Overreaction of Country ETFs to US Market Returns:

Intraday vs. Daily Horizons and the Role of Synchronized Trading

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Abstract

In this paper we study the intraday price formation process of country Exchange Traded Funds (ETFs). We identify specific parts of the US trading day during which NAVs, currency rates, premiums and discounts, and the S&P 500 index have special effects on ETF prices, and characterize a special intraday and overnight updating structure between these variables and country ETF prices. Our findings suggest a structural difference between synchronized and non-synchronized trading hours. While during synchronized trading hours ETF prices are mostly driven by their NAV returns, during non-synchronized trading hours the S&P 500 index has a dominant effect. This effect also exceeds the one that the S&P 500 index has on the underlying foreign indices and suggests an overreaction to US market returns when foreign markets are closed.

1 Introduction

In this paper we study the price formation process of country Exchange Traded Funds (ETFs). These ETFs are traded in the US market and are designed to track a wide variety of foreign country indices. As such, they should be exposed only to their home market-risk and not to US market-risk. However, they could be indirectly exposed to US market-risk through two different channels. One, through the underlying correlation between their foreign home market and the US market. Second, through potential behavioral biases generated by US market participants. In this paper we analyze the effect the US market has on country ETFs and identify specific parts of the US trading day during which country ETFs indeed overreact to the US market.

In order to do so we examine to what extent country ETF returns are driven by changes to their Net Asset Value (NAV), by currency effects, and by the S&P 500 index. In our analysis we distinguish between the intra-day and inter-day processes and examine their inter-dynamics. We identify specific parts of the US trading day during which each variable's effect is most dominant and characterize a special intraday and overnight updating structure between these variables and country ETF prices. We find that the S&P 500 index accounts for the largest part of ETF returns when foreign markets are closed. This result raises the question of whether the dominant effect the US market return has on country ETF returns during non-synchronized trading hours simply expresses the underlying market integration between the US and the foreign country, or whether it expresses a behavioral bias where traders overreact to local US market sentiment. Our findings support the latter interpretation. We show how the effect the US market return has on country ETFs increases during non-synchronized trading hours, and exceeds that of the long run underlying correlation between the two markets.

Our findings have important implications for both academic and market practitioners purposes. First, on the academic level, our findings suggest a behavioral bias. When foreign markets are closed and no foreign quotes are available to rely on, US investors overly rely on what is happening in the US and ignore the long-run underlying correlation between the markets.

Second, for market practitioners, our findings suggest that the efficiency of ETF products that experience non-overlapping trading hours with their underlying indices, strongly depends on the investment horizon at stake. Such ETFs could be a useful vehicle to gain exposure to or hedge against foreign market risk only in the long-run and for a relatively extended investment horizon. However, in the very short-run of the intraday level, such ETFs might offer very limited exposure to foreign risk and function as a mere "placebo instrument" if added to portfolio. In other words, instead of gaining exposure to foreign country risk, an investor is in fact loading additional US market-risk into his portfolio.

The remainder of the this paper is organized in the following way. In the next section we describe the mechanics of ETFs in general and of country ETFs in particular, explain their arbitrage mechanism, review the relevant academic literature, and describe our research hypotheses and plan. In Section 3 we describe the econometric model we use for analyzing ETF returns followed by the fractional co-integration model for realized volatility of returns in Section 4. In Section 5 we present the data. In Sections 6 and 7 we describe our estimation results for both the econometric models: for ETF returns and for co-integration of volatility, respectively. In Section 8 we discuss several robustness tests and report their results. Finally, conclusions are brought in Section 9.

2 ETFs: Background and Literature

An ETF is a security traded in the secondary market that is designed to track a given index. It does so by holding a portfolio of stocks that replicates the underlying index. Each ETF share represents a unit of ownership on the underlying portfolio which determines its NAV. Dealers can create new ETF share-units or redeem existing share-units at their NAV directly with the fund-sponsor. The discipline of the creation and redemption process is a critical mechanism that insures that ETF prices remain as close as possible to their NAV. Any deviations between NAVs and ETF prices can be immediately exploited for arbitrage profits. Indeed, several studies have shown how ETFs are priced very closely to their NAV (Ackert and Tian (2000); Elton, Gruber, Comer and Li (2002); Engel and Sarkar (2006); Ackert and Tian (2008)).

Country ETFs are a sub-sector of the ETF market and are designed to track stock market indices of foreign countries. A special feature of country ETFs is that ETF shares and their underlying portfolios are traded in two different markets: the ETF is traded in the US while the underlying portfolio is traded in the foreign home-country. Hence, for country ETFs the arbitrage mechanism described above suffers from the fact that the underlying portfolio and the ETF are often traded during different hours. For instance, Asian markets and US markets have no overlapping trading hours; European markets and US markets have only partial overlapping trading hours. In such cases, the arbitrage mechanism described above essentially does not exist. Consequently, ETF prices fluctuate during the US trading day while their NAVs remain stale. Thus, country ETFs naturally trade at a premium or a discount compared to their underlying foreign stale NAVs. Indeed, several studies show that premiums and discounts are far more frequent among country ETFs compared to other ETF sectors, and that their premiums are larger in magnitude and more persistent (Jares and Lavin (2004); Engle and Sarkar (2006); Tse and Martinez (2007); Ackert and Tian (2008)).

A natural question that arises given the above evidence is to what extent country ETF premiums and discounts reflect rational pricing, or, alternatively, non-rational mispricing. When foreign markets are closed, an arbitrage mechanism no longer exists to discipline any non-rational or behavioral influences that country ETF prices may be subject to. For example, in the absence of active foreign NAVs to rely on, investors may be overly influenced by what is happening in the US market and over-rely on US market returns to price country ETFs. Such influences would have been governed by an arbitrage mechanism and eliminated had foreign markets been open during US trading hours. In order to address this question we focus on country ETF intraday and overnight returns and characterize their structure.

There are a number of papers that study weekly and monthly returns of country ETFs and find that they do not behave differently from their underlying NAVs and indices, and find no evidence for excessive risk exposure to the US market. See for instance, Pennathur *et al* (2002); Taylor (2005); Tse and Martinez (2007); Delcoure and Zhong (2007); Phengpis and Swanson (2009). Other studies have found evidence for correlation between daily returns of country ETFs and the US market returns (see for example, Hughen and Mathew (2009); Zhong and Yang (2005)).

However, in all of the above literature, the chosen investment horizon and data frequency may not be suitable for detecting the exact updating mechanism that ETF prices experience, especially when concidering the dynamics between intraday and interday price processes. Daily and weekly data on ETF returns may represent time intervals too large to measure significant price formation processes that take place only at the intraday level. For example, any ETF pricing updates that take place at the US market-open in response to prior changes to NAV prices that took place earlier in the day in the foreign home-country remain undetected when using daily returns. Similarly, daily returns are a result of a combination of multiple factors that affected ETF prices non-simultaneously throughout the US trading day: NAV prices could have an effect on the market-open; the S&P 500 index may have an effect throughout the entire trading day; and lagged effects can take place at different parts of the trading day. Moreover, as mentioned above, European markets have partial overlapping trading hours with US markets, and it is most likely that their price formation process experiences different patterns during synchronized and non-synchronized trading hours. In this paper we address this gap in the literature and focus on high-frequency intraday returns to enable a more refined analysis that captures both the intraday and interday processes that affect country ETF prices, as well as the dynamics between the two return horizons. It is these time intervals that also allow for examining potential intraday overreactions and mispricing in country ETF.

In order to carry out our analysis, we use an Error Correction Model (ECM) with possible GARCH-type innovations to identify the contribution that each of the following variables has on country ETFs at the intraday level: NAV returns, S&P 500 index returns, currency effects, an Error Correction Term (ECT) for premiums and discounts between ETFs and their underlying NAV, and lagged effects. We also control for different parts of the trading day, such as synchronized and non-synchronized trading hours and market-open vs. regular trading hours.

To reinforce our findings, we investigate not only the first moment of ETF and S&P 500 returns, but also their intraday market volatility. We apply fractional cointegration (FCI) analysis to the realized volatility of their returns. We find that while the individual realized volatility series are fractionally integrated of order d, with $d \in (0, 1)$, the two series are fractionally cointegrated.

Last, we carry out a set of robustness tests to confirm the stability of our results: we use different intraday time intervals (1-minute and 15-minute intervals); we test the stability of our results over time; and we fit various GARCH specifications to the ECM model to account for possible time varying conditional variance.

To preview our results, we find that almost all of the price adjustments to foreign NAVs and lagged premiums and discounts take place at the US market open. During the rest of the US trading day, when foreign markets are closed, ETF prices mostly follow the S&P 500 index. Interestingly, in countries that have partial overlapping trading hours (i.e., European countries) we find a regime shift between synchronized and non-synchronized trading hours, where the effect the S&P 500 index has on ETF prices increases dramatically after the foreign market closes. Additionally, in all countries during non-synchronized trading hours the effect the S&P 500 index has on country ETF returns significantly exceeds that which it has on the underlying indices. These results support the hypothesis that ETF prices overreact to US market returns during non-synchronized trading hours.

3 The Model

In this section we introduce the econometric model we use to investigate the price formation process of country ETFs. Let $P_{i,t}$ denote the ETF price for country i at time t in the US. Similarly, let $NAV_{i,t}$ denote the NAV value for country i traded in its home-market at time t. All prices were transformed by natural logarithms. Let $\Delta P_{i,t}$ and $\Delta NAV_{i,t}$ denote the ETF and the underlying NAV price-differences between time $t-1$ and time t, correspondingly. Similarly, ΔSP_t denotes the S&P 500 index return between time $t-1$ and time t. All times are local US times measured in 1-minute and 15-minute intervals; all prices and returns are in US dollars. Let $ECT_{i,t}$ denote the premium or discount of ETF i compared to its NAV, i.e., $P_{i,t-1} - NAV_{i,t-1}$. This variable is the error correction term in the model, and we expect future ETF prices to adjust accordingly so that any past premiums or discounts are eliminated. Finally, we use two dummy variables to isolate two parts of the trading day that are of special interest. Let D_t be a dummy variable that assigns the value 1 if time t is the US market-open time, and the value 0 otherwise. Let $S_{i,t}$ be a dummy variable that gets the value 1 if time t is a synchronized trading time between country i and US markets, and 0 otherwise. We model the price formation process of the ETF using the following ECM-GARCH formulation :

$$\begin{aligned} \Delta P_{i,t} &= \alpha_i + \sum_{j=0}^{J} \Delta NAV_{i,t-j} \left(\beta_{i,j}^{NAV} + \delta_{i,j}^{NAV} S_{i,t-j} + \gamma_{i,j}^{NAV} D_{t-j} \right) \\ &\quad + \sum_{j=0}^{J} \Delta SP_{t-j} \left(\beta_{i,j}^{SP} + \delta_{i,j}^{SP} S_{i,t-j} + \gamma_{i,j}^{SP} D_{t-j} \right) \\ &\quad + \sum_{j=0}^{J} ECT_{i,t-j} \left(\beta_{i,j}^{ECT} + \delta_{i,j}^{ECT} S_{i,t-j} + \gamma_{i,j}^{ECT} D_{t-j} \right) + \varepsilon_{i,t}, \end{aligned} \tag{1}$$

where

$$\begin{aligned} \varepsilon_{i,t} | I(t-1) &\sim N(0, \sigma_{i,t}^2), \\ \sigma_{i,t}^2 &= \omega_1 + \omega_2 \varepsilon_{i,t-1}^2 + \omega_3 \sigma_{i,t-1}^2, \end{aligned} \tag{2}$$

with $i = (1, ..., n)$, $t = (1, ..., T)$ and $I(t-1)$ is the information set at time $t-1$. On the left hand side is the price return of ETF i at time t in the US. The first set of variable are NAV returns and lagged returns from time t to time $t-J$. These variables have three coefficients: $\beta_{i,j}^{NAV}$ for all trading hours, additional coefficient $\delta_{i,j}^{NAV}$ for synchronized trading hours, and additional coefficient $\gamma_{i,j}^{NAV}$ for the US market-open time, correspondingly. NAV returns express price adjustments and currency adjustments during foreign market regular trading hours, and only currency adjustments when foreign markets are closed. The second set of variables are the S&P 500 index returns and lagged returns from time t until time $t-J$. Again, we have three coefficients for these variables for three different parts of the trading day. The third set of variables are the error correction terms (ECT) and lagged terms, and again we measure their effect during the same three parts of the trading day.

Concerning the specification of the error term, $\varepsilon_{i,t}$, equation (2) is a GARCH(1,1) model (Bollerslev (1986)). Driven by the data, we allow for the possibility that $\omega_2 + \omega_3 = 1$, that is, an IGARCH(1,1) specification. Finally, various ARMA-GARCH combinations (see, for instance, Francq and Zakoian (2004)) are also allowed, so that the specification is rich.

The reason we split the effect of each variable into three different parts of the US trading day is due to the schedule of trading hours between the US and foreign countries. When US markets open, trade has already taken place in Europe and Asia and NAV prices have changed since their last closing-price. This new information may be reflected at the US market open, and its effect is captured by the coefficient $\gamma_{t,j}^{NAV}$. Similarly, ETF prices may be updated at the US market-open to eliminate any premiums or discounts from the last trading session that have not been translated into NAV prices on the consecutive trading day in the foreign country. This effect is captured by the coefficients $\gamma_{t,j}^{ECT}$. Similarly, all variables may have a different effect on ETF prices during synchronized trading hours, when an arbitrage mechanism exists between US markets and foreign markets, and during non-synchronized trading hours, when an arbitrage mechanism does not exist. More specifically, ETF prices can be governed by their corresponding NAV prices when home-markets are active. On the other hand, the S&P 500 index returns may have a stronger effect when foreign markets are closed. These effects are captured by the coefficients for synchronized trading hours, $\delta_{i,j}^{NAV}$, $\delta_{i,j}^{SP}$ and $\delta_{i,j}^{ECT}$.

4 Realized Volatility Fractional Cointegration

In order to have a deeper understanding of the inter-dependence between the ETF and S&P 500 index returns, we further analyze their volatility comovement. Let $V_{i,t}$, and V_t^{SP} be the realized volatility (RV) measures of the country ETF i- and the S&P index returns at time t. The construction of the RV series is specified in Section 6. The idea behind the comovement analysis is based on the growing empirical evidence that RV series are generally long memory with a memory parameter d, approximately of 0.4 in magnitude. See for instance, Andersen *et al.* (2001), Martens *et al.* (2004), Shimotsu and Phillips (2005) and Lieberman and Phillips (2008). Now, if the individual RV series V_{it} and $V_{i,t}^{SP}$ are factionally integrated of order $d^V > 0$ and $d^{SP} > 0$, respectively, but are fractionally cointegrated, then the error in the regression

$$V_{i,t} = \alpha_i + \beta_i V_t^{SP} + \varepsilon_t \tag{3}$$

must be of an integration order smaller than $\min(d^V, d^{SP})$. See Robinson and Marinucci (2001) and the references therein. Formally, we say that $V_{i,t}$ and V_t^{SP} are FCI$(d^V, d^{SP}, d^\varepsilon)$ if a linear combination ε_t of $V_{i,t}$ and V_t^{SP} is integrated of order d^ε, such that $0 \leq d^\varepsilon < \min\left(d^V, d^{SP}\right)$. This property is meaningful if and only if $d^V = d^{SP}$ and in Section 6, we shall see that on average this is indeed the case.

In less technical words, just like in classical (integer) cointegration analysis, while the individual series may be fractionally integrated and drift, we want to test for the possibility that the two series do not drift away from each other, i.e., that they are fractionally cointegrated. To facilitate the idea, we shall adopt the Geweke and Porter-Hudak (henceforth GPH, 1981) semiparametric estimator of d for both $V_{i,t}$ and V_t^{SP}, run the FCI regreression (3) and finally use again the GPH estimator to analyze the order of integration of the residual from (3). If d^ε turns out to be not significantly different from zero or smaller in magnitude than $\min(d^V, d^{SP})$, then FCI is established.

5 Data

In order to estimate the above equation we use intraday 15-minute market data downloaded from TradeStation intraday historical data service. We focus our analysis on country ETFs issued by *iShares*, which is the world's largest ETF issuer and market leader owned by BlackRock. Out of approximately 30 different available country ETFs we chose 9 Asian countries and 11 European countries with enough historical data and trading activity to carry out our tests. We downloaded nearly 11 years of data from January 2000 - December 2010 for three different time series: ETFs, NAVs and the S&P 500 index. For ETF prices we used real market quotes. For NAV quotes we used the indicative NAV (INAV), which is an estimate for the NAV published by the exchange every 15 seconds and is based on prices of the underlying securities on an intraday basis. When foreign markets are closed and real NAV prices are stale, INAV quotes reflect only currency adjustments to the last closing-price of the underlying securities. Thus, the data also allows for measuring specific currency effects on ETF prices. Finally, for the S&P 500 index we used quotes for SPY, which is SPDR's ETF that tracks the S&P 500 index. Summary statistics are provided in Table 1.

6 Estimation and Results

We carry out our tests in the following order. We start with countries that have no synchronized trading hours with US markets, i.e., Asia and Australia. Then, we address countries that have partial overlapping trading hours with US markets, i.e., European countries. We carry out several versions to our regressions: with and without lagged variables; a GARCH model and a regular regression analysis that assumes a constant conditional variance of the error term; and different time intervals of 1-minute data and 15-minute data. Since our qualitative results do not vary much between the different versions of the regressions and are therefore robust, we first report results for a simpler version of our model for the coherence of discussion. This version is based on 15-minute time intervals, includes no lagged terms, and does not assume time varying conditional variance (GARCH). This would be our benchmark model. Section 7 is dedicated to robustness tests and includes the rest of our versions as described above: 1-min data, full specification with lagged terms, and GARCH estimations. Hence, in this part we report estimation results for the following simplified model:

$$\begin{aligned} \Delta P_{i,t} &= \alpha_i + \Delta NAV_{i,t}\left(\beta_i^{NAV} + \delta_i^{NAV} S_{i,t} + \gamma_i^{NAV} D_t\right) \\ &\quad + \Delta SP_t\left(\beta_i^{SP} + \delta_i^{SP} S_{i,t} + \gamma_i^{SP} D_t\right) \\ &\quad + ECT_{i,t}\left(\beta_i^{ECT} + \delta_i^{ECT} S_{i,t} + \gamma_i^{ECT} D_t\right) + \varepsilon_{i,t}, \end{aligned} \tag{4}$$

$i = 1, ..., n$ and $t = 1, ...T$.

6.1 Case I: Non-Synchronized Trading (Asia & Australia)

We start with the case of Asia and Australia. Since there are no synchronized trading hours for this case, the dummy variable $S_{i,t}$ is always zero and can be left out of our model. Table 2 reports regression results for this case.

(Table 2 Here)

First, the estimates for the constant term α_i are not significantly different from zero for all countries, which indicates no arbitrage opportunities.

Second, two variables have a special effect at the US market-open: INAV and the ECT. The estimates for the effect of INAV at the US market-open ($\beta_i^{NAV} + \gamma_i^{NAV}$) range from 84% to 67% for all countries, and the average effect is 77%. Similarly, the effect of the ECT for lagged premiums at the US market-open ($\beta_i^{ECT} + \gamma_i^{ECT}$) is negative and ranges from -42% to -76%, with an average of -58%. All estimates are significant at 1% confidence level. The interpretation of these results is that a significant portion of the price formation of country ETFs takes place at the US market-open, where ETF prices adjust to the new NAVs that were revealed in the foreign markets. Additionally, any premiums or discounts that existed at the last trading session of the previous trading day are eliminated by a price reversal in the opposite direction of the premium or discount.

Third, the S&P 500 index has a very strong effect, in fact almost an exclusive effect, during the US trading day. After the opening session, the effect of the S&P 500 index on country ETF prices ranges from 74% to 130%, with an average effect of 89%. All estimates are significant at the 1% significance level. The additional effect the S&P 500 index has at the US market-open (γ_i^{SP}) varies from country to country, with positive, negative and zero effects. However, for all countries this additional effect is of much smaller magnitude compared to the S&P 500 effect during the US trading day.

Last, the effect of INAV during the US trading day (β_i^{NAV}) is very small, often statistically insignificant, with an average effect of 20%. The only two exceptions are Australia and Japan, with effects of 76% and 50%, correspondingly. This means that for most countries ETF prices do not adjust to currency effects during the US trading day. Similarly, ETF prices do not adjust to any premiums and discounts that open between ETF prices and their NAVs during the US trading session: all estimates for the ECT coefficient (β_i^{ECT}) are very close to zero but significant. Finally, all $\overline{R}^2$ values range from 75% to 88% indicating strong explanatory power for our estimates.

In order to determine whether these effects indicate mispricing and reflect an overreaction to the US market, we compare these effects and the effects the S&P 500 index has on the underlying indices. Table 4 and 5 report the effect the S&P 500 index has on the underlying indices of the Asian ETFs, when regressing next day returns of the underlying indices on daily S&P 500 returns. As can be seen in Table 4, in most countries, this effect is below 50%, with only Australia experiencing a relatively high effect of nearly 79%. On average this effect is 49%. This effect is less than half compared to an average of 89% for the intraday effect the S&P 500 has on the corresponding ETFs, as reported in Table 2. This finding supports the hypothesis that during the US trading day ETF returns overreact to US market returns.

In summary, our results for the case of countries that have no synchronized trading hours with US markets suggest the following pricing pattern. At the US market-open ETF prices adjust to the new NAVs revealed at their foreign home-markets and correct for any lagged premiums and discounts. Thereafter, during the US trading day, ETF prices are largely driven by the S&P 500 index with little adjustment to currency effects or any lagged premiums and discounts. The effect the S&P 500 index has on ETF intraday returns exceeds that which it has on the underlying indices, indicating an overreaction to the US market. This overreaction is then corrected for at the opening of the following US trading day.

6.2 Case II: Synchronized & Non-Synchronized Trading (Europe)

In the second case we examine country ETFs that have partial overlapping trading hours with their underlying foreign home-markets, i.e., European countries. Markets in Europe are open during the first part of the US trading day (typically until 11:30 AM EST) and are closed thereafter. Hence, these ETFs experience synchronized and non-synchronized trading hours. Our estimation results for this case are presented in Table 3.

(Table 3 Here)

First, just like the previous case for Asia, the estimates for the constant term α_i are not significantly different from zero for all countries, which indicates no arbitrage opportunities.

Second, unlike the case for Asia, INAV has a strong effect on ETF returns. Moreover, INAV has a stronger effect during synchronized trading hours compared to non-synchronized trading hours. During synchronized trading hours the total effect ($\beta_i^{NAV} + \delta_i^{NAV}$) ranges from 87% to 76% for all countries, with an average of 82%. During non-synchronized trading hours, the INAV effect (β_i^{NAV}) reduces to an average of 65%, and ranges from 80% to 42%. In this case there are no special INAV effects at the US market-open, the average marginal effect (γ_i^{NAV}) is around 6% and often not significantly different from zero.

Third, the ECT as in the Asian case, has a strong negative effect at the US market-open ($\beta_i^{ECT} + \delta_i^{ECT} + \gamma_i^{ECT}$) and ranges from -90% to -60%, with an average effect of -80%. Conversely during the US trading day, for both synchronized or non-synchronized trading hours, the ECT has a very marginal effect with an average of 2% to 12%, correspondingly.

Last, the S&P 500 index effects during synchronized and non-synchronized trading hours are of different magnitude. During synchronized trading hours, the S&P 500 effect ($\beta_i^{SP} + \delta_i^{SP}$) ranges from 10% to 39% with an average effect of 20%. On the other hand, during non-synchronized trading hours, its effect (β_i^{SP}) increases dramatically and ranges from 65%

to 103% and has an average effect of 81%. At the US market-open, the S&P 500 index does not seem to have an additional significant effect.

This regime shift in the effect the S&P 500 index has on European ETF returns between synchronized and non-synchronized trading hours supports the hypothesis that ETF returns overreact to US market returns when foreign markets are closed. As long as European markets are open, the S&P 500 index has a significantly reduced effect and the dominant price driver is the foreign NAV. However, once foreign markets close, the effect of the S&P 500 index more than triples, on average.

This phenomenon is further emphasized when we compare the effect the S&P 500 index has on European ETFs and the one it has on their underlying indices. Table 4 reports these effects when regressing next day returns of the underlying indices on daily S&P 500 returns. In most European countries this effect is below 50%, whith Austria experiences the highest effect of nearly 51%. On average this effect is 38%. This effect is less than half when compared to the effect the S&P 500 has on the corresponding intraday ETF returns during non-synchronized trading hours (81% on average, as reported in Table 3). The effect the S&P 500 has during synchronized trading hours is much closer to the effect it has on the underlying indices. These results fortify our conclusion from the regime shift reported above and further support the hypothesis that during the US trading day ETF returns overreact to US market returns.

(Table 4,5 Here)

In summary, our results for the case of country ETFs that experience both synchronized and non-synchronized trading hours with US markets show a great difference in their pricing pattern between the two parts of the US trading day. The roles of NAV and the S&P 500 index in determining the price of the ETF switch during synchronized and non-synchronized trading hours. During synchronized trading hours, when an arbitrage mechanism exists between ETFs and their NAVs, ETF prices are mostly driven by NAV values. When this arbitrage mechanism becomes unavailable during non-synchronized trading hours, INAV prices, which simply reflect currency adjustments, become less dominant, whereas the effect of the S&P 500 index becomes much more dominant. Moreover, this increased effect during non-synchronized trading hours exceeds the one the S&P 500 index has on the underlying indices. Both these results indicate an overreaction to the US market when foreign markets are closed. Additionally, the updating mechanism of ETF prices for any premiums and discounts at the beginning of the US trading day is very dominant, similar to the case of

Asian countries. Finally, $\overline{R}^2$ values range from 70% to 92% indicating strong explanatory power for the model.

7 Cointegration of Volatility

In this section, to reinforce the strong connection we found between the returns of ETFs and the S&P 500 index, we continue to examine in this section the RVs of their returns as well. On each day $t = 1, ..., n$, the RV measure is simply the sum of the intraday 15-minute squared returns of a given asset over the course of that day.

The GPH estimates $\hat{d}^V$, $\hat{d}^{SP}$ and $\hat{d}^{\hat{\varepsilon}}$ of regression (3) are given in Table 6, where $\hat{\varepsilon}$ is the regression's residual. A few comments are in place. First, it is clearly apprent that on average, in both Asia and Europe, $\hat{d}^V$ and $\hat{d}^{SP}$ are very close to each other. In Asia these estimates are approximately 0.71 in magnitude, whereas in Europe the average values are $\hat{d}^V = 0.52$ and $\hat{d}^{SP} = 0.56$. As mentioned in Section 3, for FCI to be meaningful in the bi-variate case, the true d's of the individual series should be equal. Secondly, the residuals from the FCI regression (3) have $\hat{d}^{\hat{\varepsilon}}$-values which are on average 0.18 and 0.23 in Asia and in Europe, respectively; and in all individual countries these estimates are not significantly different from zero, with the exception of Malaysia, Switzerland and Spain. These findings confirm the existence of FCI relationships between the RV series of the ETF and the S&P500 returns over the sample period.

(Table 6 Here)

In Table 7 the results for the FCI regression (3) are presented. As can be seen, the estimates for the constant term are not significantly different from zero for all countries, indicating no independent fixed difference between the volatility of the two assets. Additionally, the slope coefficient estimates range in Asia from 0.70 (Japan) to 1.53 (China) and in European countries from 0.58 (Switzerland) to 3.71 (Sweden). On average these estimates are 1.08 in Asia and 1.54 for Europe. $\overline{R}^2$ values are 0.88 on average in Asia and 0.81 in Europe, indicating strong explanatory power.

(Table 7 Here)

Overall, these findings reinforce the strong connection between the S&P 500- and the ETF returns in both their means (equation (4)) and their volatility. The latter exhibits FCI, which means that the two series do not drift apart during non-synchronized trading hours.

8 Robustness Tests

In this section we test for the robustness of our results by extending our analysis in various directions. First, we test for any changes in the effect of the S&P 500 index returns on Asian ETF returns before and after 11:30 AM EST, even though there is no shift from synchronized to non-synchronized trading in their case. We carry out this test to ensure that the structural break we found in the effect of the S&P 500 index in European countries is not driven by a generic asset correlations pattern during morning trading hours in the US that is unrelated to any synchronized or non-synchronized trading environments. Second, we test for the stability of our results on an annual basis over the last 4 years (2007-2010). Third, we use a 1-minute intraday time interval instead of the 15-minute time interval we used so far. Finally, various GARCH specifications, with and without integration (i.e., an IGARCH model) and with and without ARMA components are estimated for the basic specification (1)-(2). All of our results remain robust to the above changes indicating the stability of our estimates. We present these test results in the following four sub-sections.

8.1 Structural Break

In this section we test whether the structural break we found in the effect the S&P 500 index has in European countries is caused by the European market-close, or alternatively, is a generic phenomenon that has to do with the time of trade in the US. In order to do so, we re-run our benchmark regression in equation (3) for Asian countries, this time using the dummy variable for synchronized and non-synchronized trading hours:

$$\begin{aligned} \Delta P_{i,t} &= \alpha_i + \Delta NAV_{i,t}\left(\beta_i^{NAV} + \delta_i^{NAV} S_{i,t} + \gamma_i^{NAV} D_t\right) \\ &\quad + \Delta SP_t\left(\beta_i^{SP} + \delta_i^{SP} S_{i,t} + \gamma_i^{SP} D_t\right) \\ &\quad + \Delta ECT_{i,t}\left(\beta_i^{ECT} + \delta_i^{ECT} S_{i,t} + \gamma_i^{ECT} D_t\right) + \varepsilon_{i,t} \end{aligned}$$

where

$$i = 1, ..., n \text{ and } t = 1, ...T.$$

The variable $S_{i,t}$ gets the value 1 if time t is an overlapping trading time between US markets and European markets, and zero otherwise. In this way we create a control group of Asian ETFs that experience no synchronized trading hours with US markets, yet allow us to explore whether the effect of the S&P 500 index experiences a structural break corresponding to the one found in European ETFs. We report the results for this regression in Table 8. The coefficient for the S&P 500 index during synchronized times (δ_i^{SP}) is the one of special interest in this case. As can be seen, this coefficient has a very small effect and its marginal contribution ranges from zero to 4%; its average estimate is 2.5% for all Asian countries and not significantly different from zero in three cases (Taiwan, China and Thailand). This result is entirely different from the effect identified in the case of European markets, where the average effect increased from 20% during synchronized trading hours to 81% during non-synchronized trading hours. We conclude that the structural break we estimated in the European case is not caused by a generic asset correlation during the first part of the US trading day, but rather by the discontinuation of the arbitrage mechanism when European markets close.

(Table 8 Here)

8.2 Time Analysis: 2007-2010

We now address the stability of our results over time. We run our benchmark regression for four different years separately, from 2007 to 2010. We focus our attention on the effect of two variables: the S&P 500 index and the ECT, for each year. Our results for the Asian case are reported in Table 9 and those for the European case in Table 10.

(Tables 9,10 Here)

In both cases our qualitative results do not change over the course of the four years. First, the total effect of the S&P 500 index and the ECT are quite stable over the years, though they experience some changes from one year to another. This is expected given the financial crisis that took place during 2008-2009. However, the qualitative results are left intact. In Asia, the S&P 500 index in all countries has a significant and strong effect that ranges from 82% in 2010 to 110% in 2007, on average. Similarly, the ECT has very little effect in all years during the US trading day, but at the US market open it has a strong negative effect of around -50% in all years. The same holds for Europe: during synchronized trading hours the effect of the S&P 500 is relatively small (zero in 2008 and 20% in 2010, on average), whereas during non-synchronized trading hours its effect increases dramatically (55% in 2008 and 93% in 2010, on average). Similarly the pattern for the ECT is maintained over the course of all four years: throughout the day the effect of the ECT is close to zero, whereas at the US market open it has a strong effect (60%-70% on average).

8.3 Changing the Frequency of Returns: 1-Minute Data

Our third robustness test addresses the frequency of returns that we use. This time we run our benchmark regression again using 1-minute data instead of 15-minute data. Again, our qualitative results are not affected by the frequency of returns. Table 11 presents our regression results for the Asian case. Similar to the 15-minute regression, INAV and ECT have a significant and large effect on ETF returns only at the US market-open; throughout the rest of the trading day their impact is marginal. Additionally, the S&P 500 index has a significant and strong effect throughout the US trading day (about 70% on average).

(Table 11 Here)

Table 12 reports regression results for European countries. Again, INAVs have a strong effect at the US market open which continues throughout the rest of the US trading day, unlike the Asian case, though at lower magnitude (75% at the market-open compared to 35% during the rest of the trading day, on average). The INAV effect on ETF returns is not much different during synchronized and non-synchronized trading hours, unlike our original benchmark regression with 15-minute data. Similarly, the S&P 500 index effect on ETF returns is greater during non-synchronized trading hours compared to synchronized trading hours, but the difference is smaller compared to the 15-minute data regression. Finally, the ECT has a strong and negative effect at the US market-open, and has nearly no effect during the rest of the US trading day, for both synchronized and non-synchronized trading hours.

(Table 12 Here)

One possible explanation for the more moderate differences we find between synchronized and non-synchronized trading hours using 1-minute returns compared to the 15-minute returns are lagged effects. Information regarding S&P 500 returns and INAV returns may be processed into ETF returns not simultaneously but rather with some lag. Consequently, 1-minute data might be too high frequency data to detect their effects without taking into account any lagged effects. We address this issue in the next sub-section where we account for the broader specification of our model.

8.4 Robustness to Lag Length and Error Structure Specification

The results displayed in Tables 13-20 confirm that our main findings are robust to the specification of the error structure and the lag length, as given by (1)-(2). Specifically, in Table 13 we provide model estimates for the 15 minute intraday data when the mean equation includes first- and second lags of the independent variables and the error is an AR(4) process with GARCH(1,1) conditional variances. The overall specification, including the choice of the autoregressive component, was the result of an extensive specification search. Table 14 provides a similar output, apart for the restriction embedded by the IGARCH(1,1) model, i.e., that $\omega_2 + \omega_3 = 1$ in equation (2). This restriction was imposed on the observation that in many of the countries the sum $\hat{\omega}_2 + \hat{\omega}_3$ in the unrestricted model was close to unity. Tables 15-16 are the analogues of Tables 13-14, for the 1-minute data. While Tables 13-16 cover the Asian case, Tables 17-20 report the Eurpoean case.

By and large, Tables 13-20 show that the paper's qualitative results are unaltered and so, overall, this section can be concluded with our general findings that structural difference between synchronized and non-synchronized trading hours exists; ETF prices are mostly driven by their NAV returns during synchronized trading and by the S&P 500 index during non-synchronized trading; a large reversal adjustment to ETF premiums takes place particularly at the US market open. These main results appear to be robust to the various specifications reported in this section.

9 Summary

The purpose of this paper was to study the efficiency of country ETFs as tracking instruments that are designed to follow foreign indices. We focused our attention on their potential overreactions to US market risk, and distinguished between the daily and the intraday investment horizon. In our analysis we identified dominant factors affecting country ETF returns during different parts of the US trading day and their inter-dynamics with daily returns. Our findings suggest the following price formation structure.

First, a major price adjustment takes place at the US market-open. At the beginning of the US trading day, ETF prices adjust to their realized foreign NAV returns and correct for any lagged premiums and discounts remaining from the previous trading day.

Second, during the US trading day we find a robust difference between synchronized and non-synchronized trading hours. As long as foreign markets are open and NAVs are actively traded, foreign home-markets govern the returns of country ETFs in the US. On the other hand, when foreign markets are closed, we find that the S&P 500 index accounts for the largest part of country ETF returns. This result is fortified by the fractional co-integration connection we find for their volatility of returns, which means that the two series do not drift apart in general during non-synchronized trading hours.

The increased effect we find for S&P 500 returns on ETF returns during non-synchronized trading hours indicates an overreaction to the US market and is supported by two results. One result is that in countries that have partial synchronized trading hours with the US market (i.e., Europe) we find a regime shift in the effect the S&P 500 index has on country ETFs. During synchronized trading hours, when an arbitrage mechanism exists between ETFs and their NAVs, ETF prices are mostly driven by NAV values. When this arbitrage mechanism becomes unavailable during non-synchronized trading hours, INAV prices, which simply reflect currency adjustments, become less dominant, whereas the effect of the S&P 500 index becomes much more dominant. The increased effect during the non-synchronized part of the US trading day then matches the effect the S&P 500 index has on country ETFs with no overlapping trading hours (i.e., Asia). The other results is that in all countries the effect the S&P 500 index has on ETF intraday returns exceeds the one it has on the underlying indices. Both these findings support the hypothesis that country ETFs overreact to the US market when foreign markets are closed.

Third, several robustness tests that we carried out confirm the stability of our results. The structural break we find in the effect the S&P 500 index has on ETF returns is exclusive for countires that experience synchronized and non-synchronized trading hours with US markets. Additionally, our results do not depend on the chosen frequency of returns and remain qualitatively the same for 15-minute time intervals and 1-minute time intervals. Finally, the pricing structure we find remains robust to different lag lengths of our variables and different specifications of the error structure, i.e. GARCH and IGARCH with and without ARMA components. These results lead us to conclude the stability of our estimates and of the pricing structure described above.

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Table 1
Summary Statistics

Country	Ticker	Underlying Index	Begin	End	# of Obs.
		Asia:			
Australia	EWA	MSCI Australia	12/14/2000	12/13/2010	476,020
Hong Kong	EWH	MSCI Hong Kong	12/15/2000	12/14/2010	541,739
Japan	EWJ	MSCI Japan	12/15/2000	12/14/2010	786,598
Malaysia	EWM	MSCI Malaysia	12/15/2000	12/14/2010	437,354
Singapore	EWS	MSCI Singapore	12/15/2000	12/14/2010	469,594
Taiwan	EWT	MSCI Taiwan	12/15/2000	12/14/2010	556,240
South Korea	EWY	MSCI South Korea	12/15/2000	12/14/2010	548,825
China	FXI	FTSE/Xinhua China 25 Index	10/08/2004	12/14/2010	521,496
Thailand	THD	MSCI Thailand	03/28/2008	12/14/2010	84,394
		Europe:			
Sweden	EWD	MSCI Sweden	12/15/2000	12/14/2010	198,274
Germany	EWG	MSCI Germany	12/26/2000	12/23/2010	430,940
Switzerland	EWL	MSCI Switzerland	12/15/2000	12/14/2010	171,500
Austria	EWO	MSCI Austria Investable Market	12/19/2000	12/14/2010	192,537
Spain	EWP	MSCI Spain	12/15/2000	12/14/2010	193,610
France	EWQ	MSCI France	12/15/2000	12/14/2010	156,968
United Kingdom	EWU	MSCI United Kingdom	01/03/2000	12/27/2010	352,595
Turkey	TUR	MSCI Turkey	03/28/2008	12/14/2010	95,787

Table 2
Regression Results: 15-Min Data Non-Synchronized Trading
(Asia & Australia)

Country	Ticker	Const.	ΔINAV	ΔINAV_Open	ΔS&P	ΔS&P_Open	ECT	ECT_Open	$\bar{R}^2$
Australia	EWA	0.000	0.764	0.076	0.806	0.029	-0.010	-0.746	0.882
		0.226	*0.000*	*0.000*	*0.000*	*0.001*	*0.000*	*0.000*	
Hong Kong	EWH	0.000	0.093	0.663	0.940	-0.134	-0.007	-0.640	0.794
		0.910	*0.172*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	
Japan	EWJ	0.000	0.498	0.176	0.776	0.105	-0.004	-0.559	0.753
		0.982	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	
Malaysia	EWM	0.000	0.084	0.742	0.734	-0.184	-0.019	-0.519	0.635
		0.027	*0.001*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	
Singapore	EWS	0.000	0.275	0.553	0.914	-0.197	-0.015	-0.655	0.807
		0.405	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	
Taiwan	EWT	0.000	0.063	0.683	0.927	0.100	-0.010	-0.495	0.748
		0.776	*0.001*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	
South Korea	EWY	0.000	0.016	0.739	0.999	0.058	-0.005	-0.578	0.798
		0.373	*0.040*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	
China	FXI	0.000	0.035	0.662	1.129	-0.175	-0.005	-0.570	0.870
		0.816	*0.569*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	
Thailand	THD	0.000	-0.004	0.822	0.739	-0.018	-0.014	-0.401	0.752
		0.009	*0.936*	*0.000*	*0.000*	*0.586*	*0.000*	*0.000*	
Averages		***0.000***	***0.203***	***0.568***	***0.885***	***-0.046***	***-0.010***	***-0.574***	***0.782***

Table 3

Regression Results: 15-Min Data Synchronized & Non-Synchronized Trading

(Europe)

Country	Ticker	Const.	ΔINAV	ΔINAV_Synchronized	ΔINAV_Open	ΔS&P	ΔS&P_Synchronized	ΔS&P_Open	ECT	ECT_Synchronized	ECT_Open	$\bar{R}^2$
Sweden	EWD	0.00	0.80	-0.04	0.19	0.90	-0.60	-0.16	0.00	-0.06	-0.82	0.90
		0.41	*0.00*	*0.00*	*0.35*	*0.00*	*0.00*	*0.00*	*0.62*	*0.00*	*0.00*	
Germany	EWG	0.00	0.76	0.11	0.06	0.69	-0.56	0.00	-0.02	-0.14	-0.73	0.92
		0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.99*	*0.00*	*0.00*	*0.00*	*0.00*	
Switzerland	EWL	0.00	0.70	0.12	0.06	0.65	-0.54	0.04	-0.02	-0.09	-0.70	0.83
		0.52	*0.00*	*0.09*	*0.01*	*0.00*	*0.18*	*0.00*	*0.00*	*0.00*	*0.00*	
Austria	EWO	0.00	0.60	0.24	0.00	0.77	-0.63	0.24	-0.02	-0.06	-0.53	0.70
		0.66	*0.00*	*0.94*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	
Spain	EWP	0.00	0.78	0.09	0.03	0.81	-0.71	0.10	-0.02	-0.08	-0.80	0.90
		0.10	*0.00*	*0.18*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	
France	EWQ	0.00	0.43	0.41	0.03	0.82	-0.63	0.07	-0.03	-0.21	-0.65	0.88
		0.07	*0.00*	*0.37*	*0.00*	*0.00*	*0.10*	*0.00*	*0.00*	*0.00*	*0.00*	
United Kingdom	EWU	0.00	0.43	0.33	0.05	0.82	-0.59	0.10	-0.02	-0.05	-0.63	0.86
		0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	
Turkey	TUR	0.00	0.74	0.06	0.09	1.03	-0.64	-0.15	-0.03	-0.08	-0.59	0.80
		0.04	*0.00*	*0.03*	*0.38*	*0.00*	*0.02*	*0.00*	*0.00*	*0.00*	*0.00*	
Average		***0.000***	***0.655***	***0.164***	***0.063***	***0.811***	***-0.612***	***0.030***	***-0.019***	***-0.096***	***-0.680***	***0.847***

Table 4

Correlation between S&P 500 Index and Underlying Indices

2007-2010

Asia

Country	Const. (α)	ΔS&P (β)	$\bar{R}^2$
MSCI Australia	0.000	0.785	0.340
	0.557	*0.000*	
MSCI Hong Kong	0.000	0.428	0.163
	0.551	*0.000*	
MSCI Japan	0.000	0.540	0.275
	0.645	*0.000*	
MSCI Malaysia	0.000	0.303	0.162
	0.173	*0.000*	
MSCI Singapore	0.000	0.379	0.124
	0.524	*0.000*	
MSCI Taiwan	0.000	0.447	0.182
	0.000	*0.000*	
MSCI South Korea	0.000	0.597	0.159
	0.434	*0.000*	
MSCI Thailand	0.000	0.320	0.074
	0.000	*0.000*	
FTSE/Xinhua China 25 Index	0.000	0.591	0.151
	0.540	*0.000*	
Averages	***0.000***	***0.488***	***0.181***

Europe

Country	Const. (α)	ΔS&P (β)	$\bar{R}^2$
MSCI Sweden	0.000	0.386	0.068
	0.620	*0.000*	
MSCI Germany	0.000	0.286	0.058
	0.801	*0.000*	
MSCI Switzerland	0.000	0.308	0.110
	0.000	*0.000*	
MSCI Austria Investable Market	0.000	0.505	0.105
	0.597	*0.000*	
MSCI Spain	0.000	0.353	0.070
	0.966	*0.000*	
MSCI France	0.000	0.368	0.089
	0.979	*0.000*	
MSCI United Kingdom	0.000	0.370	0.100
	0.889	*0.000*	
MSCI Turkey	0.000	0.475	0.082
	0.463	*0.000*	
Averages	***0.000***	***0.381***	***0.085***

Table 5

Correlation between S&P 500 Index and Underlying Indices: *Beta* Coefficient by Year

2007-2010

Asia

Country	ΔS&P Coefficient			
	2007	*2008*	*2009*	*2010*
MSCI Australia	0.987	0.844	0.623	0.692
MSCI Hong Kong	0.859	0.376	0.413	0.321
MSCI Japan	0.503	0.580	0.487	0.479
MSCI Malaysia	0.735	0.224	0.278	0.363
MSCI Singapore	0.773	0.327	0.366	0.301
MSCI Taiwan	0.756	0.411	0.365	0.525
MSCI South Korea	0.903	0.551	0.535	0.664
MSCI Thailand	0.489	0.264	0.332	0.344
FTSE/Xinhua China 25 Index	1.120	0.552	0.528	0.486
Averages	***0.738***	***0.459***	***0.436***	***0.464***

Europe

Country	ΔS&P Coefficient			
	2007	*2008*	*2009*	*2010*
MSCI Sweden	0.462	0.490	0.243	0.090
MSCI Germany	0.286	0.354	0.162	0.169
MSCI Switzerland	0.234	0.422	0.131	0.191
MSCI Austria Investable Market	0.492	0.638	0.304	0.266
MSCI Spain	0.252	0.478	0.212	0.098
MSCI France	0.311	0.493	0.167	0.214
MSCI United Kingdom	0.313	0.484	0.202	0.181
MSCI Turkey	0.788	0.576	0.201	0.285
Averages	***0.392***	***0.492***	***0.203***	***0.187***

Table 6

Fractional Integration of Realized Volatility

Asian ETFs, S&P 500 Index and Residual

Country	**Ticker**	d^{v}	d^{sp}	d^{ε}
Australia	EWA	0.742	0.674	0.149
		0.000	*0.000*	*0.462*
Hong Kong	EWH	0.706	0.646	0.140
		0.000	*0.000*	*0.262*
Japan	EWJ	0.747	0.839	0.131
		0.000	*0.000*	*0.208*
Malaysia	EWM	0.626	0.646	0.268
		0.000	*0.000*	*0.043*
Singapore	EWS	0.789	0.809	0.275
		0.000	*0.000*	*0.083*
Taiwan	EWT	0.753	0.817	-0.010
		0.000	*0.000*	*0.902*
South Korea	EWY	0.828	0.772	0.330
		0.000	*0.000*	*0.117*
China	FXI	0.869	0.791	0.308
		0.000	*0.000*	*0.125*
Thailand	THD	0.301	0.385	0.031
		0.054	*0.000*	*0.875*
Average		***0.707***	***0.709***	***0.179***

European ETFs, S&P 500 Index and Residual

Country	**Ticker**	d^{v}	d^{sp}	d^{ε}
Sweden	EWD	0.307	0.483	0.395
		0.004	*0.018*	*0.133*
Germany	EWG	0.800	0.674	0.165
		0.000	*0.000*	*0.285*
Switzerland	EWL	0.609	0.498	0.396
		0.000	*0.000*	*0.005*
Austria	EWO	0.257	0.504	0.024
		0.008	*0.002*	*0.863*
Spain	EWP	0.550	0.695	0.408
		0.000	*0.000*	*0.014*
France	EWQ	0.672	0.779	0.201
		0.000	*0.000*	*0.081*
United Kingdom	EWU	0.573	0.570	0.098
		0.000	*0.000*	*0.395*
Turkey	TUR	0.416	0.299	0.187
		0.027	*0.131*	*0.340*
Average		***0.523***	***0.563***	***0.234***

Table 7

Fractional Cointegration Regression of Realized Volatility

Asian ETFs and S&P 500 Index

Country	**Ticker**	**Const.**	**Coefficient**	$\bar{R}^2$
Australia	EWA	0.000	1.326	0.921
		0.000	*0.000*	
Hong Kong	EWH	0.000	0.968	0.840
		0.000	*0.000*	
Japan	EWJ	0.000	0.707	0.914
		0.000	*0.000*	
Malaysia	EWM	0.000	0.739	0.803
		0.000	*0.000*	
Singapore	EWS	0.000	1.032	0.927
		0.000	*0.000*	
Taiwan	EWT	0.000	1.115	0.875
		0.000	*0.000*	
South Korea	EWY	0.000	1.297	0.884
		0.000	*0.000*	
China	FXI	0.000	1.525	0.825
		0.000	*0.000*	
Thailand	THD	0.000	0.989	0.911
		0.897	*0.000*	
Average			***1.078***	***0.878***

European ETFs and S&P 500 Index

Country	**Ticker**	**Const.**	**Coefficient**	$\bar{R}^2$
Sweden	EWD	0.000	3.711	0.815
		0.000	*0.000*	
Germany	EWG	0.000	0.896	0.774
		0.000	*0.000*	
Switzerland	EWL	0.000	0.583	0.735
		0.000	*0.000*	
Austria	EWO	0.000	1.420	0.689
		0.163	*0.000*	
Spain	EWP	0.000	1.025	0.803
		0.000	*0.000*	
France	EWQ	0.000	1.363	0.910
		0.138	*0.000*	
United Kingdom	EWU	0.000	0.952	0.878
		0.000	*0.000*	
Turkey	TUR	0.000	2.340	0.832
		0.215	*0.000*	
Average			***1.536***	***0.805***

Table 8
Regression Results: 15-Min Data Structural Break
(Asia)

Country	Ticker	Const.	ΔINAV	ΔINAV_Synchronized	ΔINAV_Open	ΔS&P	ΔS&P_Synchronized	ΔS&P_Open	ECT	ECT_Synchronized	ECT_Open	$\bar{R}^2$
Australia	EWA	0.000	0.730	0.033	0.077	0.796	0.000	0.039	-0.008	-0.743	-0.004	0.882
		0.189	*0.000*	*0.030*	*0.000*	*0.000*	*0.972*	*0.000*	*0.000*	*0.000*	*0.128*	
Hong Kong	EWH	0.000	0.220	0.760	-0.225	0.931	-0.152	0.027	-0.006	-0.636	-0.006	0.794
		0.916	*0.017*	*0.000*	*0.043*	*0.000*	*0.000*	*0.008*	*0.000*	*0.000*	*0.021*	
Japan	EWJ	0.000	0.472	0.136	0.066	0.763	0.076	0.041	-0.005	-0.565	0.007	0.753
		0.941	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	
Malaysia	EWM	0.000	0.117	0.771	-0.063	0.709	-0.241	0.082	-0.019	-0.520	0.001	0.636
		0.034	*0.002*	*0.000*	*0.204*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.747*	
Singapore	EWS	0.000	0.235	0.489	0.116	0.892	-0.255	-0.040	-0.017	-0.732	0.012	0.876
		0.447	*0.000*	*0.000*	*0.041*	*0.000*	*0.000*	*0.001*	*0.000*	*0.000*	*0.001*	
Taiwan	EWT	0.000	0.030	0.638	0.079	0.924	0.094	0.009	-0.010	-0.496	0.001	0.748
		0.768	*0.218*	*0.000*	*0.034*	*0.000*	*0.000*	*0.432*	*0.000*	*0.000*	*0.612*	
South Korea	EWY	0.000	0.018	0.742	-0.005	0.986	0.028	0.043	-0.006	-0.583	0.006	0.798
		0.402	*0.091*	*0.000*	*0.757*	*0.000*	*0.030*	*0.000*	*0.000*	*0.000*	*0.004*	
China	FXI	0.000	0.020	0.653	0.024	1.124	-0.186	0.016	-0.003	-0.564	-0.007	0.870
		0.808	*0.919*	*0.000*	*0.907*	*0.000*	*0.000*	*0.175*	*0.003*	*0.000*	*0.004*	
Thailand	THD	0.000	-0.019	0.780	0.057	0.735	-0.023	0.009	-0.013	-0.400	-0.001	0.752
		0.009	*0.742*	*0.000*	*0.614*	*0.000*	*0.591*	*0.852*	*0.000*	*0.000*	*0.857*	
Average		***0.000***	***0.006***	***0.025***	***0.725***	***0.948***	***0.023***	***-0.060***	***-0.008***	***-0.001***	***-0.516***	***0.807***

Table 9

Regression Results per Year, 2007-2010

(Asia & Australia)

Country	Ticker	Variable	2007		2008		2009		2010	
			Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
Average all Countries		***ΔS&P***	***1.099***		***0.913***		***0.845***		***0.820***	
		ECT	***-0.012***		***-0.006***		***-0.012***		***-0.009***	
		ECT_Open	***-0.521***		***-0.493***		***-0.550***		***-0.451***	
Australia	EWA	ΔS&P	0.747	*0.000*	0.818	*0.000*	0.787	*0.000*	0.939	*0.000*
		ECT	-0.009	*0.002*	-0.010	*0.000*	-0.010	*0.000*	-0.009	*0.000*
		ECT_Open	-0.762	*0.000*	-0.785	*0.000*	-0.688	*0.000*	-0.625	*0.000*
		$\overline{R}^2$	0.868		0.897		0.900		0.934	
Hong Kong	EWH	ΔS&P	1.252	*0.000*	0.970	*0.000*	0.881	*0.000*	0.818	*0.000*
		ECT	-0.006	*0.007*	-0.005	*0.003*	-0.009	*0.000*	-0.013	*0.000*
		ECT_Open	-0.706	*0.000*	-0.642	*0.000*	-0.540	*0.000*	-0.557	*0.000*
		$\overline{R}^2$	0.826		0.848		0.842		0.808	
Japan	EWJ	ΔS&P	0.694	*0.000*	0.828	*0.000*	0.791	*0.000*	0.755	*0.000*
		ECT	-0.007	*0.000*	-0.001	*0.665*	-0.006	*0.000*	-0.008	*0.000*
		ECT_Open	-0.508	*0.000*	-0.509	*0.000*	-0.498	*0.000*	-0.502	*0.000*
		$\overline{R}^2$	0.705		0.816		0.759		0.729	
Malaysia	EWM	ΔS&P	1.001	*0.000*	0.764	*0.000*	0.626	*0.000*	0.625	*0.000*
		ECT	-0.020	*0.000*	-0.029	*0.000*	-0.021	*0.000*	-0.014	*0.000*
		ECT_Open	-0.555	*0.000*	-0.437	*0.000*	-0.644	*0.000*	-0.449	*0.000*
		$\overline{R}^2$	0.643		0.629		0.705		0.743	
Singapore	EWS	ΔS&P	1.177	*0.000*	0.948	*0.000*	0.830	*0.000*	0.760	*0.000*
		ECT	-0.016	*0.000*	-0.014	*0.000*	-0.018	*0.000*	-0.017	*0.000*
		ECT_Open	-0.586	*0.000*	-0.727	*0.000*	-0.651	*0.000*	-0.688	*0.000*
		$\overline{R}^2$	0.769		0.869		0.868		0.868	
Taiwan	EWT	ΔS&P	1.121	*0.000*	0.970	*0.000*	0.849	*0.000*	0.781	*0.000*
		ECT	-0.009	*0.000*	-0.012	*0.000*	-0.007	*0.000*	-0.001	*0.296*
		ECT_Open	-0.456	*0.000*	-0.620	*0.000*	-0.418	*0.000*	-0.006	*0.665*
		$\overline{R}^2$	0.744		0.815		0.756		0.596	
South Korea	EWY	ΔS&P	1.231	*0.000*	1.038	*0.000*	0.955	*0.000*	0.917	*0.000*
		ECT	-0.007	*0.000*	-0.010	*0.000*	-0.004	*0.008*	-0.004	*0.032*
		ECT_Open	-0.594	*0.000*	-0.681	*0.000*	-0.568	*0.000*	-0.498	*0.000*
		$\overline{R}^2$	0.790		0.836		0.889		0.854	
China	FXI	ΔS&P	1.572	*0.000*	1.248	*0.000*	1.086	*0.000*	1.027	*0.000*
		ECT	-0.025	*0.000*	0.000	*0.730*	-0.007	*0.000*	-0.010	*0.000*
		ECT_Open	0.000	*0.013*	0.000	*0.427*	-0.544	*0.000*	-0.538	*0.000*
		$\overline{R}^2$	0.667		0.654		0.885		0.857	
Thailand	THD	ΔS&P	NA	*NA*	0.635	*0.000*	0.804	*0.000*	0.760	*0.000*
		ECT	NA	*NA*	0.024	*0.043*	-0.026	*0.020*	-0.004	*0.258*
		ECT_Open	NA	*NA*	-0.032	*0.210*	-0.397	*0.000*	-0.198	*0.000*
		$\overline{R}^2$	NA		0.423		0.746		0.446	

Table 10
Regression Results per Year, 2007-2010
(Europe)

Country	Ticker	Variable	2007		2008		2009		2010	
			Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
Average all Countries:		***ΔS&P***	***0.735***		***0.794***		***0.784***		***0.933***	
		ΔS&P_Synchronized	***-0.607***		***-0.568***		***-0.454***		***-0.728***	
		ECT	***-0.008***		***-0.013***		***-0.028***		***-0.040***	
		ECT_Open	***-0.579***		***-0.547***		***-0.674***		***-0.660***	
Sweden	EWD	ΔS&P	0.883	0.000	0.799	0.000	0.864	0.000	1.057	0.000
		ΔS&P_Synchronized	-0.741	0.000	-0.712	0.000	-0.256	0.002	-0.752	0.000
		ECT	-0.004	0.558	0.018	0.024	-0.023	0.022	-0.058	0.000
		ECT_Open	-0.798	0.000	-0.873	0.000	-0.859	0.000	-0.657	0.000
		$\overline{R}^2$	0.917		0.916		0.925		0.933	
Germany	EWG	ΔS&P	0.702	0.000	0.660	0.000	0.694	0.000	0.760	0.000
		ΔS&P_Synchronized	-0.342	0.000	-0.563	0.000	-0.506	0.000	-0.683	0.000
		ECT	-0.003	0.548	-0.009	0.096	-0.024	0.000	-0.069	0.000
		ECT_Open	-0.797	0.000	-0.498	0.000	-0.668	0.000	-0.791	0.000
		$\overline{R}^2$	0.882		0.849		0.951		0.938	
Switzerland	EWL	ΔS&P	0.684	0.000	0.610	0.000	0.733	0.000	0.770	0.000
		ΔS&P_Synchronized	-0.667	0.000	-0.569	0.000	-0.546	0.000	-0.584	0.000
		ECT	-0.045	0.004	-0.023	0.008	-0.054	0.000	-0.026	0.003
		ECT_Open	-0.420	0.000	-0.528	0.000	-0.866	0.000	-0.713	0.000
		$\overline{R}^2$	0.793		0.854		0.847		0.901	
Austria	EWO	ΔS&P	0.743	0.000	0.757	0.000	0.862	0.000	0.988	0.000
		ΔS&P_Synchronized	-0.490	0.000	-0.619	0.000	-0.552	0.000	-0.608	0.000
		ECT	0.007	0.482	-0.016	0.327	-0.029	0.019	-0.064	0.000
		ECT_Open	-0.554	0.000	-0.126	0.006	-0.714	0.000	-0.722	0.000
		$\overline{R}^2$	0.775		0.792		0.835		0.920	
Spain	EWP	ΔS&P	0.707	0.000	0.797	0.000	0.726	0.000	1.070	0.000
		ΔS&P_Synchronized	-0.623	0.000	-0.704	0.000	-0.589	0.000	-0.971	0.000
		ECT	0.019	0.000	-0.033	0.000	-0.023	0.024	-0.018	0.014
		ECT_Open	-0.634	0.073	-0.784	0.000	-0.538	0.000	-0.670	0.000
		$\overline{R}^2$	0.797		0.897		0.949		0.958	
France	EWQ	ΔS&P	0.787	0.000	0.756	0.000	0.761	0.000	0.949	0.000
		ΔS&P_Synchronized	-0.766	0.000	-0.681	0.000	-0.396	0.000	-0.816	0.000
		ECT	-0.008	0.570	-0.035	0.000	-0.026	0.020	-0.029	0.001
		ECT_Open	-0.325	0.000	-0.697	0.000	-0.671	0.000	-0.634	0.000
		$\overline{R}^2$	0.786		0.852		0.945		0.958	
United Kingdom	EWU	ΔS&P	0.641	0.000	0.840	0.000	0.746	0.000	0.858	0.000
		ΔS&P_Synchronized	-0.622	0.000	-0.696	0.000	-0.259	0.000	-0.775	0.000
		ECT	-0.024	0.001	-0.010	0.010	-0.035	0.000	-0.045	0.000
		ECT_Open	-0.525	0.000	-0.819	0.000	-0.456	0.000	-0.562	0.000
		$\overline{R}^2$	0.831		0.894		0.885		0.888	
Turkey	TUR	ΔS&P	NA	NA	1.128	0.000	0.885	0.000	1.010	0.000
		ΔS&P_Synchronized	NA	NA	0.002	0.998	-0.527	0.000	-0.634	0.000
		ECT	NA	NA	-0.051	0.018	-0.010	0.386	-0.014	0.001
		ECT_Open	NA	NA	-0.489	0.018	-0.616	0.000	-0.531	0.000
		$\overline{R}^2$	NA		0.749		0.811		0.882	

Table 11
Regression Results: 1-Min Data Non-Synchronized Trading
(Asia & Australia)

Country	Ticker	Const.	ΔINAV	ΔINAV_Open	ΔS&P	ΔS&P_Open	ECT	ECT_Open	$\bar{R}^2$
Australia	EWA	0.000	0.218	0.583	0.785	0.010	-0.002	-0.696	0.616
		0.222	*0.000*	*0.000*	*0.000*	*0.025*	*0.000*	*0.000*	
Hong Kong	EWH	0.000	0.010	0.740	0.748	0.030	-0.002	-0.572	0.525
		0.760	*0.466*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	
Japan	EWJ	0.000	0.054	0.603	0.551	0.324	-0.002	-0.560	0.420
		0.915	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	
Malaysia	EWM	0.000	0.031	0.727	0.578	0.015	-0.005	-0.394	0.346
		0.001	*0.001*	*0.000*	*0.000*	*0.002*	*0.000*	*0.000*	
Singapore	EWS	0.000	0.048	0.694	0.700	-0.026	-0.004	-0.518	0.459
		0.225	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	
Taiwan	EWT	0.000	0.009	0.733	0.736	0.216	-0.002	-0.473	0.490
		0.573	*0.161*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	
South Korea	EWY	0.000	0.002	0.774	0.839	0.043	-0.001	-0.583	0.606
		0.542	*0.374*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	
China	FXI	0.000	0.022	0.680	1.034	-0.130	0.000	-0.605	0.796
		0.859	*0.130*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	
Thailand	THD	0.000	0.019	0.578	0.442	0.416	-0.003	-0.219	0.375
		0.929	*0.143*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	
Averages		***0.000***	***0.046***	***0.679***	***0.712***	***0.100***	***-0.002***	***-0.513***	***0.515***

Table 12
Regression Results: 1-Min Data Synchronized & Non-Synchronized Trading
(Europe)

Country	Ticker	Const.	ΔINAV	ΔINAV_Synchronized	ΔINAV_Open	ΔS&P	ΔS&P_Synchronized	ΔS&P_Open	ECT	ECT_Synchronized	ECT_Open	$\bar{R}^2$
Sweden	EWD	0.000	0.441	-0.024	0.433	0.502	-0.174	-0.172	-0.008	-0.064	-0.648	0.647
		0.919	*0.000*	*0.000*	*0.086*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*12.000*
Germany	EWG	0.000	0.351	0.141	0.418	0.571	-0.274	-0.266	-0.007	-0.091	-0.754	0.576
		0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	
Switzerland	EWL	0.000	0.345	0.091	0.356	0.432	-0.309	0.135	-0.014	-0.111	-0.482	0.507
		0.000	*0.000*	*0.000*	*0.001*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	
Austria	EWO	0.000	0.321	0.062	0.421	0.402	-0.201	0.073	-0.007	-0.041	-0.523	0.446
		0.003	*0.000*	*0.000*	*0.051*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	
Spain	EWP	0.000	0.447	-0.040	0.480	0.458	-0.126	-0.170	-0.008	-0.063	-0.722	0.695
		0.078	*0.000*	*0.000*	*0.001*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	
France	EWQ	0.000	0.394	0.053	0.409	0.532	-0.277	-0.074	-0.015	-0.059	-0.739	0.464
		0.694	*0.000*	*0.000*	*0.079*	*0.000*	*0.006*	*0.000*	*0.000*	*0.000*	*0.000*	
United Kingdom	EWU	0.000	0.175	0.176	0.378	0.594	-0.252	0.060	-0.006	-0.036	-0.470	0.524
		0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	
Turkey	TUR	0.000	0.237	0.085	0.452	0.523	-0.180	0.045	-0.009	-0.065	-0.556	0.557
		0.128	*0.000*	*0.000*	*0.000*	*0.000*	*0.087*	*0.000*	*0.000*	*0.000*	*0.000*	
Average		***0.000***	***0.339***	***0.068***	***0.418***	***0.502***	***-0.224***	***-0.046***	***-0.009***	***-0.066***	***-0.612***	***0.552***

Table 13

Regresion Results: 15 Min GARCH & Lagged Variables

(Asia)

Country	**Australia**		**Hong Kong**		**Japan**		**Malaysia**		**Singapore**		**Taiwan**		**South Korea**		**China**		**Thailand**		***Average***
Ticker	**EWA**		**EWH**		**EWJ**		**EWM**		**EWS**		**EWT**		**EWY**		**FXI**		**THD**		
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	
Const.	0.00	0.01	0.00	0.34	0.00	0.76	0.00	0.24	0.00	0.71	0.00	0.63	0.00	0.98	0.00	0.55	0.00	0.07	***0.00***
$\Delta INAV_t$	0.79	0.00	0.12	0.07	0.52	0.00	0.06	0.00	0.36	0.00	0.05	0.03	0.05	0.00	-0.06	0.56	0.01	0.66	***0.21***
$\Delta INAV_{t-1}$	0.01	0.02	-0.01	0.43	0.00	0.82	0.02	0.65	0.00	0.96	0.02	0.69	-0.01	0.19	-0.02	0.21	-0.14	0.04	***-0.01***
$\Delta INAV_{t-2}$	0.00	0.90	0.00	0.61	-0.03	0.00	0.00	0.78	0.00	0.86	-0.05	0.03	0.00	0.50	0.03	0.00	0.01	0.70	***0.00***
ΔINAV_Open	0.04	0.03	0.63	0.00	0.16	0.00	0.59	0.00	0.48	0.00	-0.03	0.26	0.69	0.00	0.75	0.00	0.20	0.16	***0.39***
$\Delta S\&P_t$	0.80	0.00	0.89	0.00	0.77	0.00	0.72	0.00	0.80	0.00	0.95	0.00	0.94	0.00	1.02	0.00	0.74	0.00	***0.85***
$\Delta S\&P_{t-1}$	0.01	0.42	0.06	0.00	0.09	0.00	0.02	0.61	0.02	0.28	0.02	0.80	0.05	0.03	0.05	0.09	0.16	0.01	***0.05***
$\Delta S\&P_{t-2}$	0.01	0.25	0.02	0.13	0.05	0.00	0.02	0.06	0.02	0.08	0.08	0.05	0.05	0.00	-0.08	0.00	0.02	0.59	***0.02***
ΔS&P_Open	0.03	0.21	-0.10	0.01	0.09	0.00	-0.06	0.06	-0.27	0.00	0.48	0.00	0.08	0.01	-0.09	0.02	0.32	0.03	***0.05***
ECT_t	0.00	0.97	-0.02	0.32	-0.05	0.01	-0.02	0.55	-0.03	0.20	-0.05	0.44	-0.03	0.05	0.02	0.37	-0.13	0.08	***-0.03***
ECT_{t-1}	-0.01	0.36	0.01	0.23	0.01	0.55	0.01	0.80	0.00	0.94	0.01	0.81	0.01	0.24	0.01	0.62	0.15	0.03	***0.02***
ECT_{t-2}	0.01	0.39	0.01	0.49	0.04	0.00	0.01	0.68	0.02	0.11	0.05	0.00	0.02	0.06	-0.03	0.01	-0.01	0.65	***0.01***
ECT_Open	-0.70	0.00	-0.62	0.00	-0.51	0.00	-0.37	0.00	-0.68	0.00	-0.03	0.66	-0.52	0.00	-0.61	0.00	-0.01	0.91	***-0.45***
AR(1)	-0.23	0.00	-0.19	0.00	-0.21	0.00	-0.22	0.00	-0.19	0.00	-0.17	0.02	-0.13	0.00	-0.11	0.01	0.04	0.66	***-0.16***
AR(2)	-0.08	0.00	-0.08	0.00	-0.07	0.00	-0.07	0.00	-0.03	0.10	0.03	0.28	-0.06	0.00	-0.06	0.01	-0.06	0.07	***-0.05***
AR(3)	-0.02	0.20	-0.04	0.02	-0.04	0.00	0.01	0.74	0.00	0.81	0.04	0.09	-0.04	0.01	-0.03	0.14	0.00	0.86	***-0.01***
AR(4)	-0.01	0.23	-0.01	0.26	-0.02	0.00	0.02	0.41	-0.01	0.48	0.00	0.81	-0.01	0.30	-0.02	0.37	-0.02	0.60	***-0.01***
$\bar{R}^2$	0.87		0.79		0.76		0.57		0.89		0.19		0.80		0.87		0.49		***0.69***
Variance Equation:																			
Const.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***0.00***
$Residual_{t-1}^2$	0.30	0.00	0.35	0.00	0.31	0.00	0.32	0.00	0.02	0.00	1.17	0.00	0.44	0.00	0.73	0.00	0.57	0.01	***0.47***
$GARCH_{t-1}$	0.66	0.00	0.56	0.00	0.49	0.00	0.61	0.00	0.98	0.00	0.07	0.00	0.59	0.00	0.36	0.00	-0.01	0.52	***0.48***

Table 14

Regresion Results: 15 Min IGARCH & Lagged Variables

(Asia)

Country	Australia		Hong Kong		Japan		Malaysia		Singapore		Taiwan		South Korea		China		Thailand		*Average*
Ticker	EWA		EWH		EWJ		EWM		EWS		EWT		EWY		FXI		THD		
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	
Const.	0.00	0.01	0.00	0.66	0.00	0.03	0.00	0.09	0.00	0.00	0.00	0.87	0.00	0.89	0.00	0.10	0.00	0.00	***0.00***
$\Delta INAV_t$	0.81	0.00	0.06	0.22	0.55	0.00	0.06	0.01	1.01	0.00	0.00	0.14	0.04	0.00	0.04	0.07	0.00	0.81	***0.29***
$\Delta INAV_{t-1}$	0.00	0.83	-0.01	0.35	-0.01	0.16	0.00	0.92	0.10	0.00	0.00	0.94	-0.01	0.26	0.02	0.14	0.00	0.99	***0.01***
$\Delta INAV_{t-2}$	0.00	0.78	0.01	0.42	0.00	0.84	0.00	0.80	0.09	0.00	0.01	0.23	0.00	0.70	0.03	0.00	0.01	0.75	***0.01***
ΔINAV_Open	0.02	0.24	0.68	0.00	0.12	0.00	0.46	0.00	-0.15	0.03	0.00	0.55	0.71	0.00	0.63	0.00	0.07	0.23	***0.28***
$\Delta S\&P_t$	0.79	0.00	0.89	0.00	0.80	0.00	0.67	0.00	0.79	0.00	0.90	0.00	0.95	0.00	1.06	0.00	0.77	0.00	***0.85***
$\Delta S\&P_{t-1}$	0.03	0.03	0.03	0.15	0.02	0.29	0.03	0.49	0.05	0.03	0.03	0.58	0.06	0.00	-0.08	0.01	0.04	0.76	***0.02***
$\Delta S\&P_{t-2}$	0.01	0.18	0.01	0.47	0.02	0.02	0.01	0.45	0.01	0.35	-0.01	0.64	0.02	0.02	-0.03	0.10	-0.03	0.29	***0.00***
ΔS&P_Open	0.04	0.06	-0.14	0.00	0.07	0.03	0.05	0.39	-0.31	0.00	0.55	0.00	0.03	0.29	-0.16	0.00	0.30	0.00	***0.05***
ECT_t	-0.02	0.15	-0.01	0.64	-0.02	0.41	-0.04	0.46	-0.14	0.00	0.00	0.93	-0.02	0.19	0.06	0.04	-0.01	0.96	***-0.02***
ECT_{t-1}	0.01	0.40	0.01	0.70	0.01	0.53	0.02	0.74	0.08	0.00	0.01	0.81	0.01	0.49	-0.03	0.07	0.01	0.93	***0.01***
ECT_{t-2}	0.01	0.30	0.00	0.99	0.01	0.41	0.02	0.21	0.04	0.00	-0.01	0.23	0.01	0.33	-0.03	0.02	0.00	0.89	***0.01***
ECT_Open	-0.68	0.00	-0.60	0.00	-0.56	0.00	-0.32	0.00	-0.63	0.00	-0.08	0.16	-0.55	0.00	-0.62	0.00	-0.17	0.22	***-0.47***
AR(1)	-0.17	0.00	-0.13	0.00	-0.15	0.00	-0.14	0.02	0.01	0.66	-0.08	0.15	-0.11	0.00	-0.13	0.00	-0.05	0.74	***-0.11***
AR(2)	-0.06	0.00	-0.06	0.00	-0.06	0.00	-0.05	0.08	0.15	0.00	-0.02	0.03	-0.03	0.01	-0.06	0.00	-0.02	0.45	***-0.02***
AR(3)	-0.01	0.15	-0.02	0.02	-0.01	0.35	-0.02	0.08	0.02	0.17	0.00	0.83	-0.01	0.34	-0.03	0.00	-0.01	0.63	***-0.01***
AR(4)	-0.01	0.34	0.01	0.38	-0.03	0.00	-0.02	0.03	0.01	0.21	0.00	0.57	0.01	0.32	0.01	0.43	0.02	0.08	***0.00***
$\overline{R}^2$	0.87		0.79		0.76		0.57		0.86		0.50		0.80		0.88		0.43		***0.72***
Variance Equation:																			
$Residual_{t-1}^2$	0.009	0.000	0.009	0.000	0.000	0.003	0.001	0.000	0.000	0.000	0.002	0.000	0.011	0.000	0.003	0.000	0.004	0.000	***0.00***
$GARCH_{t-1}$	0.991	0.000	0.991	0.000	1.000	0.000	0.999	0.000	1.000	0.000	0.998	0.000	0.989	0.000	0.997	0.000	0.996	0.000	***1.00***

Table 15

Regresion Results: 1 Min GARCH & Lagged Variables

(Asia)

Country	**Australia**		**Hong Kong**		**Japan**		**Malaysia**		**Singapore**		**Taiwan**		**South Korea**		**China**		**Thailand**		***Average***
Ticker	**EWA**		**EWH**		**EWJ**		**EWM**		**EWS**		**EWT**		**EWY**		**FXI**		**THD**		
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	
Const.	0.00	0.28	0.00	0.00	0.00	0.00	0.00	0.85	0.00	0.99	0.00	0.26	0.00	0.04	0.00	0.12	0.00	0.55	***0.00***
$\Delta INAV_t$	0.30	0.00	0.60	0.00	0.11	0.00	-0.01	0.32	0.08	0.00	0.02	0.54	0.01	0.00	0.02	0.14	0.07	0.04	***0.13***
$\Delta INAV_{t-1}$	0.03	0.00	0.03	0.02	-0.17	0.00	0.12	0.09	-0.01	0.60	-0.16	0.00	0.02	0.08	0.02	0.22	0.02	0.81	***-0.01***
$\Delta INAV_{t-2}$	-0.02	0.00	-0.05	0.00	-0.08	0.00	-0.02	0.02	-0.01	0.15	-0.05	0.00	0.00	0.52	-0.01	0.40	-0.02	0.38	***-0.03***
ΔINAV_Open	0.46	0.00	0.13	0.31	0.53	0.00	0.48	0.00	0.70	0.00	0.00	0.98	0.76	0.00	0.66	0.00	0.03	0.72	***0.42***
$\Delta S\&P_t$	0.79	0.00	0.71	0.00	0.57	0.00	0.49	0.00	0.63	0.00	0.68	0.00	0.82	0.00	0.99	0.00	0.54	0.00	***0.69***
$\Delta S\&P_{t-1}$	0.09	0.00	0.08	0.00	0.30	0.00	0.03	0.41	0.12	0.00	0.23	0.00	0.05	0.00	0.03	0.23	0.18	0.01	***0.12***
$\Delta S\&P_{t-2}$	0.09	0.00	0.08	0.00	0.13	0.00	0.05	0.00	0.07	0.00	0.05	0.01	0.03	0.00	0.02	0.21	0.09	0.00	***0.07***
ΔS&P_Open	0.09	0.00	0.07	0.02	0.30	0.00	0.18	0.00	-0.11	0.00	0.70	0.00	0.10	0.01	-0.10	0.01	0.51	0.00	***0.19***
ECT_t	-0.08	0.00	-0.02	0.35	-0.36	0.00	0.07	0.28	-0.07	0.00	-0.25	0.00	0.01	0.27	-0.01	0.71	-0.22	0.02	***-0.10***
ECT_{t-1}	-0.02	0.21	-0.02	0.23	0.22	0.00	-0.10	0.14	0.03	0.17	0.21	0.00	-0.02	0.24	0.01	0.76	0.08	0.30	***0.04***
ECT_{t-2}	0.10	0.00	0.05	0.00	0.14	0.00	0.03	0.01	0.04	0.00	0.04	0.01	0.00	0.57	0.00	0.84	0.14	0.00	***0.06***
ECT_Open	-0.56	0.00	-0.51	0.00	-0.20	0.00	-0.33	0.00	-0.59	0.00	0.19	0.00	-0.57	0.00	-0.55	0.00	0.05	0.62	***-0.34***
AR(1)	-0.29	0.00	-0.37	0.00	-0.01	0.43	-0.46	0.00	-0.38	0.00	-0.18	0.00	-0.26	0.00	-0.23	0.00	-0.18	0.06	***-0.26***
AR(2)	-0.08	0.00	-0.14	0.00	0.00	0.68	-0.21	0.00	-0.18	0.00	-0.12	0.00	-0.10	0.00	-0.08	0.00	-0.03	0.45	***-0.10***
AR(3)	-0.09	0.00	-0.10	0.00	-0.01	0.00	-0.10	0.00	-0.12	0.00	-0.08	0.00	-0.07	0.00	-0.04	0.00	-0.07	0.00	***-0.08***
AR(4)	-0.06	0.00	-0.07	0.00	0.00	0.42	-0.04	0.00	-0.05	0.00	-0.05	0.00	-0.04	0.00	-0.03	0.00	-0.08	0.01	***-0.05***
$\bar{R}^2$	0.63		0.51		0.49		0.32		0.68		0.05		0.61		0.81		0.17		***0.47***
Variance Equation:																			
Const.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	***0.00***
$Residual_{t-1}^2$	0.10	0.00	0.14	0.00	0.16	0.00	0.13	0.00	0.09	0.00	0.41	0.00	0.21	0.00	0.20	0.00	0.23	0.00	***0.19***
$GARCH_{t-1}$	0.90	0.00	0.87	0.00	0.61	0.00	0.87	0.00	0.91	0.00	0.72	0.00	0.85	0.00	0.83	0.00	0.86	0.00	***0.82***

Table 16

Regresion Results: 1 Min IGARCH & Lagged Variables

(Asia)

Country	**Australia**		**Hong Kong**		**Japan**		**Malaysia**		**Singapore**		**Taiwan**		**South Korea**		**China**		**Thailand**		***Average***
Ticker	**EWA**		**EWH**		**EWJ**		**EWM**		**EWS**		**EWT**		**EWY**		**FXI**		**THD**		
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	
Const.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***0.00***
$\Delta INAV_t$	0.28	0.00	0.09	0.00	0.08	0.00	0.00	0.70	0.08	0.00	0.00	0.68	-0.02	0.00	0.05	0.17	0.00	0.44	***0.06***
$\Delta INAV_{t-1}$	0.31	0.00	-0.11	0.00	-0.08	0.00	0.05	0.52	0.00	1.00	-0.20	0.00	-0.08	0.00	-0.01	0.45	0.04	0.63	***-0.01***
$\Delta INAV_{t-2}$	-0.15	0.00	-0.08	0.00	-0.06	0.00	-0.01	0.68	0.00	0.74	-0.04	0.00	-0.03	0.00	-0.02	0.00	0.02	0.32	***-0.04***
ΔINAV_Open	0.55	0.00	0.63	0.00	0.60	0.00	0.35	0.00	0.76	0.00	0.02	0.31	0.74	0.00	0.63	0.00	0.05	0.23	***0.48***
$\Delta S\&P_t$	1.00	0.00	0.72	0.00	0.56	0.00	0.51	0.00	0.66	0.00	0.73	0.00	0.73	0.00	1.02	0.00	0.54	0.00	***0.72***
$\Delta S\&P_{t-1}$	-0.29	0.00	0.29	0.00	0.15	0.00	0.04	0.34	0.10	0.00	0.26	0.00	0.26	0.00	0.12	0.00	-0.01	0.88	***0.10***
$\Delta S\&P_{t-2}$	0.11	0.00	0.15	0.00	0.09	0.00	0.04	0.00	0.04	0.00	0.08	0.00	0.12	0.00	0.05	0.00	0.04	0.13	***0.08***
ΔS&P_Open	-0.33	0.00	0.05	0.24	0.21	0.00	0.20	0.00	-0.23	0.00	0.69	0.00	0.03	0.58	-0.15	0.01	0.60	0.00	***0.12***
ECT_t	0.27	0.00	-0.32	0.00	-0.15	0.00	0.01	0.83	-0.06	0.01	-0.20	0.00	-0.15	0.00	-0.09	0.00	0.03	0.68	***-0.07***
ECT_{t-1}	-0.26	0.00	0.19	0.00	0.07	0.00	-0.04	0.57	0.04	0.07	0.16	0.00	0.09	0.00	0.05	0.01	-0.02	0.82	***0.03***
ECT_{t-2}	-0.01	0.42	0.14	0.00	0.08	0.00	0.02	0.13	0.02	0.08	0.04	0.00	0.06	0.00	0.04	0.00	-0.01	0.39	***0.04***
ECT_Open	-1.02	0.00	-0.24	0.00	-0.37	0.00	-0.21	0.00	-0.70	0.00	0.09	0.10	-0.41	0.00	-0.54	0.00	-0.20	0.01	***-0.40***
AR(1)	-0.59	0.00	0.00	0.89	-0.25	0.00	-0.34	0.00	-0.33	0.00	0.00	0.99	-0.11	0.00	-0.01	0.69	-0.30	0.00	***-0.21***
AR(2)	-0.14	0.00	0.00	0.95	-0.09	0.00	-0.10	0.00	-0.16	0.00	-0.02	0.06	0.09	0.00	-0.03	0.07	-0.12	0.00	***-0.06***
AR(3)	0.05	0.00	-0.02	0.00	-0.07	0.00	-0.05	0.00	-0.09	0.00	-0.03	0.00	-0.07	0.00	-0.02	0.03	-0.03	0.06	***-0.04***
AR(4)	-0.13	0.00	-0.01	0.00	-0.03	0.00	-0.02	0.00	-0.03	0.06	-0.02	0.00	-0.02	0.00	-0.02	0.02	-0.02	0.04	***-0.03***
$\overline{R}^2$	0.56		0.50		0.49		0.31		0.68		0.32		0.58		0.82		0.26		***0.50***
Variance Equation:																			
$Residual_{t-1}^2$	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.010	0.000	0.000	0.000	0.001	0.000	0.000	***0.00***
$GARCH_{t-1}$	1.000	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000	0.000	1.000	0.000	***1.00***

Table 17

Regresion Results: 15 Min GARCH & Lagged Variables

(Europe)

Country	**Sweden**		**Germany**		**Switzerland**		**Austria**		**Spain**		**France**		**United Kingdom**		**Turkey**		**Average**
Ticker	**EWD**		**EWG**		**EWL**		**EWO**		**EWP**		**EWQ**		**EWU**		**TUR**		
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	
Const.	0.00	0.00	0.00	0.98	0.00	0.00	0.00	0.05	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	***0.00***
$\Delta INAV_t$	0.37	0.00	0.64	0.00	0.69	0.00	0.74	0.00	0.72	0.00	0.61	0.00	0.62	0.00	0.41	0.00	***0.60***
$\Delta INAV_{t-1}$	0.03	0.50	0.31	0.00	-0.03	0.05	-0.03	0.18	-0.01	0.54	-0.05	0.00	0.00	0.76	0.23	0.16	***0.05***
$\Delta INAV_{t-2}$	0.03	0.53	-0.06	0.00	-0.02	0.16	0.00	0.90	-0.04	0.00	0.00	0.86	-0.02	0.18	0.01	0.62	***-0.01***
ΔINAV_Open	0.50	0.00	-0.09	0.00	0.08	0.00	0.11	0.00	0.06	0.02	0.12	0.00	0.05	0.16	0.00	0.97	***0.10***
$\Delta INAV\_Synchronized_t$	-0.12	0.00	0.28	0.00	0.10	0.00	0.08	0.00	0.12	0.00	0.20	0.00	0.15	0.00	0.42	0.02	***0.15***
$\Delta INAV\_Synchronized_{t-1}$	0.05	0.28	-0.28	0.00	0.04	0.01	0.03	0.15	0.03	0.08	0.04	0.03	0.00	0.87	-0.15	0.27	***-0.03***
$\Delta INAV\_Synchronized_{t-2}$	0.00	0.98	0.06	0.00	0.00	0.96	0.00	0.94	0.03	0.03	-0.02	0.38	0.01	0.68	0.00	0.95	***0.01***
$\Delta S\&P_t$	0.35	0.00	0.84	0.00	0.65	0.00	0.69	0.00	0.77	0.00	0.76	0.00	0.72	0.00	1.00	0.00	***0.72***
$\Delta S\&P_{t-1}$	0.18	0.00	-0.26	0.01	0.10	0.00	0.06	0.01	0.08	0.01	0.09	0.00	0.09	0.00	-0.16	0.13	***0.02***
$\Delta S\&P_{t-2}$	0.15	0.00	0.07	0.00	0.03	0.06	-0.04	0.05	0.06	0.00	0.01	0.64	0.04	0.00	-0.07	0.05	***0.03***
ΔS&P_Open	-0.05	0.43	0.18	0.00	-0.16	0.00	-0.19	0.00	-0.17	0.00	-0.25	0.00	0.02	0.57	-0.05	0.70	***-0.08***
$\Delta S\&P\_Synchronized_{t-1}$	0.01	0.83	-0.74	0.00	-0.34	0.00	-0.38	0.00	-0.47	0.00	-0.39	0.00	-0.44	0.00	-0.58	0.00	***-0.42***
$\Delta S\&P\_Synchronized_{t-2}$	-0.21	0.00	0.22	0.01	-0.09	0.00	-0.05	0.02	-0.09	0.00	-0.07	0.00	-0.09	0.00	0.03	0.63	***-0.04***
$\Delta S\&P\_Synchronized_t$	-0.09	0.06	-0.08	0.00	0.00	0.97	0.06	0.03	-0.03	0.13	0.02	0.49	-0.02	0.17	0.06	0.08	***-0.01***
ECT_t	-0.11	0.00	0.06	0.16	-0.14	0.00	-0.03	0.23	-0.06	0.07	-0.09	0.02	-0.13	0.00	0.18	0.05	***-0.04***
ECT_{t-1}	0.02	0.63	-0.07	0.08	0.08	0.01	0.05	0.05	0.00	0.96	0.06	0.06	0.08	0.00	-0.12	0.11	***0.01***
ECT_{t-2}	0.08	0.00	0.01	0.63	0.04	0.05	-0.01	0.54	0.06	0.00	0.02	0.39	0.03	0.01	-0.06	0.04	***0.02***
ECT_Open	-0.25	0.00	-0.71	0.00	-0.52	0.00	-0.61	0.00	-0.68	0.00	-0.62	0.00	-0.46	0.00	-0.70	0.00	***-0.57***
$ECT\_Synchronized_{t-1}$	0.04	0.03	-0.15	0.00	-0.09	0.00	-0.04	0.07	-0.11	0.00	-0.20	0.00	0.02	0.03	-0.05	0.16	***-0.07***
$ECT\_Synchronized_{t-2}$	-0.06	0.03	0.06	0.10	-0.03	0.21	-0.02	0.31	0.01	0.75	-0.02	0.44	-0.03	0.01	0.03	0.51	***-0.01***
$ECT\_Synchronized_t$	0.01	0.67	-0.01	0.61	0.01	0.46	0.04	0.05	-0.02	0.38	0.00	0.94	-0.01	0.32	0.02	0.25	***0.01***
AR(1)	-0.33	0.00	-0.25	0.00	-0.14	0.00	-0.24	0.00	-0.17	0.00	-0.15	0.00	-0.16	0.00	-0.43	0.00	***-0.23***
AR(2)	-0.14	0.00	-0.12	0.00	0.00	0.86	-0.11	0.00	0.01	0.48	-0.01	0.71	-0.02	0.16	-0.21	0.01	***-0.07***
AR(3)	-0.09	0.00	0.00	0.79	0.01	0.27	-0.05	0.00	-0.01	0.49	-0.03	0.01	-0.02	0.04	-0.14	0.06	***-0.04***
AR(4)	-0.08	0.00	-0.03	0.09	0.01	0.34	-0.04	0.00	0.03	0.02	0.02	0.31	0.00	0.67	0.00	0.88	***-0.01***
$\overline{R}^2$	0.59		0.80		0.84		0.83		0.89		0.93		0.81		0.66		***0.80***
Variance Equation:																	
Const.	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.21	0.00	0.02	0.00	0.30	0.00	0.03	0.00	0.26	***0.00***
$Residual_{t-1}^2$	0.07	0.00	1.15	0.01	0.02	0.00	0.09	0.00	0.03	0.12	0.17	0.00	0.04	0.00	0.01	0.33	***0.20***
$GARCH_{t-1}$	0.92	0.00	0.36	0.00	0.98	0.00	0.90	0.00	0.95	0.00	0.77	0.00	0.96	0.00	0.99	0.00	***0.85***

Table 18

Regresion Results: 15 Min IGARCH & Lagged Variables (Europe)

Country	Sweden		Germany		Switzerland		Austria		Spain		France		United Kingdom		Turkey		*Average*
Ticker	EWD		EWG		EWL		EWO		EWP		EWQ		EWU		TUR		
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	
Const.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.00	***0.00***
$\Delta INAV_t$	0.36	0.00	0.68	0.00	0.68	0.00	0.74	0.00	0.65	0.00	0.57	0.00	0.62	0.00	0.41	0.00	***0.59***
$\Delta INAV_{t-1}$	0.01	0.81	0.02	0.16	-0.03	0.21	-0.07	0.00	-0.05	0.04	-0.07	0.01	-0.01	0.57	0.23	0.14	***0.00***
$\Delta INAV_{t-2}$	0.03	0.49	-0.13	0.00	-0.01	0.25	0.01	0.58	0.00	0.81	-0.04	0.11	-0.01	0.24	0.01	0.65	***-0.02***
ΔINAV_Open	0.53	0.00	-0.37	0.00	0.09	0.00	0.23	0.00	0.34	0.00	0.17	0.00	0.04	0.24	0.00	0.97	***0.13***
$\Delta INAV\_Synchronized_t$	-0.12	0.01	0.06	0.13	0.09	0.01	0.02	0.64	-0.12	0.00	0.16	0.00	0.15	0.00	0.42	0.02	***0.08***
$\Delta INAV\_Synchronized_{t-1}$	0.06	0.22	0.06	0.00	0.03	0.09	0.05	0.03	0.06	0.00	0.05	0.06	0.00	0.82	-0.15	0.25	***0.02***
$\Delta INAV\_Synchronized_{t-2}$	0.00	0.91	0.06	0.00	0.00	0.95	-0.01	0.65	-0.03	0.06	0.03	0.32	0.00	0.92	0.00	0.90	***0.01***
$\Delta S\&P_t$	0.34	0.00	0.76	0.00	0.66	0.00	0.72	0.00	0.75	0.00	0.80	0.00	0.73	0.00	1.00	0.00	***0.72***
$\Delta S\&P_{t-1}$	0.20	0.00	0.07	0.01	0.10	0.00	0.19	0.00	0.06	0.06	0.13	0.00	0.10	0.00	-0.17	0.11	***0.09***
$\Delta S\&P_{t-2}$	0.15	0.00	0.23	0.00	0.02	0.16	0.02	0.52	-0.04	0.02	0.04	0.26	0.04	0.00	-0.07	0.04	***0.05***
ΔS&P_Open	-0.04	0.47	0.73	0.00	-0.16	0.00	-0.42	0.00	-0.65	0.00	-0.35	0.00	0.03	0.46	-0.04	0.70	***-0.11***
$\Delta S\&P\_Synchronized_{t-1}$	-0.01	0.79	-0.41	0.00	-0.33	0.00	-0.19	0.00	0.02	0.39	-0.32	0.00	-0.44	0.00	-0.58	0.00	***-0.28***
$\Delta S\&P\_Synchronized_{t-2}$	-0.18	0.00	-0.18	0.00	-0.08	0.00	-0.14	0.00	-0.06	0.07	-0.09	0.04	-0.09	0.00	0.03	0.64	***-0.10***
$\Delta S\&P\_Synchronized_t$	-0.10	0.03	-0.11	0.00	0.00	0.99	-0.02	0.58	0.11	0.00	-0.02	0.64	-0.01	0.21	0.06	0.07	***-0.01***
ECT_t	-0.14	0.00	-0.13	0.00	-0.12	0.00	-0.22	0.00	-0.02	0.60	-0.14	0.00	-0.13	0.00	0.18	0.04	***-0.09***
ECT_{t-1}	0.04	0.33	-0.10	0.00	0.07	0.02	0.13	0.01	0.11	0.01	0.08	0.09	0.08	0.00	-0.12	0.10	***0.04***
ECT_{t-2}	0.09	0.00	0.22	0.00	0.03	0.17	0.09	0.01	-0.12	0.00	0.05	0.21	0.03	0.01	-0.06	0.03	***0.04***
ECT_Open	-0.22	0.00	-0.30	0.01	-0.53	0.00	-0.39	0.00	-0.70	0.00	-0.68	0.00	-0.46	0.00	-0.70	0.00	***-0.50***
$ECT\_Synchronized_{t-1}$	0.04	0.03	0.02	0.65	-0.09	0.02	-0.05	0.25	-0.09	0.03	-0.08	0.09	0.03	0.01	-0.05	0.14	***-0.04***
$ECT\_Synchronized_{t-2}$	-0.05	0.05	0.04	0.27	-0.03	0.29	-0.03	0.47	-0.10	0.01	-0.03	0.55	-0.04	0.00	0.03	0.50	***-0.03***
$ECT\_Synchronized_t$	0.00	0.99	-0.14	0.00	0.02	0.31	-0.05	0.13	0.12	0.00	-0.05	0.29	0.00	0.84	0.02	0.24	***-0.01***
AR(1)	-0.31	0.00	-0.21	0.00	-0.15	0.00	0.00	0.92	-0.20	0.00	-0.12	0.00	-0.15	0.00	-0.43	0.00	***-0.19***
AR(2)	-0.12	0.00	0.08	0.00	-0.01	0.57	0.00	0.90	-0.06	0.01	-0.01	0.63	-0.02	0.22	-0.22	0.01	***-0.04***
AR(3)	-0.09	0.00	0.05	0.00	0.01	0.30	0.00	0.84	-0.05	0.00	-0.02	0.31	-0.02	0.03	-0.14	0.04	***-0.03***
AR(4)	-0.08	0.00	0.02	0.01	0.01	0.43	0.00	0.88	0.03	0.04	-0.01	0.60	0.00	0.80	0.00	0.92	***0.00***
$\overline{R}^2$	0.59		0.76		0.84		0.84		0.91		0.93		0.81		0.66		***0.79***
Variance Equation:																	
$Residual_{t-1}^2$	0.02	0.00	0.01	0.00	0.01	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.00	***0.01***
$GARCH_{t-1}$	0.98	0.00	0.99	0.00	0.99	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.98	0.00	0.99	0.00	***0.99***

Table 19

Regresion Results: 1 Min GARCH & Lagged Variables

(Europe)

Country	**Sweden**		**Germany**		**Switzerland**		**Austria**		**Spain**		**France**		**United Kingdom**		**Turkey**		***Average***
Ticker	**EWD**		**EWG**		**EWL**		**EWO**		**EWP**		**EWQ**		**EWU**		**TUR**		
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	
Const.	0.00	0.73	0.00	0.00	0.00	0.07	0.00	0.49	0.00	0.00	0.00	0.98	0.00	0.00	0.00	0.03	***0.00***
$\Delta INAV_t$	0.52	0.00	0.20	0.01	0.49	0.00	0.45	0.00	0.60	0.00	0.70	0.00	0.27	0.00	0.21	0.00	***0.43***
$\Delta INAV_{t-1}$	0.14	0.00	-0.20	0.00	0.14	0.00	0.16	0.00	0.09	0.00	0.06	0.39	-0.04	0.01	-0.03	0.60	***0.04***
$\Delta INAV_{t-2}$	0.06	0.00	-0.05	0.01	0.01	0.46	-0.02	0.44	0.02	0.07	0.01	0.46	-0.01	0.30	-0.09	0.03	***-0.01***
ΔINAV_Open	0.19	0.00	0.27	0.16	0.07	0.01	0.25	0.00	0.10	0.00	0.06	0.08	0.50	0.00	-0.01	0.89	***0.18***
$\Delta INAV\_Synchronized_t$	0.14	0.00	0.25	0.00	0.14	0.00	0.11	0.00	0.14	0.00	0.05	0.74	-0.05	0.55	0.15	0.00	***0.12***
$\Delta INAV\_Synchronized_{t-1}$	-0.06	0.03	0.11	0.00	-0.05	0.00	-0.07	0.01	-0.01	0.73	0.02	0.76	0.04	0.00	0.15	0.00	***0.02***
$\Delta INAV\_Synchronized_{t-2}$	-0.08	0.00	0.00	0.81	-0.05	0.00	0.01	0.82	-0.04	0.01	-0.04	0.02	-0.02	0.08	0.04	0.30	***-0.02***
$\Delta S\&P_t$	0.71	0.00	0.56	0.00	0.59	0.00	0.49	0.00	0.67	0.00	0.71	0.00	0.63	0.00	0.88	0.00	***0.65***
$\Delta S\&P_{t-1}$	0.14	0.00	0.23	0.00	0.12	0.00	0.18	0.00	0.10	0.00	0.05	0.01	0.17	0.00	0.33	0.00	***0.16***
$\Delta S\&P_{t-2}$	0.09	0.00	0.09	0.00	0.10	0.00	0.09	0.00	0.10	0.00	0.11	0.00	0.12	0.00	0.20	0.00	***0.11***
ΔS&P_Open	-0.03	0.34	0.01	0.98	0.15	0.00	0.09	0.02	0.08	0.08	0.15	0.06	-0.07	0.26	0.58	0.00	***0.12***
$\Delta S\&P\_Synchronized_{t-1}$	-0.45	0.00	-0.25	0.00	-0.38	0.00	-0.31	0.00	-0.52	0.00	-0.55	0.00	-0.11	0.05	-0.41	0.00	***-0.37***
$\Delta S\&P\_Synchronized_{t-2}$	-0.17	0.00	-0.08	0.00	-0.16	0.00	-0.18	0.00	-0.12	0.00	-0.13	0.00	-0.11	0.00	-0.31	0.00	***-0.16***
$\Delta S\&P\_Synchronized_t$	-0.05	0.00	0.00	0.88	-0.06	0.00	-0.04	0.13	-0.08	0.00	-0.07	0.01	-0.07	0.00	-0.12	0.00	***-0.06***
ECT_t	-0.03	0.09	-0.38	0.00	-0.04	0.18	-0.09	0.00	-0.04	0.03	-0.03	0.36	-0.22	0.00	-0.17	0.00	***-0.12***
ECT_{t-1}	-0.08	0.00	0.22	0.00	-0.10	0.00	-0.08	0.00	-0.05	0.02	-0.08	0.07	0.08	0.00	0.03	0.52	***-0.01***
ECT_{t-2}	0.11	0.00	0.15	0.00	0.14	0.00	0.17	0.00	0.10	0.00	0.11	0.01	0.13	0.00	0.13	0.00	***0.13***
ECT_Open	-0.67	0.00	-0.36	0.00	-0.47	0.00	-0.43	0.00	-0.71	0.00	-0.76	0.00	-0.23	0.00	-0.20	0.01	***-0.48***
$ECT\_Synchronized_{t-1}$	-0.01	0.26	0.00	0.76	-0.04	0.01	0.01	0.44	-0.01	0.21	-0.02	0.66	0.01	0.05	0.07	0.00	***0.00***
$ECT\_Synchronized_{t-2}$	-0.01	0.25	-0.02	0.20	0.00	0.87	0.00	0.94	-0.01	0.66	0.02	0.60	-0.01	0.10	-0.09	0.00	***-0.01***
$ECT\_Synchronized_t$	0.00	0.82	0.01	0.60	0.02	0.17	-0.02	0.01	-0.02	0.05	-0.05	0.10	0.00	0.45	0.00	0.95	***-0.01***
AR(1)	-0.48	0.00	0.00	0.90	-0.48	0.00	-0.39	0.00	-0.47	0.00	-0.52	0.00	-0.21	0.00	-0.31	0.00	***-0.36***
AR(2)	-0.17	0.00	0.00	0.72	-0.16	0.00	-0.09	0.00	-0.20	0.00	-0.23	0.00	-0.04	0.00	-0.05	0.10	***-0.12***
AR(3)	-0.12	0.00	0.00	0.51	-0.14	0.00	-0.11	0.00	-0.16	0.00	-0.16	0.00	-0.10	0.00	-0.07	0.00	***-0.11***
AR(4)	-0.07	0.00	0.00	0.47	-0.09	0.00	-0.08	0.00	-0.10	0.00	-0.10	0.00	-0.05	0.00	-0.07	0.00	***-0.07***
$\overline{R}^2$	0.59		0.50		0.43		0.46		0.64		0.51		0.50		0.41		***0.51***
Variance Equation:																	
Const.	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.15	***0.00***
$Residual_{t-1}^2$	0.14	0.00	0.15	0.00	0.13	0.00	0.15	0.00	0.15	0.00	0.17	0.00	0.09	0.00	0.09	0.00	***0.13***
$GARCH_{t-1}$	0.87	0.00	0.60	0.00	0.88	0.00	0.86	0.00	0.84	0.00	0.85	0.00	0.91	0.00	0.91	0.00	***0.84***

Table 20

Regresion Results: 1 Min IGARCH & Lagged Variables

(Europe)

Country	**Sweden**		**Germany**		**Switzerland**		**Austria**		**Spain**		**France**		**United Kingdom**		**Turkey**		***Average***
Ticker	**EWD**		**EWG**		**EWL**		**EWO**		**EWP**		**EWQ**		**EWU**		**TUR**		
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	
Const.	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	***0.00***
$\Delta INAV_t$	0.51	0.00	0.15	0.02	0.48	0.00	0.49	0.00	0.61	0.00	0.57	0.00	0.62	0.00	0.22	0.00	***0.46***
$\Delta INAV_{t-1}$	0.13	0.00	-0.19	0.02	0.15	0.00	0.13	0.00	0.09	0.00	-0.10	0.05	-0.01	0.57	0.17	0.00	***0.05***
$\Delta INAV_{t-2}$	0.02	0.40	0.15	0.03	0.00	0.81	0.02	0.27	0.03	0.11	-0.06	0.15	-0.01	0.24	0.01	0.68	***0.02***
ΔINAV_Open	0.17	0.00	-0.15	0.12	0.12	0.00	0.18	0.00	0.07	0.03	0.26	0.00	0.04	0.24	0.24	0.00	***0.12***
$\Delta INAV\_Synchronized_t$	0.14	0.00	0.35	0.00	0.12	0.00	0.11	0.00	0.13	0.00	0.08	0.07	0.15	0.00	0.13	0.00	***0.15***
$\Delta INAV\_Synchronized_{t-1}$	-0.04	0.09	-0.06	0.44	-0.05	0.00	-0.03	0.28	-0.06	0.02	0.17	0.00	0.00	0.82	-0.01	0.75	***-0.01***
$\Delta INAV\_Synchronized_{t-2}$	-0.03	0.06	-0.21	0.00	-0.03	0.00	-0.04	0.03	0.00	0.83	-0.02	0.81	0.00	0.92	-0.02	0.28	***-0.04***
$\Delta S\&P_t$	0.69	0.00	0.64	0.00	0.60	0.00	0.55	0.00	0.66	0.00	0.61	0.00	0.73	0.00	0.72	0.00	***0.65***
$\Delta S\&P_{t-1}$	0.11	0.00	0.23	0.00	0.08	0.00	0.17	0.00	0.09	0.00	0.39	0.00	0.10	0.00	0.05	0.19	***0.15***
$\Delta S\&P_{t-2}$	0.10	0.00	0.01	0.67	0.10	0.00	0.13	0.00	0.05	0.00	0.11	0.02	0.04	0.00	0.05	0.07	***0.08***
ΔS&P_Open	-0.01	0.73	0.30	0.05	0.13	0.00	0.15	0.00	0.14	0.00	-0.12	0.28	0.03	0.46	0.19	0.02	***0.10***
$\Delta S\&P\_Synchronized_{t-1}$	-0.41	0.00	-0.29	0.00	-0.37	0.00	-0.37	0.00	-0.47	0.00	-0.40	0.00	-0.44	0.00	-0.27	0.00	***-0.38***
$\Delta S\&P\_Synchronized_{t-2}$	-0.14	0.00	0.17	0.00	-0.15	0.00	-0.18	0.00	-0.06	0.02	-0.39	0.00	-0.09	0.00	-0.05	0.21	***-0.11***
$\Delta S\&P\_Synchronized_t$	-0.06	0.00	0.12	0.00	-0.07	0.00	-0.09	0.00	-0.09	0.00	-0.05	0.52	-0.01	0.21	-0.03	0.33	***-0.04***
ECT_t	-0.03	0.23	-0.35	0.00	-0.03	0.29	-0.07	0.00	-0.01	0.72	-0.51	0.00	-0.13	0.00	0.09	0.04	***-0.13***
ECT_{t-1}	-0.07	0.00	0.36	0.00	-0.11	0.00	-0.06	0.02	-0.05	0.22	0.31	0.02	0.08	0.00	-0.16	0.00	***0.04***
ECT_{t-2}	0.10	0.00	-0.02	0.65	0.13	0.00	0.13	0.00	0.06	0.00	0.19	0.01	0.03	0.01	0.06	0.01	***0.09***
ECT_Open	-0.68	0.00	-0.17	0.05	-0.55	0.00	-0.46	0.00	-0.65	0.00	-0.53	0.00	-0.46	0.00	-0.55	0.00	***-0.51***
$ECT\_Synchronized_{t-1}$	0.00	0.88	-0.14	0.00	-0.01	0.21	0.02	0.02	0.01	0.55	0.24	0.00	0.03	0.01	0.01	0.67	***0.02***
$ECT\_Synchronized_{t-2}$	-0.01	0.48	-0.02	0.69	-0.01	0.28	-0.02	0.04	-0.03	0.19	-0.32	0.03	-0.04	0.00	-0.01	0.83	***-0.06***
$ECT\_Synchronized_t$	0.00	0.63	0.16	0.00	-0.01	0.39	-0.01	0.16	-0.02	0.12	0.04	0.75	0.00	0.84	-0.01	0.39	***0.02***
AR(1)	-0.47	0.00	0.07	0.14	-0.47	0.00	-0.41	0.00	-0.46	0.00	-0.07	0.39	-0.15	0.00	-0.49	0.00	***-0.31***
AR(2)	-0.17	0.00	-0.05	0.04	-0.15	0.00	-0.12	0.00	-0.22	0.00	-0.11	0.31	-0.02	0.22	-0.19	0.00	***-0.13***
AR(3)	-0.12	0.00	-0.18	0.00	-0.13	0.00	-0.11	0.00	-0.13	0.00	-0.12	0.01	-0.02	0.03	-0.11	0.00	***-0.12***
AR(4)	-0.07	0.00	-0.19	0.00	-0.08	0.00	-0.07	0.00	-0.08	0.00	-0.04	0.46	0.00	0.80	-0.06	0.00	***-0.07***
$\overline{R}^2$	0.59		0.46		0.43		0.46		0.64		0.54		0.81		0.41		***0.54***
Variance Equation:																	
$Residual_{t-1}^2$	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.28	0.00	0.00	0.00	0.00	***0.00***
$GARCH_{t-1}$	1.00	0.00	1.00	0.00	0.99	0.00	0.99	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00	***1.00***