For the period 1992-1994, the Sampoerna stock dominates all the other individual stocks in the efficient portfolio with 100 percent proportion for the risk preference 0.1, 0.2 as well as 0.3. Bank Bali, Duta, and Prima stocks are not included in any efficient portfolio for this period.

Figure 3: Efficient Frontiers in terms of λ and m
for the Indonesian stock market

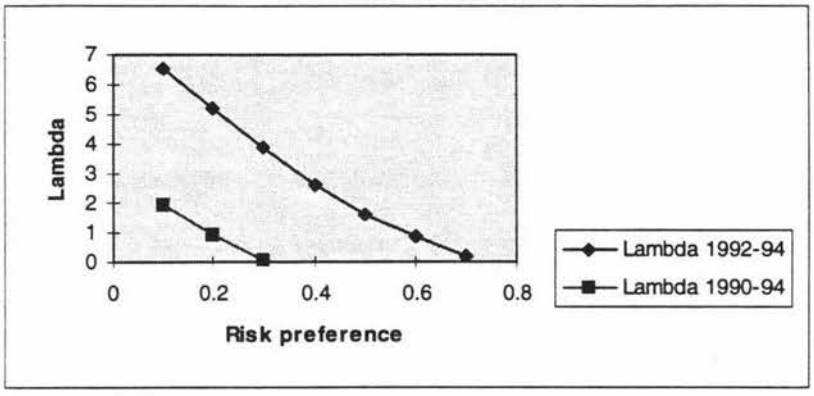


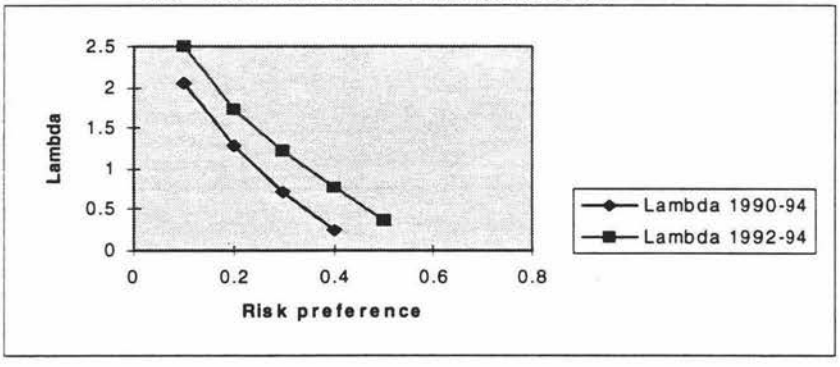
Table 15 shows the efficient frontier of the Asia-Pacific markets. Four countries are not included in any portfolio over the period 1990-1994. These are Malaysia, Thailand, Australia as well as Japan. It is notable that as the risk that investors anticipate to take increases, the proportion of Hongkong, Philippines, and Singaporean stocks included in the portfolios increases.

Table 15: Portfolios on the Asia-Pacific Efficient Frontier for Indonesian investor

Period October 1990 - December 1994					
m	**λ**	**Return**	**Risk**	**Countries**	**Proportion %**
0.4	0.241	0.0204	0.0451	Hongkong, Philippines, Singapore, India, Korea, N.Zealand	(12, 8, 20, 13, 26, 21)
0.3	0.711	0.0220	0.0496	Hongkong, Philippines, Singapore, India, Korea, Taiwan, N.Z	(18, 9, 24, 13, 21, 2, 13)
0.2	1.271	0.0256	0.0644	Hongkong, Philippines, Singapore, India, Korea, Taiwan	(33, 15, 31, 12, 5, 4)
0.1	2.048	0.0273	0.0924	Hongkong, Philippines	(69, 31)
Period January 1992 - December 1994					
m	**λ**	**Return**	**Risk**	**Countries**	**Proportion %**
0.5	0.376	0.0239	0.0403	Philippines, India, Korea, New Zealand, Japan	(29, 13, 23, 27, 8)
0.4	0.779	0.0253	0.0437	Philippines, India, Korea, New Zealand	(33, 13, 29, 25)
0.3	1.227	0.0262	0.0464	Philippines, India, Korea, New Zealand	(39, 13, 26, 22)
0.2	1.733	0.0290	0.0584	Philippines, India, Korea, New Zealand	(.60, 12, 17, 11)
0.1	2.497	0.0335	0.0856	Philippines	(100)

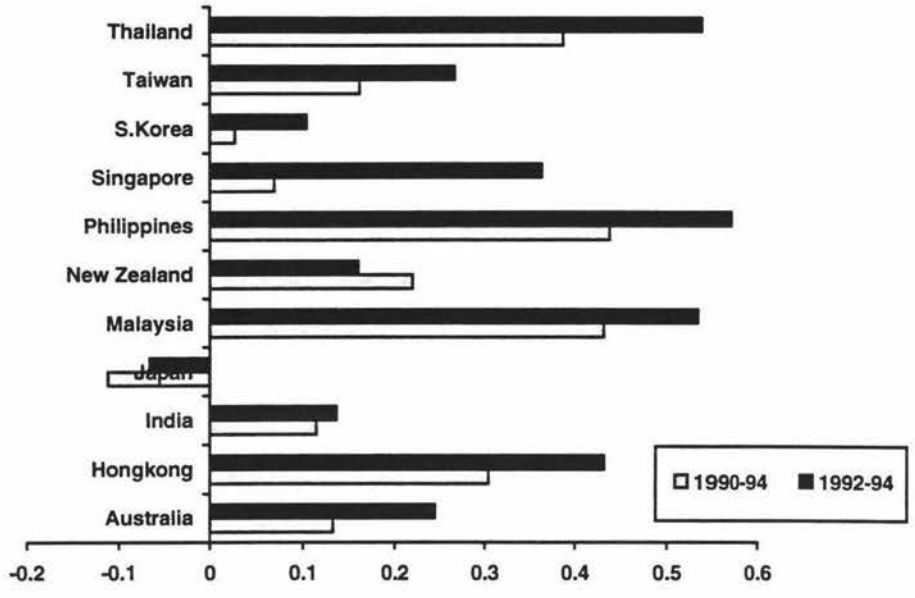
The result for 1992-1994 are substantially different to those of the period 1990-1994. The Japanese stocks take the place of Hongkong and Taiwanese stocks in the portfolio. The portfolios on the efficient frontiers are Philippines, India, South Korea, New Zealand, and Japan. At the risk preference of **m** equal to 0.10, the only country included in the portfolio is Philippines

Figure 4: Efficient Frontiers in terms of λ and m
for the Asia-Pacific stock markets



It is noteworthy that India and Japan are included in the efficient frontier over the period 1992-1994, while the performance of both markets are not better than the Hongkong or Taiwanese markets, in terms of both return and risk. In comparison, the Hongkong's return (2.81%) is higher than India (2.61%) or Japan (0.89%), while the Hongkong's risk (11.15%) is lower than India (12.77%). It is obvious that Hongkong dominates India in terms of return and risk. The inclusion of India and Japan is therefore due to the correlation between Indonesia and India which is very low, while the correlation between Indonesia and Japan is negative (see Figure 5).

Figure 5: Correlation of the Indonesia market with the Asia-Pacific markets

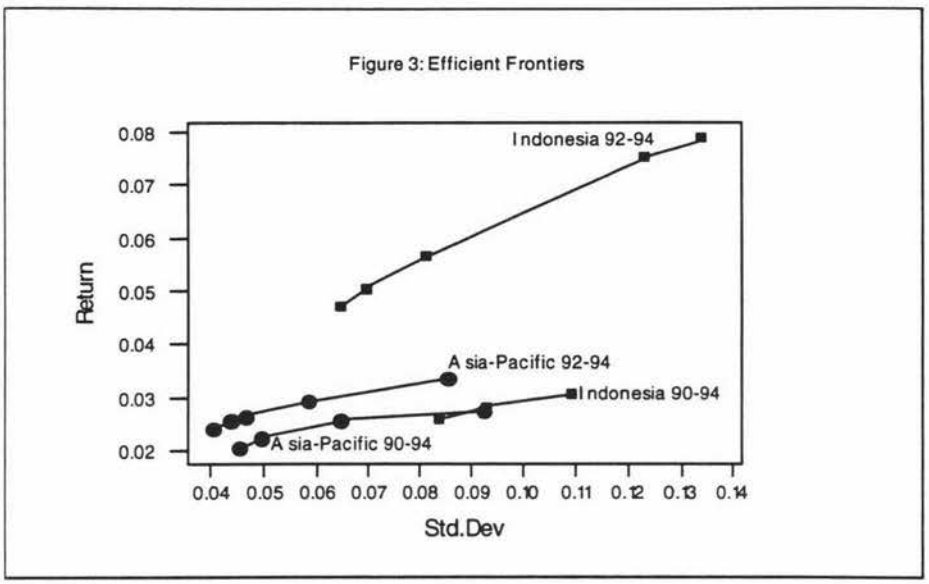


The inclusion of India and Japan in the portfolio could generate a substantial risk reduction for Indonesian investors. The finding of negative correlation between two countries is consistent with the finding of Roll[42] who showed that the correlation between the Indonesian and Japanese equity markets was negative for the period 1985-1988 and 1989-1992. Meanwhile, the correlation between Indonesia and Hongkong or Taiwan is relatively high.

It is also interesting to note in Figure 4 that is a significant improvement in both the Indonesian efficient frontiers and the Asia-Pacific efficient frontiers over the two periods under study. The efficient frontiers over the period 1992-1994 lie above the efficient frontiers over the period 1990-1994 in both cases with the Indonesian efficient frontier showing the greater improvement.

[42] Roll, R. (1995). An Empirical survey of Indonesian equities 1985-1992. Pacific-Basin Finance Journal,3, 159-192.

Figure 4: Efficient frontier in terms of return and risk



4.4. The Optimal Portfolios

Table 16 presents the composition of the optimal portfolios for an Indonesian investor who diversifies his or her money into the purely domestic market as well as the Asia-Pacific market. It can be seen that the Indonesian market offers 2.86 percent return per month at the optimal portfolio for the period 1990-1994 and 5.18 percent for the period 1992-1994. For the period 1990-1994, an Indonesian investor's optimal portfolio is composed of the Mayora stocks with an investment weight of 47 percent, the Sampoerna stocks 23 percent, the Duta and Bali stocks with 4 percent and 2 percent respectively . The 1992-1994 optimal portfolio is, meanwhile, composed of Charoen (50 %), Sampoerna (44 %), and Trias stocks (6%).

Table 16: The Composition of the Optimal Portfolios

	Return	Risk	Companies / Countries	Proportion %
Indonesia :				
1990-1994	0.0286	0.0964	Mayora, Sampoerna, Trias, Hadtex, Duta, Bali	(47, 23, 18, 6, 4, 2)
1992-1994	0.0518	0.0720	Charoen, Sampoerna, Trias	(50, 44, 6)
Asia-Pacific:				
1990-1994	0.0244	0.0591	Singapore, Hongkong, Philippines, Korea, India	(29, 25, 18, 15, 13)
1992-1994	0.0258	0.0451	Philippines, New Zealand, Korea, India	(37, 27, 23, 13)

Investing in the Asia-Pacific markets, an Indonesian investor earns a lower return than investing in the domestic market. The Asia-Pacific return is 2.44 percent per month for the period 1990-1994 and 2.58 percent for the period 1992-1994. In this case, an Indonesian investor's optimal portfolio is composed of the Singaporean stocks with an investment weight of 29 percent, the Hongkong stocks at 26 percent, Philippines 18 percent, Korea 15 percent, and India 13 percent in the period 1990-1994. For the period 1992-1994, the composition of the optimal portfolio is Philippines 37 percent , New Zealand 27 percent, South Korea 23 percent, and India 13 percent.

The inclusion of India in the optimal portfolio is probably due to its negative correlation with New Zealand, South Korea, and Hongkong who dominate the other markets in terms of the investment proportion (see Appendix 2). Also, the correlation between India and Indonesia or Philippines is very low.

The composition of optimal portfolios reveals that an Indonesian investor should not invest in Japanese, Australian, Malaysian, and Thai markets in the two periods under study. The Malaysian and Thai markets are not included due to their high correlations with Indonesian, Philippines and Singaporean markets. It can be noted that Malaysia, Indonesia, Philippines, Thailand, and Singapore are the members of ASEAN (the Association of Southeast Asia Nation) countries. The relatively high correlation among ASEAN countries supports the Santamaria and Espitia study[43] as well as Eun and Resnick study[44] that economic integration of countries, as well as close coordination of economic policies is reflected into closely

[43] Santamaria, M., & Espitia, M. (1994). International Diversification among the Capital Markets of the EEC. Applied Financial Economics, 4, 1-10.

[44] Eun, C., & Resnick, B. (1987). International diversification under Estimation Risk: Actual vs. Potential Gains. in S.J. Khoury & A. Ghosh (eds), Recent Developments in International Banking and Finance. Lexington, Mass: Lexington Books, D.C. Heath & Co.

related movement within the different country's capital market. The same tends to hold for the United States and Canada, and EEC countries.

Japan and Australian markets are meanwhile marked by low returns and high risks. Japan and Australia are thus excluded from the Indonesian investor's optimal portfolio.

4.5. The Gains from the Asia-Pacific Diversification

As mentioned in the definition of terms, the diversification gain is measured by the Sharpe ratio differential; a positive value indicates that Indonesian investors can potentially gain from Asia-Pacific diversification. However, before analysing the gains, it is of importance to discuss the effect of diversification toward risk and return of the national markets.

Figure 5 shows the efficient frontier and optimal portfolio of the Asia-Pacific markets as well as the optimal portfolio for the Indonesian market in the period 1990-1994. Obviously, the efficient frontier lies above the Asia-Pacific markets. The optimal portfolio (the combination of Hongkong, Philippines, Korean, and Indian markets) dominates almost all of the national markets in terms of risk and return except for Hongkong, Philippines, Taiwan , and Indonesia who have higher returns but more risk.

Figure 5: Efficient Frontier and Optimal Portfolio, period 1990-1994

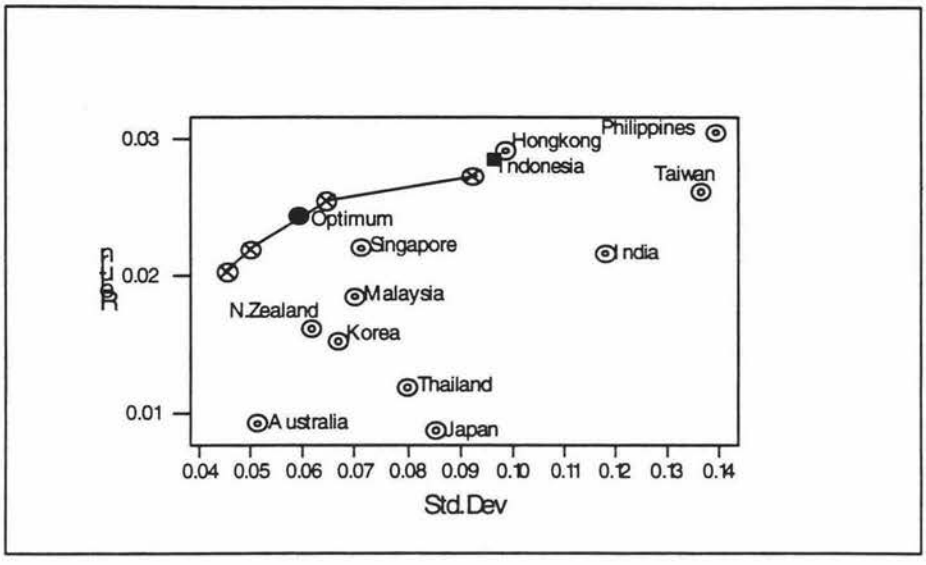


Figure 5 shows that an Indonesian investor can significantly achieve risk reduction by holding the Asia-Pacific optimal portfolio instead of the individual national portfolio. In comparison, the standard deviations of each national market in the portfolios are 13.92 percent for Philippines, 9.83 percent for Hongkong, 6.64 percent for South Korea, and 11.79 percent for India compared to 5.91 percent only for the optimal portfolio. In addition, the optimal portfolio's return (2.44%) is much higher than the Korean and Taiwanese markets, 1.53 percent and 0.87 percent respectively.

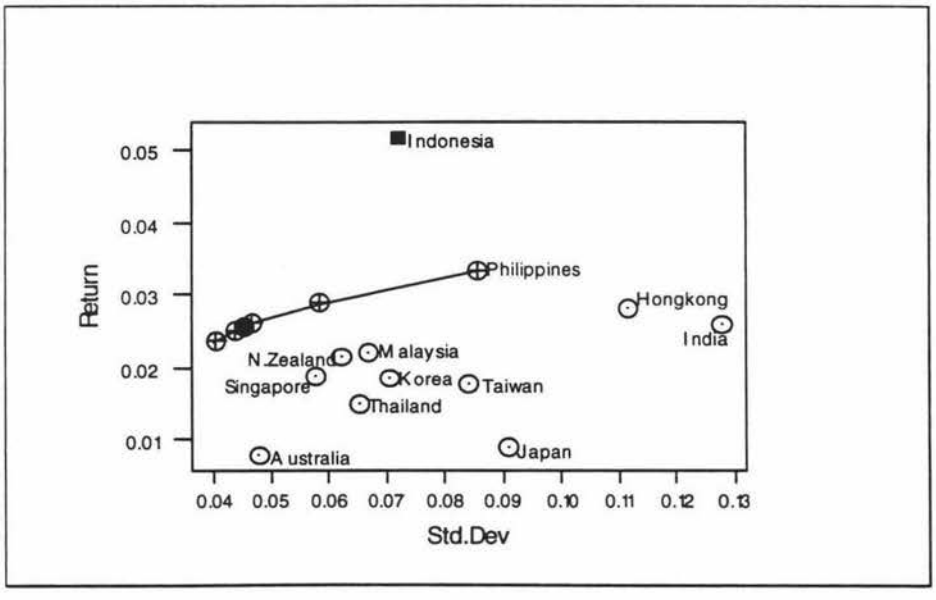
Table 17 presents the Sharpe ratio for Indonesian and Asia-Pacific diversification. During the period 1990-1994, the Sharpe ratio for Asia-Pacific portfolio is 23.16 percent compared to 11.93 percent for Indonesia . It reveals that the Sharpe ratio differential is positive. This finding implies that the Asia-Pacific diversified portfolio is superior to the purely Indonesian diversified portfolio. In other words, an Indonesian investor can potentially gain from the Asia-Pacific diversification over the period 1990-1994.

Table 17: The Sharpe Ratio for period 1990-1994

	Return	Risk	Interest Rate	Sharpe Ratio
Asia-Pacific	0.0244	0.0591	0.01072	0.2315
Indonesia	0.0286	0.0964	0.01072	0.1855
			the Sharpe ratio differential	0.0460

An interesting point to note from Figure 6 is the efficient frontier of the Asia-Pacific markets lies above all the national markets of Asia-Pacific. In fact, the standard deviations of the Asia-Pacific diversified portfolio, 4.51 percent, appears to be the lowest compared to the national markets in the Asia-Pacific which have standard deviations ranging from 4.76 percent to 12.77 percent. This means that substantial risk reduction can be achieved by holding the Asia-Pacific diversified portfolio instead of holding the national market as an investment strategy.

Figure 6: Efficient Frontier and Optimal Portfolio, period 1992-1994



However, the position of the optimal portfolio for a purely Indonesian diversified portfolio is well above that of the efficient frontier of the Asia-Pacific diversified portfolios (see Table 18). The domestic return for the Indonesian diversified portfolio is 5.18 percent compared to 2.58 percent for the Asia-Pacific diversified portfolio. This means that the Indonesian investors are able to double their portfolio return by holding the purely domestic portfolio for the higher amount of risk.

Another point of interest is the negative value of the Sharpe ratio differential for Asia-Pacific and Indonesian diversification over the period 1992-1994 (see Table 18). In this instance, the Sharpe ratio for the Asia-Pacific portfolio is 33.44 percent compared to 57.06 percent for the Indonesian portfolio. This finding therefore rejects the hypothesis of the study that the diversification gains from Asia-Pacific portfolios are better than those of the Indonesian market portfolio. The analysis indicates that the Asia-Pacific diversification could not provide a benefit for the Indonesian investors over the period 1992-1994.

Table 18: The Sharpe Ratio for period 1992-1994.

	Return	Risk	Interest Rate	Sharpe Ratio
Asia-Pacific	0.0258	0.0451	0.01072	0.3344
Indonesia	0.0518	0.0720	0.01072	0.5706
			the Sharpe ratio differential	-0.2362

4.6. Summary

The Indonesian market and the Asia-Pacific markets showed better performance fro the period 1992-1994 than for the period 1990-1994, in terms of return as well as

risk. Furthermore, the empirical results showed that the 1990-1994 efficient frontiers lie below the 1992-1994 efficient frontiers. Interestingly, the 1992-1994 efficient frontier for the Indonesian market lies well above the efficient frontier for Asia-Pacific markets.

The composition of optimal portfolios revealed that Mayora and Trias stocks should be included in the purely domestic diversified portfolio for both periods. Meanwhile the Philippines, South Korean, and Indian stock markets should be included in the Asia-Pacific optimal portfolio in both periods. The Indian market does not perform better than Thai, Taiwanese or Malaysian markets but the inclusion of India is reasonable because the Indian market correlates negatively with South Korean, New Zealand, and the Hongkong market. India also has a relatively low degree of correlation with Philippines. Four of these countries dominate the optimal portfolio over the two periods under study.

Gains from Asia-Pacific diversification do exist for the period 1990-1994. The period 1992-1994 is, on the other hand, marked by a negative value of Sharpe ratio differential, indicating that Indonesian investors cannot significantly gain from Asia-Pacific diversification.

CONCLUSIONS

The objective of this study has been to examine the gains for Indonesian investors who diversify their portfolios into the Asia-Pacific stock markets compared to purely domestic diversification.

Earlier studies have shown that the low correaltion among national stock markets provided substantial risk reduction opportunities for the investors who diversified their portfolios internationally. The previous evidence has lead to the conclusion that an investor can significantly achieve risk reduction by holding the international portfolios instead of the domestic portfolios. In other words, the gains from international diversification do exist.

However, the empirical results of this study do not fully support this view, particularly for the period 1992-1994. These results are elaborated upon next.

It was shown that the Indonesian market's performance between 1992-1994 was substantially better than its performance during the period 1990-1994. The Indonesian market's monthly return increased from 0.01 percent to 1.91 percent, while standard deviation decreased from 7.60 percent to 6.95 percent. For the same periods, the average return of the Asia-Pacific markets increased from 1.91 percent to 1.99 percent, while standard deviation decreased from 8.87 percent to 7.89 percent. These comparisons reveal that the Asia-Pacific stock markets are undergoing sustained growth, especially for such emerging markets as Indonesia, Thailand, Philippines, and India.

Gains from Asia-Pacific diversification do exist for the period 1990-1994. For the more recent period of 1992-1994, however the sharpe ratio has a negative value

indicating that the Indonesian investors cannot significantly gain from the Asia-Pacific diversification.

Thus this study suggest that Indonesian investors should diversify their portfolios within the Indonesian market instead of investing abroad.

During the analysis it became apparent that there were significantly different results for the two periods under study. The period 1990-1994 supported the previous studies on the benefit of international diversification, the period 1992-1994 did not. These results are therefore very much period specific and this point needs to be emphasized. The superior result of the purely domestic market indicates the necessity for further research that would yield valuable information about the gains of international diversification in recent years, especially from other emerging market perspectives.

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APPENDIX 1

The Returns, Standard Deviations, Coefficient of Correlations, and Liquidities of Individual Stocks on the Jakarta Stock Exchange:

1. BANKING

	1990-94					1992-94				
	MEAN	STD DEV	Coefficient of Variation	RANK		MEAN	STD DEV	Coefficient of Variation	RANK	Liquidity
DANAMON	0.0251	0.2008	7.9965	2		0.0487	0.1823	3.7460	5	
BDNI	0.0154	0.1792	11.6681	4		0.0522	0.1893	3.6283	3	
DUTA	-0.0149	0.1512	-10.1184	x		0.0028	0.1546	55.3253	11	
NIAGA	0.0071	0.1410	19.9906	8		0.0276	0.1259	4.5593	7	
BII	0.0126	0.1743	13.7888	6		0.0492	0.1831	3.7238	4	
BALI	0.0104	0.1325	12.6874	5		0.0433	0.1394	3.2210	1	
SURYA	0.0106	0.1700	16.0107	7		0.0389	0.1329	3.4144	2	illiquid
BUN	0.0003	0.1771	517.1036	10		0.0238	0.1931	8.1243	10	
LIPPO	0.0314	0.2989	9.5119	3		0.0777	0.3723	4.7893	8	
PANIN	0.0704	0.4185	5.9427	1		0.1193	0.5137	4.3070	6	
TAMARA	0.0028	0.1382	49.8460	9		0.0248	0.1470	5.9190	9	

2. PHARMACEUTICAL PRODUCTS

	1990-94					1992-94				
	MEAN	STD DEV	Coefficient of Variation	RANK		MEAN	STD DEV	Coefficient of Variation	RANK	
BAYER	0.0290	0.2587	8.9142	2		0.0479	0.2253	4.7040	5	illiquid
DANKOS	0.0459	0.2352	5.1184	1		0.0727	0.2041	2.8057	3	illiquid
MERCK	0.0144	0.1611	11.2191	3		0.0270	0.1163	4.3132	4	illiquid
PFIZER	0.0044	0.0818	18.6609	4		0.0400	0.0608	1.5225	1	delisted
SCHERING	-0.0053	0.1307	-24.4968	x		0.0131	0.1318	10.0741	7	illiquid
SQUIBB	0.0037	0.1395	37.6363	5		0.0191	0.1002	5.2559	6	illiquid

3.INSURANCE

	1990-94					1992-94				
	MEAN	STD DEV	Coefficient of Variation	RANK		MEAN	STD DEV	Coefficient of Variation	RANK	
ABDA	-0.011	0.1555	-14.1887	x		0.0009	0.1422	164.6689	9	
AHAP	0.0079	0.1078	13.6579	3		0.01	0.0449	4.499	1	illiquid
BINTANG	0.0014	0.2319	164.3294	6		0.031	0.2492	8.0291	5	illiquid
DAYIN	0.0156	0.2269	14.5418	4		0.0269	0.2545	9.4596	6	illiquid
RAMAYANA	0.0049	0.1184	24.0921	5		0.0193	0.1241	6.426	4	illiquid
LIPPO	0.0161	0.1625	10.1136	2		0.041	0.2023	4.9394	3	illiquid
MAREIN	-0.0082	0.211	-25.6236	x		0.0013	0.1514	115.5803	8	
PANIN	0.0241	0.2261	9.3713	1		0.0421	0.2065	4.9028	2	illiquid
POOL						0.0154	0.1958	12.7504	7	illiquid

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4. CEMENT

	1990-94					1992-94				
	MEAN	STD DEV	Coefficient of Variation	RANK		MEAN	STD DEV	Coefficient of Variation	RANK	
INDOCEMENT	0.4312	14.0105	32.4922	1		2.5717	12.5875	4.8947	1	
CIBINONG	-0.4186	12.7984	-30.5766	x		-0.3556	12.3405	-34.6993	x	negative
GRESIK						0.0175	0.0973	5.5476	2	

5. FOOD AND BEVERAGES

	1990-94					1992-94				
	MEAN	STD DEV	Coefficient of Variation	RANK		MEAN	STD DEV	Coefficient of Variation	RANK	
AQUA	-0.0152	0.0971	-6.3847	x		-0.0130	0.1097	-8.3364	x	negative
DELTA	0.0118	0.1082	9.2045	4		0.0180	0.1362	7.6385	4	
MULTI B	-0.0064	0.0740	-11.5886	x		-0.0070	0.0891	-12.0781	x	negative
MAYORA	0.0454	0.2705	5.9627	1		0.0710	0.3327	4.6749	3	
SARI H	0.0230	0.1575	6.8506	2		0.0530	0.1475	2.7908	2	illiquid
ULTRA JM	0.0164	0.1196	7.3076	3		0.0350	0.0804	2.2793	1	illiquid
SUBA						0.0070	0.1653	24.7129	5	

6. GARMENT AND APPAREL PRODUCTS

	1990-94					1992-94				
	MEAN	STD DEV	Coefficient of Variation	RANK		MEAN	STD DEV	Coefficient of Variation	RANK	
BATA	0.0111	0.1669	15.0913	2		0.0203	0.1377	6.7711	2	illiquid
GREAT R	0.0034	0.1746	50.791	3		0.0185	0.1455	7.8420	3	
MAYATEXDIAN	0.0218	0.2434	11.1744	1		0.0681	0.2896	4.2513	1	
MAYERTEX	-0.0036	0.2476	-69.0326	x		-0.0013	0.2936	-226.845	x	negative
PAN B T	-0.0041	0.1915	-46.1545	x		-0.0100	0.1471	-14.6796	x	negative
ITAMARAYA						-0.0066	0.0217	-3.2802	x	negative

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7. AUTOMOTIVE AND ALLIED PRODUCTS

	1990-94					1992-94				
	MEAN	STD DEV	Coefficient of Variation	RANK		MEAN	STD DEV	Coefficient of Variation	RANK	
ASTRA	-0.0064	0.1122	-17.5249	x		0.0066	0.1154	17.5300	3	
INDOSPRING	0.0272	0.2862	10.5367	1		0.0492	0.3337	6.7884	1	illiquid
LIPPO IND	-0.0066	0.0722	-10.9815	x		-0.0145	0.0346	-2.3767	x	negative
PRIMA AS	-0.0060	0.2153	-36.0340	x		0.0059	0.2102	35.8766	4	
UNITED T	0.0073	0.1465	20.0479	2		0.0177	0.1259	7.1027	2	
NIPRESS						-0.0072	0.0733	-10.2433	x	negative

8. PROPERTY

	1990-94					1992-94				
	MEAN	STD DEV	Coefficient of Variation	RANK		MEAN	STD DEV	Coefficient of Variation	RANK	
DUTA AR	0.0130	0.2180	17.4280	2		0.0310	0.2290	7.3290	6	
PUDJIADI	0.0140	0.1550	11.3910	1		0.0380	0.1640	4.2720	1	illiquid
PETROSEA	0.0000	0.0920	-204.893	x		0.0080	0.0560	6.9070	5	
PAKUWON	0.0100	0.1850	18.7130	3		0.0290	0.1760	6.0370	4	
SUMMARECON	0.0070	0.1620	23.5460	4		0.0290	0.1700	5.7690	3	illiquid
LIPPO						0.0260	0.1190	4.4990	2	illiquid
DHARMALA						-0.0070	0.1720	-24.4900	x	negative

9. HOTEL

	1990-94					1992-94				
	MEAN	STD DEV	Coefficient of Variation	RANK		MEAN	STD DEV	Coefficient of Variation	RANK	
BUMI MH	-0.0038	0.1382	-36.8152	x		0.0034	0.1271	37.5947	2	
PRAP SB	-0.0072	0.1399	-19.3551	x		-0.0091	0.1442	-15.9029	x	negative
J I H	0.0022	0.1405	63.0182	1		0.0254	0.1306	5.1431	1	
SAHID JAYA	-0.0124	0.1194	-9.6670	x		-0.0005	0.1042	-192.5736	x	negative

10. TOBACCO

	1990-94					1992-94			
	MEAN	STD DEV	Coefficient of Variation	RANK		MEAN	STD DEV	Coefficient of Variation	RANK
BAT	0.0066	0.1613	24.5789	3		0.0288	0.1257	4.3713	3
G.GARAM	0.0240	0.1557	6.4821	2		0.0408	0.1553	3.8050	2
HM SAMPOERNA	0.0339	0.1666	4.9131	1		0.0806	0.1357	1.6844	1

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11. TEXTILE AND ALLIED PRODUCTS

	1990-94					1992-94				
	MEAN	STD DEV	Coefficient of Variation	RANK		MEAN	STD DEV	Coefficient of Variation	RANK	
CENTEX	-0.0210	0.1170	-5.6950	x		-0.0310	0.1270	-4.1500	x	negative
ERATEX	0.0250	0.3850	15.3770	3		0.0430	0.4260	9.7920	4	illiquid
GREAT GS	-0.0030	0.0720	-21.1210	x		0.0000	0.0010	-9.6440	x	negative
HADTEX	0.0050	0.2540	46.7790	4		0.0280	0.2730	9.7320	3	
RODA V	0.1500	1.1310	7.5300	2		0.0440	0.1960	4.4240	1	illiquid
TIFICO	-0.0400	0.1570	-3.9430	x		-0.0140	0.0850	-6.2740	x	negative
UNITEX	-0.0020	0.0820	-35.9030	x		-0.0010	0.0980	-92.0320	x	negative
INDORAMA	0.0450	0.3090	6.8580	1		0.0710	0.3640	5.1360	2	illiquid
POLYSINDO						0.0220	0.3150	14.2780	5	
ARGO P						-0.0060	0.0780	-13.3180	x	negative

12. PAPER AND ALLIED PRODUCTS

	1990-94					1992-94				
	MEAN	STD DEV	Coefficient of Variation	RANK		MEAN	STD DEV	Coefficient of Variation	RANK	
INDAH K	0.0070	0.1619	22.9775	1		0.0311	0.1307	4.2021	1	
INTI INDO	0.0020	0.1567	78.7885	2		0.0216	0.1112	5.1383	2	
TJIWI K	-0.0050	0.1563	-31.0016	x		0.0151	0.1568	10.3593	3	

13. ELECTRONICS AND ALLIED PRODUCTS

	1990-94					1992-94				
	MEAN	STD DEV	Coefficient of Variation	RANK		MEAN	STD DEV	Coefficient of Variation	RANK	
A GRAPHIA	-0.0089	0.1247	-14.0753	x		-0.0170	0.1016	-5.9824	x	negative
METRODATA	-0.0185	0.1205	-6.5235	x		-0.0122	0.1028	-8.3962	x	negative
MULTIPOLAR	0.0004	0.1343	330.6000	1		-0.0126	0.1407	-11.2121	x	negative
TRAFINDO	-0.0019	0.1660	-85.5889	x		0.0012	0.1887	154.0874	3	illiquid
TEXTRONIC						0.0035	0.0674	19.0278	2	illiquid
VOKSEL						0.0131	0.0997	7.6252	1	illiquid

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14. CERAMICS, PLASTICS AND ALLIED PRODUCTS

	1990-94					1992-94				
	MEAN	STD DEV	Coefficient of Variation	RANK		MEAN	STD DEV	Coefficient of Variation	RANK	
ASTER J	-0.0092	0.1690	-18.2873	x		0.0248	0.1968	7.9496	4	
BERLINA	0.0046	0.1835	39.7138	2		0.0211	0.1964	9.3239	5	
IGARJAYA	-0.0127	0.1549	-12.2411	x		0.0003	0.1597	509.8531	7	
SURYA T	-0.0029	0.1059	-36.7557	x		0.0092	0.1025	11.1531	6	
TRIAS S	0.0170	0.1483	8.7068	1		0.0490	0.1511	3.0810	1	
EKADHARMA						0.0170	0.1075	6.3298	3	
DYNAPLAST						0.0166	0.0769	4.6283	2	

15. METAL, CABLE AND ALLIED PRODUCTS

	1990-94					1992-94				
	MEAN	STD DEV	Coefficient of Variation	RANK		MEAN	STD DEV	Coefficient of Variation	RANK	
BAKRIE B	0.0435	0.2379	5.4692	2		0.0696	0.2257	3.2451	1	illiquid
CITRA T	0.0184	0.0641	3.4835	1		0.0003	0.0288	112.6524	4	
JAYA PS	-0.0166	0.1566	-9.4432	x		0.0109	0.1467	13.4995	3	
LIONMESH	-0.0137	0.1355	-9.8650	x		-0.0223	0.1655	-7.4146	x	negative
SUCACO	-0.0015	0.1072	-71.9749	x		-0.0044	0.0679	-15.3549	x	negative
TEMBAGA MI	-0.0181	0.1161	-6.4014	x		-0.0046	0.1045	-22.8218	x	negative
IKI KABEL						0.0132	0.155	11.7231	2	illiquid

16. TRADING AND CHAIN STORE

	1990-94					1992-94				
	MEAN	STD DEV	Coefficient of Variation	RANK		MEAN	STD DEV	Coefficient of Variation	RANK	
HERO S	0.0119	0.1367	11.5065	2		0.0124	0.1089	8.8114	3	
SOEDARPO	-0.0029	0.1693	-59.0003	x		0.0248	0.1821	7.3431	2	
TIGARAKSA	0.0131	0.1212	9.2811	1		0.0239	0.0838	3.5039	1	illiquid
TOKO GA						-0.0263	0.0756	-2.8752	x	negative

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17. ANIMAL FEEDS

	1990-94					1992-94				
	MEAN	STD DEV	Coefficient of Variation	RANK		MEAN	STD DEV	Coefficient of Variation	RANK	
CHAROEN	0.0160	0.1580	9.7130	3		0.0270	0.0590	2.1570	1	
CP PRIMA	0.0220	0.1570	7.0150	1		0.0340	0.1670	4.8470	2	
JAPFA	0.0510	0.4250	8.2640	2		0.0930	0.5220	5.5990	3	
TJILATJAP	-0.0040	0.1790	-45.3510	x		0.0160	0.2030	12.6800	4	

APPENDIX 2

The Pairwise Correlation among the Asia-Pacific Stock Markets.

CORRELATION												
1990-94	AU	HO	IN	IND	JA	MA	NZ	PH	SI	SK	TA	TH
Australia (AU)	1	0.172	0.091	0.132	0.408	0.266	0.590	0.475	0.325	0.052	0.467	0.234
Hongkong (HO)		1	0.204	0.304	0.051	0.454	0.356	0.355	0.449	0.090	0.242	0.340
India (IN)			1	0.115	-0.106	0.105	-0.009	0.111	0.047	-0.059	0.196	0.307
Indonesia (IND)				1	-0.112	0.432	0.221	0.438	0.069	0.027	0.162	0.388
Japan (JA)					1	0.187	0.161	0.002	0.440	0.257	0.175	0.073
Malaysia (MA)						1	0.372	0.508	0.492	0.252	0.406	0.631
New Zealand (NZ)							1	0.374	0.294	0.003	0.221	0.201
Philippines (PH)								1	0.166	-0.038	0.613	0.492
Singapore (SI)									1	0.335	0.110	0.490
S.Korea (SK)										1	0.109	0.243
Taiwan (TA)											1	0.432
Thailand (TH)												1
1992-94	AU	HO	IN	IND	JA	MA	NZ	PH	SI	SK	TA	TH
Australia (AU)	1	0.035	0.015	0.245	0.362	0.080	0.530	0.176	0.270	0.021	0.421	-0.050
Hongkong (HO)		1	0.234	0.432	-0.046	0.459	0.347	0.397	0.549	0.071	0.265	0.341
India (IN)			1	0.136	-0.184	0.156	-0.08	0.118	0.020	-0.15	0.227	0.278
Indonesia (IND)				1	-0.066	0.534	0.160	0.569	0.364	0.104	0.268	0.539
Japan (JA)					1	0.066	0.101	-0.22	0.319	0.260	0.092	-0.27
Malaysia (MA)						1	0.384	0.279	0.640	0.335	0.248	0.578
New Zealand (NZ)							1	0.189	0.427	0.117	0.165	0.045
Philippines (PH)								1	0.517	-0.030	0.443	0.412
Singapore (SI)									1	0.454	0.383	0.416
S.Korea (SK)										1	0.045	0.340
Taiwan (TA)											1	0.163
Thailand (TH)												1