Global Journals LaTeX JournalKaleidoscope™
Artificial Intelligence formulated this projection for compatibility purposes from the original article published at Global Journals. However, this technology is currently in beta. *Therefore, kindly ignore odd layouts, missed formulae, text, tables, or figures.*

An Empirical Study Of Japanese Market Efficiency: Comparing The Risk-Adjusted Performance Of An ETF Portfolio Versus The Topix Index

Pedro Kono D.B.A.[1], Pan Yatrakis Ph.D.[2] and Sabrina Segal D.B.A.[3]

[1] Temple University and Nova Southeastern University

Received: 23 January 2011 Accepted: 17 February 2011 Published: 4 March 2011

Abstract

This study tests the market efficiency of the Japanese equity market. The analyses compare the performance of a portfolio consisting of exchange-traded funds (ETFs) with that of the overall market, exemplified by the Topix Index, during the period of June 30, 2008 to June 30, 2009. The ETF portfolio is constructed according to the Modern Portfolio Theory (MPT) developed by Harry Markowitz in 1952. The study concludes that an optimal ETF portfolio can outperform an overall market index when performance is measured using the Sharpe ratio, i.e., the return per unit of risk.

Index terms— efficiency, analyses, overall market, Sharpe ratio

1 INTRODUCTION

n any economy, the primary role of capital markets is the allocation of ownership of the economy's capital stock (Fama, 1970). An efficient market is one in which prices provide accurate signals for capital allocation, under the assumption that security prices at any time fully reflect all available information (Fama, 1970). Therefore, portfolio performance may best be measured relative to passive benchmarks (Fama, 1991). An exchange-traded fund (ETF) represents shares of ownership in a fund, depository receipts, or unit investment trusts that hold a pool of investments which usually tracks the performance of a specific market index. Such an index may represent the broad market, a specific industry, investment style, or non-equity instrument, such as bonds, REITs, high-yield bonds, currencies, precious metals, and other commodities. ETFs have been described as prototypes for the future evolution of the mutual fund industry (Poterba & Shoven, 1992), as they provide many benefits, such as diversification, tax efficiency, liquidity (since they trade like stocks), and a low expense ratio when compared with open or closed-end mutual funds. For example, Rompotis (2005) found that the expense ratios of 16 ETFs studied between 4/30/2001 and 11/20/2002 were significantly lower than those of mutual funds tracking the same indexes. Harper, Madura and Schnusenberg (2006) found that ETFs have higher mean returns and Sharpe ratios than closed end funds (CEFs), suggesting that passive investment strategies utilizing ETFs may outperform active strategies which rely on CEFs. Previous research on the performance of Japanese mutual funds during the period 1982 to 1992 concluded that most such funds underperformed the market benchmark by 3.6% to 10.8% per annum (Cai, Chan, and Yamada, 1997). The authors attributed this finding to the fact that many mutual funds were subsidiaries of brokerage houses, which provided no incentive fee to fund managers in return for better performance. To the contrary, these funds were susceptible to agency conflicts, prompting a high turnover of assets and resulting in high brokerage commission expenses, thereby eroding fund performance. However, since the 1990s, Japan's Ministry of Finance has imposed new regulations allowing banks and foreign companies to manage mutual funds so as to increase domestic competition. They also mandated the disclosure of commissions, thereby facilitating the comparison of performance within the mutual fund industry (Cai, et. al., 1997).

The Japanese stock market index used in this study is the Topix Index. It is the market capitalization index representing 96% of all stocks traded in Tokyo Stock Exchange (TSE). There are currently 1,600 companies

listed on the TSE, and this index is therefore much more representative of the Japanese stock market than other commonly used indexes, such as the Nikkei 225. The present study applies Markowitz's (1952) Modern Portfolio Theory (MPT) to ETF securities based on market capitalization, testing the performance of an optimal ETF portfolio against that of the Topix Index. The results of this study should provide insight to practitioners and academics on the results of investing in portfolios made up of ETF securities, as compared to a passive instrument linked to the broad Japanese market, such as the Topix Index. Exchange-Traded Funds usually track security or commodity indexes in many categories and provide the most effective and least costly method of achieving the kind of increase in a portfolio's expected return. An appropriate portfolio diversification allows investors to: a) maximize return and minimize risk; b) maximize return for the same level of risk; and c) minimize risk for the same level of return. Diversified portfolios are efficient because they optimize the combination of input (risk) per unit of output (return), and their optimal combination forms the efficient frontier (Markowitz, 1991). One of the pillars of MPT is the Efficient Market Hypothesis or EMH (Stewart, 2006). According to Bernstein (2006), it is the quest of portfolio managers for alpha, or excess returns, that makes markets efficient. This, in turn, leads to a great paradox, as all investors would prefer to track an index or to adopt other kinds of passive strategies. However, if all investors were to follow this strategy, the market would become less efficient, thereby creating opportunities for alpha hunters **??**Bersntein, 2006). Today's investors are engaged in alpha-beta separation, and the desire to increase exposure to alpha and active risk is growing (Hill, 2006). These observations indicate that investing in diversified index funds, which carry low management and transaction fees, is, according to the MPT, the most efficient investment strategy (Malkiel, 2003). The analyses conducted in this study are based on Markowitz's MPT (Markowitz, 1952(Markowitz, , 1959)). Since its formulation, MPT has revolutionized the investment world by allowing managers to quantify investment risk and expected return. The earlier focus on individual asset risk has therefore shifted to the risk of the entire portfolio. According to Fabozzi and Markowitz (2002), MPT provides a scientific and objective analysis of risks and returns, complementing the subjective art of investment management. Recent empirical research determined that a portfolio of country-specific ETFs generates efficiency gains beyond those achieved by simply investing in a global index fund (Miffre, 2007). The purpose of the present study is to determine whether a portfolio of Japanese ETFs, constructed according to MPT, provides a higher return per unit of risk than the Topix Index. The results provide insight on whether investors should diversify their portfolios with Japanese ETF securities, using the MPT to increase return per unit of risk, or simply invest in a market security tied to the Topix Index.

2 II.

3 METHODOLOGY

ETF securities were introduced in Japan on July 1, 2001. As of June 10, 2008, there were 66 ETFs representing various asset classes and having a total net asset value (NAV) of ¥3,026 billion. Our analysis consisted of constructing from among these a single ETF portfolio conforming to the principles of the MPT. Only ETFs meeting strict maturity and liquidity criteria as of June 30, 2008 were included in the portfolio. The criteria are as follows: a) more than three years of existence, and b) more than ¥30 billion in net asset value.

The selected ETFs were defined as follows: 1) Asset classes: market capitalization (large, medium, and small cap); investment style (value, core, growth); industries (financials, health care, technology, industrial, material, REITs, precious metals, commodities, etc); bonds (corporate and government short-, medium-, long-term, fixed income, high-yield); and regions (U.S., international, global).

2) The returns, variances, standard deviations, correlations, and co-variances were determined from June 30, 2005 to June 30, 2008.

3) The optimal portfolio was determined from the ETF asset classes, their statistical data, an expected risk-free rate of 2.0% per annum, and a market return of 6.0 % per annum. 4) The performance of the optimal ETF portfolio was measured as the return per unit of risk from June 30, 2008 to June 30, 2009, and was compared with the performance of the Topix Index during the same period. 5) The returns per unit of risk of the ETF portfolio and market portfolio were statistically tested using correlation analysis and a one-tailed t-test.

The following null hypothesis was tested: A portfolio composed of Japanese ETFs and constructed according to the MPT provides a higher return per unit of risk than the Topix Index. The optimal ETF portfolio was determined on the basis of the ETFs' statistical data, the expected market return and risk-free rate, and the mean-variance optimization model of the MPT. Software designed to determine the optimal portfolio was utilized. The statistical results were used to calculate the Sharpe ratios, i.e., the return per unit of risk. The optimal ETF portfolio was composed of seven ETFs which complied with the maturity and liquidity criteria set for the study, and which track either the Nikkei 225 companies or groups of large, medium, and small companies within the Topix Index. The seven ETFs comprising the optimal portfolio, together with their respective weightings, are presented in Table 1, below. how the risk of each security relates to those of other securities in a portfolio (Chernoff, 2002). Markowitz used a quantitative definition of risk to provide a means of calculating the price of that risk, or the amount of additional risk that must be borne in exchange for an diversification required by MPT to attain the most efficient portfolio along Markowitz's efficient frontier (Kono, Yatrakis, Simon, and Segal, 2007). The primary innovation of MPT was to recognize that risk must be measured not in terms of individual securities, but by

4 SUMMARY AND CONCLUSIONS

Our analysis concluded that the ETF portfolio had a better ratio of performance to risk, i.e., a lower negative return per unit of risk, than the overall market in Japan, as measured by the Topix Index. The beta coefficient was significant at the 0.1% confidence level, although the coefficient of the intercept was significant at just above the conventional 5% level, at 5.5% (see Table 3, below). It is noteworthy that the optimal portfolio required the inclusion of only a small number of ETFs. This was as expected because ETFs are already diversified securities and the use of ETFs should therefore constitute an efficient and cost-effective way of building and rebalancing optimal portfolios (Kono et al., 2007).

The results shed light on the question of whether investors in Japanese securities could increase their returns over those of the Topix Index by diversifying their portfolios using ETFs selected according to the MPT. We find that such an increase in returns is indeed possible using an optimal portfolio of ETFs which track Japanese securities. In an academic sense, this study tests the efficiency of the Japanese stock market by applying MPT to the creation of portfolios comprising a new category of index securities, the ETFs. We conclude that such an optimal ETF portfolio can outperform the most comprehensive index of stocks trading on the Tokyo Exchange. This conclusion challenges the applicability of the semi-strong form of the EMH in the Japanese market in that securities prices do not seem to reflect all the information available to investors. Our conclusion contrasts with that of a previous study evaluating the performance of international mutual funds, which found no evidence that such funds, individually or as a group, provide investors with performance that is superior to that of a broad international equity index (Cumby & Glen, 1990). A possible explanation may lie in the fact that most indexes are weighted by market capitalization, which may overweight overvalued stocks while underweighting stocks that are undervalued, thereby potentially causing a drag on capitalization-weighted indexes **??**Hsu, Li, Meyers and Zhu, 2007). While this effect may be most severe in less efficient markets, it may influence the performance of market indexes in more developed ones as well. The ETF market in Japan is growing rapidly in terms of both the number of funds and their net asset value, probably due to the benefits of cost effectiveness, tax efficiency, liquidity, and transparency. As more Japanese ETFs meet the maturity and liquidity criteria used in this study, it may be possible in the future to construct even more efficient ETF portfolios following the principles of MPT. Future research on Japanese ETFs could also examine the relationship between cash flows and performance, as expense ratios may vary among ETFs even though they may have the same investment objectives. For example, a previous study found that a portfolio of index funds selected on the basis of low expense ratios and high past returns outperformed portfolios of index funds selected by investors, thus questioning the rationality of investors' selection criteria (Elton, Gruber, and Busse, 2004).

This page is intentionally left blank [1] [2] [3] [4]

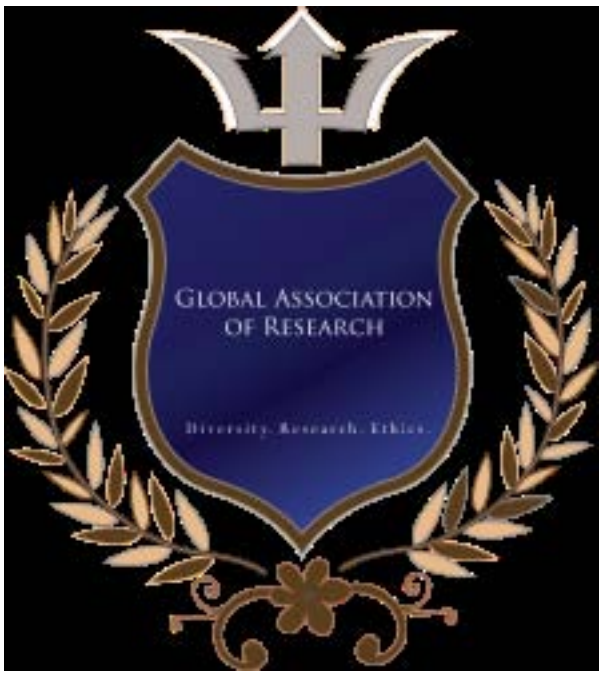

Figure 1: ?

1

ETF	Exchange Code	Weight (%)
1306 -	Topix index	13
1321 -	Nikkei 225	18
1330 -	Nikkei 225	18
1320 -	Topix index	18
1308 -	Topix index	13
1305 -	Topix Index	14
1615 -	Topix Index	6
Total		100

Figure 2: Table 1 :

2

Figure 3: Table 2 ,

2

Portfolio	# of Securities	Return	Risk-free Rate	Risk	Return/Risk (*)
ETF Portfolio	7	-4.12%	-0.50%	4.81%	-0.960
Topix Index	96% of market	-4.88%	-0.50%	5.19%	-1.036

(*) p=0.0902
III.

Figure 4: Table 2 :

3

Regression Statistics							
Multiple R	0.994						
R Square	0.988						
Adj R Sq	0.987						
Std Error	8E-04						
Observations 52							
ANOVA							
	df	SS		MS	F	Signif F	
Regression	1	0.002485	0.00248	4021.28	1.9224E-49		
Residual	50	3.09E-05	6.2E-07				
Total	51	0.002516					
	Coeff.	Std Error	t Stat		P-value	Lower 95%	
Intercept	0.03	0.015284	1.96396	0.05511	-0.0006817	0.0607166	0.004402664 0.0556322
X Variable 1	0.97	0.015298	63.4136	1.9E-49	0.93937949	1.0008337	0.944468463 0.9957447

Figure 5: Table 3 :

[1]Global Journal of Management and Business Research Volume XI Issue V Version I ©2011 Global Journals Inc. (US) April

[2]An Empirical Study Of Japanese Market Efficiency: Comparing The Risk-Adjusted Performance Of An ETF Portfolio Versus The Topix Index.©2011 Global Journals Inc. (US)

[3]©2011 Global Journals Inc. (US)April 2011

[4]An Empirical Study Of Japanese Market Efficiency: Comparing The Risk-Adjusted Performance Of An ETF Portfolio Versus The Topix Index.

[Malkiel ()] *A Random Walk Down Wall Street*, B G Malkiel . 2003. New York: W. W. Norton & Company, Inc.

[Hsu et al. ()] 'Accounting-Based Index ETFs and Inefficient Markets'. J Hsu , F Li , B Myers , J Zhu . *Institutional Investor*, 2007. p. 2007.

[Hill ()] 'Alpha as a Net Zero-Sum Game'. J M Hill . *Journal of Portfolio Management* 2006. p. 32.

[Rompotis (2005)] 'An Empirical Comparing Investigation on Exchange Traded Funds and Index Funds Performance'. G Rompotis . *Social Science Research Network* 2005. Dec. 15. (SSRN) . (Working Paper)

[Stewart ()] 'Behavioral Finance -Not to Be Ignored'. P Stewart . *Trusts & Estates* 2006. (6) p. 145.

[Chernoff ()] J Chernoff . *Physics, Math and Managing Money". Pensions & Investments*, 2002. p. 30.

[Kono et al. ()] 'Comparing Risk-Adjusted Performance of ETF Portfolios vs. S&P 500 index'. P M Kono , P G Yatrakis , H K Simon , S Segal . *Financial Decisions (formerly Journal of Financial Decisions)* 2007. 2007. (2) .

[Miffre ()] 'Country-Specific ETFs: An Efficient Approach to Global Asset Allocation'. J Miffre . *Journal of Asset Management* 2007. 2007. 8.

[Fama ()] 'Efficient Capital Markets: A Review of Theory and Empirical Work'. E F Fama . *Journal of Finance* 1970.

[Fama ()] 'Efficient Capital Markets: II'. E F Fama . *Journal of Finance* 1991. p. 46.

[Elton et al. ()] E J Elton , M J Gruber , J Busse . *Are Investors Rational? Choices Among Index Funds*, 2004. p. 59.

[Cumby and Glen ()] 'Evaluating the Performance of International Mutual Funds'. R E Cumby , J D Glen . *The Journal of Finance* 1990. 119 (2) .

[Markowitz ()] Harry M Markowitz . *Portfolio Selection: Efficient Diversification of Investments*, (Cambridge, UK) 1991. Basil Blackwell. (nd ed.)

[Harper et al. ()] 'Performance Comparison Between Exchange-Traded Funds and Closed-End Funds'. J Harper , J Madura , O Schnusenberg . *Journal of International Financial Markets* 2006. 16 (2) . (Institutions and Money)

[Markowitz (1952)] 'Portfolio Selection'. H M Markowitz . *The Journal of Finance* 1952. March. p. 12.

[Markowitz ()] *Portfolio Selection, Efficient Diversification of Investments*, Harry M Markowitz . 1959. New York: John Wiley & Sons, Inc. p. .

[Poterba and Shoven ()] J M Poterba , J B Shoven . *Exchange-Traded Funds: A New Investment Option for Taxable Investors*, 1992. 92.

[Bernstein ()] 'The Paradox of the Efficient Market'. P L Bernstein . *Journal of Portfolio Management* 2006. p. 32.

[Cai et al. ()] 'The Performance of Japanese Mutual Funds'. J Cai , K C Chan , T Yamada . *The Review of Financial Studies* 1997. 10 (2) .

[Fabozzi and Markowitz ()] *The Theory and Practice of Investment Management*, F J Fabozzi , H M Markowitz . 2002. Hoboken, NJ: John Wiley & Sons, Inc.