

# Does Integration Occur on a Certain Day? The Case of the Lithuanian Stock Market

Rayenda Brahmana, Muath Asmar \*

## Abstract:

***This paper explores the intersection between market integration and Weekend Effect by investigating the possibility of integration to occur in a certain day over the period of 1 January 1990 until 31 December 2010. The integration was retrieved from the intercept time varying rolling regression of Stehle's (1977) ICAPM Model. Meanwhile, the Weekend effect is captured by the intercept time varying rolling regression of French's (1980) Monday Effect Model. For robustness, we modified the French's Model to examine the seasonality inside market integration with Exchange Rate and Oil Prices as the control variable. This research remarks the seasonality of Lithuanian stock market integration.***

**Key words:** Market Integration, Weekend Anomaly, Portfolio Benefit, Lithuanian Stock Market

**JEL:** F36, G14, G11

**DOI:** 10.2478/v10033-011-0012-0

## 1. Introduction

Stock market integration research has been extensively conducted and evolving over the past several years. However, exploration in this area has continued because of its contribution to the body of knowledge and industrial practices. One of the important issues of market integration is how it can appear in most stock markets in the world.

Interestingly, just like market integration, most stock markets also experience the weekend effect, a calendar anomaly associated with the distribution of daily common stock returns. The weekend effect refers to the repeated returns cycle on a certain day (usually Monday). Those particular returns have had a negatively high dispersal compared to other days. Such a phenomenon has been verified mainly in the developed market over the past two decades.

Related back to market integration, this event indicates ignorance of the equity risk premium and diminishing potential cross-border diversification. To a finance manager on the corporate level, stock market integration indicates that there are fewer opportunities to

acquire capital at lower cost across borders, awarding the discouragement of foreign listing activities. The other contributions from stock market integration cater to the potential for welfare gains (see Cole and Obstfeld, 1992; Van Wincoop, 1994; Lewis, 1996) and beneficial consequences on long-term economic growth (see Obstfeld, 1994; Devereux and Smith, 1994; Levine and Zervos, 1996, 1998; Bekaert et al., 2001, 2005).

However, the recent catastrophic economic events such as the Asian Monetary Crisis 1997 and the Global Crisis of 2008 have countered those early findings, showing the high correlation of dossiers among stock

### \* Rayenda Brahmana

Finance Cluster. School of Management, Universiti  
Sains Malaysia  
E-mail: raye\_brahm@yahoo.com

### Muath Asmar

Finance Cluster. School of Management, Universiti  
Sains Malaysia

		Lithuania Stock Return				
		Monday	Tuesday	Wednesday	Thursday	Friday
World Stock Return	Monday	0.5289				
	Tuesday		0.3374			
	Wednesday			0.3379		
	Thursday				0.3419	
	Friday					0.3403

**Table 1:** The Occurrence of Lithuanian Returns Correlation on a Certain Day

markets in the world. These global economic disasters have affected the allure of the transmission of stock market falls. In short, they suggest the increasing value of stock market integration.

It is noteworthy that several researchers have also found a high correlation among stock markets on a certain day, a phenomenon known as seasonality. For example a study by Tang and Kwok (1994) reported that correlation among stocks was highest during Monday. Tang and Kwok (1997) also found a strong seasonality component on the day of the week effect in correlations of Australia, Germany, Hong Kong, Japan, the UK, and the US.

The first paper that linked market integration and seasonality was by Jaffe and Westerfield (1985). They examined seasonality in terms of correlation between many stock markets and the US stock market. More recently, Chandra (2006) constructed the day of the week effect in the returns and conditional correlation for various Asia Pacific equity markets. The paper found the day of the week effect in the returns and correlations for some of these markets.

To prove this anomalous condition, we successfully demonstrate it in Table 1. By following the preliminary result of Jaffe and Westerfield (1985), Table 1 suggests that there is a strong weekend effect pattern on market correlation. As we have known, market integration starts from the correlation among national stock returns. The seasonality correlation depicted in Table 1 implies that there might be a high correlation between these two markets on Monday. In short, there is a possibility that market integration occurs on Monday.

Table 1 vividly shows the symptoms of market integration seasonality. Intuitively, if the market integration and weekend effect together occur in the market, it elicits speculation on whether it might be an intersection between the weekend effect and market integration. In other words, if the stock market around the

world experiences the weekend effect, it might be a possibility that the integration across the country occurs on a certain day. This is what we call the seasonality of the weekend effect. Unfortunately, studies that explores the seasonality of market integration are rare - a gap that this study intends to fill.

This research study aims to investigate if stock market integration also follows the anomaly of the weekend effect. Connecting these two phenomena, we hypothesize that there is a possibility of seasonality in market integration. In light of such possible interactions between the weekend effect and market integration, it is surprising that there is relatively little literature on these associations, except the discussion of seasonality in stock market correlation (See Jaffe and Westerfield, 1985). This is an interesting peculiarity, considering its possible contributions, such as: (1) global fund managers will have comprehensive knowledge about seasonality in market integration that will allow them to construct a new investment strategy; (2) portfolios will significantly diminish on certain days; and (3) signals of a financial contagion can spread out faster on a certain day.

The remainder of this paper is structured as follows. The next section will address the literature review. After that we outline an empirical approach in section 3 by showing the measurement development of the weekend effect and market integration while addressing the equation model. The model in this paper is estimated by using a cointegration test, Granger Causality, and Regression. The results of these tests will be addressed in section 4. The last section will discuss and conclude the paper.

## 2. Literature

The generally accepted definition of market integration is an event where prices among the different locations have co-movement over a long period,

indicating the significant correlation between two or more stock markets. Co-movement implies diminishing portfolio benefits. Hence, market integration is an event where portfolio benefits are lessened.

This market integration has been extensively documented in many ways. For instance, Arshanapalli & Doukas (1993), Meric & Meric (1997), and Hardouvelis, Malliaropoulos, & Priestly (2006) investigated the market integration of developed markets. Daly (2003) examined the integration of emerging markets into the world market. Further, several research studies investigated market integration in terms of its trading block (Fredericsson and Mani, 2004) or regionalism (Bussiere, Fidrmuc, and Schnatz, 2005).

In terms of Lithuanian stock market integration, it is actually hard to find empirical research, as the Lithuanian Stock market is a relatively new stock market. So far, we only found Guiso, Jappelli, Padula and Pagano (2004) who attempted to estimate the integration of European Countries, including Lithuania, by gauging financial market development and growth. In their research, the Lithuanian stock market was found to show integration with other European Stock markets on the industry level and firm level. Another recent research study was conducted by Welfens and Islami (2010), which examined the financial market integration of the Eastern European stock market, including the Lithuanian stock market.

On the other hand, we also found that the weekend effect occurs in most stock markets in the world. The presence of the weekend effect would mean that equity returns are not independent of the day of the week. We compiled weekend effect studies around the world. The early studies of this anomaly are Cross (1973) and French (1980) who introduced the first definitions of the weekend effect and the Monday effect.

Further, French and Roll (1986) and Damodaran (1989) examined the information flow over the weekend and found that Monday's variance is more than three times that of other days of the week. Tong (2000) demonstrated that trade-orders on Monday are conditional on the previous week or Friday's return by using a t-test. This weekend effect is also found in both developed stock markets and developing stock markets.

There is also not much research investigating the weekend effect in Lithuanian stock markets. Ajayi, Mehdi, and Perry (2004) found significant negative Monday returns in the Lithuanian stock market. Sakalauskas & Krikščiūnienė (2007) found that the daily trading volume of the Vilnius Stock differs according to

the weekend effect. Thus, there is no research investigating the association between the Lithuanian stock market integration and its weekend effect.

The association between market integration and weekend effect is very rare. So far, we have only found empirical results discussing correlations between seasonality and the stock market (see Jaffe and Westerfield, 1985). They investigated seasonality and stock market correlation for the US stock market on other markets. By using descriptive analysis, they found seasonality to be within correlations among stock markets. Moreover, there is a possibility that the correlation between two markets becomes stronger on a certain day. The relatively infrequent discussion of Lithuanian stock market integration, the Lithuanian weekend effect, and the seasonality of Lithuanian market integration lends importance to this paper, especially considering the implications of stock market integration both for practitioners and academics.

### 3. Methodology and Data

#### 3.1. Market Integration Measurements

This paper follows Bekaert & Harvey (1995), Dumas & Solnik (1995), Ferson & Harvey (1991), and Hardouvelis et al. (2001) in developing a measurement of market integration, which was developed from the International CAPM of Steehle (1977). The model is as follows.

$$E_{t-1}(r_{i,t}) = \lambda_w \beta_{i,w} + \lambda_d \beta_{i,d} \quad (1)$$

Where  $r_{it}$  is the excess return on the domestic portfolio  $i$ ,  $\lambda$  is the market risk premium,  $\beta_{iw}$  is the risk of portfolio  $i$  relative to world portfolio,  $w$  is defined as  $\beta_{iw} = COV_{t-1}[r_{i,t}, r_{w,t}] / VAR_{t-1}[r_{i,t}]$  and  $\beta_{id}$  is the domestic market portfolio  $d$ . The null hypothesis of the integration is  $\lambda_d$  equal to zero.

We developed an integration index by using time varying of rolling regression to retrieve the market integration data series. Following Bekaert and Harvey (1995) and Korajzyk (1996), we estimated the integration by using the following formula:

$$R_{w,t} - R_{FW,t} = \alpha_i + \beta_i (R_{m,t} - R_{FM,t}) + \varepsilon_{i,t} \quad (2)$$

Where  $R_{w,t}$  is the returns of the world portfolio in time  $t$ .  $R_{FW,t}$  is the returns of the international risk free rate.  $R_{m,t}$  is the returns of the market.  $R_{FM,t}$  is the risk free rate of the domestic market. This equation implies the domestic market integrates into the world. The  $\alpha$  shows the level of integration. According to Bekaert and Harvey (1995), the

closer the intercept is to zero, the more it indicates integration. Perfect integration will be indicated by a zero index.

The intercept was obtained by employing a 60-day window size rolling regression of equation (2). After running the one day looping of this rolling regression, we adjusted the market integration index by trailing the Leving and Zervos (1998) method, as follows.

$$MI_{i,t} = -|\hat{\alpha}_{i,t}| \quad (3)$$

### 3.2. Weekend Effect Measurements

This paper adapts French's Model (1980) to retrieve the weekend effect where the formula is:

$$R_{i,t} = \alpha_t + \beta_1 D_{Tues} + \beta_2 D_{Wed} + \beta_3 D_{Thur} + \beta_4 D_{Fri} + \varepsilon_t \quad (4)$$

Where  $R_{i,t}$  is the stock returns of market/firm  $i$  in period  $t$ .  $D_{Tues}$ ,  $D_{Wed}$ ,  $D_{Thur}$ , and  $D_{Fri}$  are the Tuesday Dummy, Wednesday Dummy, Thursday Dummy, and Friday Dummy, respectively. According to Gujarati and Porter (2009), if there are more than 3 or 4 dummies, the equation will be charged on a dummy trap. With regard to avoiding the dummy trap, one dummy has to be eliminated and its proxy replaced by an intercept without reducing the main point of the equation.

In French's Model (1980), there is no Monday Dummy, and the weekend effect is represented by the significant result in the intercept. This is in line with the Gujarati and Porter (2009) dummy trap elimination. This is also the reason why we chose French's Model (1980) as the weekend effect model.

Hence, we employed again the rolling regression of a 60-day window size to collect the measurements. The intercept of equation (4) indicates the weekend anomaly. We pulled out if there is not a significant result at the intercept.

### 3.3. The Research Empirical Model

The empirical model for this research study is a straightforward model:

$$MI_t = \alpha + \beta_{1,t} DOWA_t + \varepsilon_t \quad (5)$$

This model examines the dynamic relationship between market integration and the day-of-the week anomaly (DOWA). As a robustness check, we tested again

the occurrence of integration on a certain day by regressing the modification of French's Model (1980).

It is noteworthy that running the modified French's (1980) model needs several procedures. First, we employed the returns difference between the world stock market and the Lithuanian stock market. This "abnormal returns" or returns difference is our dependent variable. It is a robust proxy because it not only mimics the probability to gain abnormal returns by "picking" Lithuania, but also shows the dispersion of the Lithuania returns from World returns. The more it is dispersed from world returns distribution, the less it is integrated. The independent variables are the French's Model (1980) dummy variable where the intercept representing the Monday Effect. The formula is:

$$R_{diff(W,D)} = \beta_1 D_{Mon} + \beta_2 D_{Tues} + \beta_3 D_{Wed} + \beta_4 D_{Thur} + \beta_5 D_{Fri} + \beta_6 ER_t + \beta_7 OIL_t + \varepsilon_t \quad (6)$$

Where  $R_{diff(W,D)}$  is the return difference between the World Market and the Lithuanian Market.  $D_{Tues}$ ,  $D_{Wed}$ ,  $D_{Thur}$ , and  $D_{Fri}$  are the Tuesday Dummy, Wednesday Dummy, Thursday Dummy, and Friday Dummy, respectively.

In French's (1980) model, the intercept represents the Monday Effect with regard to avoiding the "Dummy Trap". If we did the same procedure, there will be a biased conclusion. Therefore, following Gujarati and Porter's (2009) suggestion, we modified French's (1980) model by eliminating the intercept while adding the Monday slope in the equation with regard to eliminating the dummy trap. To eliminate the variance errors, we introduce Exchange Rate and Oil Price as the control variables. These two variables are the determinant of market integration and are commonly used as control variables in market integration studies (see Ferson and Harvey, 1994; Ng, 2004).

### 3.4. Data

We retrieved the Lithuanian stock market index and MSCI All-Country World Index on a daily basis over the sample period of 2000-2010 from the Thomson Data Stream. We used the US 3-Month Treasury bill as a global risk free rate. The return is calculated by using the standard normal logarithm formula.

For the dynamic linkages equation, we use the measurement of market integration and the weekend effect as stated in equation [1] and equation [4],

respectively. Meanwhile, for the robustness test in the regression model, we straightforwardly use the log returns by modifying French's (1980) model.

## 4. Results

### 4.1. Unit Root Test Results

Finance research usually uses time series data, which are assumed to be stationary. Using non-stationary data in regression analysis leads to spurious regression results. To check the stationary, we conducted the Augmented Dickey Fuller (ADF) of the unit root test.

This test allows this research to gauge the robustness of the integration properties of market integration and the weekend effect. The null hypothesis is that  $Y_t$  has a unit root (non-stationary), that is  $H_0: \alpha_2=0$ , versus the alternative hypothesis that  $Y_t$  is stationary or  $H_1: \alpha_2<0$ .

Table 2 shows the results of the unit root test. Comparing the calculated ADF statistic to the MacKinnon (1991) critical value, we conclude that market integration measurement and weekend effect measurement is stationary at level and first difference. It indicates that all variables are integrated and have long run co-movement indication. Therefore, we continued the procedure for the co-integration test.

	Level		First Difference	
	Coefficient	Probability	Coefficient	Probability
DOWA	-0.012749	0.0001	1.000004	0.0000
MI	-0.020861	0.0000	1.023394	0.0000

**Table 2:** Unit Root Test Results

### 4.2. Cointegration Test Results

The unit root test results show that there is a stationary level and first difference. Therefore, we continue on to cointegration in regard to investigating the dynamic linkages between market integration and the weekend effect. To test for this cointegration or long run relationship, we employed the maximum likelihood approach of Johansen (1988) based on a vector autoregressive model:

$$X_t = \mu + \Pi_1 X_{t-1} + \dots + \Pi_k X_{t-k} + e_t$$

Where  $X_t$  is the vector variables integrated on the same order;  $\mu$  is the intercept terms for the vector,  $\Pi$  is the coefficient matrix, and  $e_t$  is the error terms which are

assumed to be white noise. This equation equivalently states in the following cointegration regressions:

$$Y_t = \beta_0 + \beta_1 X_t + u_t \quad (6)$$

Where the null hypothesis is that  $Y_t$  and  $X_t$  are not co-integrated.

The results of the cointegration test are documented in table 3. It clearly indicates the cointegration of market integration and the weekend effect for all sample periods. This means the movement of market integration is followed by the weekend effect in the long run relationship. This finding seems to be consistent with the view that the stronger the market integration between the Lithuanian stock market and world, the higher the degree of co-movement. There were similar results with Jaffe and Westerfield (1985) where the higher the correlation between the US market and other markets, the higher the co-movement in seasonality.

If we turn back to the hypothesis that there is an association between the two variables, this linkage result indicates the seasonality in market integration. In other words, the migration of portfolio benefit in market integration could occur on a certain day. Thus, cointegration has a limitation in answering this question robustly. We did three verifications: the Vector Autoregression Model for the long run relationship, a Granger Causality for the correlation causality in the short term, and regression, all to tackle this issue.

Ho	Trace Test		Max Eigen Value	
	Trace Statistic	Critical Value	Trace Statistic	Critical Value
$r=0$	43.16071*	15.49471	24.77891*	14.2646
$r \leq 1$	18.3818	3.841466	18.3818	3.841466

\* significant in 1%

**Table 3:** Cointegration Test Results

Now we look at the result of the long run relationship of VECM. Based on equation [6] of VECM, it can be inferred that there is a long run relationship between the weekend effect and market integration. The result of the equation states that the weekend effect is heavily influenced by market integration. This can be seen from the slope coefficient of market integration, which is higher than 50%. The intercept of the equation also shows a 4.9% trend value. This means that in the long run the weekend effect can be associated with 58% of market



integration movement. To check the correlation causality, we further investigated with a Granger Causality.

$$DOWA = 0.04940 + 0.580369MI + \varepsilon_t \quad [6]$$

#### 4.3 Granger Causality Test Results

We proceed with the Granger Causality test in order to investigate the short run dynamic co-movement between market integration and the weekend effect. In general, the Granger Causality test is one that can determine whether one variable is useful in forecasting another variable by revealing its causality. Table 4 shows the unidirectional Granger Causality results from market integration and the weekend effect. It indicates that there is a strong and significant correlation between the current market integration and the lag one of weekend effects.

The result of our Granger Causality test corroborates the long run relationship under the vector error correction model. It suggests significant interaction between market integration and the weekend effect. In other words, it indicates the seasonality in stock market integration, or that the integration of the Lithuanian stock market is stronger and higher on Monday.

The results suggest that a global fund manager should avoid Monday because of diminishing portfolio returns. Moreover, it also reveals that the global financial contagion can spread in Lithuania faster on a Monday. To determine on which day integration occurs more often we utilized equation 6.

These results are interesting for at least two reasons. First, the results show the co-movement among variables in the long run. It confirms our earlier results, where there is a strong association between market integration and the weekend effect. It designates strong and significant causalities from market integration to the weekend effect. Second, it indicates the existence of seasonality in market integration by signifying that the occurrences of market integration on Monday, where the Lithuanian stock market might have strong integration during that particular day. This finding implies the diminishing of the portfolio of the Lithuanian stock market might occur according to seasonality.

Granger Causalities Hypotheses	Chi-Square	Probability
The Market integration Does Not Granger Cause DOWA	4.463216	0.8865
The DOWA Does Not Granger Cause Market integration	17.78752	0.0032

**Table 4:** Granger Causality Test Result

#### 4.4 Robustness Check

We performed a robustness check by running equation [6] because the Granger causality test implies strong association between market integration and the weekend effect. Following the theoretical model of the weekend effect (see French, 1980; Gibbons & Hess, 1981; Rogalski, 1984; Jaffe & Westerfield, 1985; Lakonishok & Smidt, 1988; Connolly, 1989; Berument and Kiyimaz, 2001; Chandra, 2006; Rahman, 2009), we adopted and modified the model by eliminating the intercept and introducing two commonly used control variables for market integration.

Table 5 addresses whether there is a weekend effect on Lithuanian stock market integration. If we look at the results, the entirety of weekday trading is not significant even at the 10% level except for the Monday Dummy (significant at the 1% level). Moreover, the coefficient shows negative relationships except for the intercepts. Interestingly, the coefficient value of the entire day is close to zero. This means the power of changes during those days is very small. The return's difference shows the ability to gain abnormal returns. This is a concept similar to market integration. The result indicates that investors hardly gain abnormal returns during Mondays.

In terms of the control variables, both show significant results. The exchange rate and the oil price have effects on market integration. This is in line with previous literature, where market integration is determined by exchange rate (Ferson and Harvey, 1998) and Oil Price (Ng, 2002). This significance also reveals our model is robust enough to explain the relationship between the Monday dummy and market integration, and it confirms our Granger Causality result.

Variable	Coefficient	Prob.
DMON	-0.0086	0.0000
DTUE	0.0047	0.3139
DWED	0.0022	0.1697
DTHU	0.0017	0.3201
DFRI	0.0031	0.4512
ER	0.0047	0.0000
OIL	0.0019	0.0003
Rsquared	0.114221	

**Table 5:** The Modified French's (1980) Model Result

DMON is the Weekend Effect sign, DTUE is the Tuesday Dummy; DWED is the Wednesday Dummy; DTHU is the Thursday Dummy; and DFRI is the Friday Dummy. ER stands for Exchange Rate; and OIL is the oil price.

Another robustness check, which was a t-test, was conducted to confirm the conclusion. Preceding the t-test, we prepared the data set first. Our research deducted the Lithuania returns by World return on the basis of day. We then classified the result of Monday as one class and the rest of the day as another class. In the end, we ran a t-test between the Monday result and the results of other days and found a significant difference. This implies that seasonality does occur and causes different abnormal returns between Lithuania and the World. Therefore, the research concludes that there is seasonality in market integration. Furthermore, it is indeed apparent that an investor cannot gain more returns on Monday because of market integration.

Variable	Mean		T value	Mean Difference
	Monday	Other Day		
Returns Difference	0.0795	0.049301149	-3.064**	-0.00062

\*\* significant at 5%

**Table 6:** T-Test Result

## 5. Conclusion

The importance of market integration has become a catalyst for the study of financial markets. Market integration contributes to the explanation of diminishing global portfolio benefits, which is imperative for both the body of knowledge on this area and industry practice. This study investigates market integration in-depth by intersecting it with the weekend effect. Moreover, this

study sheds light on the understanding of market integration's weekend anomaly. Note that the occurrences of different levels of market integration on Monday might lead to the idea of avoiding trading on Monday because it can diminish portfolio benefits and easily become a financial contagion.

Our study undertook many investigative steps to ensure that a weekend effect occurs in market integration. We employed a Unit Root Test, Cointegration Test, VECM, Granger Causality, Modified French's Model (1980) regression, and T-Difference test to confirm and relate one finding to another. In short, we did vigorous work to authenticate the seasonality in Lithuanian stock market integration.

Our statistical results show five important findings. First, there is cointegration between market integration and the weekend effect. This means there is co-movement between the changes in market integration and the changes in the weekend effect. This co-movement signals a long run relationship.

This result is followed by a second finding, wherein we found a significant long run relationship between the weekend effect and market integration. Based on the VECM result, the long run relationship of the changes between these two variables is very strong. Equation [6] shows more than 50% of market integration contributes to the changes of the weekend effect.

To verify this strong relationship, we examined the causality relationship by conducting a Granger Causality test. The Granger Causality results show a unidirectional relationship between market integration and the weekend effect. The unidirectional relationship indicates that market integration does granger cause the weekend effect.

We then proceeded to test the existence of seasonality in market integration. By modifying French's (1980) model, our research found that there is a relationship between the abnormal returns of the world portfolio (Lithuania minus World) and day-of-the-week anomaly. Hence, we surmise that the abnormal returns occur on a certain day, which in this case is Monday. We examined it further by employing a t-test and found a significant difference between Monday's returns and other weekday returns. This indeed confirms our hypothesis.


In conclusion, we can remark that seasonality occurs in market integration. Our explanation concerns market development and liquidity. Indeed, it is related to the market microstructure and market participant behavior.

This is based on the similarity of the explanation of the weekend effect and market integration. The literature suggests that the explanations of the weekend effect are: market development (see Porter, 1992; Aggrawal and Tandon, 1993; Kamara, 1997; Kok and Wong, 2004; Rezvanian et al., 2008), and liquidity (Lakonishok and Maberley, 1990; Abraham and Ikenberry, 1994; Yahyazadehfar et al, 2006).

Market integration also has a similar explanation, such as market development (Carrieri et al., 2007), and liquidity (Gerard et al., 2003). Consequently, it suggests that these two occasions are caused by the same triggers, which are financial development and liquidity. The Lithuanian stock market is a relatively new market. Financial development is still on its way, and its liquidity is not as stable as other MSCI emerging markets. These two drivers could lead to dynamic co-movement between the market integration of the Lithuanian stock market and its weekend effect. In short, this study suggests that a global fund manager and finance manager at the firm level should consider market integration based on seasonality, as we found a significant relationship between Monday returns correlated with the Lithuanian and World stock markets, Monday is not a good day for portfolio benefits. Moreover, market participants have to be aware of the transmission of a financial contagion.

A few caveats remain in this study. First, we limited our sample to the Lithuanian stock market. This market is a relatively new market compared to others. It was established only in 2001. The lack of a market macrostructure and microstructure might contribute to this seasonality.

Second, the construction of the variable measurement is based on the assumption that the ICAPM and French's Model are the correct underlying models in retrieving the measurement. Although the ICAPM and French's Model still remain the most popular models for market integration and the weekend effect, this is based on several strong assumptions. Hence other alternative measures for market integration and the weekend effect could be considered. For example, in terms of market integration, future research can use the world beta of Akdogan (1996) by taking world systematic risk as the integration index. In terms of the weekend effect, coming research can follow Connolly (1989) or Berument and Kiymaz (2001). Moreover, measurements are retrieved based on time varying rolling regression, where the determining of window size is debatable. Finally, this research study investigates dynamic co-

movements, wherein the model will be more robust with one dependent and one independent variable. 

## References

- Abraham, A. and Ikenberry, D.L. (1994) The Individual Investor and the Weekend Effect. *The Journal of Financial and Quantitative Analysis*, 29(2): pp. 263-277.
- Aggrawal, A. and Tandon, K. (1994) Anomalies or Illusions? Evidence from stock markets in eighteen countries. *Journal of International Money and Finance*, 13: p. 83-106.
- Ajayi, R.A., Mehdian, S., and Perry, M.J (2004) The Day-of-the Week Effect in Stock Returns: Further Evidence from Eastern European Emerging Markets. *Emerging Markets Finance and Trade*, Vol.40, No.4: pp53-62
- Akdogan, H. (1996) A suggested approach to country selection in international portfolio diversification. *The Journal of Portfolio Management*, Fall: pp.33-40.
- Alexakis, P., and Xanthakis, M, (1995) Day of the Week Effect on the Greek Stock Exchange. *Applied Financial Economics*, 5: pp.43-50
- Arshanapalli, B. and J. Doukas, (1993) International Stock Market Linkages: Evidence from the Pre- and Post- October 1987 Period. *Journal of Banking and Finance*, 17: pp.193-208.
- Ayuso, J. and Blanco, R. (2001) Has financial market integration increased during the nineties? *Journal of International Financial Markets, Institutions and Money*, 11: 265-287.
- Barone, E. (1990) The Italian Stock Market: Efficiency and Calendar Anomalies. *Journal of Banking and Finance*, Vol.14, No.2-3: pp.483-510
- Basher, S.A., and Sadorsky, P. (2006) Day-of-the week effects in Emerging Stock Markets. *Applied Economics Letter*, 13: pp621-628
- Bekaert, G., Harvey, C.R. and Lundblad, C.T. (2001) Emerging equity markets and economic development. *Journal of Development Economics*, 66, 465-504.
- Bekaert, G., Harvey, C.R. and Lundblad, C.T. (2005) Does financial liberalization spur economic growth? *Journal of Financial Economics*, 77: pp.3-55.
- Bekaert, G., & Harvey, C. R. (1995) Time-Varying World Market Integration. *The Journal of Finance*, 50(2), 403-444.
- Berument, H. and Kiymaz, H (2001) The Day of the Week Effect on Stock Market Volatility. *Journal of Economics and Finance*, 25(2): p. 181-193.
- Bildik, R. (1999) Day-of-the week effects in Turkish money and stock markets. *Annual Meeting of EFMA, Paris, June 25-28* (1999).
- Brahmana, R., and Hooy, Chee-Wooi. (2010). Bilateral Trading and Regionalism Market Integration. 2nd International Conference on Management, Hospitality and Tourism, and Accounting, 12-13 November, 2010, Jakarta, Indonesia
- Bussière, M., Fidrmuc, J., & Schnatz, B. (2005) Trade integration of Central and Eastern European countries - lessons from a gravity model. [Working Paper]. *Working Paper Series 545, European Central Bank*.
- Carrieri, F., Errunza, V.R. and Hogan, K. (2007) Characterizing world market integration through time. *Journal of Financial and Quantitative Analysis*, 42(2): pp.915-940.
- Chandra, M., (2006) The day-of-the-week effect in conditional correlation. *Review of Quantitative Finance and Accounting*, 27: p. 297-310.
- Choudhry, T. (2000) Day of the week effect in emerging Asian stock markets: Evidence from the GARCH model. *Applied Financial Economics*, 10: pp.235-242.



- Click, R.W., and Plummer, M.G. (2004). Stock Market Integration in ASEAN after the Asian Financial Crisis. *Journal of Asian Economics*, Vol.16, No.1: pp5-28.
- Cole, H. and Obstfeld, M. (1992) Commodity trade and international risk sharing: How much do financial markets matter? *Journal of Monetary Economics*, 28, 3-24.
- Connolly, R.A. (1989) An Examination of the Robustness of the Weekend Effect. *The Journal of Financial and Quantitative Analysis*, 24(2): p. 133-169.
- Cross, F., (1973) The Behavior of Stock Prices on Fridays and Mondays. *Financial Analysts Journal* 29: pp.67-69.
- Damodaran, A. (1989) The Weekend Effect in Information Releases: a Study of Earnings and Dividend Announcement. *Review of Financial Studies*, Vol.2, No.4: pp.607-623
- Damodar N. Gujarati and Dawn C Porter. (2009) Basic Econometric. Fifth Edition. McGraw Hill
- Devereux, M.B. and Smith, G.W. (1994) International risk sharing and economic growth. *International Economic Review*, 35, 535-551.
- Dumas, B., & Solnik, B. (1995) The World Price of Foreign Exchange Risk. *The Journal of Finance*, 50(2), 445-479.
- Ferson, W.E. and Harvey, C.R. (1994) Sources of risk and expected returns in global equity markets. *Journal of Banking and Finance*, 18: pp.775-803.
- French, K.R., (1980) Stock Returns and The Weekend Effect. *Journal of Financial Economics*, 8: pp.55-69.
- Fredriksson, P. G., and Mani, M. (2004) Trade Integration and Political Turbulence: Environmental Policy Consequences. *The B.E. Journal of Economic Analysis & Policy*, advances.4(2), 1.
- Gérard, B., Thanyalakpark, K. and Batten, J.A. (2003) Are the East Asian market integrated? Evidence from the ICAPM. *Journal of Economics and Business*, 55: pp.585-607.
- Gibbons, M.R. and Hess, P. (1981) Day of the Week Effects and Asset Returns. *The Journal of Business*, 54(4): p. 579-596.
- Grubel, H. (1968) International Diversified Portfolio: Welfare Gains and Capital Flows. *American Economic Review*, 58: pp.1299- 1314.
- Hardouvelis, G. A., Malliaropoulos, D., and Priestley, R. (2006) EMU and European Stock Market Integration. *Journal of Business*, 79(1): pp.365-392.
- Hardouvelis, G. A., Priestley, R., & Malliaropoulos, D. (2001) EMU and European Stock Market Integration. *SSRN eLibrary*.
- Ho, Y.K., and Cheung, Y.L. (1994) Seasonal Pattern in Volatility in Asian Stock Markets. *Applied Financial Economics*, 4: pp.61-67
- Hooy, C-W., and Goh, K-L. (2007) The Determinants of Stock Market Integration: A Panel Data Investigation. 15<sup>th</sup> Annual Conference on Pacific Basin Finance, Economics, Accounting, and Management Proceeding. 20&21 July, Ho Chi Minh City, Vietnam.
- Jaffe, J. and R. Westerfield, (1985) The Week-End Effect in Common Stock Returns: The International Evidence. *The Journal of Finance*, 40(2): pp.433-454.
- Johansen, S. (1988) Statistical Analysis of Cointegration Vectors. *Journal of Economic Dynamics and Control*, 12: pp.231- 254.
- Kamara, A., (1997) New Evidence on the Monday Seasonal in Stock Returns. *The Journal of Business*, 70(1): pp. 63-84.
- Korajczyk, R. A. (1996) A Measure of Stock Market Integration for Developed and Emerging Markets. *The World Bank Economic Review*, 10(2), 267-289.
- Lakonishok, J. and Maberly, E. (1990) The Weekend Effect: Trading Patterns of Individual and Institutional Investors. *The Journal of Finance*, 45(1): p. 231-243.
- Lakonishok, J. and Smidt, S. (1988) Are Seasonal Anomalies Real? A Ninety-Year Perspective. *The Review of Financial Studies*, 1(4): p. 403-425.
- Levine, R. and Zervos, S. (1996) Stock market development and long-run growth. *World Bank Economic Review*, 10, 323-340.
- Levine, R. and Zervos, S. (1998) Stock markets, banks, and economic growth. *American Economic Review*, 88, 537-558.
- Levine, R., & Zervos, S. (1998) Capital control liberalization and stock market development. *World Development*, 26(7): pp.1169-1183.
- Levine, R., and Zervos, S. (1996) Stock Market Development and Long Run Growth. *World Bank Economic Review*, Vol.10, No.2: pp323-339
- Lewis, K.K. (1996) What can explain the apparent lack of international consumption risk-sharing? *Journal of Political Economy*, 104, 267-297.
- Lucey, B. (2000). Anomalous Daily Seasonality in Ireland? *Applied Economics Letters*, 7(10): pp.637-40
- Meric, I., and Meric, G. (1997). Co-movements of European equity markets before and after the 1987 crash. *Multinational Finance Journal*, 1: pp.137-152.
- Ng, D.T. (2004) The international CAPM when expected returns are time-varying. *Journal of International Money and Finance*, 23: pp.189-230.
- Ng, T.H. (2002) Stock Market Linkages in South-East Asia. *Asian Economic Journal*, Vol.16, No.4:
- Obstfeld, M. (1994) Risk taking, global diversification and growth. *American Economic Review*, 84, 1310-1329.
- Ostermark, R. (1989) Predictability of Finnish and Swedish Stock Returns. *Omega*, Vol.17, No. 3: pp.223-236
- Özmen, T. (1997). Dünya Borsalarında Gözlemlenen Anomaliler ve IMKB Üzerine Bir Deneme, *Capital Market Board of Turkey*, No. 61.
- Porter, D.C. (1992) The probability of trade at the ask: An Examination of Interday and Intraday Behaviour. *Journal of Financial and Quantitative Analysis*, Vol. 27: pp. 209-227.
- Rahman, M.L., (2009) Stock Market Anomaly: Day of the Week Effect in Dhaka Stock Exchange. *International Journal of Business and Management*, 4(5): p. 193-206.
- Rogalski, R.J., (1984) New Findings Regarding Day-of-the-Week Returns over Trading and Non-Trading Periods: A Note. *The Journal of Finance*, 39(5): p. 1603-1614.
- Sakalauskas, V., and Krikščiūnienė, Dalia. (2007) The Impact of Daily Trade Volume on the Day-of-the Week Effect in Emerging Markets. *Information Technology and Control*, Vol.36, No.1A
- Solnik, B.H. (1974) Why not Diversify Internationally. *Financial Analysts Journal*, 30: pp.48- 54.
- Solnik, B., and Bousquet, L. (1990) Day of the Week Effect of the Paris Bourse. *Journal of Banking and Finance*, Vol.14, No.2-3: pp.461-468
- Stehle, R. (1977) An empirical test of the alternative hypotheses of national and international pricing of risky assets. *Journal of Finance*, 32, 493-502.
- Tong, W. (2000) International Evidence on Weekend Anomalies. *Journal of Financial Research*, Vol.23, No.4: pp. 495-522.
- Van Wincoop, E. (1994) Welfare gains from international risk sharing. *Journal of Monetary Economics*, 34, 175-200.
- Yahyazadehfar, M., Abounoori, E., and Shababi, H. (2006) Teheran Stock Exchange Returns: an Empirical Analysis. *Iranian Economic Review*, Vol.11, No.16