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Exploring a Home Bias-Free Area on the Expected Return Frontier

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ABSTRACT

This research aims to evaluate the efficient frontier of the Expected Value (EV) model for the top five stocks on the Malaysian and Indonesian stock markets. The study will explain that the identified home bias-free area can be better understood through the efficient frontier of a combined portfolio of stocks from both markets. The method involves comparing the efficient frontier graphs of the EV model, which are calculated using linear programming concepts with the SOLVER add-in. It was found that the optimal expected return on the Indonesian market yields better results with lower relative risk for each level of return achieved. The efficient frontier of the combined stocks from both countries also explains how to avoid home bias, as indicated by the identified home bias-free area. The portfolio results from combining stocks yield higher returns than the portfolios from each market and exhibit a better coefficient of variation. Future studies could utilize broader return windows, such as weekly or monthly, to make the research findings more comprehensive.

Keywords: Optimization, EV Model, Efficient Frontier, Home Bias-Free Area, Coefficient of Variation, SOLVER

A. INTRODUCTION

Investors can assess two stocks offering the same expected return, they will typically choose the one with lower risk if acting rationally. This assessment can be conducted using various methods such as valuation analysis, growth analysis, profitability analysis, and dividend distribution analysis (Teng, 2023). Diversifying a portfolio is also recommended to minimize unsystematic risk. Markowitz's mean-variance analysis laid the foundation for modern portfolio theory (Markowitz, 1952). This model was later refined by William Sharpe, who developed the Single Index Model (Sharpe, 1963) and the Capital Asset Pricing Model (Sharpe, 1964), as well as by Stephen A. Ross, who introduced the Arbitrage Pricing Theory (Ross, 1976).

In 2023, the Jakarta Composite Index (IHSG) indicated a 6.16% increase in the performance of the Indonesian stock market (Chandra, 2023), following a 4.09% rise in 2022.

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In comparison, as measured by the FTSE KLCI, the Malaysian stock market experienced a decrease of -2.73% in 2023, after a -3.37% decline in 2022 (Chandra, 2022). It is important to note that composite indices, which reflect overall market performance, do not account for the individual returns of investors. Some indices are constructed using a smaller number of selected stocks, such as the IDX 30 in Indonesia and the FTSE KLCI in Malaysia.

Investors typically do not immediately shift their investments just because they see a drop in their local composite stock index while noticing significant gains in foreign markets. This reluctance to move capital abroad despite better opportunities is known as home bias (Coval & Moskowitz, 1999). Home bias reflects a preference for domestic over international investments, influenced by factors beyond mere financial calculations. Investment behavior theory suggests that this tendency may be rooted in non-rational factors, including a sense of familiarity with domestic markets, perceived lower risk, and psychological comfort. (Yusef, 2015). Additionally, cultural and informational barriers may reinforce this bias, making investors less inclined to explore or trust foreign investment opportunities. To counteract home bias, achieving symmetric information is crucial. Symmetric information ensures that all investors have access to the same high-quality and comprehensive data, reducing informational asymmetries and enabling more rational investment decisions. By promoting transparency and equal access to market information, investors are better positioned to make informed choices and potentially diversify their investments more effectively across international markets.

Indices based on 30 stocks are subject to change over time. The composition of these indices is adjusted according to fluctuations in market capitalization and overall stock performance. As a result, some stocks may consistently remain on the list for extended periods, while others might be added or removed more frequently. For example, a stock with a high market capitalization may maintain its place in the index longer than smaller or less volatile stocks that might experience more frequent changes. This research aims to analyze 7 stocks that have consistently been on the 30-stock indices of both the Indonesian and Malaysian stock exchanges. By focusing on these stable stocks, the study aims to explore their performance and resilience over time, providing insights into their relative stability and significance within these key market indices.

Recently, we encountered the opportunity to develop a home bias-free area concept while comparing two efficient frontiers in the Malaysian and Indonesian stock markets. However, our publication on this topic has not yet been released. The illustration below (figure 1) depicts

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this concept. The area above the FTSE KLCI efficient frontier, up to the same maximum return in FTSE KLCI in an expected return of the IDX 30 efficient frontier, represents a zone where there is no difference in the rate of return for Malaysian investors if they invest in Indonesia, and may even offer a lower risk. If Malaysian investors prefer higher risk, then at elevated risk levels, they would achieve a higher expected return by investing in the Indonesian stock market. This unexpected finding has sparked our interest in exploring it further.

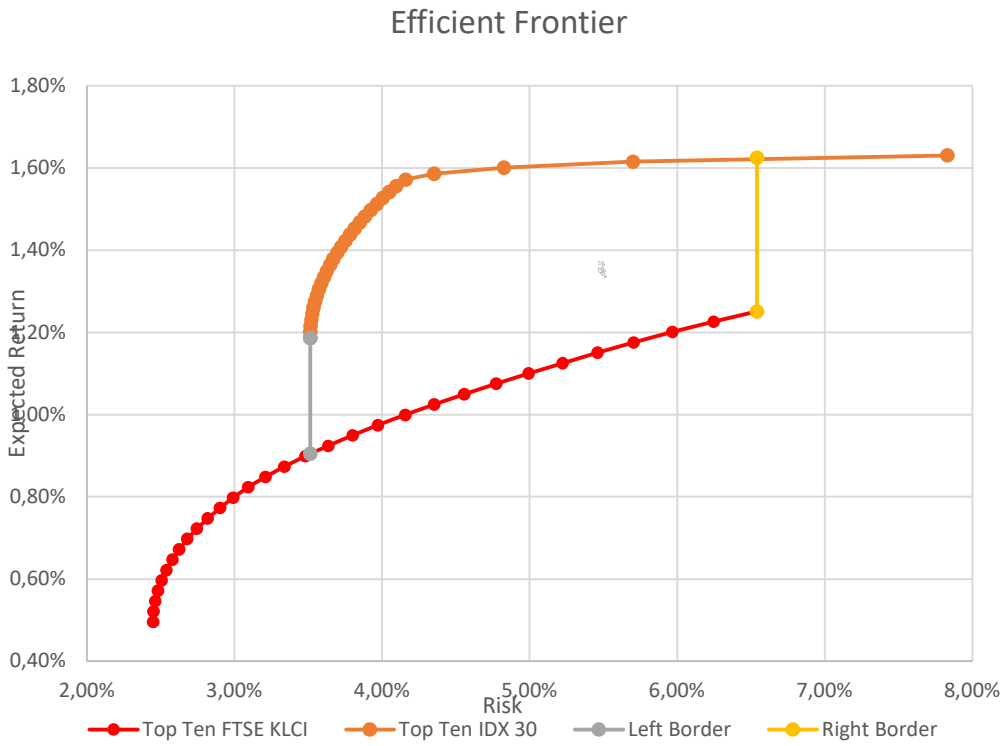

Figure 1. Home Bias-Free Zone in Two Efficient Frontier

Source: Private Data, (unpublished yet)

The Securities Market Summary from Bursa Malaysia for September 2024 indicates that local investors dominated securities transactions (Bursa Malaysia, 2024b). Out of RM 66.5 billion in traded value, only 42.58% was attributable to foreign investors. Foreign shareholders represented merely 13.66% of the total shareholders. In comparison, on the Indonesia Stock Market, foreign shareholders accounted for 48.5% (Simon, 2024). In the same month of September 2024 IDX value transaction is Rp. 287. For the same month, the Indonesia Stock Exchange recorded a transaction value of Rp 287,021.54 billion, with foreign net purchases amounting to only Rp 21.918 billion (Bursa Efek Indonesia, 2024). Malaysian investors who

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invest directly in Indonesia have reached a significant number, becoming one of the top five foreign investors in the country. However, their numbers still lag far behind those of Singaporean investors investing in Indonesia (Mae, 2024). Some of the facts stated above provide an indication that Malaysian investors tend to invest more in their own stock market rather than investing in Indonesia.

In this study, we aim to explore in greater detail how to identify areas that could provide a compelling reason for investors to avoid home bias. In addition to adhering to the assumptions of modern portfolio theory, we also assume that investors are willing to think realistically and prioritize better portfolio performance. First, we will identify the efficient frontier of the Malaysian and Indonesian stock markets. Second, we will examine whether there is an area that could be considered more advantageous for the efficient frontier, with higher expected returns but overlapping risks. Third, we will determine the efficient frontier of a combined portfolio from both the Malaysian and Indonesian stock markets to see if it yields better results and better risk.

B. LITERATURE REVIEW

Modern Portfolio Theory

Modern Portfolio Theory (MPT), introduced by Harry Markowitz in his groundbreaking 1952 paper *Portfolio Selection*, is a foundational element of modern finance. Markowitz's work established a systematic approach to optimizing investment portfolios by balancing risk and return. The central objective of MPT is to create a portfolio that either maximizes expected returns for a given level of risk or minimizes risk for a given level of expected return. This is achieved through diversification, which reduces the overall risk of a portfolio compared to holding individual securities. The theory emphasizes that portfolio risk is not only a function of the individual volatilities of the assets but also of the correlations between them. For example, holding assets with low or negative correlations can help mitigate overall portfolio risk, as their price movements tend to offset each other.

The Efficient Frontier, a concept central to MPT, is a graphical representation of the set of optimal portfolios that offer the highest expected return for a specific level of risk. Portfolios on the efficient frontier are considered 'efficient' because they provide the best possible return for their associated risk. This concept was further developed and formalized by economists such as James Tobin (Tobin, 1958), who extended Markowitz’s work by introducing the concept of the capital market line and integrating risk-free assets into the theory.

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MPT is built upon several key assumptions: investors are rational and risk-averse, meaning they seek to maximize returns while minimizing risk; financial markets are efficient, reflecting all available information in asset prices; asset returns are normally distributed, which simplifies the analysis of risk and return; and the correlations between asset returns remain constant over time. (Sharpe, 1964). Eugene Fama further supported the market efficiency assumption with his Efficient Market Hypothesis (EMH), suggesting that asset prices always fully reflect all available information (Eugene F. Fama, 1970).

These assumptions and concepts were further supported and extended by subsequent research. Robert Merton incorporated the concept of intertemporal choice into MPT, broadening its applicability to dynamic investment scenarios (Merton, 1973). Myron Scholes and Fischer Black also contributed with the development of the Black-Scholes model for pricing options, which builds upon MPT principles to address financial derivatives (Black & Scholes, 1973).

By integrating these theoretical frameworks and empirical research, MPT provides a comprehensive approach to portfolio management. It aids investors in constructing portfolios that aim to achieve an optimal balance between risk and return, enabling more strategic and informed investment decisions.

Efficient Frontier

As mentioned earlier, the efficient frontier is a central concept in MPT. This concept represents a graphical depiction of the optimal portfolios that offer the highest expected return for a given level of risk or, alternatively, the lowest risk for a given level of expected return. On a graph where the x-axis measures risk (often represented by standard deviation or volatility) and the y-axis measures expected return, the efficient frontier appears as an upward-sloping curve.

The efficient frontier is derived from portfolio optimization. It demonstrates the benefits of diversification—combining various assets into a portfolio to achieve a superior risk-return profile compared to holding individual securities. Portfolios on the efficient frontier are considered optimal because they provide the best possible return for their level of risk. In contrast, portfolios below this curve are inefficient, as they offer lower returns for the same risk or higher risk for the same return.

A significant development in understanding the efficient frontier came from James Tobin (Tobin, 1958). Tobin introduced the concept of the Capital Market Line (CML), which extends

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the efficient frontier to include risk-free assets. By combining risk-free assets with risky investments, the CML provides a new set of portfolios that enhance the risk-return trade-off, demonstrating that investors can achieve higher returns for a given level of risk by incorporating risk-free investments.

William Sharpe further contributed to the concept with his development of the Sharpe Ratio (Sharpe, 1964)The Sharpe Ratio quantifies the return per unit of risk, providing a measure to evaluate portfolio efficiency. This ratio helps investors assess how well portfolios on the efficient frontier perform relative to their risk.

The efficient frontier assumes several conditions: that investors are rational and risk-averse, markets are efficient (with all information reflected in asset prices), asset returns are normally distributed, and correlations between asset returns are constant over time. These assumptions support the efficient frontier's practical application in portfolio management.

In summary, the efficient frontier is a crucial tool in portfolio theory, helping investors identify portfolios that optimize the trade-off between risk and return. By understanding and utilizing the efficient frontier, investors can make more informed decisions about how to allocate their assets to achieve their investment goals.

Forming the efficient frontier begins with gathering historical data on the returns, risks, and correlations of the assets you're considering for inclusion in your investment portfolio. This data forms the basis for understanding how different assets behave individually and in relation to one another.

The next step involves calculating the expected return and risk for each asset. Expected return is typically derived from the average historical returns of the asset over a specified period, while risk is measured by the standard deviation of those returns. To understand how the assets interact, you also need to estimate the correlations between them. Correlation measures the degree to which the returns of two assets move together, providing insight into how diversification might reduce overall portfolio risk.

Once you have this data, you create various portfolios by combining different assets in different proportions. Each portfolio will have a unique risk-return profile based on the weights assigned to each asset. To generate these portfolios, you use optimization techniques or simulation methods. These techniques help you explore a wide range of possible combinations to see how different asset allocations impact the overall portfolio's risk and return.

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For each portfolio, you calculate the expected return and risk. The expected return of a portfolio is essentially the weighted average of the returns of its constituent assets. Risk, on the other hand, is determined by a more complex formula that accounts for the variances of individual assets and their correlations with each other. This formula helps you understand how the combined effect of the assets' risks and their interactions contribute to the overall portfolio risk.

After all these calculations are completed, you plot the portfolios on a graph with the x-axis representing risk (standard deviation) and the y-axis representing expected return. The resulting curve on the graph is known as the efficient frontier. This curve represents the set of optimal portfolios that provide the highest expected return for each level of risk.

The efficient frontier thus serves as a crucial tool for investors, enabling them to visualize and choose portfolios that offer the best possible trade-off between risk and return. By selecting a portfolio on this frontier, investors can ensure they are achieving the maximum potential return for their chosen level of risk, making informed decisions that align with their investment objectives.

Theoretical Developments in the Mean-Variance Model

Markowitz's Mean-Variance Model provided a systematic approach for constructing portfolios that aim to maximize expected returns for a given level of risk, or conversely, minimize risk for a specified return (Giglio, Kelly, & Pruitt, 2021)This theoretical framework revolutionized investment management by demonstrating how diversification could reduce portfolio risk by selecting assets with less-than-perfectly correlated returns.

Another area of advancement is the use of alternative risk measures. Traditional MPT relies on variance as a measure of risk, but recent research has explored alternative metrics such as semi-variance and expected shortfall. A robust optimization models incorporating these alternative risk measures (Cheng & Xie, 2022). Their research addresses the limitations of variance and offers methods to improve portfolio stability under conditions of uncertainty.

The effects of quantitative easing and monetary policy on portfolio optimization have been analyzed also (Borio & Zabai, 2021). Those two central bank policies influence asset returns and portfolio construction, providing valuable insights into the interplay between monetary policy and investment strategies.

Updating MPT to multifactor models have been made to include new factors and alternative data sources. Fama and French (Fama & French, 2023) revised their models to

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incorporate macroeconomic indicators and non-traditional data, improving portfolio performance and risk management.

These advancements reflect a growing sophistication in portfolio theory, integrating new methodologies, technologies, and considerations to address the complexities of modern financial markets. The continuous evolution of MPT highlights its adaptability and relevance in an ever-changing investment landscape.

Home Bias

The concept of home bias in international investments was first rigorously examined by Kenneth R. French and James M. Poterba in their seminal 1991 paper, "Investor Diversification and International Equity Markets," published in The American Economic Review (French & Poterba, 1991). Their study highlighted a key phenomenon: investors tend to allocate a disproportionate amount of their portfolios to domestic assets, even when optimal diversification principles suggest that global diversification would enhance returns and reduce risk. This pioneering research laid the groundwork for further exploration into the reasons behind home bias and its implications for investment strategies and economic policy.

Earlier, in 1974, Bruno Solnik introduced the idea that international investments could reduce portfolio risk without sacrificing returns. Solnik's work demonstrated that the returns on foreign securities often exhibit lower correlations with domestic returns, providing significant diversification benefits (Solnik, 1974). His findings established the theoretical basis for global diversification, illustrating that expanding investment beyond national borders could help mitigate overall portfolio risk.

Despite these theoretical advantages, empirical research has consistently shown that many investors exhibit significant home bias, preferring to invest primarily in domestic assets. This persistent preference, despite the benefits of international diversification, has been the subject of extensive research. Key contributors to understanding this phenomenon include Eugene Fama and Kenneth French, who explored the implications of market efficiency and investor behavior on asset allocation (Fama & French, 1992).

Home bias arises from several factors. Asymmetric information, as discussed by Robert J. Shiller, plays a crucial role; investors often feel more knowledgeable and confident about their domestic markets compared to foreign ones (Shiller, 1990). Shiller highlighted that

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volatility and investor behavior are influenced by perceived information asymmetries, which affect investment decisions .

Together, these factors contribute to a suboptimal investment strategy where many investors do not fully exploit the diversification benefits offered by international markets. Understanding and addressing home bias remains a critical area of study in investment research, aiming to guide investors towards more effective portfolio diversification strategies.

C. RESEARCH METHOD

The research method used is descriptive quantitative, accompanied by graphical analysis. Calculations are performed according to Markowitz's mean-variance model, and the results are presented in graphs. Using these graphs, a deeper analysis is conducted to identify the coordinate points that will delineate a home bias-free area.

The data source used in this study includes daily closing stock prices from the Malaysian stock market and the Indonesian stock market, specifically for stocks listed in the FTSE KLCI and IDX 30 indices, spanning from January 2010 to December 2023. We selected the top 5 stocks based on the highest returns. Initially, we considered the top 10 stocks, but we found that the other 5 stock had excessively high risk and negative return, so we reduced the selection to 5 stocks. Combining stock transaction data from two countries can sometimes face synchronization issues as not all markets are active on certain dates. Data combination is performed only when both markets are conducting transactions.

We did not formulate statistical hypotheses, as our analysis did not involve formal statistical testing. Instead, our approach focuses on graphically identifying a "safe" zone for investors impacted by home bias, with respect to portfolio performance. The main activities of our research are calculating the optimal portfolio, illustrating the efficient frontier, and identifying the efficient frontier graph to depict the ideal conditions for addressing home bias.

The analysis was conducted using Microsoft Excel and the Solvin add-in for solving linear programming to calculate the optimal portfolio. We have developed our data processing framework to handle optimal portfolio analysis for up to 100 stock units within the portfolio. To compute the optimal portfolio for 5 stock components, we simply deselect the stocks that are not used or included in the worksheet.

D. RESULTS AND DISCUSSION

Table 1 presents the results of the initial quantitative analysis, showing the optimal portfolio composition along with its expected return and risk.

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Table 1. Compotition, Risk and Return of the Portfolios IDX 30

	Maximum Expected Return						Minimum Risk
				Weight			
BBCA	0.00%	0.00%	16.27%	27.48%	14.14%	29.76%	44.64%
BBNI	0.00%	3.60%	3.15%	3.18%	3.11%	2.99%	2.77%
BBRI	0.00%	2.53%	18.12%	20.97%	37.95%	29.40%	20.41%
BMRI	100.00%	84.37%	62.46%	48.36%	28.17%	20.67%	13.59%
UNTR	0.00%	9.49%	0.00%	0.00%	16.63%	17.18%	18.60%
Total	100%	100%	100%	100%	100%	100%	100%
Exp. Return	0.136%	0.126%	0.115%	0.105%	0.095%	0.084%	0.074%
Std. Dev.	0.016	0.014	0.013	0.012	0.011	0.010	0.010
Coeff. Of Var.	11.991	11.390	11.195	11.270	11.477	11.926	13.222

Source: IDX 30 (Processed)

Table 2. Compotition, Risk and Return of the Portfolios FTSE KLCI

	Maximum Expected Return						Minimum Risk
				Weight			
2445	0.00%	3.70%	6.85%	9.55%	11.86%	13.86%	15.70%
4197	0.00%	5.30%	10.75%	16.23%	21.64%	26.92%	29.43%
5347	0.00%	87.44%	74.85%	62.27%	49.73%	37.24%	25.66%
5681	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
5819	0.00%	3.56%	7.55%	11.95%	16.76%	21.98%	29.21%
Total	100%	100%	100%	100%	100%	100%	100%
Exp. Return	0.035%	0.032%	0.029%	0.027%	0.024%	0.021%	0.018%
Std. Dev.	0.011	0.010	0.009	0.008	0.008	0.007	0.007
Coeff. Of Var.	31.546	30.765	30.339	30.545	31.801	34.724	39.360

Source: FTSE KLCI (Processed)

From Table 1 and 2 above, we create a graphs of the efficient frontier, which displays a collection of points representing expected return and risk (standard deviation).

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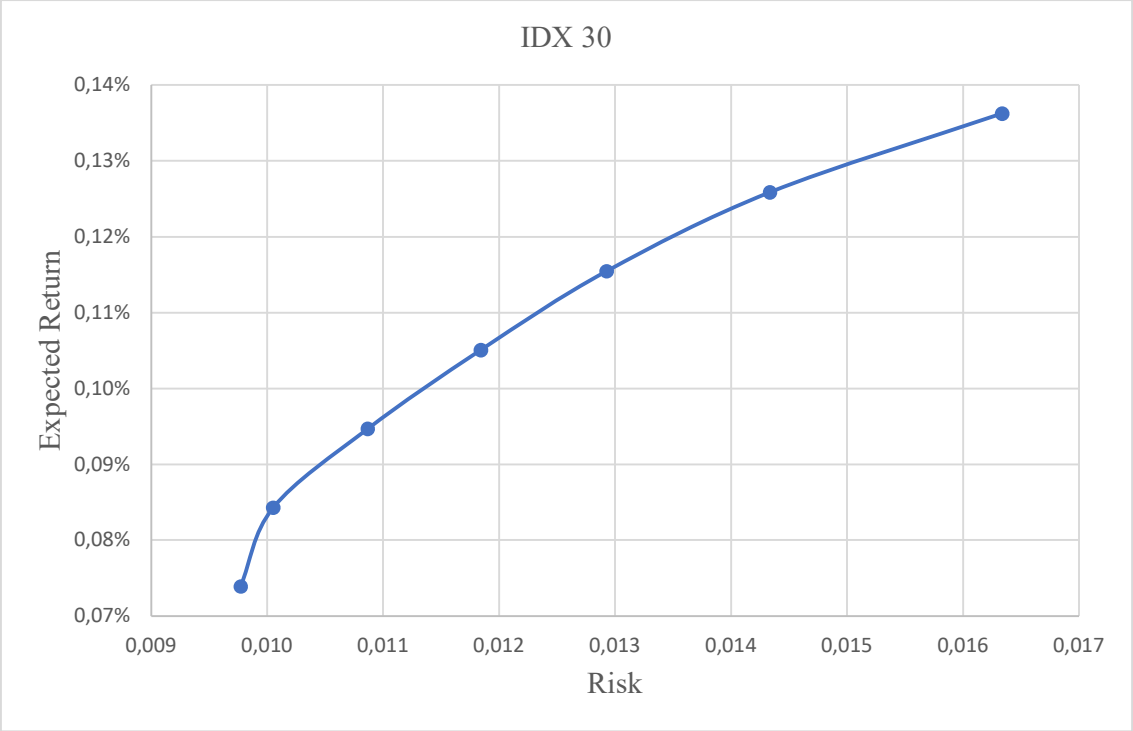

Figure 2. Efficient Frontier from Top IDX 30
Source: IDX 30 (Processed)

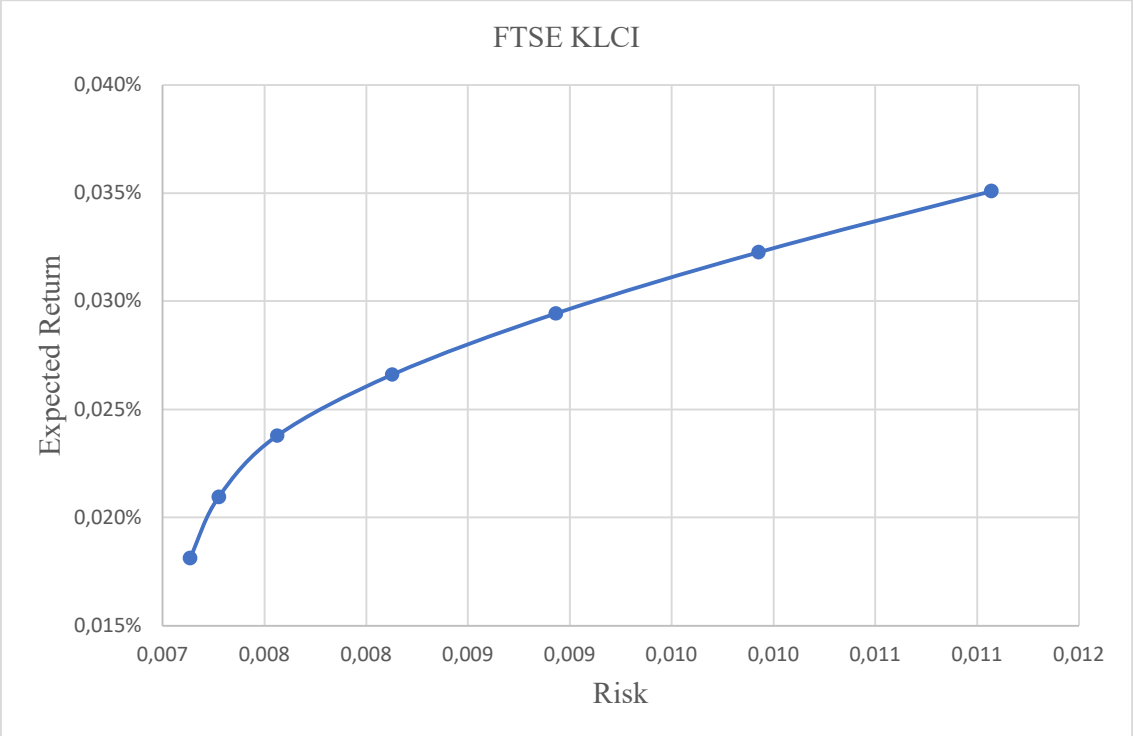

Figure 3. Efficient Frontier from Top FTSE KLCI
Source: FTSE KLCI (Processed)

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We combine the two graphs above to see if there is any intersection in risk or expected return. We can compare the numbers, but it is much easier to combine the graphs.

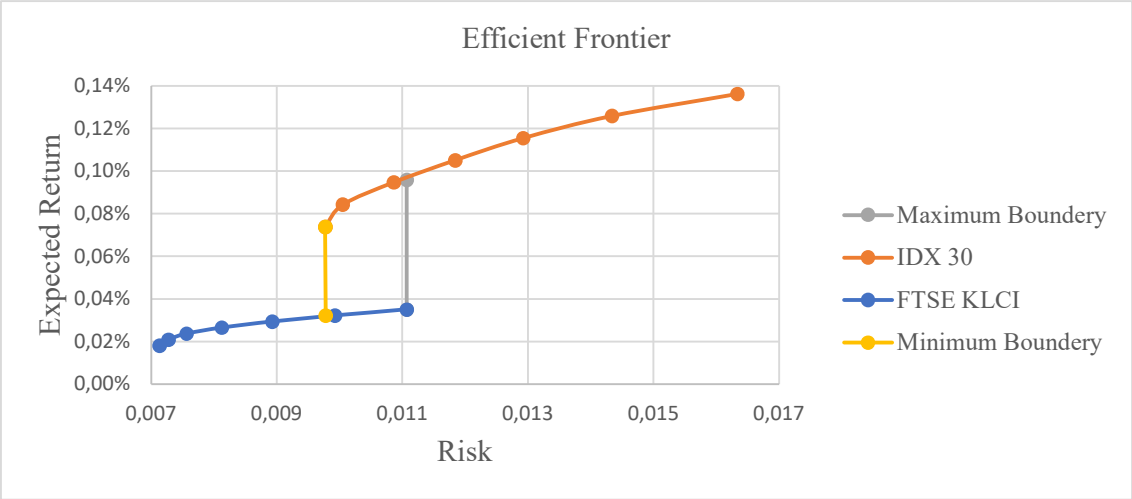

Figure 4. Efficient Frontier of both FTSE KLCI and IDX 30
Source: FTSE KLCI (Processed)

We also add the minimum and maximum boundary lines. The maximum boundary is an extrapolation from the rightmost point of the FTSE KLCI efficient frontier that intersects with the IDX 30 efficient frontier at the same level of risk. The minimum boundary is an extrapolation from the leftmost point of the IDX 30 efficient frontier that intersects with the FTSE KLCI efficient frontier at the same level of risk.

The left intersection point has an expected return of 0.032% and a risk of 0.010. The right intersection point has an expected return of 0.096% and a risk of 0.011. We suggest that the bounded area could serve as a zone where the risk is the same but offers a higher expected return for investors in the market with a lower efficient frontier, in this case, investors in the Malaysian market.

To complement the recommendation for investing in foreign markets, we attempted to calculate the portfolio results using five selected assets from each market. The results are shown in Table 3, and we have included the overall efficient frontier portfolio in Figure 5.

Table 3. Compotition, Risk and Return of the Portfolios IDX 30 and FTSE KLCI

	Maximum Expected Return						Minimum Risk
	Weight						
BBCA	0.00%	0.00%	0.00%	0.00%	0.00%	3.05%	11.35%
BBNI	0.00%	39.85%	32.43%	26.10%	19.57%	11.80%	1.88%
BBRI	0.00%	0.00%	0.00%	0.21%	1.07%	2.27%	4.08%

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BMRI	100.00%	50.83%	39.87%	31.76%	23.44%	14.91%	6.06%
UNTR	0.00%	2.55%	5.73%	5.62%	5.45%	5.22%	4.89%
2445	0.00%	0.00%	0.00%	1.24%	2.85%	4.32%	5.54%
4197	0.00%	0.00%	1.29%	3.55%	5.50%	7.12%	8.15%
5347	0.00%	6.77%	20.68%	19.65%	18.50%	17.24%	15.79%
5681	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
5819	0.00%	0.00%	0.00%	11.86%	23.62%	34.07%	42.26%
Total	100%	100%	100%	100%	100%	100%	100%
Exp. Return	0.136%	0.119%	0.102%	0.085%	0.068%	0.051%	0.034%
Std. Dev.	0.016	0.012	0.010	0.008	0.007	0.006	0.005
Coeff. Of Var.	11.991	9.653	9.339	9.281	9.585	10.987	15.547

Source: FTSE KLCI, IDX 30 (Processed)

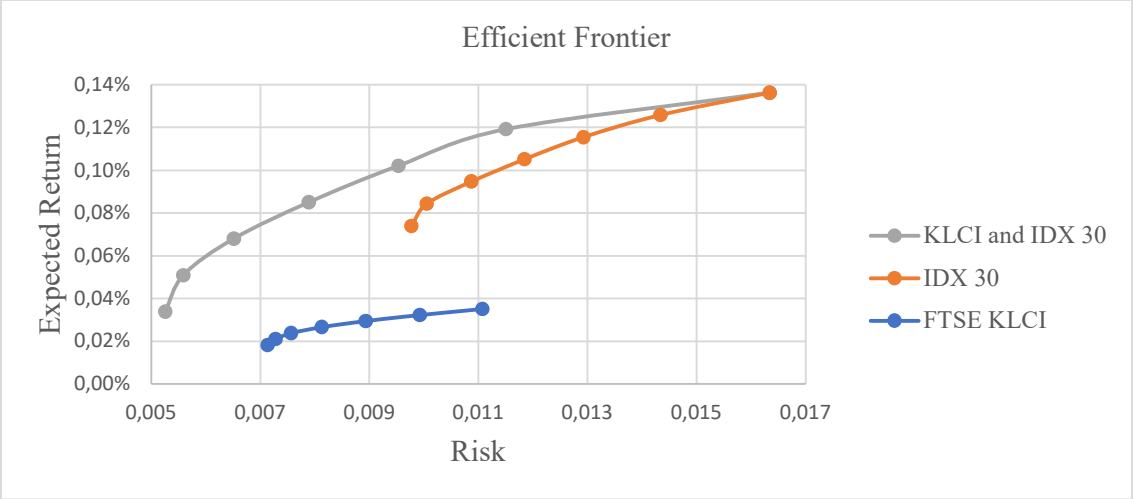

Figure 5. Efficient Frontier from All Portfolio
Source: FTSE KLCI, IDX 30 (Processed)

We can clearly see that combining portfolios from both stock markets yields significantly better results. Investors with low risk aversion can achieve lower risk with higher expected returns. The expected return obtained even approaches the highest result when investing solely in the Malaysian domestic market, with risk being at its highest level. Similarly, high-risk-taking investors will also obtain higher expected returns. Even if Malaysian investors only tolerate the risk in the domestic market, they will still achieve a significantly higher expected return.

Considering the analysis above, several key points require our attention. Firstly, it is evident that the Indonesian stock market offers better returns with an equally low level of risk as compared to the Malaysian stock market. Another important aspect to discuss is the concept

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of a home bias-free area, which was initially thought to be a basis for Malaysian investors to feel more at ease investing in Indonesia. However, a more comprehensive explanation can be achieved by analyzing an efficient frontier, created from a portfolio that combines stocks from Indonesia and Malaysia. The final point of interest is the coefficient of variation. It is notable that across various points on the efficient frontier, its value is nearly consistent.

Factors that can explain why investment returns on the Indonesian stock market are higher include: better economic growth, higher domestic consumption (evident from the population size, which is nearly ten times larger) (World Bank, 2024), and the structure of the Indonesian stock market, which is predominantly dominated by the financial and consumption sectors (Otoritas Jasa Keuangan (OJK), 2024). In contrast, the Malaysian stock market is more heavily influenced by the energy sector, which has been declining globally (Bursa Malaysia, 2024). Additionally, Malaysia's more conservative monetary policies contribute to the lower risk appetite among investors (Bank Negara Malaysia, 2024).

Identifying a home bias-free area is fundamentally aimed at reducing the effort needed to determine whether better investment opportunities exist in foreign stock markets. Evaluating optimal results through the efficient frontier of a combined portfolio of stocks from both countries will certainly provide a more definitive outcome regarding whether it can yield better investment returns. The efficient frontier, which identifies the optimal point between return and risk, yields more optimal results compared to those obtained from a naive portfolio (a 1/N combination of each portfolio component) (Lv, Tsang, Wagner, & Wong, 2023). The efficient frontier of the mean-variance model remains relevant for determining the optimal stock proportions in a stock portfolio, even though several derivative methods, such as the Bayesian Portfolio, have emerged, which incorporate predictive results into portfolio data (Trichilli, Abbes, & Masmoudi, 2020).

Unlike the Sharpe Ratio or Jensen Measure (Trichilli et al., 2020), evaluating relative risk from a portfolio analysis is simpler using the coefficient of variation (Hakim & Waluyo, 2023). The coefficient of variation compares the risk per unit of expected return obtained, providing a standard measure of risk within a portfolio. The coefficient of variation for portfolios on the Malaysian stock market is notably higher, around 30. In contrast, the coefficient of variation for portfolios on the Indonesian stock market is approximately 11, which is lower than that of Malaysia. This indicates that investing in Indonesia presents a lower risk compared to investing in Malaysia. Combining stocks from both countries into a single portfolio offers a middle

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ground in risk selection, especially for Malaysian investors, as the coefficient of variation for the combined portfolio can range from 9 to 15, which is about one-third of the coefficient of variation for a portfolio consisting solely of Malaysian stocks.

E. CONCLUSION

The conclusion of this research is that the discovery of a home bias-free area reveals that the investment returns from a portfolio of the big five stocks in Malaysia are lower and their relative risk is higher compared to a portfolio of the big five stocks on the Indonesian stock market. The home bias-free area is more easily explained by combining portfolios of the top five stocks from each stock market, yielding better results than the big five portfolios on the Malaysian or Indonesian stock markets. A suggestion for future research is to use different return windows. This study utilized a daily return window; future research could consider employing weekly or monthly return windows. Based on the fact that almost all analyses conducted still need to be done manually and step by step, the current use of the Solver add-in has its limitations. Therefore, developing a cloud-based application service capable of providing optimal portfolio solutions based on the Expected Variance (EV) Model could be an interesting idea.

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