

**THE FACTORS THAT AFFECT STOCK MARKET CO-MOVEMENTS ACROSS  
THE GLOBE**

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## **Abstract**

This paper attempts to explain the extent to which international stock market returns correlate with US stock market returns of the previous day. The purpose of this study is to confirm the expected positive correlation in co-movement between the US and non-US stock markets, and the extent to which this positive correlation is related to the time lag between the US market closing time (the previous day) and the non-US country's opening time; as well as the type of legal system, the dominant language, and the state of development of the non-US country. The paper also attempts to explain how this relationship would hold in the case there is a weekend in between the close of the US stock market and the opening of the non-US stock market, and during the 2008 financial crisis. We find that US stock market returns are a significant predictor for non-US market returns on the following trading-day and that developed economies and countries with English as the dominant language are more highly correlated. Markets that are further away from the US and that have a common law legal system are inversely are less correlated than those that don't. Additionally, we find that when there is a weekend between the US closing and non-US opening, the returns have a weaker correlation. Finally, during the 2008 financial crisis, developed economies were more highly correlated with US stock market returns on the previous trading-day than the others.

**Keywords:** International stock market returns, US stock market returns, Co-movement, Correlation, Weekend Effect, 2008 financial crisis.

## 1. Introduction

The US stock market is the largest stock market in the world and globalization has slowly and steadily been increasing interconnectivity between international stock markets. This interdependence has led to an increase in attention among investors and economists, especially after the 2008 Financial Crisis. The 2008 financial crisis has been called the worst crisis since the Great Depression of the 1930's. Azadinamin (2013) finds that the bankruptcy of the Lehman Brothers in September 15th, 2008, caused not only stock market returns in emerging markets to sharply decline, but also an immediate crisis in the Eurozone. This generates interest in the basic principles of how stock markets are interconnected and how the international markets co-move with the US.

In this study we ask the following question: How do US stock market returns affect the returns of non-US stock markets in the following day, and how do different types of legal systems, the state of development, the dominant language, and the time-zone difference affect this relationship? To answer this question, this study analyzes daily international stock market returns in 38 markets and their correlation with the previous day's stock return in the US market.

The study finds that non-US stock market returns are positively correlated with the US stock market returns of the previous trading-day. The interaction terms of US stock market returns with the dominant language and the state of development of the economy are positively correlated with the non-US market returns, while the interaction term with the type of legal system and the time lag are negatively significantly correlated. When there is a weekend between the previous trading-day in the US and the following trading day in the non-US market, US returns have a weaker correlation with the non-US returns. Finally, during the 2008 financial crisis, developed economies were more correlated with US stock market returns compared to non-developed economics.

## 1.1. Literature Review

Research in this subject area finds that international stock markets are dependent on the US stock market. According to Forbes and Rigobon (2002), in terms of interdependence, there should be a high degree of co-movement during periods of stability as well as during periods of financial crises. Bekaert and Harvey's (1995) research argues that co-movement across markets increases significantly after negative stock shocks whereas Becker, Finnerty and Gupta (1989) present how correlations between developed markets (specifically the US, the UK and Japan) increased significantly following the 1987 market crash in the US.

Lee and Kim (1993) extend this analysis to emerging South-East Asian economies and find that an increased correlation is present between the US stock markets and stock markets in emerging economies during the 1987 US stock market crash. An additional study by Rasiah, Cheong and Doner (2014) finds a significant increase in the co-movement of returns in the stock markets of South-East Asian countries during the Asian crisis.

Mainstream literature identifies various economic, financial, and cultural variables as determinants of stock market co-movement. An illustrative example could be the interdependence between UK and US markets. Because the UK has close ties with the US in economic fundamentals (especially trade), the impact of the US subprime crisis on the UK stock market is much more intensely and quickly felt (the two markets also have the same language, legal system and state of development).

Two additional studies (Kogut and Singh, 1988; Lucey and Zhang, 2010) provide evidence that cultural similarity (such as due to a similar language and legal system) may increase co-movement between stock markets as it indicates that there will be less information asymmetry. The literature also suggests that the common law legal system generally provides a stronger base for financial development and investor protection when compared to civil law

based legal systems (Graff, 2008), which may suggest that common law countries may be more correlated with the US economy.

Jaffe and Westerfield (1985) analyze correlations between the U.S. market returns and four other non-US market returns. They show that for each day of the week, there is generally a positive and significant correlation. Schollhammer and Sand (1985) and Eun and Shim (1989), using daily market closing data from several countries in the 1980s, find that there is a large interdependence between those stock markets. Becker et al. (1989) studies US stocks that were also traded on the Tokyo Stock Exchange during 1985 to 1988. They show that the US market has a significant impact on Japanese equities, the performance of the US stock market the previous day was able to explain between 11-18% of the fluctuations in the Japan overnight returns.

## **1.2. Hypotheses**

The foundation of this paper rests on a study of whether the returns in international stock markets can be explained by the variation in the returns of the US stock market the previous day, which is the first thing we will be testing in this paper. If there is a significant relationship, a series of other tests will be undertaken to better understand this relationship.

Next we test whether there is a stronger correlation between the US and non-US market when there is a smaller time difference between the closing of the US market and the opening of the non-US market. It is expected that the US would react to events that should affect all of the other markets as well. However, the longer the duration from the close of the US market (NYC at 4 PM), to the opening of the market in the respective country, the higher the possibility that other things have occurred and therefore the expected positive correlation would reduce.

The next relationship to test concerns whether returns in countries with English as the dominant language are more correlated with US market returns compared to those which have

a different dominant language. We will then test whether returns in countries with a common law legal system are more correlated with US market returns. The intuition here is that countries that have the same language and legal systems are more highly correlated because the interpretation of information is more similar. Due to frictions, information released in English may be interpreted differently when translated to a different language. Similarly, there are differences in interpretation of news, when the legal environment of the two countries is different. It is important to note here that although countries that are English speaking tend to have a common law legal system and vice versa, there are some exceptions because of which this distinction needs to be made. The exceptions are India, Malaysia and Ireland. India and Malaysia being countries with a common law legal system with a majority language that isn't English, and Ireland being an English-speaking country that follows a civil law legal system.

We use the term developed when describing a country that is developed both in terms of its economy and its financial markets. The FTSE group classifies 25 countries as developed markets. Thus, we would like to test whether countries that have developed financial markets are likely to be more correlated with the US markets, possibly due to their stronger global orientation. Countries that have developing financial markets tend to experience frictions due to inefficiencies in their stock markets or due to capital controls. Thus, they are expected to have less correlation with the US market returns.

The next step would be to test whether all these variables together have a significant effect in explaining movements in international stock market returns the following day. Another expected relationship we explore in this study concerns whether the correlation between the US stock market returns and international stock market returns will be significantly weaker after the US market closes on Friday and the international stock market opens the following Monday. We anticipate that it would be reduced because more information has



become available over the weekend that would weaken the relevancy of the information released on Friday.

Finally, we would like to explore how this relationship would hold when we restrict our data to the year 2008, the period of the financial crisis. Due to what we know from the literature about strong co-movements during downturns, we expect that US stock market returns would have a higher correlation with international stock market returns during this period because, especially because the financial crisis of 2008 originated in the US.

## **2. Research Methodology**

### **2.1. Data Description**

The sample data that we are using in our analysis has been retrieved from the WRDS database. We have collected daily return data for 38 international stock markets as well as for the US stock market. Our data includes the daily return with dividends of the major index of the country. Additionally, we created a variable for the difference in time zones between the closing of the US stock market (on the previous day) and the opening of the international stock market. On a given calendar day, the US stock market is the last to close. The goal of this paper to explain the co-movements of the US stock markets with other stock markets, and for this purpose, we use the closing return of a calendar day as the independent variable to explain the returns the following trading day. Other variables used to explain the co-movements include the time lag difference between the US and non-US market; and the language, the legal system, and the development of the non-US country.

**Table 1: Summary statistics of the sample markets**

Market	N	Mean Return	SD Return	Minimum	Maximum	Legal Origin	Language	Time Lag	Developed
US	23098	.000392	.0114704	-.17413	.11354	Common	English	0	Yes
New Zealand	6,843	.00044	.00821	-.12951	.10278	Common	English	0	Yes
Australia	8115	.0004067	.0111278	-.2141645	.0631879	Common	English	2	Yes
Japan	7,865	.00016	.01298	-.14907	.13282	Other	Other	3	Yes
South Korea	7,474	.0003112	.01688	-.119792	.119533	Other	Other	3	Yes
Philippines	6,535	.00038	.01249	-.10856	.17135	Other	Other	4	No
Singapore	8,001	.00031	.01262	-.304658	.148789	Common	English	4	Yes
Taiwan	7,481	.000175	.016592	-.0951187	.097071	Other	Other	4	Yes
China	6,001	.0004911	.0195112	-.1552049	.3371771	Other	Other	4.5	No
Hong Kong	7,878	.00054	.0161	-.3449	.16541	Other	Other	4.5	Yes
Malaysia	7,306	.00033	.01196	-.17375	.195528	Other	Other	5	No
Indonesia	6,915	.00045	.01550	-.13034	.14741	Other	Other	5	No
Thailand	7,503	.00035	.015150	-.14931	.1812942	Other	Other	6	No
India	6,269	.0006	.01464	-.11769	.15914	Other	Other	6.75	No
Turkey	3,298	.000461	.015172	-.101651	.122409	Other	Other	10	No
Greece	4,397	-.0001	.01843	-.18553	.14796	Other	Other	10	No
South Africa	4,186	.00058	.011105	-.074154	.059150	Other	Other	10	No
Germany	4,985	.00022	.0119	-.0686	.0950	Other	Other	10	Yes
Finland	4,956	.0003244	.0182123	-.1695744	.1675348	Other	Other	11	Yes
Austria	4,891	.0003411	.0119493	-.0843103	.1148049	Other	Other	11	Yes
Belgium	5,014	.0002993	.0115407	-.0788631	.0849748	Other	Other	11	Yes
Denmark	8,019	.0005083	.0103468	-.0962692	.0840768	Other	Other	11	Yes
France	5,026	.0002783	.0122219	-.0789461	.1021154	Other	Other	11	Yes
Hungary	5,664	.00056	.01643	-.19147	.14381	Other	Other	11	No
Italy	4,991	.00016	.01330	-.1106	.10462	Other	Other	11	Yes
Netherlands	5,043	.00025	.01222	-.08400	.09081	Other	Other	11	Yes
Norway	7,674	.00052	.01332	-.11604	.111478	Other	Other	11	Yes
Poland	5,925	.00037	.01383	-.09752	.074086	Other	Other	11	Yes
Spain	4,983	.000252	.01305	-.113044	.125891	Other	Other	11	Yes
Sweden	8,047	.000528	.013394	-.080926	.108653	Other	Other	11	Yes
Switzerland	8,042	.000322	.010703	-.112127	.10668	Other	Other	11	Yes
Portugal	5,021	.0001124	.011087	-.102320	.11179	Other	Other	11	Yes
Egypt	3,464	.0007853	.0142507	-.1536589	.1111937	Other	Other	11.5	Yes
Ireland	4,996	.00026	.01390	-.13054	.10649	Other	English	12.5	Yes
UK	8,127	.00035	.010096	-.118175	.085771	Common	English	12.5	Yes
Brazil	5,788	.0005535	.0166169	-.1933118	.211057	Other	Other	16	No
Chile	4,194	.0004619	.0082027	-.0575694	.1168116	Other	Other	16	No
Mexico	6,375	.00068	.01349	-.10946	.12953	Other	Other	17.5	No
Colombia	3,292	.0004576	.0113676	-.081114	.1274162	Other	Other	17.5	No

The table provides the return data (including dividends) of the index that we follow in each of the 39 markets of the study. N is the number of daily observations, Time lag is the number of hours between the start of trade in the country and the close of trade in the US in the previous calendar day.

**Time:**<sup>1</sup> The time variable captures the difference between the closing time of the US market the previous day and the opening time of the non-US market in units of hours. For markets with trading hours overlapping with the US, we use the next day. Thus, when the New York Stock Exchange closes at 4:00 PM (ET) on the 16th of September 2019, the Australian

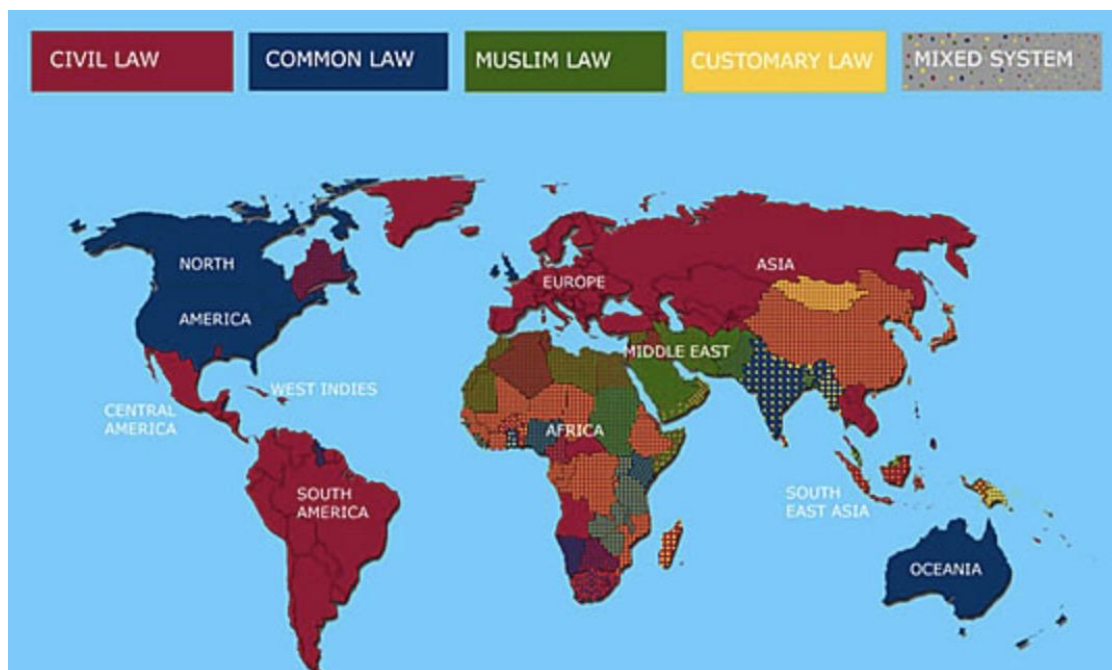
<sup>1</sup> Although we were careful to make sure the time difference due to different opening and closing hours in different markets, we did not account for variation due to daylight savings. Nevertheless, this shouldn't have any significant effect on the results of our research.

Securities Exchange opens for normal trading hours at 10:00 AM (AEST) on the 17th of September 2019. In this example, the time variable should have a value of 2.

**Language:** To capture any effect of language, we assigned 0 to the language variable for all the countries that do not operate in the English Language and 1 to all the countries that do. This way all the countries that share the same operating language as the US have 1 and the rest have 0.

**Legal:** To capture any effect of the type of the legal system, we assigned a value of 1 to all countries that use the common law system and zero to all countries that use the any other legal system. This way all the countries that share the same legal system as the US have 1 and the rest have 0. The grouping we have used to define this variable uses data from the University of Ottawa's JuriGlobe, and can be found in the appendix of this paper.

Figure 2.1.1 Legal Systems Around the Globe



Source: JuriGlobe - World Legal Systems (University of Ottawa)

**Development:** To capture any effect that is associated with a market being developed or developing, we assigned a value of 1 to all the countries that have developed financial markets

and zero 0 to all countries that have developing financial markets<sup>2</sup>. This way all the countries that have developed financial markets like that of the US have values of 1 and conversely the rest have 0. The grouping we have used to define this variable uses data from the MSCI indices and is provided in the appendix of this paper.

## **2.2. Methodology**

After collecting daily return data for the US market and all the different non-US markets, we altered the date for the US markets to that of the previous trading-day. This was to ensure that the US market return would precede the opening of non-US markets. This led to some minor complications where we didn't have corresponding data for certain days, for example, when it is a Monday in New Zealand and a Sunday in the US, or when there was a missing US data point (such as a statutory holiday). In these cases, we used the previous return available for the US market.

Next, we regressed the index returns for each of the non-US markets against the returns of the US market of the previous day. We repeated the regression controlling for country and year fixed effects. We then repeat this process while interacting each of the specific country level variables with the US market, to analyze whether the correlation that we find between the US and the non-US market is dependent on these variables. We then check the significance of the interaction to see how much of the co-movement of the non-US market with the US market is dependent on the specific county level variables.

The next step was to conduct a “horse-race” and run a regression of the non-US market returns in comparison with the returns of the US market using all the variables previously mentioned to attempt to explain the correlation between the markets.

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<sup>2</sup> This data has been retrieved from the MSCI Developed Markets and MSCI Emerging Markets Indices.

The same test was repeated using only the returns for the US stock market on Fridays and the international stock market returns on the following Monday, using all the previously mentioned variables to check how the relationship holds when there is a weekend between the US market closing time and the international market opening time. Finally, we repeated the test using data points that were in the 2008 time period to see how this relationship held during the 2008 financial crisis.

### **3. Results**

#### **3.1. The US Stock Market against International Stock Markets**

The first step in our analysis is to run a regression of the international stock markets against the US stock market. The regression was first conducted without controlling for a fixed effect and then repeated while controlling for a fixed effect with respect to a particular year and a particular country. The model used for this regression is as provided in equation (1) and the output is presented in Table 2 below.

$$Ret_{i,t} = \beta_1 \times usRet_{t-1} + \alpha_i + \varepsilon_{i,t} \quad (1)$$

Where:

$Ret_{i,t}$  = the return in the non-US country  $i$  at time  $t$ .

$usRet_{t-1}$  = the return in the US stock market at time  $t-1$ .

**Table 2: Autocorrelation of International market with the US market.**

	(1)	(2)	(3)
$usRet_{t-1}$	0.232***	0.230***	0.232***
	(0.00238)	(0.00238)	(0.00238)
Constant	0.00028***	0.000281***	0.000280***
	(0.0000277)	(0.0000277)	(0.0000277)
Control for Fixed Effect	None	Year	Country
Observations	230,286	230,286	230,286
R-squared	0.044	0.042	0.044

The dependent variable is the return on day  $t$  of the international market and the independent variable is the US return on the previous trading day. Standard errors are provided in parenthesis.  $usRet_{t-1}$  is the return in the US stock market at time  $t-1$ . Significance is \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

Table 2 shows US stock market returns on the previous day are a significant and for each 1% change in the US market at  $t-1$ , the average non-US market moves 23 basis points in the same direction. The regression implies that the relationship between returns in the US stock market and those of the international stock markets are significant and fixed-effect here matters (as expected) little.

Since controlling for a fixed effect by country group and year is negligible in the model, we are able to continue our analysis without having to control for these effects for the rest of this study.

### 3.2. Interaction with the Time, Language, Legal and Developed Variables

The Tokyo Stock Exchange and the New York Stock Exchange are the two largest stock markets in the world. The time lag (by our definition, see 2.1. Data Description) between these two markets is 3 hours. Becker et al (1989) claim that since there is no overlap between these two markets, traders and speculators may use US stock market performances as a predictor of market movements on the Tokyo Stock Exchange. Since international stock markets tend to be influenced by the US markets, the shorter the time lag between the US stock market closing for the previous day and the international market opening for the following day, the higher the expected correlation between the two is.

Using the data presented in this table, we ran the same regression as above, except for including the time variable. This can be seen in the model provided below:

$$Ret_{i,t} = \beta_1 \times usRet_{t-1} + \beta_2 \times time_i + \beta_3 \times usRet_{t-1} \times time_i + \alpha_i + \varepsilon_{i,t} \quad (2)$$

Where:

$time_i$  = the time lag between the closing of the US stock market at t-1 and the opening of the international stock market i at t.

$usRet_{t-1} \times time_i$  = the joint effect between usRet at t-1 and the time lag with international stock market i.

We then use dummy variables to test the significance level of the three additional predictors of the co-movement with US stock market returns (legal, language and the state of development). Table 3 consists of the outputs of four separate regressions of the US stock market returns with the time lag, language, legal and development variables individually.

**Table 3: Autocorrelation of International market with the 4 variables.**

	(1)	(2)	(3)	(4)
$usRet_{t-1}$	0.371*** (0.00586)	0.223*** (0.00258)	0.193*** (0.00409)	0.0385*** (0.00407)
$usRet_{t-1} \times time_i$	-0.0157*** (0.00552)			
$time_i$	0.0000147* (0.00000637)			
$usRet_{t-1} \times language_i$		0.0610*** (0.00665)		
$language_i$		-0.0000512 (0.0000762)		
$usRet_{t-1} \times legal_i$			0.0589*** (0.00503)	
$legal_i$			0.0000603 (0.0000701)	
$usRet_{t-1} \times developed_i$				0.0114** (0.00542)
$developed_i$				-0.00013* (0.0000586)
Constant	0.00015*** (0.0000615)	0.000288*** (0.0000302)	0.000366*** (0.0000477)	0.000327*** (0.0000467)
Control for Fixed Effect	None	None	None	None
Observations	230,286	230,286	230,286	230,286
Adjusted R-squared	0.043	0.04	0.04	0.086

The table provides regression results where the dependent variable is the return on day  $t$  of the international stock market.  $time_i$  is the time lag in hours between the close of the US market and the opening of the non-US market in the following trading-day.  $language_i$  equals one if the English is the language in the non-US market, and zero otherwise.  $legal_i$  is an indicator that equals one if the non-US market has a common law legal structure and zero otherwise.  $developed_i$  equals one if the country is developed and zero otherwise (according to MSCI indices). Standard errors are provided in parenthesis. Significance is \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

From Table 3, we are able to conclude that  $usRet_{t-1}$ ,  $usRet_{t-1} \times time_i$  and the three other interaction terms all prove the presence of a significant relationship in predicting international stock market returns following the US close. It is important to note that the interaction term  $usRet_{t-1} \times time_i$  has a negative coefficient, implying that our hypothesis that the time lag reduces the correlation is true. The results imply that, for example, a 1% increase in the US leads to 37 basis point increase in New Zealand ( $time_i = 0$  for NZ, so interaction



term drops as there is no time lag between the markets, i.e., there is an overlap of one hour when the US market is still open at day  $t$  and the NZ is open in calendar day  $t+1$ ). There is a reduced effect of 0.0157 for each additional hour, so continuing the example of a 1% increase in the US, Japan market is expected to increase by  $37 - 3*1.6 = 32.8$  basis point (there is a 3 hour lag between the US close and Japan's open). The interaction term  $usRet_{t-1} \times language_i$  is positive and significant showing that having English as the dominant language will make the international stock market returns move in the same direction as the US stock market by 6% more compared to a non-English market. The same is true for the interaction terms  $usRet_{t-1} \times legal_i$ , the effect is close to 6%. The  $usRet_{t-1} \times developed_i$  has the right sign, but the effect is only about 1%. In any case, the results are consistent with the hypotheses. Note also that the interaction term  $usRet_{t-1} \times developed_i$  is only significant at a confidence interval of 95%.

### 3.3. Interaction with all the Variables Together, the Weekend Effect and the 2008 Financial Crisis

The next regression in our analysis tests how significant all of the variables are when put together. The model we will be using to test this hypothesis is given below:

$$\begin{aligned}
 Ret_{i,t} = & \beta_1 \times usRet_{t-1} + \beta_2 \times usRet_{t-1} \times time_i + \beta_3 \times usRet_{t-1} \times developed_i \\
 & + \beta_4 \times usRet_{t-1} \times legal_i + \beta_5 \times usRet_{t-1} \times language_i \\
 & + \beta_6 * time_i + \beta_7 * developed_i + \beta_8 * legal_i + \beta_9 * lang_i + \alpha_i + \varepsilon_{i,t}
 \end{aligned} \tag{3}$$

The results of the regression are provided in Table 4 below:

**Table 4: Autocorrelation of all the variables together, the Weekend Effect and the 2008 financial crisis.**

	(1)	(2)	(3)
	All weekdays	Monday only	Financial Crisis Period
$usRet_{t-1}$	0.437*** (0.00894)	0.3556*** (0.0301)	0.329*** (0.0278)
$usRet_{t-1} \times time_i$	-0.0156*** (0.000612)	-0.0204*** (0.0018)	-0.0189*** (0.00223)
$usRet_{t-1} \times developed_i$	0.0302*** (0.00552)	0.0785*** (0.0156)	0.0793*** (0.0193)
$usRet_{t-1} \times legal_i$	-0.0662*** (0.00976)	-0.0895** (0.0279)	-0.0306 (0.0348)
$usRet_{t-1} \times language_i$	0.0397*** (0.0105)	-0.0329 (0.0294)	-0.0438 (0.0371)
$time_i$	0.000017* (0.00000698)	-0.0000517 (0.000197)	0.0000111 (0.0000243)
$developed_i$	-0.000108 (0.0000647)	0.000196 (0.00017)	0.0000825 (0.000212)
$legal_i$	0.0000109 (0.000113)	0.000445 (0.000307)	0.000348 (0.000385)
$language_i$	-0.0000396 (0.000122)	-0.000531 (0.000323)	-0.000303 (0.000406)
Constant	0.000376*** (0.0000269)	-0.000283** (0.000965)	-0.000464 (0.000307)
Control for Fixed Effect	None	None	None
Observations	230,286	33,657	9,014
Adjusted R-squared	0.045	0.092	0.064

For a description of the variables, see Table 3. Output (1) shows the autocorrelation of International market returns with the all of the variables. All variables are defined in Table 3. Output (2) shows co-movements between the US market returns on Friday with international market returns on the following Monday. Output (3) shows co-movements during the 2008 financial crisis. Standard errors in parentheses. Significance is \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

From Table 4 output (1) we are able to conclude that US market returns on the previous day and the interaction variables with time lag, legal, development and language provide evidence of a significant relationship in predicting international stock market returns following the US close. This proves all of our initial hypotheses to be correct in the direction in which they affect international market returns except for the interaction term  $usRet_{t-1} \times legal_i$ , which has a negative coefficient. For example, a 1% increase in US returns on the previous

trading-day would, on average, lead to a 44 basis point increase before adjusting for the effect from the other variables. This effect would decrease by 1.56 basis points for each additional hour the time lag between the US close and the non-US market increases. If the country is developed, the effect would increase by 3.02 basis points, and if English is the dominant language, it would increase by an additional 3.97 basis points. Interestingly, we see that if the country has a common law legal system, this effect would actually decrease by 6.62 basis points. This would mean that a 1% increase in the US market returns on the previous day would lead to a 31.19 basis point increase in Ireland, but only a 24.47 basis point increase in the UK. Further study needs to be conducted in this area to find the reasoning behind this inverse relationship.

In the case of the interaction term  $usRet_{t-1} \times legal_i$ , a possible explanation may be that since global wealth is a finite resource, each market with a common law legal system can be seen as a substitute or a competitor to one another since they provide similar protections for stockholders. Graff (2006) argues that common law legal systems provide a stronger basis for financial development and economic growth than civil law and are also more effective in the protections provided to shareholders. Another possible explanation could be that we didn't take the size of the markets into account.

Output (2) tests the "Weekend Effect", or how this relationship holds when a weekend falls between the closing of the US stock market and the opening of the international stock market on the following Monday. The output shows that the coefficient of US market returns at t-1 is significant and positive. Building on our previous example, we can see the magnitude drop by approximately 8 basis points when we compare it to the coefficient of US market returns at t-1 from output (1), showing that there is a weaker impact of US returns when taking into account the Weekend Effect. The interaction term  $usRet_{t-1} \times language_i$  is not significant in this case. The interaction term  $usRet_{t-1} \times legal_i$  is significant, but only with a confidence

interval of 95% and is still negative. In fact, it reduces the effect further by 2.33 basis points when there is a weekend in between as compared to output (1). The interaction term  $usRet_{t-1} \times developed_i$  has a higher magnitude in predicting stock market returns in international stock markets on the following Monday, increasing the effect by an additional 4.83 basis points as compared to output (1). This result infers that US market returns on Fridays are a weaker predictor of international stock market returns than on the other days of the week. However, the dominant language is negligible when looking at the effect of US market returns on Fridays while the effects of the legal system and the state of development are magnified.

Events of global importance tend to have a significant impact on the world's stock markets. Output (3) tests how the relationship between all the variables held during the 2008 financial crisis. In this case, the only significant variables in predicting a movement in international stock market returns were US market returns the previous day and the interaction terms  $usRet_{t-1} \times time_i$  and  $usRet_{t-1} \times developed_i$ . The coefficient of US market returns the previous day had a lower magnitude when compared to the coefficient obtained from output (1), but the coefficients of the other two interaction terms increased in magnitude. A 1% increase in US returns during the 2008 financial crisis would lead to only a 33 basis point increase based on US market returns. The effect would reduce by 1.89 basis points for every hour the time lag increases and would increase by 7.93 basis points if the country was developed. This infers that developed countries were more affected by movements in US returns during the financial crisis and the US market returns and the time lag had a reduced effect. Additionally, the dominant language and the legal system were insignificant. In this case, a 1% decrease in the US market on the previous day would lead to a decrease of 33.27 basis points in Singapore, but only a decrease of 25.34 basis points in the Philippines.

A possible explanation into why the interaction term  $usRet_{t-1} \times time_i$  has a stronger effect in predicting international stock market returns during the 2008 financial crisis is because

during that period the US market was the epicenter of the crisis. In countries which the time lag was lower, investors would be quicker to sell off their securities leading to the fall in stock returns in their respective markets.

For the interaction term  $usRet_{t-1} \times developed_i$ , we believe there to be 2 reasons why the magnitude of the coefficient increased. The first would be that developed financial markets were more interconnected with each other, and the US was the source of the crisis. Hence, those with developed financial market were more significantly affected by US market returns. The second explanation would be that developing financial markets had frictions and capital controls that protected their financial markets while the US was in free-fall. This can be seen in the case of China where Campion and Neumann (2003) found that China regulated their capital outflows by imposing minimum stay requirements for certain types of capital, including direct and portfolio investment. According to Kimball and Xiao (2006), the use of capital controls has been particularly successful in limiting financial outflows to reduce volatility during times of financial crisis.

#### **4. Conclusion**

The study finds consistent evidence that the correlation between the US stock market returns and the average international stock return on the following trading day have a significant correlation. Additionally, we found that the various interaction terms with the variables we used in this study were also significant in predicting international stock return movements to a certain degree. Most of our initial hypotheses were supported by the results we obtained from our data, except for the interaction term  $usRet_{t-1} \times legal_i$ , which showed evidence of an opposite relationship to the one that we had initially expected. This is probably due to the high correlation between legal original and the language variable. As expected, the variables used in this study predict a small portion of the returns in international stock markets.

Stock market returns in countries that have developed financial markets that have English as the dominant language tend to be more positively correlated with stock returns in the US market on the previous day, whereas those with a greater time lag and that have a common law legal system tend to be negatively correlated.

Additionally, when there is a weekend between the closing of the US market and the opening of an international stock market, so as expected, we find that the returns of the international stock market to have a weaker correlation with the US on Mondays. Interestingly, we don't find a higher correlation during the 2008 financial crisis, the correlation seems to be lower as the coefficient on the US lagged return is smaller. The other variables showed no significant relationship during the 2008 financial crisis, which may suggest that during crisis importance in commonality across markets is reduced.

An interesting conclusion of this research that could be studied further is the reasoning behind why the interaction term with the legal system, when taken together with all the variables, has a negative coefficient. This study could also be extended by adding variables for the volume of trade of the non-US market with the US market, and the size of each of the markets used in the analysis.

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