Historical Sector Exposures vs. Optimal Sector Exposures: Evidence from Bursa Malaysia

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Abstract

The main objective of this research is to estimate and compare the historical sector exposures (weights) and optimal sector exposures for the market proxy in Bursa Malaysia over the 1 December 2005-30 November 2017 examination period. The reason for this comparison is to analyse the potential inconsistencies between the two kinds of sector exposures. The results indicated that the key sectors that drove the performance of Bursa Malaysia were the industrial, trading, and services sectors, followed by the consumer sector until 2016. However, the plantation sector has become the key driver of performance in 2017. Yet, to achieve mean-variance efficiency in Bursa Malaysia, investors should allocate considerable investments in the plantation, finance, and consumer sectors. The plantation sector investment is the safest cushion during the global financial crisis of 2007/2008. Opposite to the historical sector exposures, no investment should be allocated in the industrial sector over the entire examination period.

Keywords: Historical Sector Exposures; Optimal Sector Exposures; Sectors; Bursa Malaysia; Sharpe Ratio

Introduction

Markowitz (1952) introduced the concept of risk and diversity into the portfolio selection process with his modern portfolio theory (MPT). According to the MPT, the market portfolio is the best risky portfolio for all investors to invest in. While Tobin's (1958) separation theorem builds on the MPT by suggesting that investors can split their money between a market portfolio and a risk-free asset to adjust their investments according to their desirefor risk. Sharpe (1964), Lintner (1965), and Mossin (1965) all contributed to the development of the capital asset pricing model (CAPM). According to CAPM, the return of the portfolio x is computed as follows:

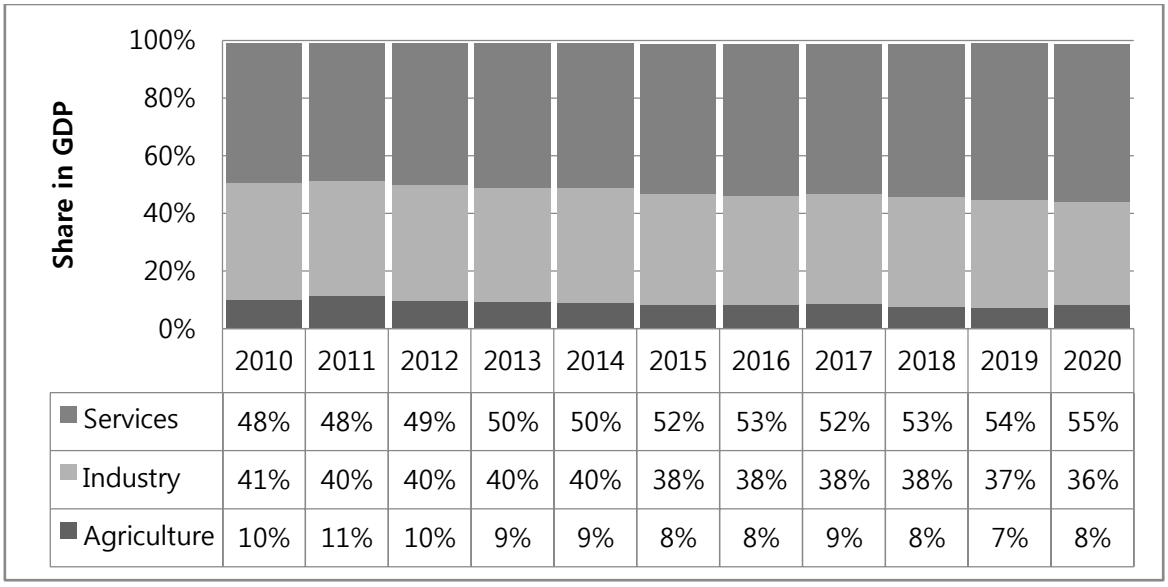
$$R_x = R_{f-}\beta_{x,m}(R_m - R_x) \quad (1)$$

Where, R_f is the return of the risk-free rate, $\beta_{x,m}$ is the beta coefficient between the return of the market and the return of portfolio x, and $(R_m - R_x)$ is market risk premium, which is the difference between the return of the market and the risk-free rate.

Malaysia is among the few developing countries in the Asia Pacific region that has been able to stably prosper thanks to its enormous natural resources. However, from being a significant exporter of raw commodities, the country has expanded its economic horizons. According to a report issued by Mordor Intelligence in 2020, the manufacturing sector, which accounts for about 60% of total exports, has a significant portion of the economy. Besides, agriculture, infrastructure and communication, electronics and electrical, oil gas and energy, tourism, wholesale and retail, and healthcare are among the 12 main economic categories listed by the Malaysian Investment Development Authority (MIDA).Malaysia's aerospace sector is also another significant development area, with the country aiming to become the preferred global aerospace outsourcing hub (Mordor Intelligence, 2020).

The department of statistics in Malaysia (2021) showed that the industrial production index increased by 1.4% in June 2021over the same month in 2020. The rise in the industrial production index was fueled by a 10.3% increase in the mining index. The manufacturing and electricity indices, on the other hand, declined 0.2% and 4.8%, respectively. As adopted from Statista (2021), which is a global business data platform, Figure 1 illustrates the share of economic sectors in Malaysia's gross domestic product (GDP) over the period from 2010 to 2020.

Figure 1: Share in GDP by the Main Sectors in Malaysia



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Services	48%	48%	49%	50%	50%	52%	53%	52%	53%	54%	55%
Industry	41%	40%	40%	40%	40%	38%	38%	38%	38%	37%	36%
Agriculture	10%	11%	10%	9%	9%	8%	8%	9%	8%	7%	8%

It is noted from the figure above that the agriculture sector was around 8% of Malaysia's gross domestic product in 2020, while the industry sector was about 36%, and the services sector contributed about 55%. Over the period from 2010 to 2020, Service and industry sectors had established themself as the backbone of Malaysia's economic growth, they employed more people than all of the country's basic businesses (such as agriculture and mining) combined. Consequently, both sectors are considered two main sectors that drive the performance of the Malaysian economy. On the other hand, according to the MIDA report issued in 2019,the foreign direct investment increased to RM3.7 billion in the fourth quarter of 2019, up from RM2.9 billion in the third quarter, and was mostly directed to the construction sector as well as the wholesale and retail trade subsector of the services sector.

According to Pyeman and Ahmad (2017), the primary sectors in Bursa Malaysia were (1) trading and services, (2) industrial, (3) consumer, (4) construction, (5) plantation, (6) finance, (7) technology, (8) mining, and (9) properties. Nevertheless, according to the Market Consultation No.1 report for Bursa Malaysia's sector classification and sectorial index revamp issued in March 2018, Bursa Malaysia introduced a new sector categorization to make comparisons between Bursa Malaysia and other global stock markets easier. (1) the energy sector; (2) the healthcare sector; (3) the telecommunications and media sector; (4) the transport and logistics sector; and (5) the utility sector were the five new sectoral indices on the main market. On the other hand, the infrastructure, hotel, mining, and trading and services sectors had been deleted, while the next three sectors had been renamed and broadened as follows:(1) the finance sector was renamed to the financial services sector;(2) the consumer sector was renamed to the consumer products and services sector; and(3) the industrial products sector was renamed to the industrial products and services (Bursa Malaysia, 2018).

The main objective of this research is to estimate the historical sector exposures (weights) for the market proxy and investigate how they differed from their respective hypothetical optimal sector exposures in Bursa Malaysia over the examination period from 1 December 2005 to 30 November 2017.Thus, the main question is: What are the respective historical sector exposures for the market proxy, and how are they different from their respective optimal sector exposures over the examination period?

Literature Review

The process of determining the value of various assets that create fund returns is known as performance attribution. (Hsieh, 2010). The return-based style decomposition of a fund, according to Sharpe (1992), is based on a multi-factor model that includes different investing styles and asset classes as components. Sharpe (1992) examined the performance of 395 mutual funds in the United States from January 1985 to December 1989. Utility funds, balanced funds, income funds, and growth funds were among the mutual funds included. The author used a total of 12 asset types and styles in his analysis. The results demonstrate that the *R*-squared of the out-of-sample was higher than 80% across the investigation period, according to the style exposure which was updated monthly.

As a result, the model adequately explains the performance of mutual funds in the United States. Also, Sharpe (1992) asserted that the performance of the mutual funds' returns was principally driven by the performance of their respective investment styles and asset classes rather than the stock selection of the fund managers. This finding is similar to the findings of Yu (2008) after studying the performance of mutual funds in South Africa. Fung and Hsieh (1998), on the other hand, found that the return-based style decomposition approach pioneered by Sharpe (1992) was unable to explain the performance of the hedge funds, whose activities include leveraging, derivatives, and short selling.

Vo, Pham, Pham, Truong and Nguyen (2019) tested the risk, return, and diversification for 10 sectors in four countries namely, Vietnam, Thailand, Malaysia, and Singapore, over the period from 2007 to 2016.The sectors were consumer goods; industry; telecommunications; basic materials; health care; technology; consumer services; utilities; oil and gas; and finance. The optimal proportions of sectors are determined by using the MPT model, and the risk is measured by applying the conditional VAR (Value at Risk). The results showed that in the optimal portfolios, in general, the health care sector in Vietnam and Singapore has a dominant role compared with other sectors as it achieved the lowest risk and highest return. The consumer services sector was the best in Thailand, while in Malaysia, the consumer services and telecommunications and, to some degree, the health care sectors were the best-performing sectors compared to others. Vardharaj and Fabozzi (2007) examined the performance attribution of the US and worldwide markets, as well as emerging market stock portfolios, from January 1995 to December 2007. According to the authors, the asset allocation strategies based on different sectors and asset allocation strategies based on different investment styles should not be considered separately. The authors determined that economic sector indices, size indices, and value indices may account for 90% of stock return fluctuations.

Over the out-of-sample period from 1 December 2006 to 30 November 2017, Rohuma (2021) applied the tactical sector allocation to examine whether the past sector compositions could be employed to build optimum forward-looking sector allocation for a portfolio on Bursa Malaysia. The financial, agricultural, and consumer sectors all played a key role in Bursa Malaysia, according to the findings. Moreover, during the global financial crisis of 2007/2008investors should be invested inthe plantation industry since it's the safest investment. Rohuma (2021) also revealed that historical sector compositions may be effectively employedto build the best forward-looking sector allocation strategies for a traditional portfolio on the Bursa Malaysia stock exchange.

It may be argued that before selecting portfolio components, portfolio managers should first choose which sectors to invest in. Gupta and Basu (2011) argued that combining multiple sectors into portfolios allows investors to get a greater risk-adjusted return than the benchmark. In addition, Cavaglia, Melas, and Tsouderos (2000) claimed that sector allocation is a key technique for maximizing returns. They also claimed that investors using the sector allocation method will earn a greater risk-adjusted return than those using the passive investing technique. Hsieh and Hodnett(2011a)provided evidence in support of this claim. According to Morrison and Tuominen (2018), the relevance of the sector component has expanded dramatically and may now even outweigh country-specific variables in driving stock index returns.

This research is different from other research since it estimates and compares the historical sector exposures for a market proxy and explores how they differed from their respective optimal sector exposures in Bursa Malaysia over the study period from 1 December 2005 to 30 November 2017.

Methodology

The data for this study was mainly obtained from the Taiwan Economic Journal's (TEJ) database, which was available by subscription. Because daily and weekly data include a high level of random white noise, the research uses monthly data (Mun, Vasconcellos & Kish, 2000). The return on investment (ROE) is used to calculate a stock's return, which is retrieved directly from the TEJ database. Furthermore, the study only investigates the tradable sectors until September 2018. Since, as previously stated, Bursa Malaysia reorganised the sector categorisation after that date. The reorganised sectors are not included in the study since they were formed after 30 November 2017, which was the end of the research period. Besides, any sector whose average market value during the examination period was less than 10% of the overall market value is excluded from the study. According to research data, Table 1 shows the market value, expressed as percentages, for each sector compared to the overall market value at the end of November for each year over the examination period from 1 December 2005 to 30 November 2017.

Table 1: Market Capitlisation for Tradable Sectors Relative to the Total Market Capitlisation

	Trade/service	Consumer	Industrial	Plantation	Finance	Others
Nov. 2006	26.9%	21.0%	15.7%	9.9%	16.2%	10.2%
Nov. 2007	23.0%	18.8%	15.4%	11.5%	19.1%	12.2%
Nov. 2008	36.3%	21.6%	9.7%	10.3%	14.2%	8.0%
Nov. 2009	32.6%	20.2%	10.7%	11.3%	16.4%	8.8%
Nov. 2010	34.9%	19.2%	9.5%	11.0%	16.4%	9.0%
Nov. 2011	39.1%	15.3%	9.8%	14.8%	13.8%	7.3%
Nov. 2012	33.3%	17.5%	12.3%	14.5%	14.3%	8.1%
Nov. 2013	35.9%	15.8%	9.8%	15.4%	13.9%	9.3%
Nov. 2014	37.0%	15.2%	8.9%	13.7%	14.5%	10.6%
Nov. 2015	31.3%	17.7%	11.0%	14.2%	13.2%	12.5%
Nov. 2016	39.3%	19.2%	12.1%	14.3%	1.3%	13.8%
Nov. 2017	30.5%	17.4%	14.9%	7.5%	16.0%	13.6%
Average	33.35%	18.24%	11.64%	12.37%	14.12%	10.28 %

According to the results of the previous table, the trading and services sector, consumer sector, industrial sector, plantation sector, and financial sector are the sectors with an average market value of more than 10% of the overall market value. These sectors are employed in the analysis. However, the technology sector, housing sector, building sector, mining sector, and hotel sector are among the sectors whose market value is less than 10% of total market value and are referred to as "others" in the table.

Historical Sector Exposures vs. Optimal Sector Exposures

The return-based style decomposition of Sharpe (1992) is considered one of the most extensively employed methodologies in finance. Therefore, following the methodology of Hsieh (2010), the historical sector exposures of this research are estimated on an annual basis by applying the Sharpe (1992) approach to find each sector weight in the market proxy that minimises the error term variance of the regression over the entire study period. The changes in sector allocation are assessed in light of the economic events or phases that occurred throughout the respective study period.On the other hand, following the methodology of Hsieh et al. (2012), the hypothetical optimal sector exposures are also estimated on an annual basis to find each sector's weight in the same market proxy that maximises the Sharpe ratio over the same study period. The main goal of this comparison is to analyse the potential inconsistencies between historical and optimal sector exposures of the market proxy. This comparison is important to realise if cap weighting over-or under-weights specific sectors, particularly during important economic events such as the global financial crisis (GFC). To discover possible reasons for performance gaps, the variations in sector exposures between the two allocation techniques are also analyzed.

1. Estimating the Historical Sector Exposures

The historical sector exposures are computed using the return decomposition technique, which involves regressing the market proxy's monthly returns on the monthly returns of their respective sectors, as shown in Equation 2:

$$r_{mp,t} = [\ (\widehat{W}_{s1} \cdot r_{s1,t}) + (\widehat{W}_{s2} \cdot r_{s2,t}) + \ \ldots \ + (\widehat{W}_{sn} \cdot r_{sn,t})\ ] + \varepsilon_i \quad \ldots\ldots\ldots\ldots\ldots \ (2)$$

where,

$r_{mp,t}$: is the returns of the market proxy in month *t*;

$\widehat{W}_{s1}, \widehat{W}_{s2}$ and $\widehat{W}_{sn}$: are the weights of sectors s_1, s_2 ….. to sn;

$r_{s1,t}$, $r_{s2,t}$ and $r_{sn,t}$: are the returns of sectors s_1, s_2….. to sn in month *t*; and

ε_i :is the regression's error term, reflects the market proxy's return that isn't explained by s ector exposures.

Equation 2 can be rearranged so the error term is the main subject, as in Equation3:

$$\varepsilon_i = r_{mp,t} - [\,(\widehat{W}_{s1}\,.\,r_{s1,t}) + (\widehat{W}_{s2}\,.\,r_{s2,t}) + \ldots + (\widehat{W}_{sn}\,.\,r_{sn,t})\,] \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

Finally, the time series error term variance, which should be minimised each year, is computed as follow s in Equation 4:

$$\sigma_{\varepsilon}^{2} = \frac{\sum(\varepsilon_{i,t} - \bar{\varepsilon})^{2}}{T-1} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

Where:

$\varepsilon_{i,t}$: is the error term in month *t*;
$\bar{\varepsilon}$: is the average of time series error term; and
T : is the number of months in each year.

The yearly historical sector exposures measure the sensitivities of the return of the market proxyin respect of the changes in the returns of their corresponding sectors. Where if one sector performs worse or better compared to other sectors, its market value decreases or increases rather than other sectors, which in turn decreases or increases its effects on the market proxy. Accordingly, any changes in the historical sector exposures of the market proxyrepresent changes in the performance of their respective sectors. The optimisation process is applied by using the 12-month sector's return every year over the 1 December 2005–30 November 2017 examination period, to find each sector's weight that minimises the yearly error term variance of the regression.

2. Estimating the hypothetical Optimal Sector Exposures

The optimal sector exposures are determined by calculating which sector weight maximises the Sharpe ratio for the market proxy,for each year throughout the research period. In Equation 5, the monthly Sharpe ratio for the market proxy in year t is calculated as follows:

$$SR_{op,t} = \frac{\bar{r}_{op,t} - \bar{r}_{f,t}}{\sigma_{op,t}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (5)$$

Where:

$\bar{r}_{op,t}\bar{r}_{op,t}$:is the monthly average returns of the optimal portfolio *op* in year *t*;
$\bar{r}_{f,t}$:is the monthly average returns of the risk-free proxy in year *t*; and
$\sigma_{op,t}$:is the standard deviation of the optimal portfolio monthly returns in year *t*.

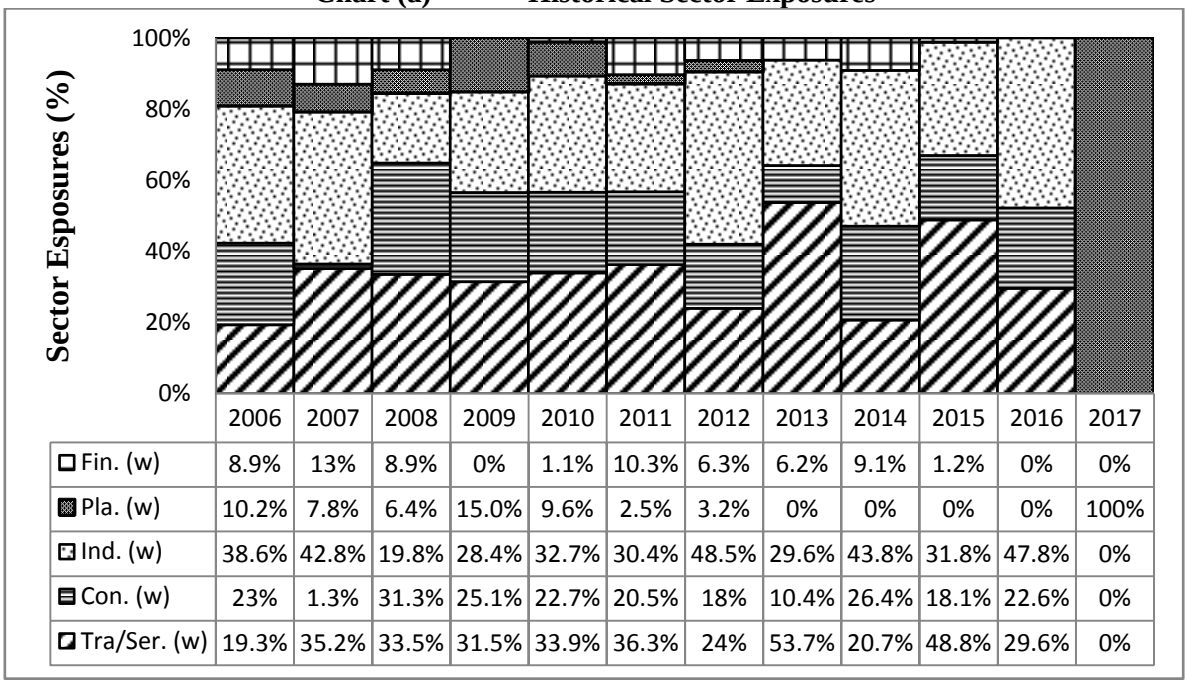
Accordingly, in year *t*, the optimal sector exposures are represented by the weights $\widehat{W}_{s1}, \widehat{W}_{s2} \ldots \widehat{W}_{sn}$ in Equation 2 that maximises the Sharpe ratio in Equation 5.Two constraints are used to ensure that the return of the optimum sector portfolio is positively and fully attributed to the component sector index: (1) The total weight of all sectors is 100%; and (2) each sector's weight is between 0 and 100%. As a result, the analysis just uses the long-only base. In terms of choosing the proxies, constructing a market proxy from accessible sample stocks is necessary for conducting a fair evaluation of portfolios built from the same pool of sample stocks (Hsieh and Hodnett, 2011b). As a result, this study uses a portfolio that includesall stocks in the research data as a market proxy (hereinafter, MP). It is worth mentioning also that the risk-free proxy for this research is the 3-month Bank Negara Treasury –the central bank of Malaysia- bills rate.

Results

This section compares the annual historical sector exposures with the annual optimal sector exposures of the MP over the 1 December 2005–30 November 2017 examination period. Chart (a) in Figure 2 illustrates the annual historical sector exposures for the MP, at the end of November each year over the study period, while the annual optimal sector exposures of the MPare presented in Chart (b) over the same examination period.

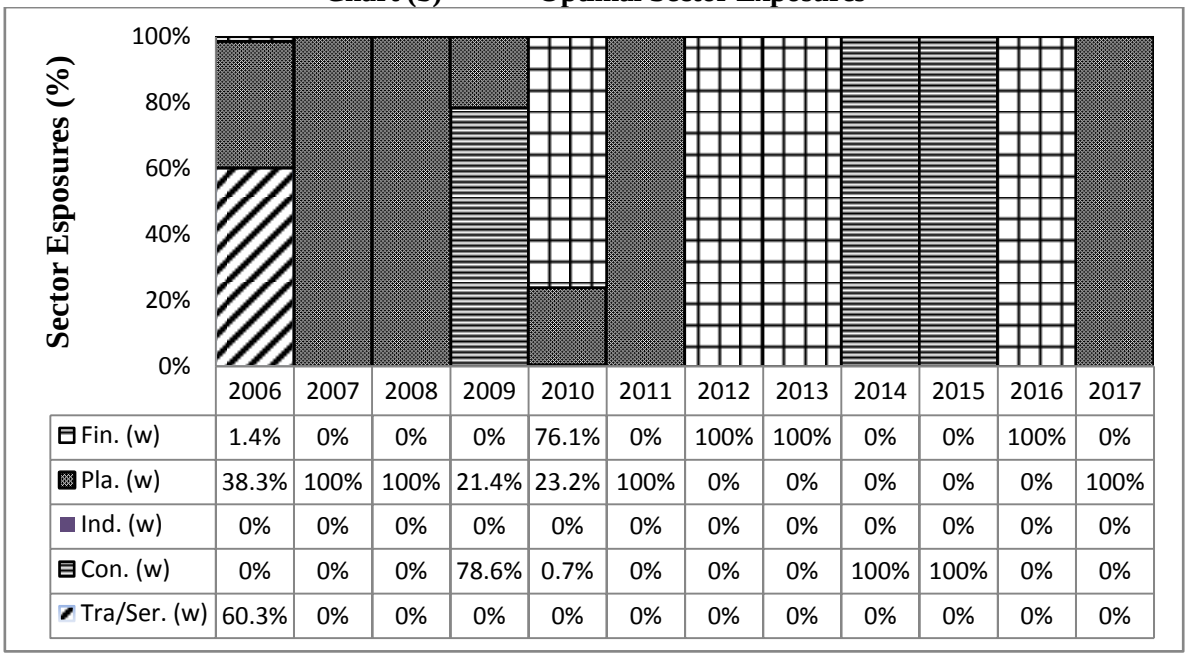
Figure 2: Historical Sector Exposures vs. Optimal Sector Exposures for the MP

Chart (a) Historical Sector Exposures



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Fin. (w)	8.9%	13%	8.9%	0%	1.1%	10.3%	6.3%	6.2%	9.1%	1.2%	0%	0%
Pla. (w)	10.2%	7.8%	6.4%	15.0%	9.6%	2.5%	3.2%	0%	0%	0%	0%	100%
Ind. (w)	38.6%	42.8%	19.8%	28.4%	32.7%	30.4%	48.5%	29.6%	43.8%	31.8%	47.8%	0%
Con. (w)	23%	1.3%	31.3%	25.1%	22.7%	20.5%	18%	10.4%	26.4%	18.1%	22.6%	0%
Tra/Ser. (w)	19.3%	35.2%	33.5%	31.5%	33.9%	36.3%	24%	53.7%	20.7%	48.8%	29.6%	0%

Chart (b) Optimal Sector Exposures



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Fin. (w)	1.4%	0%	0%	0%	76.1%	0%	100%	100%	0%	0%	100%	0%
Pla. (w)	38.3%	100%	100%	21.4%	23.2%	100%	0%	0%	0%	0%	0%	100%
Ind. (w)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Con. (w)	0%	0%	0%	78.6%	0.7%	0%	0%	0%	100%	100%	0%	0%
Tra/Ser. (w)	60.3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

The results of the historical sector exposures in Chart (a) indicate that the exposure of the financial sector on the MP over the entire examination period was weak, between 0% and 13%. However, before 2009, its exposure was considered somewhat stable, with an average of around 10%, but it significantly declined in 2009. This is the effect of the collapse of major financial institutions in 2008 that triggered the GFC, such as the Royal Bank of Scotland, Merrill Lynch, American International Group (AIG), JP Morgan Chase (The Guardian, 2020), and the banking crisis sparked by the collapse of Lehman Brothers Holdings in September 2008 (Williams, 2010). This is coupled with fears that emerged that a new crisis might occur when Dubai admitted that it might not be able to pay its debt in 2009. Thus, investors around the world lost confidence in investing in the financial sector. As a result, the exposure to the financial sector was 0% in 2009. The exposure of the financial sector was volatile, but low in general after 2009 until declining significantly between 2015 and 2017.

According to the Financial Stability Review issued in September 2019 by bank Negara, investments in the financial sector in Malaysia might have been negatively affected in these years due to the significant decrease in the bank's return on equity (ROE) and return on assets (ROA), which were below the current ten-year average. The declining market valuation for the listed banks in Bursa Malaysia since 2014 in line with market expectations for the future profitability of banks may also have played a role (Bank Negara, 2019).

Except in the year 2017, the plantation sector had a low exposure over the entire examination period, since plantations' importance diminished over time in Malaysia. This might be because Malaysia's economy is noticeably dependent on the industrial and export sectors. The World Trade Organisation, in its World Trade Statistical Review 2018 report, ranked Malaysia as the 25th largest exporter worldwide in 2017. Therefore, the results show that the industrial sector, as well as the trade and services sector, were considered the main economic drivers for the performance of the MP since they had the heaviest sector exposures over the majority of the examination period. The plantation sector, however, became the main economic driver for the performance in 2017 with 100% sector exposure. This might be because palm oil production in Malaysia recovered outstandingly during 2017, which had a positive effect and spinoff on the plantation sector (United Plantation Berhad, 2017). Where according to the Malaysian Palm Oil Council (MPOC) in 2020, Malaysia produces 28% of palm oil worldwide, which represents around 33% of global exports in palm oil.

Finally, the exposure of the consumer sector was between 0% and 31.3% over the study period. However, it lost its exposure significantly in 2007 when the GFC started, as it fell from 23% in 2006 to 1.3% in 2007. This was due to customers adjusting their purchasing behaviour during the crisis because of the uncertainty about the future (Nie, Zhao & Yu, 2010). Although the crisis continued in 2008, the consumer sector rebounded significantly to 31.3% in 2008, as a result of the growth in the Malaysian economy, where it reached 4.6% in 2008, due to the strong domestic and external demand (Bank Negara, 2008). Moreover, the Malaysian Economic Monitor report clarified that the growth of the income in Malaysia was inclusive in 2008 (World Bank, 2018), which led to a noticeable improvement in the consumer sector in terms of a strong and speedy recovery from the GFC in 2008 (World Bank, 2010). Malaysian consumer spending was USD103,19 billion in 2008, while it was only USD87,39 billion in 2007 (Macrotrends, 2019). The exposure of the consumer sector became stable from 2008 to 2016, but it lost its exposure significantly in favour of the plantation sector in 2017.

The results of the optimal sector exposures in Chart (b) emphasise that there is a chance to enhance the Sharpe ratio if investors tactically allocate 100% of the funds in the plantation sector in 2007, 2008, 2011, and 2017. It is also evident that the best strategy for sector allocation is to allocate 100% of the funds in the financial sector in 2012, 2013, and 2016. But the largest percentage of investments should be toward the consumer sector at 100% in 2014 and 2015. Along similar lines to Rohuma (2021), the results further suggest that the plantation sector investment is the safest cushion during the GFC of 2007/2008. However, the largest percentage of the investment should stay in the trading and services sector followed by the plantation sector in 2006. The largest percentage of the investments should stay in the consumer sector, and then the plantation sector, in 2009. Further, the biggest proportion of investment in 2010 should remain in the financial sector, followed by the plantation sector. Contrary to the historical sector exposure results, no investment should be allocated to the industrial sector over the entire examination period.

To sum up this section, the results show discrepancies between the historical sector exposures of the MP and their respective optimal sector exposures. For instance, the industrial, as well as the trading and services sectors, were the main sectors that drive the performance of Bursa Malaysia over the majority of the study period. In the meantime, the plantation sector has become the main driver of the performance in 2017. In terms of the optimal sector exposures of the MP, the results emphasise that investors should allocate most of the investments in the plantation and consumer sectors over the majority of the examination period. Conventional investors should also allocate a high percentage of the fund to the financial sector, but not during the crisis period. The plantation sectors are considered the safest investment during the crisis period, while no funds should be allocated to the industrial sector over the entire examination period.

Conclusion

The main objective of this research is to construct and compare the historical sector exposures and the optimal sector exposures for the market proxy over the examination period from 1 December 2005 to 30 November 2017.

The comparison was conducted to examine whether there were any differences in the portfolios' performance between the two different kinds of sector allocation methods. The research only took into account sectors whose average market value over the examination period was bigger than 10% of the total market value. Also, the new sector classifications that were applied to Bursa Malaysia from 24 September 2018 have been excluded from the analysis.

The results showed discrepancies between the exposures of the historical and optimal sector of the market proxy.In the historical sector exposures, the main sectors that drove the performance were the industrial sector and the trading and services sector, followed by the consumer sector until 2016. The plantation sector, however, has become the main driver of the performance in 2017. In contrast, the results indicated that investors should not allocate funds to the industrial sector for the entire examination period. In terms of optimal sector exposures, investors should have allocated a high percentage of investment to the plantation and consumer sectors. The conventional investor should also have invested highly in the financial sector, but not during the crisis period, while the plantation sector was the safest cushion of investment during the crisis period.

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