

Preliminary Master Thesis

International Portfolio Diversification Through ETFs

An empirical analysis of transitory effects and
asynchronous returns on US traded funds

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1. Introduction

This thesis investigates US traded country Exchange Traded Funds (ETFs). The purpose of country ETFs is to track foreign equity indices and thereby offering international diversification possibilities for US investors. Compared to an index mutual fund a country ETF is more tax efficient, cheaper and more liquid. These factors are the most common explaining country ETFs increasing popularity over mutual funds. The creation/redemption mechanism is what enables ETFs to offer these favorable features. The creation/redemption mechanism will be carefully explained in chapter 3, as it is the most important factor understanding the pricing of ETFs. By being traded in the US the country ETFs prices are affected by US investor sentiment, while the Net Asset Value (NAV) is traded in its respective home market. Thus, the ETF prices may trade at a premium or discount relative to the NAV due to US investor sentiment and asynchronous returns. Hence, country ETFs may provide a more accurate correlation between the equity markets than the underlying index provides.

Research question: “Is the difference in correlation between the US market and a country equity market index or its ETF due to return asynchronicity or US market transitory effects?”

One of the benefits ETFs hold over mutual funds is that they are being traded in the secondary market throughout the stock exchange opening time while mutual funds prices are settled typically once a day. Hence, there is supply and demand for country ETFs just as there is for normal shares. As a US listed country ETF tracks a foreign index the returns of the two series may differ in time. For some country ETFs on Asian indices there may be no synchronous trading hours. Hence, the US ETF which is traded in the market may put too much weight on US sentiment as the underlying market is closed. This is how transitory effects and asynchronous returns may give rise to ETF premiums or discounts. If the ETF were able to perfectly replicate the underlying index the two time-series would be equally correlated with the US market. As we expect to find a stronger correlation between the ETF and the US market it may imply a tracking error. We do not expect this tracking error to persist in the long run, but to be observable in the short term relationship between the series. Tracking error is defined as the standard deviation of a fund's excess returns. Excess returns is defined as the absolute difference between the fund's performance and that of its benchmark.

This thesis seeks to identify variables that has a significant effect on the pricing of country ETFs in order to explain the standard deviation of the ETFs excess returns and whether it can be explained by return asynchronicity, transitory effects or both. Firstly, the dataset consisting of ETF returns, index returns and S&P-500 returns will be inspected in order to highlight the differences in correlation. Secondly, the observed difference will be explained. Explanatory variables in the regression will include variables for the asynchronous returns and transitory effects. The explained difference will in the end give rise to a discussion on the implications for investors seeking international diversification.

2. Background and Literature Review

2.1 Background

The first US ETF launched was the S&P 500 Depositary Receipt (SPDR) in 1993 and is the most popular ETF on the market today with a turnover of more than \$14bn each day. Since 1993 the ETF market has grown tremendously, accounting for almost a half of all trading in US stocks with over \$3tn in assets under management. The three biggest ETF providers are Blackrock, Vanguard and State Street which holds approximately 69% of all ETF assets (Authers & Newlands, 2016). The creation redemption mechanism, the short time horizon of ETFs and their growth as an asset class is what motivates research of their pricing. This thesis investigates iShares which is the country ETFs issued by Blackrock. Compared to foreign direct investments, iShares have made it easier for investors demanding international diversification. It is fairly easy for investors to grasp country ETFs function, but the mechanism that enables the international diversification of country ETFs are more complicated. Country ETFs constitutes a larger and larger share of the international equity market and is growing at a quick phase. This has made it a popular field of research, but also attracted regulators attention.

The underlying NAV is correlated with the US market, but as we will see from the data the true correlation between equity markets may be stronger due to asynchronous return series and US transitory effects. Regulators fear the transmission of shocks between equity markets may impose a systemic threat to the economy due to the arbitrage structure of ETFs and the mismatch between the liquidity in the ETF and the underlying (Authers and Newlands, 2016). That is,

the explosive growth of ETFs may imply that their function has changed from tracking an index to rather moving the index. The Financial Stability Board warned in 2011 about the liquidity risk related to a large sell-off in less liquid assets. In country ETFs that is tracking emerging economies the underlying index is often dominated by a few large state owned companies which is liquid, while the smaller companies in the underlying index is less liquid. When US sentiment related to emerging markets is negative, for instance related to US politics, a large sell-off in the ETF is transmitted to the underlying through the creation/redemption mechanism. Institutional investors (AP) will buy the ETF and sell the underlying which may imply a massive sell-off in less liquid companies in the underlying index. This may imply a downward pressure on the stock value that is reflected in fundamentals, but the effect may be too strong due to the mismatch in liquidity.

Although the risk of financial contagion is not fully within the scope of the thesis it motivates the research question and the relevance of our findings. By using historical data to show how transitory effects in the US economy and different time zones affect correlations between equity markets we will gain a better understanding of the integration between equity markets, the implications for international diversification and how the mismatch in liquidity of ETFs may impose a systemic risk.

2.2 Literature Review

Engle and Sarkar (2006) investigates premiums and discounts of ETFs with both domestic and international exposure. They find that premiums and discounts for domestic ETFs are typically small and only lasting several minutes. For ETFs with international exposure the case is different. They find that the premiums and discounts is more persistent and may last several days. These findings are also supported by Ackert and Tian (2008) who finds that the mispricing is related to momentum, illiquidity and size effects.

A paper by Huang and Lin (2011) compares the international diversification benefits between country ETFs and foreign direct investments. They highlight the benefits of international diversification and proves that country ETFs offers the same returns as direct investments and may also provide a higher Sharpe ratio.

Levy and Lieberman (2012) studies the intraday price formation of US

listed country ETFs. They find that when the foreign market is closed the S&P 500 accounts for the largest part of country ETF returns. They suggest the existence of a behavioral bias where US investors ignore the long run correlation between the markets and rely too much on US sentiment. They agree with the study of Engle and Sarkar (2006) that a long investment horizon is needed to obtain the true foreign exposure. If country ETFs are added to a portfolio in order to obtain international diversification in the short term an investor may be adding more US risk to the portfolio and not obtaining the correlation between the underlying net asset values.

This finding is supported in an earlier study by Pennathur, Delcours and Anderson (2002) who finds that by using a single factor model iShares is doing a good job in tracking foreign indices by MSCI. When the researchers use a two-factor model which isolates the “true” diversification benefits they find that both iShares and closed end country funds contain a considerable exposure to US risk. Thus, it offers limited international diversification benefits.

A study by Phengpis and Swanson (2009) contradicts Pennathur, Delcours and Anderson's findings. They argue that iShares indeed offers international diversification benefits as US exposure is weaker, less significant and less prevalent than previously suggested. The data used in their study is monthly data. As suggested by Levy and Lieberman (2012) this time frame may be too wide to capture the effects US risk has on country ETFs.

Jares and Lavin (2004) looks at ETFs that track Japan and Hong Kong equity markets. The feature of these ETFs is that they have no overlapping trading hours with US markets. They find that the ETFs contain deviations from the underlying NAV and propose profitable trading opportunities. Buy ETFs when they trade at a discount relative to NAV, and short sell ETFs when they trade at a premium.

Delcours and Zhong (2007) finds that iShares trade at significant premiums even after controlling for time differences and transaction costs. As suggested by related literature they find that price deviations are limited and converge to zero within two days. They suggest several transitory variables to explain the price deviations such as institutional ownership, bid-ask spreads, trading volume, exchange rate volatility and financial crises. However, all these factors alone cannot explain the premiums. Therefore, the authors propose behavioral factors as a possible explanatory variable.

This research has a clear distinction from the research by Levy and Lieberman. While Levy and Lieberman has used intraday return series in their model this paper argues that the problem of stale prices can not be eliminated with the use of intraday returns. That is, the problem of stale prices or asynchronous returns has to be corrected for. One way to correct the underlying NAV is to adjust it, as proposed by Goetzman et. al. (2001), by including the predictable portion of next days NAV into todays NAV. Thus, the “true” NAV is used in the model describing premiums or tracking errors making it possible to isolate the transitory effects from the asynchronous returns.

Other papers such as Kleimeier, Lehnert and Verschoor (2008) and Martens and Poon (2001) also argues that the use of daily close returns is not suitable and that stale pricing has to be corrected for in order to obtain the true relationship. However, these studies do not calculate the “true” NAV as proposed by Goetzman et. al (2001), but uses intraday or synchronous return series. This is not possible for the Asian countries as there are no synchronous trading hours.

3. Theory and hypothesis

3.1 Theory

Economists, led by the pillar Eugene F. Fama, mentions the Efficient Market Hypothesis (EMH), as the fundamental premise in which justify the creation of index funds and ETFs. The key to understanding how ETFs works is the creation/redemption mechanism. The ETFs are similar to mutual funds in that the market value is close to their net asset value (NAV). However, unlike closed-end funds, new exchange traded shares can be created and redeemed. In other words, the mechanism explains how the ETFs own anything of value and how it acquires the securities.

The creation mechanism starts with a ETF sponsor, e.g. iShares, which creates ETF shares and sends them to an authorized participant (AP), typically a large bank or other institutional investor. The AP sends back baskets of underlying securities in exchange for the ETF. The AP or market maker, can trade bundles of ETF shares (called “creation units,” typically 50,000 shares) with the ETF sponsor. Since the price of ETFs shares are determined by the demand and supply in the secondary market, it may diverge from the value of the underlying securities (NAV). The AP can then create new ETF shares by transferring the securities in the underlying to the sponsor (Authers 2016).

Symmetrically, the AP can redeem ETF shares, by sending back the ETF shares. The sponsor retires the unwanted shares from the market and gives the AP the underlying securities, or cash, in exchange.

In an efficient market, the price of an ETF should have the price of its underlying portfolio, up to transaction costs, because the two assets have the same fundamental value. Since new shares of ETFs can be created and redeemed almost continuously facilitates arbitrage so that, on average, the ETF price cannot diverge consistently and substantially from its net asset value (NAV).

The creation redemption mechanism can explain the arbitrage process which arises through the way an ETF is structured and the relationship between the primary and secondary market. It is common to distinguish between the cases where ETFs are traded with a premium (the price of the ETF exceeds NAV) and discount (the price of the ETF is lower than NAV). When the ETF is traded on a premium in the secondary market, APs have an incentive to buy the underlying securities, submit them to the ETF sponsor, and ask for newly created ETF shares in exchange (primary market). Then the AP or market maker sells the new supply of ETF shares to investors. This process puts downward pressure on the ETF price and, potentially, leads to an increase in the NAV, reducing the premium.

Opposite, when there is a discount on the ETF price, APs buy ETF units in the market and redeem them for the basket of underlying securities from the ETF sponsor. Then the APs can sell the securities in the market. This generates positive price pressure on the ETF and possibly negative pressure on the NAV, which reduces the discount (Itzhak, Franzoni & Moussawi 2012). This mechanism is the reason ETFs have been so successful in tracking a country index over time.

Correlation is often used in portfolio management to measure the amount of diversification among the assets contained in a portfolio. The consensus between economists have been that global correlations have increased. A reason to investors' interest for international equity exposure have traditionally been the belief that foreign stocks and stock markets is reasonable uncorrelated from our home. The theory is that stock markets in different countries tend to move in different times. In Morningstar's test of correlations between S&P 500 and 8 other indices showed that there has been an increased market correlation from 2012 and 15 years back (Morningstar 2012). Thus, the last couple of years we have seen more theories and literature around the higher volatility and correlation dynamics in the financial market and (how this affect ETFs tracking performance).

Our research question originates from the fact that ETFs are traded on the US markets when local markets are closed part of or through the whole day of trading hours. Hence, there will be asynchronous returns between the ETF and the underlying index since movements in returns happens at different times. We will also investigate the role of transitory effects on the different markets and ETF returns. These factors are bypassing effects, regardless of time difference.

A theory of why country ETFs are more correlated with the US market than the index it is tracking, can be due to *behavioral bias*. As we will look further into, Lieberman & Levy's (2012) findings showed that when foreign markets are closed and no foreign quotes are available in the US, investors may ignore the long-run underlying correlation between the markets. Hence, they rely more on the sentiment in the home market. Short term, this could lead to mispricing.

3.2 Hypothesis

The goal of the thesis is to look at whether country ETFs measure more accurately the true correlation between international equity market returns and thus provide a more accurate measure of potential international diversification benefits. With this in mind, we have formed 4 main hypotheses. These will be tested for each market index separately, before comparison. We will come back to the different market indices in the next chapter.

As the statistical framework suggests, the null hypothesis represents the conservative approach. Hence, it is the theory that we are testing against.

- i) Does Country ETFs provide the same international diversification opportunity as the underlying correlation?
 1. H_0 : Tracking errors (or use premium/discount) are not persistent in the long run.
 H_A : Tracking errors (or use premium/discount) are persistent in the long run.
 2. H_0 : There exists no premium/discounts regardless of time perspective.
 H_A : There exists premiums/discounts regardless of time perspective.

Since the ETFs are designed to track the benchmark index and the arbitrage mechanism that occurs/exists, the conservative approach is that there will be no existence of premiums or discounts regardless of time perspective. Guided by previous studies and literature we do however expect that there will be short term

fluctuations between the country ETFs and the underlying index (NAV). Next step, in testing our hypothesis will be to investigate:

- ii) The largest impact on the premiums or discounts between ETFs and the underlying indices are due to asynchronous returns or the transitory effects?
3. H_0 : With asynchronous returns, transitory effects do not give rise to premiums/discounts.
 H_A With asynchronous returns, transitory effects do give rise to premiums/discounts.

To proceed from here, we need to adjust for the time (explained more in details in chapter 5), and test when we have “synchronous” returns.

4. H_A : With synchronous returns, transitory effects is the driving factor to premiums/discounts.

4. Methodology

A feature of country ETFs that is acknowledged in existing literature and the industry is that in a long enough time perspective (monthly or yearly) country ETFs is able to fulfill its purpose i.e. track the underlying index. This finding can be supported by econometric theory as the ETF and foreign index time series most likely are cointegrated. This means that if the time series are found cointegrated they will be bound by a stationary linear relationship and deviations from this relationship is expected to be temporary (Engle and Granger, 1987) Hence, we are most certain to reject our first null hypothesis and establish that our statistical model will be used to explain short term deviations.

As we expect to find a stronger correlation between the ETFs and foreign indices than US index and foreign index we can establish the fact there exists temporary price deviations. Our statistical model will use tracking errors as the dependent variable. Tracking errors is defined as the standard deviation of a fund's excess returns. Excess returns is defined as the absolute difference between the fund's performance and that of its benchmark.

$$TE = \sqrt{\frac{(R_{ETF,t} - R_{INDEX,t})^2}{n - 1}}$$

The tracking error as dependent variable will be explained by independent

variables capturing the transitory effects and asynchronous returns.

Asynchronous returns

In the existing literature the major problem is time alignment of data. That is, being able to isolate the effect of transitory variables with the use of a proxy on synchronous NAV returns. Hence, how we decide to decompose the returns is highly important for our study. Research papers have proposed different solutions to the problem.

In the paper by Levy and Lieberman (2012) this issue it dealt with by including dummy variables that takes the value of 1 if the underlying market is open and the value of 0 if the underlying market is closed. As ETFs tracking Asian indices will exclusively be taking the value 0 we argue that this may not be a sufficient method to isolate the transitory effects. Another way to go around the challenge, is to calculate the NAVs on a “real-time” basis. For example, to calculate NAVs of European iShares during the morning hours using the “synchronous” intraday transaction data of the iShares component stock values and exchange rates. However, feasibility of intraday data on asset holdings are not available for many funds. In addition, Engle and Sarkar (2002) point out, even if you successfully estimate the “real-time NAVs” using the most recent transaction price of each component security of the portfolio, the same stale quote can exist for stocks with low volume. This method is also less helpful for funds that is tracking Asian country indices, as these assets are traded during the hours when the U.S. market is closed (Zhong and Delcours, 2006).

As proposed by Goetzmann et. al. (2001) the “true NAV” can be estimated by making it orthogonal to the available information in the market. Meaning, taking the predictable portion of the next day’s NAV and include in today’s stale quoted NAV.

The calculation of the “true NAV” is tedious and may not fully capture the effect of asynchronous returns. Hence, we intend to use NAV provided by industry. The proxy provided by industry has many different names and abbreviations such as iNAV (Indicative NAV), “fair value NAV”, IV (indicative value) or IOPV (Indicative Optimized Portfolio Value). All of these proxies provide more or less the same information. That is, they provide an approximation of the ETFs NAV every 15 seconds throughout the trading day. The problem with all of these proxies is that they do not solve the problem of asynchronous returns.

The proxy we would need to isolate transitory effects by making returns synchronous is what is referred to as eNAV or estimated NAV. This proxy incorporates all available information based on historical patterns and multivariate regressions as well as futures prices, exchange rates and so forth (Abner, 2016). However, even though this type of variable has been used in valuation of closed-end mutual funds it is not yet an established standard in the ETF industry which implies that the availability of the data may be limited. Thus, we consider this aspect as the main challenge of our thesis. Our main priority is to get hold of eNAV-type of data, but as it could be found challenging we must be open for alternative ways of dealing with asynchronous returns.

Transitory effects

Given that we are able to deal with the asynchronous returns we need to explain the potential tracking error due to transitory effects. Several factors may affect tracking errors. Frino and Gallagher (2001), Kostovetsky (2003), and Milonas and Rompotis (2006) mention expenses, fund cash flows, dividends, and index composition changes as factors that drive index fund tracking errors. In addition, (Shin 20xx) includes annual expense ratio including all costs to manage ETFs, volatility of ETFs' daily trading average trading volume, daily return on exchange rates and annual dividend as factors to predict the average tracking errors.

With the appropriate time alignment of data and transitory variables our regression will be expressed with the following simplified regression where F denominates different transitory variables:

$$TE_{i,t} = \beta_0 + \beta_1 F_i + \dots + \beta_n F_i + \varepsilon_i$$

5. Data

To test our hypothesis questions, we must use several country indices to have a representative selection of data from different time-zones. We restrict the sample of ETFs listed on the US exchange to the ETF provider, iShares by Blackrock. The data of daily returns shown below, gives an illustration of the ETFs and their respective benchmark. These are the ETFs we will use to answer our research question:

Country	Ticker	Underlying Index	Inception Date	End	Number of obs.
Japan	EWJ	MSCI Japan	12.03.1996	30.12.2016	5239
Australia	EWA	MSCI Australia	12.03.1996	30.12.2016	5239
Hong Kong	EWH	MSCI Hong Kong	12.03.1996	30.12.2016	5239
Singapore	EWS	MSCI Singapore	12.03.1996	30.12.2016	5239
Malaysia	EWM	MSCI Malaysia	12.03.1996	30.12.2016	5239
Germany	EWG	MSCI Germany	12.03.1996	30.12.2016	5239
Canada	EWC	MSCI Canada	12.03.1996	30.12.2016	5239
Switzerland	EWL	MSCI Switzerland	12.03.1996	30.12.2016	5239
Spain	EWP	MSCI Spain	12.03.1996	30.12.2016	5239
Italy	EWI	MSCI Italy	12.03.1996	30.12.2016	5239
Sweden	EWD	MSCI Sweden	12.03.1996	30.12.2016	5239

We will study the returns with different horizons (yearly, monthly, daily). Since the pricing mechanism that ETF prices experience due to the feature of intraday trading, there is also likely that we need to retrieve and analyze intraday and/or interday data.

To capture both the wide and narrow time differences we have chosen five European and five Asian country ETFs. All of the chosen ETFs are the ones with longest inception dates and similar structure and cost.

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