

## DAY OF THE WEEK EFFECT IN LATIN AMERICAN STOCK MARKETS

### EL EFECTO DIA DE SEMANA EN LOS MERCADOS ACCIONARIOS DE LATINOAMERICA

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#### Abstract

*This article examines the Day of the Week Effect for the main stock markets in Latin America in Argentina, Brazil, Chile, Colombia, Mexico, and Peru, during the period, 1993-2007. I undertake three different analyses, including GARCH models for the returns and volatility of daily returns by day of the week for the major stock market indexes in the region. I document significant evidence of a Monday Effect (lower than expected returns) or a Friday Effect (higher than expected returns) in many cases in the region. Thus, despite the mitigating influences of longstanding awareness of these anomalies and lowered information and transaction costs from the growth of the internet, the Day of the Week Effect has persisted into recent times.*

Keywords: *Day of the week effect, Latin America, emerging markets.*

JEL Classification: *G10, G14, G15.*

#### Resumen

*Este artículo analiza el Efecto Día de Semana en los principales mercados accionarios de Latinoamérica: Argentina, Brasil, Chile, Colombia, México y Perú, durante el periodo 1993-2007. El estudio incluye tres diferentes análisis, incluyendo modelos GARCH para los retornos y volatilidad de los retornos diarios de los índices característica de cada uno de los mercados analizados. De los resultados se puede evidenciar la existencia del Efecto*

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*Día Lunes (retornos menores a los retornos de los otros días) y Efecto Fin de Semana (retornos superiores a los demás días) en varios mercados. A pesar de la publicación de estos efectos, de la mayor información y menores costos de transacción debido al crecimiento del uso de internet, el Efecto Día de Semana aún persiste.*

Palabras Clave: *Efecto día de semana, Latinoamérica, mercados emergentes.*

Clasificación JEL: *G10, G14, G15.*

## 1. INTRODUCTION

In a well-functioning efficient market, one would expect that every day of the week should exhibit similar returns and volatility. These priors have not held up in many studies on the so-called Day of the Week, many of which –though not all– document lower daily returns on Monday (“the Monday Effect”) and higher daily returns on Fridays (“the Friday or Weekend Effect”). There are several reasons to revisit this evidence in the context of Latin American stock markets. First, the effect has been known for a long time, and if information and transaction costs are low enough, the effect should disappear in efficient markets. Second, the growth of the internet, by lowering information costs and providing ease of trading, may just allow for the necessary conditions for the mitigation of the Day of the Week Effect. Third, Latin America represents a major segment of emerging markets. In general emerging markets have not received as much attention on this issue, and Latin America, in particular, has been ignored. To the best of my knowledge, this will provide the first evidence on Day of the Week Effect for major stock markets in Latin America. This in itself is of interest, given the size of some of the markets in Latin America.

In this paper, I examine the Day of the Week Effect for stock markets in all the six major Latin American countries, Brazil, Chile, Colombia, Mexico, Argentina and Peru for the recent period, 1993–2007. I study both the average returns for each day of the week, as well as the volatility of returns on those days individually. To begin with, I undertake a univariate analysis of average returns on each day of the week in comparison to the average daily returns for the rest of the days of the week. Next, I undertake two additional analyses, in which I employ a GARCH methodology, using daily returns in local currency terms. First, I examine rates of returns by each day of the week, ignoring volatility changes by day of the week. Second, I consider both together – Day of the Week Effects on daily returns and on volatility.

I find continuing evidence of the Day of the Week Effect. Purely in a light conclusion, this points towards a search for a behavioral explanation for the Day of the Week Effect, since the effect persists despite so many advantages in reduced informational and transactional costs from improved internet and other technologies. Mondays have been associated with added stresses, while Fridays are associated with relief in the upcoming off-days. These aspects have not changed over the past many decades.

The rest of the paper is organized as follows: In the next Section, I describe the prior literature on the Day of the Week Effect. The data and methodology are presented in Section 3. I present and discuss my findings in Section 4. Concluding remarks are contained in Section 5.

## 2. LITERATURE REVIEW

The earliest study on the Day of the Week Effect goes back to Fields (1931), who found statistically significant differences between average returns on Mondays and Fridays for the stock market in the United States. Specifically, the Day of the Week Effect has been broken down into two specific effects, the Monday Effect and a Friday or Weekend Effect, although conceptually the effect applies to every day of the week. The Monday Effect refers to lower daily returns on Mondays, while the Friday Effect refers to higher daily returns on Fridays, compared to the other days of the week.

There is a long history of work on the Day of the Week Effect, although until recently it was mostly focused on the United States stock markets and then on European markets. Among these studies, the work by Cross (1973), French (1980) and Lakonishok and Levi (1982) may be cited.

The work by French (1980) provides a useful illustration of this stream of research. He examined daily returns for Standard and Poor's 500 Index, which is a value-weighted index of the five hundred largest equities in the United States, over a 25-year period, 1953-1977. He found that on average the daily returns on Mondays were robustly lower, whether one considered the entire 25-year period or each of the five 5-year periods. Results consider a lower average return for Mondays than the average for the whole period, and also for five subgroups selected every five years. Gibbons and Hess (1981) affirmed these findings with both U.S. stocks as well as U.S. Treasuries. Interestingly, Gibbons and Hess (1981) ruled out several plausible explanations for the phenomenon. In a broader study, that incorporated other calendar anomalies, Lakonishok and Smidt (1988), found corroborative evidence of anomalous returns on weekends, month-ending days and sessions before holidays. For another North American market, Pope and Yadav (1992) found evidence of the Day of the Week Effect for the Canadian stock market.

Dubois and Louvet (1996) performed their analysis on different European stock markets, in France, England, Germany and Switzerland, among others, and concluded negative average returns at the beginning of the week. They also report that in recent periods the effect disappears in the USA. Arsad and Coutts (1997) analyzed the British stock market by studying the FT30 index for the period, 1935-1994. They document that Monday had lower returns compared to other days of the week.

Berument and Kiyamaz (2003) studying the S&P 500 market index during the period of 1973 to 1997 using GARCH models found that the day of the week effect is found in both volatility and in return equations and that the results are consistent after taking sub periods. Very recently, Charles (2010) analyzed the Day of the Week Effect for six European countries, applying a GARCH model to returns and volatility, and found evidence of both types of anomalies in the stock markets: in Athens, Paris

and Dublin, for anomalies based on returns and for anomalies based on volatility in Milan, Zurich and Helsinki.

Several studies attempted to explain the Monday effect. French (1980) suggests the calendar time hypothesis, which states that Monday returns should be higher than other weekday returns. He found a negative Monday effect, and this result was inconsistent with his hypothesis. Gibbons and Hess (1981) and Keim and Steimbaugh (1984) suggest that this effect is due market settlement procedures. Despite of all the studies that have been done and being an effect known for long time, there is no consensus in this regard.

The Day of the Week Effect has been examined in stock markets worldwide, although emerging markets have received attention more recently compared to developed markets in North America or Europe. Brooks and Persaud (2001) have analyzed Asian stock markets, the Philippines, South Korea, Malaysia, Singapore, Taiwan and Thailand, and found significant differences in average returns for different days of the week. In particular, they find higher average returns on Mondays and negative returns on Tuesdays for Thailand and Malaysia. In Taiwan, they found negative average returns on Wednesdays. Notably, while these findings have in common significant differences across different days of the week, they differ from studies on the U.S. regarding which days experience the higher returns.

Mills, Siriopoulos, Markellos and Harizanis (2000) analyzed the Greek stock market. Rather than examining only basket indices, they analyzed calendar effects for each of the constituent stocks of the Athens Stock Exchange General Index for the period from October 1986 to April 1997, and they found evidence on the Day of the Week Effect, even as they proposed that the anomalous effect should disappear with Greece having joined the European Union.

Some studies have questioned the day-of-the-week effect results. For example, Connolly (1989), using US data adjusted for sample size, heteroscedasticity and serial correlation, who reported that the day of the week effect disappeared after 1975.

A recent study on emerging markets was conducted by Ajayi, Mehdian and Perry (2004), who analyzed the Day of the Week Effect for emerging stock markets in eleven Eastern European countries. While the daily average returns for Mondays for six indexes among countries in the region were negative, only in two countries was the difference statistically significantly different from other days of the week. Therefore, they conclude against an anomalous finding on the Monday Effect. Similarly, Bodla and Kiran (2006) analyzed the Indian stock market, and concluded against evidence for the existence of the Day of the Week effect in India.

This paper offers evidence on the Day of the Week Effect for Latin American countries, all the stock market analyzed are classified emerging markets.

### **3. DATA AND METHODOLOGY**

For the analysis of the Day of the Week Effect is divided in two. First, daily closing values for each index were used, expressed in their respective domestic currency. After doing the analysis for each index, the same analysis is done for a selected

group of stocks. The selection criterion was liquidity. Stocks were selected if more than 70% of yearly trading days they had a transaction volume over USD 10,000 per day. The idea behind this second analysis is to analyze the effect, if present, of non-synchronous trading.

The period of study examines the daily returns from January 2nd, 1993 through December 31st, 2007. The source of the data is the *Economática* database<sup>1</sup>.

Daily returns are attained by taking logarithms:

$$R_{it} = \ln\left(\frac{I_{it}}{I_{it-1}}\right) \quad (1)$$

where  $R_{i,t}$  is the daily return for stock index  $i$  (for each stock market) on day  $t$ .  $I_{i,t}$  is the closing value for  $i$  index on day  $t$ . Descriptive statistics for each index by daily basis, are presented in Table 1. In order to isolate any pre-holiday effect and to focus on the Day of the Week Effect, I drop from analysis any weeks that contain a holiday.

TABLE 1

DESCRIPTIVE STATISTICS FOR DAILY RETURNS FOR 6 LATIN AMERICA STOCK INDEXES, 1993-2007

	BOVESPA	IPC	IPSA	IGBC	MERVAL	ISBVL
Mean	0.22%	0.06%	0.05%	0.06%	0.02%	0.10%
Median	0.19%	0.08%	0.03%	0.04%	0.10%	0.08%
Maximum	28.82%	11.06%	8.98%	14.69%	16.12%	15.00%
Minimum	-16.22%	-14.31%	-6.42%	-11.05%	-14.76%	-10.43%
Standard Deviation	2.64%	1.60%	1.12%	1.31%	2.22%	1.60%
Skewness	0.65	-0.18	0.24	0	-0.25	0.11
Kurtosis	11.99	8.56	7.69	16.32	8.41	10.65
Jarque-Bera	10,663	4,274	2,907	20,316	3,930	8,024
Observations	3,105	3,305	3,140	2,750	3,190	3,290

In Table 1 can be observed that the average daily rate of return over the period of this study is positive for all the 6 markets, all in local currency terms. BOVESPA experienced the highest average returns of 0.22%, possibly because of higher inflation in Brazil. The Argentine index, MERVAL, had the lowest returns, a mere 0.02%, which possibly reflects the financial crisis experienced by Argentina during this period. It can be seen also that MERVAL has one of the highest standard deviations, probably for the same reason. It is also instructive to consider the maximums and minimums,

<sup>1</sup> This database provides financial and economic information for the main Latin American markets. For more information, please see [www.economática.com](http://www.economática.com).

which tell us that there were days with extreme returns both on the up side as well as the down side.

A first approach to study the Day-of-the-Week effect is to estimate the following equation for each market or selected stock:

$$R_{it} = \alpha_{i0} + \alpha_{i1}D_1 + \alpha_{i2}D_2 + \alpha_{i3}D_3 + \alpha_{i4}D_4 + \varepsilon_{it} \quad (2)$$

This methodology assumes that the residuals are normally distributed, homoscedastic and not autocorrelated. These OLS assumptions for daily returns are likely to be invalid as shown by Chang *et al.* (1993), leading to the irrelevance of the t-statistics for this particular case. The homoscedastic assumption can be solved by using the heteroscedasticity consistent errors, as proposed by White (1980), but this approach does not consider the distribution of the residuals. Normality test are employed to check the distribution of the residuals. If the residuals are normally distributed, an F-test and an ANOVA table are used. If the residuals are not normally distributed, nonparametric test are used to test the existence of the effect. This was the approach taken by Dubois and Louvet (1996).

In order to effectively determine the presence of the Day of the Week Effect in daily return series and taking into account the time varying property of volatilities, the following GARCH model (Bollerslev, 1986) was applied, using auxiliary variables and an autoregressive model with lag  $k$  in the returns. The model is presented as following:

$$R_{it} = \mu_{i,0} + \alpha_{i,1}D_1 + \alpha_{i,3}D_3 + \alpha_{i,4}D_4 + \alpha_{i,5}D_5 + \sum_{l=1}^k \mu_{i,l}R_{t-l} + \varepsilon_t \quad (3)$$

$$\sigma_{i,t}^2 = \eta_i + \lambda_i \varepsilon_{i,t}^2 + \theta_i \sigma_{i,t-1}^2 + \gamma_{i,t}$$

where  $R_{i,t}$  is the daily return on day  $t$  for index  $i$ , and  $D$  stands for auxiliary variables, which take values 0 or 1 (binaries). For instance, since  $D_1$  is the auxiliary variable associated with Mondays, therefore when  $t$  corresponds to it, it takes a value of 1, otherwise it is null or zero.  $D_3$ ,  $D_4$  and  $D_5$  work with the same logic and are associated with Wednesdays, Thursdays and Fridays. Note that  $D_2$  is not taken as a part of the equation to avoid the dummy variable trap. So, the coefficients on the D-indicator variables provide differences from Tuesdays, and are the main focus of the empirical analysis here. Coefficient  $\mu_o$  is the constant part of the daily returns, while the  $\mu_i$  values constitute the autoregressive component of it. Coefficients  $\alpha_i$  measure the size and sign of the Day of the Week Effect for the daily returns, relative to the omitted day (Tuesdays). If there is no Day of the Week Effect, these coefficients are expected to take a value of zero.

Each market is adjusted to a lag  $k$ , based on the minimized Akaike Information Criterion (AIC) for an autoregressive moving average model (ARMA), as suggested by Hsieh (1991). The used model is GARCH (1,1), since it has been demonstrated that it fits well under these circumstances according to Baillie y Bollersev (1991). The  $\sigma_t^2$  expression represents conditional variance for  $\varepsilon_t^2$ .

Restating the presence of the Day of the Week Effect in terms of volatility, instead of daily rates of return, requires a similar model, but now I add auxiliary variables for volatility. The proposed model is presented as follows:

$$R_{it} = \mu_{i,0} + \alpha_{i,1}D_1 + \alpha_{i,3}D_3 + \alpha_{i,4}D_4 + \alpha_{i,5}D_5 + \sum_{l=1}^k \mu_{i,l}R_{t-l} + \varepsilon_t \tag{4}$$

$$\sigma_{i,t}^2 = \eta_i + \lambda_i \varepsilon_{i,t}^2 + \theta_i \sigma_{i,t-1}^2 + \beta_{i,1}D_1 + \beta_{i,3}D_3 + \beta_{i,4}D_4 + \beta_{i,5}D_5 + \gamma_{i,t}$$

where  $\beta_i$  coefficients measure the size and direction of the Day of the Week Effect in volatility, in comparison as before to the base value on Tuesday. It is predicted that the  $\beta_i$  coefficients will have zero values if there is no Day of the Week Effect.

A fundamental characteristic to check in time series analysis is stationarity. For testing this, the Augmented Dickey-Fuller (ADF) test was applied on the daily return series for each market. Using a maximum lag of 28 days stationarity can be assured, since the t-statistic is highly negative, way lower than the 5% and even the 1% critical values. Results are shown on Table 2.

TABLE 2

ADF STATIONARY TEST ON DAILY RETURNS ON LATIN AMERICA STOCK MARKETS

Market	BOVESPA	IPC	IPSA	IGBC	MERVAL	ISBVL
t-statistic	-14.37	-14.19	-13.66	-12.6	-13.86	-14.12
Critical value at 5%	-2.86	-2.86	-2.86	-2.86	-2.86	-2.86
Critical value at 1%	-3.43	-3.43	-3.43	-3.43	-3.43	-3.43
p-value	0.0001	0.0000	0.0001	0.0000	0.0001	0.0001

#### 4. EMPIRICAL RESULTS

Daily average returns on each day, Mondays through Fridays, are compared with the average daily rates of returns for the rest of the days of the week (ROW), as a starting point for the choice of day to be omitted in the GARCH model (or the day relative to which the returns on the other days are to be considered). The daily returns and the ROW daily returns are shown in Table 3. Some effects are immediately apparent: On average, Mondays earn lower returns than the average for the rest of the days for every market examined in Table 3. When we take the t-test also into account, Monday returns are significantly lower for four markets. With no exceptions, Fridays have higher returns compared to other days of the week. In 5 out of the 6 cases, Friday returns are statistically significantly higher. Also, notably very few other days, Tuesdays, Wednesdays, or Thursdays have returns that are remarkably different. There are only 3 cases where the difference are out of the 18 comparisons for these 3 days versus the rest of the days. There is one weakly significant case of

TABLE 3  
COMPARISON OF DAILY AVERAGE RETURNS VERSUS AVERAGE OF REST OF THE WEEK RETURNS

	Monday	Tuesday	Wednesday	Thursday	Friday	ROW
<b>BOVESPA</b>						
Mean Return	0.00%	0.28%	0.34%	0.01%	0.50%	0.16%
Standard Deviation of Returns	2.65%	2.59%	2.41%	2.81%	2.68%	2.62%
<i>t</i> -statistic	-2.35	<b>0.59</b>	1.26	-2.18	2.85	***
<b>IPC</b>						
Mean Return	-0.14%	0.06%	0.13%	0.12%	0.12%	0.04%
Standard Deviation of Returns	1.69%	1.58%	1.60%	1.65%	1.49%	1.63%
<i>t</i> -statistic	-3.46	<b>-0.01</b>	1.30	1.10	1.25	
<b>IPSA</b>						
Mean Return	-0.15%	0.02%	0.12%	0.05%	0.20%	0.01%
Standard Deviation of Returns	1.12%	1.14%	1.16%	1.09%	1.08%	1.13%
<i>t</i> -statistic	-5.00	***	1.72	<b>0.18</b>	3.93	***
<b>MERVAL</b>						
Mean Return	-0.15%	0.08%	0.06%	-0.03%	0.17%	-0.01%
Standard Deviation of Returns	2.39%	2.12%	2.08%	2.33%	2.15%	2.23%
<i>t</i> -statistic	-2.05	**	<b>0.45</b>	-0.71	1.87	*
<b>IGBC</b>						
Mean Return	0.02%	-0.10%	0.07%	0.08%	0.21%	0.02%
Standard Deviation of Returns	1.30%	1.28%	1.28%	1.47%	1.20%	1.34%
<i>t</i> -statistic	-0.72	-3.20	<b>0.23</b>	0.47	3.32	***
<b>ISBVL</b>						
Mean Return	0.02%	0.02%	0.02%	0.10%	0.34%	0.04%
Standard Deviation of Returns	1.70%	1.72%	1.50%	1.65%	1.40%	1.64%
<i>t</i> -statistic	-1.40	-1.39	-1.44	<b>0.00</b>	4.74	***

\* indicates statistical significance at the 10 percent level.

\*\* indicates statistical significance at the 5 percent level.

\*\*\* indicates statistical significance at the 1 percent level.



difference between returns on Wednesdays and other days of the week. If we go by the lowest return days, we can pick different days from among these three as the base case in our analysis below.

Except for Mondays, the IPyC index has indistinguishable returns on other days. The Merval and IPSA indexes show both a Monday and a Weekend Effect. The IGBC index shows lower returns on Tuesdays instead of Mondays, based on the statistically significant average returns on that day compared to the rest of the week. The IGBC index also shows a Weekend Effect, since its Friday return is significantly greater than on other days. Finally, the ISBVL index supports a Friday Effect only. Overall, the analysis so far shows that the day of the week does matter in terms of the rates of return experienced. Compared to the hypothesis that all days of the week should have similar returns, we see many exceptions.

Finding the optimal lag ( $p$ ) for an AR ( $p$ ) model for each market is the second step for my analysis. The Akaike information criterion (AIC) is used for this optimization with the following model:

$$R_{i,t} = \mu_{i,0} + \sum_{l=1}^p \varphi_{i,l} R_{t-l} \tag{5}$$

Table 4 presents values for the  $p$  variable which minimizes the AIC for each return series for the analyzed markets.

TABLE 4

OPTIMAL VALUES FOR  $P$  IN AN ARMA ( $P,Q$ ) MODEL FOR EACH STOCK MARKET

	BOVESPA	IPC	IPSA	IGBC	Merval	ISBVL
<i>lag p</i>	4	2	3	2	2	4

It can be observed in Table 4 that the lags are not the same for the different markets. All optimal lags are 4 days or less according to the minimization of the AIC criterion.

Once both optimal auto regression lag and dummy variables are resolved, the Day of the Week analysis can be performed. Results are presented in Table 5, where we focus on returns for different days of the week and ignore changes in volatility by day of the week. If we consider either a Monday Effect or a Friday Effect to constitute a Day of the Week Effect, every market considered in this study, except for Mexico, has a Day of the Week Effect: For the Brazilian stock market, the evidence support a Friday Effect and a slight Wednesday Effect, all relative to Tuesdays. For both Chilean and Argentine stock markets, the Monday Effect can be seen. The Colombian stock market shows a Tuesday and Friday Effect. The Peruvian stock market shows both a Monday and a Weekend Effect.

TABLE 5  
ESTIMATION OF RETURN MODEL FOR DAY OF THE WEEK EFFECT FOR LATIN AMERICAN STOCK MARKETS

	BOVESPA			IPC			IPSA			
	Value	Std. Error	p-value	Value	Std. Error	p-value	Value	Std. Error	p-value	
<i>Return Coefficients</i>										
Monday	-0.0010	0.0011	0.3400	-0.0009	0.0007	0.1514	-0.0023	0.0005	0.0000	***
Tuesday							-0.0005	0.0005	0.3434	
Wednesday	0.0018	0.0011	0.0979	0.0008	0.0007	0.2492	0.0001	0.0005	0.8696	
Thursday	-0.0003	0.0010	0.7614	0.0004	0.0007	0.5866				
Friday	0.0027	0.0011	0.0137	0.0003	0.0007	0.6638	0.0006	0.0005	0.2584	
Constant	0.0007	0.0008	0.3574	0.0011	0.0005	0.0228	0.0010	0.0004	0.0101	**
<i>Volatility Coefficients</i>										
Constant	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	***
Residual2	0.1295	0.0097	0.0000	0.1212	0.0079	0.0000	0.1413	0.0125	0.0000	***
GARCH2	0.8476	0.0116	0.0000	0.8566	0.0093	0.0000	0.8325	0.0144	0.0000	***
Log likelihood	7,441			9,325			10,087			
Akaike info criterion	-4,8120			-5,6479			-6,4455			
Schwarz criterion	-4,7611			-5,6165			-6,3951			

(continued on next page)

Table 5 (continued)

	IGBC			Merval			ISBVL			
	Value	Std. Error	p-value	Value	Std. Error	p-value	Value	Std. Error	p-value	
<i>Return Coefficients</i>										
Monday	0.0001	0.0005	0.8161	-0.0027	0.0009	0.0042	***	-0.0008	0.0005	0.0881 *
Tuesday	-0.0014	0.0005	0.0064	***	-0.0010	0.0010	0.3335	-0.0009	0.0005	0.0796 *
Wednesday								-0.0004	0.0005	0.4282
Thursday	0.0004	0.0005	0.3863	-0.0006	0.0010	0.5049				
Friday	0.0012	0.0005	0.0271	**	-0.0004	0.0010	0.7050	0.0015	0.0005	0.0026 ***
Constant	0.0003	0.0004	0.4619	0.0019	0.0007	0.0081	***	0.0009	0.0004	0.0123 **
<i>Volatility Coefficients</i>										
Constant	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 ***
Residual2	0.3393	0.0280	0.0000	***	0.1116	0.0074	0.0000	0.2308	0.0129	0.0000 ***
GARCH2	0.5125	0.0314	0.0000	***	0.8581	0.0092	0.0000	0.7498	0.0105	0.0000 ***
Log likelihood	8.624			8.058				9.665		
Akaike info criterion	-6.2691			-5.0489				-5.8751		
Schwarz criterion	-6.2476			-5.0298				-5.8528		

\* indicates statistical significance at the 10 percent level.  
 \*\* indicates statistical significance at the 5 percent level.  
 \*\*\* indicates statistical significance at the 1 percent level.

Volatility, as modeled above along with the returns, is examined in Table 6 for a Day of the Week Effect. First, I examine the findings on daily returns. The BOVESPA (Brazil), IGPC (Colombia), and ISBVL (Peru) show a significant Friday Effect because they experienced higher daily returns on Fridays. The Monday Effect, lower daily average returns on Monday, show up in Chile (IPSA) and in Argentina (MERVAL). So, if we consider either a Monday or a Friday Effect, a Day of the Week Effect in returns is seen by 5 out of the 6 main markets in Latin America. Next, I examine the findings regarding volatility in Table 6: The BOVESPA (Brazil), IPyC (Mexico), and ISBVL (Peru) had significantly lowered volatility on Fridays. The IGBC (Colombia) saw significantly higher volatility on Fridays. As for Mondays, IPSA (Chile), IGBC (Colombia), MERVAL (Argentina), and ISBVL (Peru) had higher volatility on Mondays. In general, there is a tendency for Fridays to have higher returns and lower volatility, while Mondays have lower returns and higher volatility. The general tone of Mondays is negative, while it is positive on Fridays. Regarding the volatilities for the remaining days of the week, it can be seen a positive effect for IGBC on Thursdays and a slight positive effect for Thursdays on MERVAL. It is also observed a negative Tuesday effect for ISBVL.

After doing the analysis for the indexes, stocks were selected according to the liquidity criterion explained in the methodology. With these stocks, the same analysis was done for testing the Day of the Week effect in returns and in volatility for every selected stock in each market.

Table 7 shows that the effect for individual stocks is persistent. Overall in can be seen that the Monday effect is more frequent than the Friday effect in both returns and in volatilities. It is also observed that volatilities tend to be more sensitive to the day of the week rather than returns. In every country, at 10% confidence level, the Monday effect in returns has a maximum frequency for the Chilean stocks, showing that 68.9% of stocks have this effect. For a Friday effect in returns, the maximum at 10% confidence level is 30% of Peruvian stocks. The minimums at 10% confidence level are 24.4% of Brazilian stocks returns with a Monday effect and with a Friday effect. For Argentinian stocks the corresponding value is 6.8% of stocks returns. These results show a Day-of-the-Week effect in returns and are coherent with the previous analysis.

In volatilities it is observed that there is a larger effect compared to returns. For a Monday effect in volatilities, at 10% confidence level there is a maximum for Mexican stocks with 67.2% of stocks volatility. Friday effect at 10% confidence level has a maximum in Colombian IGBC stocks, with 60.0% of stocks volatility. It is also interesting that the effect in volatilities is strong, which can be seen in the minimums. The minimum at 10% confidence level for Monday effect is 44.3% of Chilean stocks volatility. The minimum at 10% confidence level for Friday effect is 41.0%, also for Chilean stocks.

TABLE 6  
RETURN AND VOLATILITY MODEL CONSIDERING DAY OF THE WEEK EFFECT FOR LATIN AMERICAN STOCK MARKETS (INDEX ANALYSIS)

	BOVESPA			IPC			IPSA		
	Value	Std. Error	p-value	Value	Std. Error	p-value	Value	Std. Error	p-value
<i>Return Coefficients</i>									
Monday	-0.0011	0.0012	0.3377	-0.0010	0.0007	0.1408	-0.0023	0.0005	0.0000 ***
Tuesday							-0.0005	0.0005	0.3553
Wednesday	0.0017	0.0011	0.1384	0.0007	0.0007	0.2936	0.0002	0.0005	0.7422
Thursday	-0.0003	0.0012	0.7922	0.0004	0.0007	0.6059			
Friday	0.0024	0.0011	0.0279 **	0.0001	0.0007	0.8528	0.0006	0.0005	0.2158
Constant	0.0008	0.0009	0.3557	0.0011	0.0005	0.0288 **	0.0009	0.0003	0.0057 ***
<i>Volatility Coefficients</i>									
Monday	0.0000	0.0000	0.5547	-0.0000005	0.0000	0.9759	0.000019	0.0000	0.0027 ***
Tuesday							0.000010	0.0000	0.1754
Wednesday	-0.0001	0.0000	0.1332	-0.0000140	0.0000	0.3695	0.000007	0.0000	0.3972
Thursday	0.0000	0.0000	0.2498	-0.0000107	0.0000	0.3992			
Friday	-0.0001	0.0000	0.0023 ***	-0.0000258	0.0000	0.0337 **	0.000011	0.0000	0.1811
Constant	0.0000	0.0000	0.1223	0.0000	0.0000	0.0707 *	-0.000006	0.0000	0.2330
Residual2	0.1279	0.0098	0.0000 ***	0.1203	0.0081	0.0000 ***	0.1391	0.0126	0.0000 ***
GARCH2	0.8464	0.0121	0.0000 ***	0.8577	0.0093	0.0000 ***	0.8338	0.0144	0.0000 ***
Log likelihood	7.447			9.327			10.092		
Akaike info criterion	-4.8133			-5.6468			-6.4461		
Schwarz criterion	-4.7546			-5.6079			-6.3880		

(continued on next page)

Table 6 (continued)

	IGBC			MERYAL			ISBVL		
	Value	Std. Error	p-value	Value	Std. Error	p-value	Value	Std. Error	p-value
<i>Return Coefficients</i>									
Monday	0.0003	0.0005	0.6311	-0.0026	0.0010	0.0086	-0.0008	0.0005	0.1228
Tuesday	-0.0015	0.0005	0.0012	-0.0007	0.0010	0.4668	-0.0009	0.0005	0.0841
Wednesday							-0.0004	0.0005	0.4866
Thursday	0.0003	0.0005	0.5161	-0.0005	0.0009	0.5523			
Friday	0.0009	0.0005	0.0673	-0.0004	0.0009	0.6477	0.0014	0.0005	0.0044
Constant	0.0003	0.0003	0.3102	0.0018	0.0007	0.0071	0.0009	0.0004	0.0135
<i>Volatility Coefficients</i>									
Monday	0.00004	0.0000	0.0000	0.00011	0.0000	0.0000	0.00002	0.0000	0.0322
Tuesday	0.00000	0.0000	0.6831	-0.00001	0.0000	0.8259	-0.00002	0.0000	0.0030
Wednesday							-0.00001	0.0000	0.1359
Thursday	0.00002	0.0000	0.0007	0.00005	0.0000	0.0701			
Friday	0.00001	0.0000	0.0492	0.00001	0.0000	0.6052	-0.00002	0.0000	0.0159
Constant	0.00000	0.0000	0.4201	-0.00002	0.0000	0.1759	0.00002	0.0000	0.0004
Residual2	0.32965	0.0262	0.0000	0.11311	0.0081	0.0000	0.22361	0.0130	0.0000
GARCH2	0.56209	0.0276	0.0000	0.85879	0.0096	0.0000	0.75328	0.0110	0.0000
Log likelihood	8.639			8.067			9.670		
Akaike info criterion	-6.2774			-5.0521			-5.8760		
Schwarz criterion	-6.2473			-5.0255			-5.8463		

\* indicates statistical significance at the 10 percent level.

\*\*\* indicates statistical significance at the 5 percent level.

\*\*\* indicates statistical significance at the 1 percent level.

TABLE 7  
 RETURN AND VOLATILITY MODEL CONSIDERING DAY OF THE WEEK EFFECT FOR  
 LATIN AMERICAN STOCK MARKETS (STOCKS ANALYSIS)

	BOVESPA			IPC			IPSA		
	10%	5%	1%	10%	5%	1%	10%	5%	1%
<i>Return Coefficients Significant at</i>									
Monday	24.4%	15.6%	7.5%	38.8%	29.9%	11.9%	68.9%	57.4%	39.3%
Tuesday							37.7%	23.0%	9.8%
Wednesday	14.4%	6.9%	0.6%	13.4%	7.5%	0.0%	16.4%	14.8%	4.9%
Thursday	8.8%	3.8%	0.6%	17.9%	11.9%	4.5%			
Friday	20.6%	15.0%	5.0%	16.4%	13.4%	6.0%	19.7%	11.5%	1.6%
Constant	8.1%	5.0%	1.3%	9.0%	4.5%	0.0%	26.2%	19.7%	8.2%
<i>Volatility Coefficients Significant at:</i>									
Monday	46.3%	41.3%	30.6%	67.2%	61.2%	52.2%	44.3%	41.0%	27.9%
Tuesday							55.7%	52.5%	32.8%
Wednesday	43.1%	38.1%	26.9%	55.2%	44.8%	35.8%	37.7%	32.8%	24.6%
Thursday	34.4%	31.3%	20.0%	55.2%	46.3%	37.3%			
Friday	52.5%	45.0%	31.9%	58.2%	55.2%	49.3%	41.0%	34.4%	24.6%
Constant	66.3%	56.9%	45.0%	82.1%	79.1%	64.2%	54.1%	50.8%	34.4%
Residual2	90.6%	89.4%	75.6%	100.0%	100.0%	97.0%	98.4%	98.4%	96.7%
GARCH2	90.0%	88.1%	86.3%	98.5%	98.5%	97.0%	96.7%	95.1%	95.1%
Number of Stocks Analyzed	160			67			61		

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Table 7 (continued)

	IGBC			MERVAL			ISBYL		
	10%	5%	1%	10%	5%	1%	10%	5%	1%
<i>Return Coefficients Significant at</i>									
Monday	60.0%	45.0%	35.0%	54.5%	47.7%	29.5%	33.3%	23.3%	3.3%
Tuesday	20.0%	20.0%	5.0%	9.1%	2.3%	2.3%	10.0%	6.7%	0.0%
Wednesday							20.0%	10.0%	3.3%
Thursday	15.0%	5.0%	5.0%	15.9%	11.4%	0.0%			
Friday	15.0%	10.0%	0.0%	6.8%	4.5%	0.0%	30.0%	13.3%	3.3%
Constant	25.0%	10.0%	5.0%	20.5%	9.1%	4.5%	16.7%	10.0%	3.3%
<i>Volatility Coefficients Significant at:</i>									
Monday	55.0%	50.0%	45.0%	45.5%	38.6%	22.7%	56.7%	56.7%	40.0%
Tuesday	60.0%	40.0%	30.0%	47.7%	36.4%	11.4%	70.0%	63.3%	46.7%
Wednesday							46.7%	36.7%	26.7%
Thursday	40.0%	35.0%	25.0%	38.6%	34.1%	22.7%			
Friday	60.0%	60.0%	45.0%	45.5%	43.2%	31.8%	53.3%	40.0%	26.7%
Constant	55.0%	40.0%	35.0%	38.6%	29.5%	25.0%	50.0%	40.0%	30.0%
Residual 2	100.0%	100.0%	100.0%	100.0%	97.7%	97.7%	100.0%	96.7%	93.3%
GARCH 2	100.0%	100.0%	100.0%	100.0%	100.0%	97.7%	93.3%	90.0%	90.0%
Number of Stocks Analyzed	20			44			30		



## 5. CONCLUSIONS

I undertake three different analyses of the Day of the Week Effect for 6 major stock markets in Latin America for the period, 1993-2007. Robustly, the evidence does not support the hypothesis that the daily average returns or the volatility of returns are the same irrespective of the day of the week. If I consider either a Monday Effect (lower returns) or a Friday or Weekend Effect (higher returns) as manifestations of the Day of the Week Effect, the phenomenon is fairly prevalent during the period across the markets in Latin America. Supporting the notion that Mondays are “negative” days while Fridays are “positive” days, I also find supporting evidence that on several exchanges in Latin America volatility is higher on Mondays and is lower on Fridays. This is new evidence, since Latin American stock markets have not been previously examined for the Day of the Week Effect.

The analysis done for each individual stock, selected according a liquidity filter had similar results, being consistent with the results of the index analysis, showing a Day of the Week effect on both, returns and volatilities. It was found also that the effect in volatilities is more frequent than that in returns. These results are interesting because they show that after analyzing the effect individually per stock the effect still persistent in returns and volatilities.

These findings are noteworthy because they are suggestive of underlying behavioral factors, since the priors were that the Day of the Week should disappear in more recent data. After all, the phenomenon has been known for a long time, and markets should adjust and be efficient in this regard by now. Moreover, the growth of the internet should reduce information and transaction costs, mitigating the Day of the Week Effect.

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## APPENDIX

### Appendix 1: Latin American Stock Markets

The selective major stock market indexes in the six largest Latin American countries are: (1) For Mexico, Índice de Precios y Cotizaciones (IPyC or IPC); for Brazil, Bolsa de Valores, Mercadorias & Futuros de Sao Paulo (Bovespa); for Chile, Índice de Precios Selectivo de Acciones (IPSA); for Colombia, Índice de la Bolsa de Valores de Colombia (IGBC); for Argentina, Mercado de Valores (MERVAL); and, for Peru, Índice Selectivo Bolsa de Valores (ISBVL).

*IPyC*: The IPyC index is the main indicator for the Mexican stock market, reflecting the performance of a balanced, value-weighted representation of selected, stocks. The IPyC was started in 1978.

*BOVESPA*: This is the main index for the Sao Paulo stock exchange, the prominent stock market in Brazil. The index is available going back to 1968. This index considers stocks that represent 80% of the number of transactions and volume. It also represents more than 70% of the market capitalization of companies.

*IPSA*: Formed by the 40 most active stocks, this Chilean stock market index was started in 1977. The weights of the stocks is calculated based on the market capitalization, the number of transactions and the free float.

*IGBC*: Based on the most traded and largest market capitalization, this Columbian stock market index was formed by the merger of three stock exchanges in Bogota, Medellin and Occidente. This index goes back only to 2001, which is why I revert to the IBB, which was the index for the Bogota Stock Exchange, for the years going back to 1993.

*MERVAL*: MERVAL is the important stock market index in Argentina, composed of the 25 most traded and valuable stocks in the market. It was initiated in 1986. The weights are calculated based on volume and number of transactions.

*ISBVL*: The ISBVL, or the Lima stock market index, is the prominent index for the Peruvian stock market, consisting of the 15 most representative stocks. This index was started in 1993. The weights are calculated based on volume and number of transactions.

Since the ISBVL goes back only to 1993, as a common basis for comparability, I use daily data going back to 1993 for all the six indexes that I analyze here.

