Performance Evaluation of Exchange-Traded Funds in Emerging Markets

by

Yanyan Li

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Under the direction of Dr. Francis Boabang

Approved: Dr. Francis Boabang
                    Faculty Advisor

Approved: Dr. Francis Boabang
                    MFin Director

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Abstract

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This paper evaluates the performance of ETFs in the global emerging

markets, focusing on China. Historical data on six ETFs are collected through

the period 2012 to 2013. To examine the performance of the ETFs based on

the sample, this paper employs the methodology of Jensen's Alpha, Sharpe

Ratio and Tracking Error. The results of the empirical study confirm

underperformance of the selected ETFs in China relative to the market.

However, ETFs have some other advantages as an investment instrument

such as low expense and tax efficiency.

Table of Contents

Chapter 1

Introduction

1.1 Purpose of study

While the concept of Exchange-Traded Funds (ETFs) is very popular in the US and some developed European countries, the growth in ETF markets is still in an early stage in the global emerging markets that comprise countries such as China, India, South Africa, Russia, South Korea and Brazil. Since these countries have become increasingly important to investors due to their fast growing economies, it is necessary to analyze the performance of ETFs. Thus, this research paper examines the characteristics of ETFs in China, and also evaluates their performance by using the methods of Jensen's Alpha and Sharpe Ratio, and Tracking Error.

1.2 Background of Emerging Markets and ETFs

The emerging markets are the economic powers that are experiencing rapid growth faster than the developed world. Some analysts even speculate that some emerging economies would exceed most of the developed countries by the year of 2050 (Goldman Sachs, 2003). According to the report published by the Ministry of Finance, the Government of India (2010) in the G20, the total GDP of China accounted for 13.6% of the total world GDP; these emerging markets have become increasingly powerful.

ETFs may be one of the most successful financial instruments and are

predicted to grow in size and complexity in the foreseeable future. The importance of ETFs has been gradually and widely accepted in the world, and the emerging markets are no exception. With the first ETF created in 1993, it has been grown rapidly since 2007, and now there are more than 1200 ETFs with a market capitalization of almost $1.2 trillion in the world (Grudzinski, C., 2012). Also, the emerging markets has attracted lots of investors; the second largest ETF (symbol: VWO) in terms of Assets Under Management (AUM) is emerging markets- orientated. In 2012, the net inflows of emerging market ETFs were $54.3 billion compared to just $3.7 billion in 2011, and were second only to North American ETFS with net inflows of $78.3 billion (Krouse, S., 2013).

1.3 Characteristics of ETFs

The creation of ETFs is one of the most successful financial innovations because they provide investors with a lot of benefits and this is also the reasons that ETFs have lower expense ratios. The average expense ratio for the top 20 ETFs is 0.27%, there is no front-end, back-end expense loads, or broker sales commissions. (Grudzinski, C., 2012) An ETF tracks an index similar to a mutual fund, but unlike mutual funds, ETFs are more flexible and transparent to trade, they can be traded throughout the day and prices are reported every 15 seconds, and the holdings of ETFs must be released at the end of each day. Besides, ETFs also have advantages of diversification

through one investment product and improved tax efficiency relative to active portfolio management.

However, ETF also has risks that investors need to pay attention to. After doing research about tracking errors, Barney, S found out that the more illiquid the assets are, the larger the tracking error is. In addition, for most of the cases, ETF increases liquidity and trading within illiquid assets, but if liquidity assets suffer major drops, the bid-ask spread will be significantly widen and ETF pricing can become difficult or even impossible. (Grudzinski, C., 2012)

1.4 Structure of study

The first chapter of this paper briefly introduces the research purpose and the background of ETFs. The second chapter is the literature review which provides the previous study related to this paper, and also indicates what should be improved in the future. Chapter three is the data and methodology employed in this paper, which contributes to the ETFs performance evaluation. The final part is the analysis of the results and the conclusion of this study.

Chapter 2

Literature Review

2.1 Logic of ETFs

ETFs are open-end funds, there is no limit on buying or selling shares, so investors can freely invest or redeem funds. Normally, large financial institutions enjoy the redemption policy because this kind of investors is specified and they are called as authorized participants. Moreover, this redemption policy gains authorized participants' interest by making their investment more liquid. In this case, those financial institutions can invest more when the stock goes up, and redeem funds back when the market trend goes down. The price at which investors invested or redeemed is called Net Asset Value (NAV).

As mentioned above, one of the main advantages of ETF is liquidity. Due to the fact that ETF funds are open-end funds, investors can choose to invest or redeem funds which give investors more options to invest. Thinking of investments in close-end funds, investors can only get their money back until maturity. Investors tend to invest more in ETF funds because of the liquidity advantage which gives them more freedom. Another fact about ETF is that it can be traded in the secondary market. Since the fund price always fluctuates around NAV, so investors can redeem funds when ETF price is above NAV and invest money to the secondary market and vice versa.

However, there are also some concerns about ETFs. For instance, the main reason of the underperforming of an ETF is because of the management fees and costs associated with non-accruing earnings on dividends. According to Elton et al. (2002), even though NAV of Spiders is approximate equal to fair market value, investment products underperform the market by 28 basis points per year.

2.2 Traditional models of measuring the performance of ETFs

The first sense of market portfolio was proposed by Markowitz and presented in his paper in 1952, in which he detailedly defined the meaning of portfolio selection, specifically, the relationship between expected return and variance. He precisely demonstrated that an efficient portfolio is the portfolio with the lowest risk level (variance of return) for a given level of expected return. He also brought the concept of the efficient frontier, as shown blue curve in the table below, which illustrates that the set of all optimal portfolios compose the called efficient frontier.

Table 1: Efficient frontier and the tangency portfolio
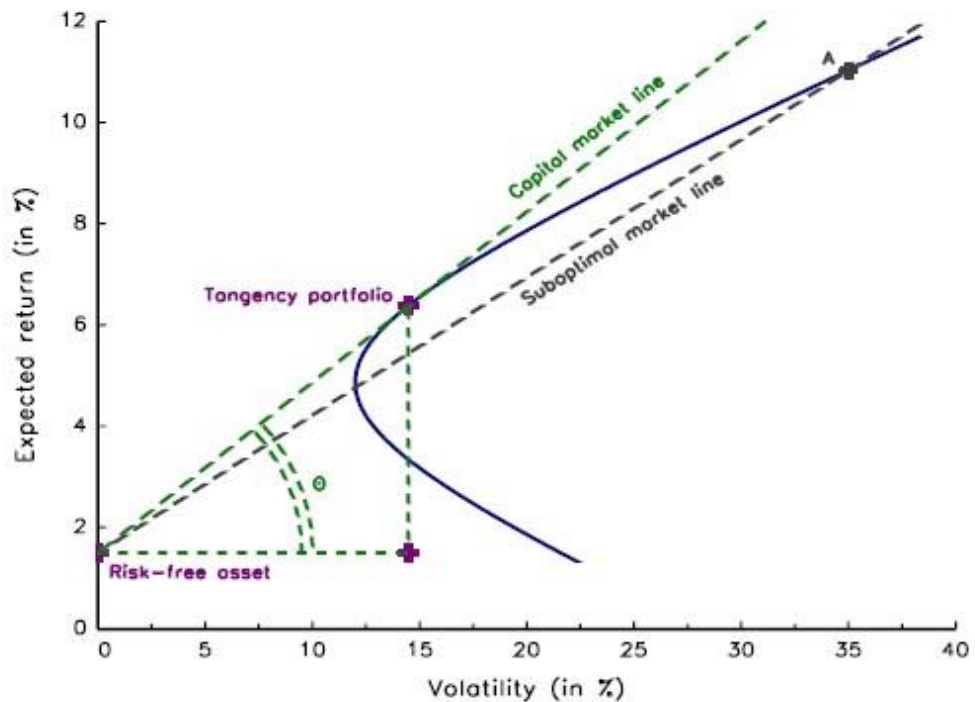
Tobin (1958) further developed the efficient frontier model. He indicated that

when considering the liquidity preference theory, the return-volatility

relationship would change to linear when combining with risk-free asset, as

presented by dashed black line in the figure above. However, the green

dashed line called the CML (Capital Market Line) dominates all other possible

combinations, and the optimal portfolio is the tangency point of the efficient

frontier and the CML.

Sharpe (1964) concluded that the studies of Markowitz and Tobin could be

broken down into security selection and asset allocation. This process is

called Separation Theorem. The theory of CAPM (Capital Asset Pricing Model)

was developed in the same year, in which it explains the relationship between the risk premium of the asset and the systematic risk, and the concept of beta was first introduced. He illustrated that the most efficient portfolio (the tangency portfolio) is the market portfolio and is composed of all risky assets. Although CAPM does come with many limitations, and is not feasible in practice, it established the concept of portfolio management.

Jensen (1968) used the alpha measure to investigate the performance of mutual funds and documented that the 115 sample of mutual funds on average underperformed the buy and hold strategy, and there is no evidence of existence of an individual fund outperform mere random chance. He also introduced the passive management of investment strategy. Moreover, the first index fund was established in 1971, after Jensen's study.

2.3 Recent studies on ETF's performance across countries

Different researches have been done in the area of performance of ETFs, while the results are mixed. Due to the short period of existence of ETFs, there are not many studies in this area. However, some of the studies reported the existence of evidence of negative performance whereas others documented strong and outstanding achievement about the performance of ETFs.

2.3.1 Negative performance of ETFs

The study did by Adjei Frederick (2009) showed indifference of performance between the S&P 500 index and the ETFs. Also, among the average of an ETF's total risks, 38% of them are not diversified. And the evidence of performance persistence has been found on both the semi-annual and the annual horizons.

Johnson (2009) documented the existence of tracking errors between 20 foreign ETFs and their home indexes. The variable of foreign index positive returns relative to the US index is found to be significant between the ETFs and their underlying indexes. Similarly, William (2009) observed the same result, i.e. tracking errors do exist when comparing foreign ETFS with their underlying home indexes.

Blitz David et al. (2010) compared the performance of European index mutual funds and ETFs with their benchmarks. The results show that European index mutual funds as well as ETFs perform poorly than the benchmarks by 50 to 150 basis points per year. Dividend tax is one of the explanatory factors of the underperformance.

Blitz David and Huij (2011) investigated the global emerging markets (GEM) ETFs and found out that the evidence of higher tracking error exhibited by GEM ETFs than others.

Houweling (2011) evaluated the performance of fixed income ETFs and found that the investment grade corporate bond ETFs. Moreover, Houweling also

mentioned that high yield corporate bond ETFs are unable to perform as well as their benchmarks whereas the treasury ETFs' performance is no significant difference to their benchmarks.

Charupat & Miu (2011) found that the price deviations of leverage ETFs are small compared to others, and the price volatility increases at the end of the day because of rebalancing.

Patrick (2011) observed that, in Hong Kong market, the tracking errors of the ETFs has a discouraging association with the size of the ETFs but has an encouraging connection to their expense ratio. As a result, it is more risky to replicate the performance of underlying securities because of the high magnitude of tracking error comparing to the ETF in other states such as the US and Australia.

Chang and Krueger (2012) compared the performance of ETFs and Closed-End Funds in various perspectives such as risks, returns and risk-adjusted returns, and found that the ETFs underperform Closed-End Funds even though the ETFs have lower expense ratio than Closed-End Funds.

2.3.2 Positive Performance of ETFs

Interestingly, there are as many studies on positive performance as the negative side. Ching-Chung et.al. (2005) documented that the performance of the ETFs in Taiwan as well as the Taiwan Top 50 Tracker Funds are almost

the same to the Taiwan stock market index.

Joel et al. (2006) compared the risk and return of foreign ETFs with closed-end country funds, and observed that the ETFs tend to have higher mean returns and Sharpe ratios than the closed-end country funds. They also evidenced that the passive investment strategy for ETFs statistically outperform the active investment strategy.

Huang and Guedj (2009) examined the suitability of the efficient indexing vehicle for the ETFs and Open-Ended Mutual Fund, and concluded that the ETFs are more appropriate for investors who are planning to hold the underlying securities for a long period of time. Also, ETFs are observed to be superior to Open-Ended Mutual Fund for less and narrower liquid underlying indexes.

Jack et al. (2009) noted that the daily prices of US ETFs are comparatively and extensively volatile. Moreover, statistically, the US ETFs are more likely to be traded at a premium from their Net Asset Value (NAV) rather than a discount. Similarly, Gerasimos (2011) indicated that the ETFs are traded at a premium, and the tendency of return can be forecasted.

Meric et al. (2009) indicated that, during the subprime crisis, the US stock market lost approximately 56% of its value. They documented that, by using the using Sharpe and Treynor portfolio performance measures, the sector of healthcare and consumer staples index funds performed best in the 38 sector index funds investigated, and the financial and home construction sector

index funds performed worst over the period of October 9, 2007 to March 9, 2009.

Wong and Shum (2010) compared the performance of the 15 sample worldwide ETFs in a bullish market with that of a bearish market. They documented that, after measuring the performance by using the Sharpe and Treynor ratios, ETFs constantly generated lower returns in the bearish market than in the bullish market over the period of 1999 to 2007.

Yuexiang et al. (2010) documented that market prices and Net Asset Values of the Shanghai 50 ETF are co-integrated, and "there is a unidirectional causality from price to NAV". Furthermore, they also noted that the price of the ETF was not closely related to the NAV in the second half of 2007.

Gerasimos (2011) indicated that the performance of ETFs can be forecasted in the short run because the return superiority of ETFs is persistent.

Prasanna (2012) examined the performance of ETFs in the Indian market, and indicated that efficient funds statistically have higher Sharpe ratios. He also concluded that there is no evidence that shows the association between fund size and performance.

2.4 Objectives

According to former researches, the importance and popularity of ETFs are widely confirmed in the modern business world recently. With the improvement of the financial markets in developing countries such as China,

South Korea, India and Brazil, the ETFs grow rapidly in these countries and become an essential part of the ETF market. Most of the prior literature reviews of the ETFs mainly focus on the ETFs in the US and some developed European countries. Little researches are found that study the ETFs in the emerging markets. Therefore, the main objectives of this paper are mostly to evaluate the performance of the ETFs in China with the methods of Jensen's Alpha, Sharpe Ratio, and Tracking Error.

Chapter 3

Methodology

3.1 Data resources

In order to examine the performance of ETFs in the selected emerging markets, this research paper quotes the data resources obtained from Bloomberg Terminal. And the sample data of this paper contains six ETFs in China, which are CHINA AMC CSI 300 INDEX ETF, INVESCO GREAT WALL CSI 300 EQ, CHINA SOUTH KAIYUAN CSI 300, HUATAI-PB CSI 300 ETF, E FUND CSI 300 ETF, and CHINA AMC CSI 300 INDEX ETF. Due to the short history of existence of most ETF funds, we can only be able to use the historical data for around one year. Furthermore, SHSZ 300 Index is the benchmark being used in the evaluation.

3.2 Methodology

3.2.1 Risk-Adjusted Performance

Jensen's alpha is based on capital pricing model (CAPM) and Treynor Index. To determine the excess return of the ETF and analyze the managerial skill by measuring the stock selection ability, we use the risk-adjusted return in Jensen's model:

$$R_{ETF} - R_f = J_{o'ETF} + (R_{MKT} - R_f) \beta_{ETF} + \varepsilon_{ETF} \text{ ------------ (1)}$$

R_{ETF} = daily return for the sample ETF

R_f = risk-free rate

J_{oETF} = coefficient that determine the excess return of the ETF

R_{MKT} = return of the SHSZ 300

β_{ETF} = the systematic risk of specified ETF

ε_{ETF} = error term for ETF that cannot explained by this model

There are three possible results:

- When $J_{oETF} > 0$, the fund could outperform the market

- When $J_{oETF} < 0$, the fund could underperform the market

- When $J_{oETF} = 0$, the fund could perform as well as the market

3.2.2 Rating Performance

In this section, we rate the performance of ETFs. To determine how well the return of the ETF compensates the investor for the per risk they take, the rating method we use is the Sharpe Ratio, which is estimated through the model below:

$$S_{ETF} = \frac{R_{ETF} - R_f}{\sigma_{ETF}} \text{ ------------ (2)}$$

R_{ETF} = average daily return for the sample ETF

R_f = risk-free rate

σ_{ETF} = average standard deviation of ETF's return

$$S_{MKT} = \frac{R_{MKT} - R_f}{\sigma_{MKT}} \text{ ------------ (3)}$$

R_{MKT} = average daily return for the market

R_f = risk-free rate

σ_{MKT} = average standard deviation of market's return

The possible results will indicate if the Sharpe ratio of selected ETFs is higher than the Sharpe ratio of the market, the fund could outperform the market, vice versa.

3.2.3 Estimating Tracking Error (TE)

The goal of an ETF is to explore investment results that correspond to the price and return performance, before various fees, to its stated benchmark. The TE measure plays an important role because it evaluates how well the ETF manager is tracking the benchmark. In this research paper, we use the following two most common methods of tracking error measurement.

The first method, $TE_{1,p}$, expresses the tracking error as the average of absolute difference between the returns of ETFs and their indexes. The absolute differences are taking into account because both positive and negative difference may exist, which would affect the results analysis. The valuation is defined as the following equation:

$$TE_{1,P} = \frac{\sum_{t=1}^{n}|e_{pt}|}{n} \text{ ------------ (2)}$$

$|e_{pt}|$ = absolute return difference in day t.

And the next, $TE_{2,p}$, presents the tracking error as the standard deviation of return differences between ETFs and the corresponding indexes. The estimation is expressed in the equation (3).

$$TE_{2,P} = \sqrt{\frac{1}{n-1}} \; \Sigma_{T=1}^{n}(e_{pt} - \bar{e}_p)^2 \; \text{------------ (3)}$$

e_{pt} = difference of the returns on day t

$\bar{e}_p$ = average return's difference over n days

To sum these two methods up, we should note that if the TE is low, the ETF

manager is replicating the stated benchmark well.

$$TE_{2,P} = \sqrt{\frac{1}{n-1}} \; \Sigma_{T=1}^{n} \quad 16 \quad - \bar{e}_p)^2 \; \text{------------ (3)}$$

e_{pt} = difference of the returns on day t

$\bar{e}_p$ = average return's difference over n days

Chapter 4

Results Analysis

4.1 Data overview

As is shown in the table 2, there are nearly 900 ETF observations in the data set. RF stands for the risk free rate, ETFPC indicates the percentage change in a different time period, and MKTPC shows the market percentage change. Since the test is based upon β_{ETF}, which is the coefficient of function $(R_{MKT} - R_f)\beta_{ETF}$, so function $(R_{MKT} - R_f)\beta_{ETF}$ is deemed as the most important factor in the regression model. Besides, the average excess return of the specific ETFs and the market is both positive, and have high volatility in the collected period.

Table 2: Data Summary

Variable	Obs	Mean	Std. Dev.	Min	Max
rf	897	.0384565	.0018543	.0359	.0398
ETFPC	896	.132626	.6167739	-.6625418	1.962013
MKTPC	896	-.0000912	.0081369	-.0630812	.0504897

4.2 Regression result

4.2.1 Risk-Adjusted Performance result

The regression model applied in the paper is random-effect regression, which is a kind of hierarchical linear model. This model assumes all the unobserved variables are independent of all the observed variables. The results below

clearly illustrate the estimates of the single-index regression analysis for evaluating the performance of the selected ETFs. Be introduced in details, according to table 3, the regression resulted the following equation,

$$R_{ETF} - R_f = -0.0005177 + (R_{MKT} - R_f)0.9823512$$

Where -0.0005177 is $J_{\partial ETF}$ and 0.9823512 is β_{ETF}. And the z-values of the coefficient are equal to 284.90 and -2.94, it denotes the result is statistically significant at the 95% critical confidence level. In addition, as the $J_{\partial ETF}$ is lower than zero, the selected funds underperform the market.

Table 3: Random-Effects Regression

```
Random-effects GLS regression              Number of obs      =        687
Group variable: name                       Number of groups   =          5

R-sq:  within  = 0.9917                     Obs per group: min =         36
       between = 0.9504                                     avg =      137.4
       overall = 0.9916                                     max =        231

                                           Wald chi2(1)       =   81169.62
corr(u_i, X)    = 0 (assumed)              Prob > chi2        =     0.0000
```

ETFRTN	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
MKTRTN	.9823512	.003448	284.90	0.000	.9755932	.9891092
_cons	-.0005177	.000176	-2.94	0.003	-.0008627	-.0001727
sigma_u	.00022969					
sigma_e	.00121785					
rho	.03434782	(fraction of variance due to u_i)				

4.2.2 Rating performance result

Table 4 reports the results of rating performance of funds and benchmarks per group according to Sharpe ratio for the period. Comparing these results, the

Sharpe ratio of the market is about 0.0066869, only one of the six ETFs outperform the market. Moreover, we can tell that investors could shift the holdings of CHINA AMC CSI 300 INDEX ETF, INVESCO GREAT WALL CSI 300 EQ, and E FUND CSI 300 ETF to CHINA SOUTH KAIYUAN CSI 300, HUATAI-PB CSI 300 ETF, and CHINA AMC CSI 300 INDEX ETF. Therefore, they can mitigate the losses from the decrease in fund markets.

Table 4: Rating of ETFs

FUND NAMES	Sharp Ratio
CHINA AMC CSI 300 INDEX ETF	-0.037987
INVESCO GREAT WALL CSI 300 EQ	-0.083471
CHINA SOUTH KAIYUAN CSI 300	0.0088785
HUATAI-PB CSI 300 ETF	0.0514279
E FUND CSI 300 ETF	-0.063517
CHINA AMC CSI 300 INDEX ETF	0.0815612

4.3 Tracking error result

There are two distinct methods of tracking error employed in estimating the deviation between the return of ETFs and their underlying indexes. The two methods are labeled as TE_1 and TE_2, TE_1 represents the absolute average return difference between ETFs and the corresponding indexes, and TE_2 is the standard errors of return difference between ETFs and their indexes. The final results are shown in table 5, which indicates the tracking errors of CHINA AMC CSI 300 INDEX ETF, INVESCO GREAT WALL CSI 300 EQ and E FUND CSI 300 ETF are relatively low, and the tracking error of HUATAI-PB

CSI 300 ETF and CHINA AMC CSI 300 INDEX ETF are much higher. The

funds are not truly tracking the benchmark,

Table 5: Tracking Error

FUND NAMES	TE1 (%)	TE2 (%)	AVERAGE
CHINA AMC CSI 300 INDEX ETF	0.006578	0.006599	0.006589
INVESCO GREAT WALL CSI 300 EQ	0.003229	0.003440	0.003334
CHINA SOUTH KAIYUAN CSI 300	0.006703	0.007109	0.006906
HUATAI-PB CSI 300 ETF	0.153237	0.156042	0.154639
E FUND CSI 300 ETF	0.004042	0.004045	0.004044
CHINA AMC CSI 300 INDEX ETF	0.163839	0.167769	0.165804

Chapter 5

Conclusion

This research paper evaluates the performance of the ETFs in the global emerging markets, and we mostly focus in the area of China. As the growth in ETF markets is in an early phase in the emerging markets, there is only about 900 data employed in the study. Be specifically, the sample data contains six ETFs under the benchmark of SHSZ 300 Index in China. We use the methods of Jensen's Alpha, Sharpe Ratio and Tracking Error to measure the performance.

This study reveals several results. Firstly, the regression result is significant at the 95% critical confidence interval. The Jensen's Alpha is equal to -0.0005177, which denotes the selected ETFs underperform the market. Secondly, the Sharpe ratio of the market is lower than most of the specific ETFs, this characteristic also show that the funds underperform the market. Finally, the method of tracking error indicates the ETFs are not exactly tracking the benchmark.

Overall, our empirical results about the performance of the ETFs in emerging markets summarizes that the selected ETFs in China underperform the market. However, the lack of data may contribute to the underperformance.

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