DAY OF THE WEEK AND MONTH OF THE YEAR ANOMALIES IN THE MEXICAN STOCK MARKET

Alejandra Cabello*
Universidad Nacional Autónoma de México
Edgar Ortiz
Universidad Nacional Autónoma de México
(Recieved 13 March 2003, accepted 17 de June 2003)

Abstract
This paper presents evidence of day-of-the week and month-of-the year effects for the case of the Mexican Stock Market for the period 1986-2001, and two subperiods identified by breakpoints in the return series. In local currency nominal terms, Monday is the worst performing day of the week, but seasonality is not limited to negative returns identified for this day; Thursday tends to show abnormally high returns. These patterns remain basically the same in terms of inflation adjusted returns and dollar adjusted returns and for the subperiods analyzed. The behavior of monthly returns also show calendar anomalies. A January effect is present in nominal terms, but it is negative in real and dollar adjusted returns. The January effect present in nominal terms cannot be explained by the tax-loss theory advanced for the case of USA, since there are no taxes on capital gains in Mexico. In real and dollar adjusted terms, January returns become negative and a long negative strecht from August to February is also present. For both daily and monthly returns, anomalies are not related to risk premia.

Resumen
Este trabajo presenta evidencia empírica sobre la presencia de anomalías día-de-la-semana y mes-del-año en la Bolsa Mexicana de Valores en el período 1986-2001 y dos subperíodos identificados por rupturas en las series de rendimientos. En términos nominales, lunes es el día con rendimientos más bajos de la semana, pero las anomalías de calendario no se limitan a ese día; el jueves presenta rendimientos anormalmente altos. Estos patrones de comportamiento permanecen básicamente iguales a su comportamiento bursátil ajustado por inflación y por el dólar. En los subperíodos estudiados, el comportamiento de los rendimientos mensuales también presenta anomalías de calendario. El efecto enero está presente en términos nominales, pero no se explica por la teoría de pérdidas impositivas avanzada para el caso de EE.UU., porque no hay impuestos a las ganancias de capital en México. En términos reales y ajustados por el dólar, los rendimientos de enero se vuelven negativos y un largo período de rendimientos negativos de agosto a febrero aparece. En los rendimientos diarios y mensuales, las anomalías de calendario no se relacionan con primas al riesgo.

JEL classification: G14, G15, N26
Keywords: Calendar anomalies, Day of the week and Month of the year effects, Mexican Stock Market

* Apdo. Postal 21-244, Col. Coyoacán, Del. Coyoacán, 04000, México, D. F. E-mail: alecr@servidor.unam.mx y edgaro@servidor.unam.mx

Valuable comments were provided by Jan Bartholdy (Arthus School of Business, Danmark), Dilip K. Ghosh (Rutgers University and Universiti Utara Malaysia), Ruijun Zhong (Tsinghua University, China), and two anonymous reviewers. Graduate Assistance was provided by Raul de Jesus, Universidad Nacional Autónoma de México.

1. Introduction

Empirical evidence of various "anomalies" have long challenged the hypothesis of efficient capital markets in the developed countries. One departure from efficiency well documented in the financial literature is the existence of a number of seasonal patterns. These anomalies include the January effect, the week-end effect, the semimonthly, and turn-of the-month effect, and the holiday effect. However research on the seasonal behavior of emerging stock markets is lacking even though one set of evidence shows that these markets have moved towards different degrees of efficiency (Aguilera, 2002; Arbelaez and Urrutia, 1998; de la Uz 2001; Neriz Jara, 2000; Zablotsky, 2001), spurred by financial liberalization and deregulation policies implemented in their countries since the end of the 1980's. Moreover, financial globalization has led to a large participation of foreign investors in the emerging markets, which in turn might have changed their overall functioning. Thus, empirical evidence needs to be provided on calendar anomalies from emerging stock markets; this is the objective of this work.

This paper examines the day-of-the week and month-of-the year effect for the case of the Mexican Stock Exchange, MSE (Bolsa Mexicana de Valores). A thorough analysis is made using returns derived from the local nominal indexes, adjusted for inflation indexes, and dollar adjusted indexes to identify the behavior of investors in this market. It is worth noting that foreign portfolio investments in Mexico have increased rapidly spurred by financial liberalization policies enforced since the end of the 1980's. These investments now account for 65% on total investment at the Mexican Stock Exchange.

The paper is organized in five sections. Following this introduction, Section II underlies financial liberalization and deregulation as a possible root for changes in the functioning of emerging stock markets and reviews the literature on day of the week and month of the year for the case of these markets. Section III explains the nature of the data and the methodology. Previous to the empirical analysis, Section IV analyzes the basic statistical characteristics of the data, for the whole series and for two subperiods to identify changes in behavior, particularly regarding volatility. Section V reports the empirical findings on day of the week and month of the year effect. Finally, Section VI advances the conclusions of the paper.

2. Financial Literature and Seasonal Anomalies at Emerging Stock Markets

Anomalous return patterns in a market might result from temporary informational inefficiencies. However, even for the case of developed stock exchanges research has shown that certain anomalies are persistent over time and show economic significance. Several hypothesis have been advanced to explain this phenomena. A behavioral view maintains that market anomalies may represent a "naïve" and even an "irrational" investor behavior (Lakonishok *et al.*, 1994). Indeed, some market anomalies can be classified as "value" or "contrarian effects." Naïve investors overreact to information and price changes extrapolating past growth too far into the future, disregarding market and firm fundamentals. In the case of emerging stock markets this behavior might be present not only for a lack of "investment culture" by large segments of participants at the stock markets, but also due to the lack of steady information that enforces in them certain attitudes and beliefs. Similarly, long term anomalies might endure at emerging markets because only few investors follow contrarian attitudes and strategies to dominant market convictions, particularly about declining trends, extrapolated too far into the future. A large body of behavioral finance literature has dealt with this issue for the case of the developed countries. However, although there is an increasing interest on international investments including the construction of portfolios with assets from emerging markets, the characteristics of these markets need still to be scrutinized to improve global stock selection strategies. Moreover, it is worth noting that international capital flows to the developing countries during the last decades have increased sharply, a large share of this flows corresponding to international portfolio investments, an invigorating change from the traditional foreign debt financing which characterized those economies during most of the XX Century. Indeed in less than two decades, as a result of financial liberalization and deregulation portfolio flows to the emerging capital markets have increased significantly and have become an important alternative for corporate financing and economic growth. At the onset of the debt crisis of the 1980's there were 32 emerging stock markets with a market capitalization value of \$62 billion dollars. By year 2000 the International Finance Corporation listed 81 emerging markets with a capitalization value of 3,000 billion dollars, including the capital markets from the economies in transition; emerging markets capitalization accounted for 8.5% of total world capitalization, contrasting with 3.1% in 1980. Net portfolio investments have increased from 53.0 billion in 1992 to 58.3 billion dollar by 2000, following however a very irregular growth and decay pattern resulting from the financial crisis of Mexico, Brazil, Argentina, Russia and the East Asian economies, and falling to 43.0 billion dollars during 2001 due the Turkish and Argentine crisis.

Liberalization and increased foreign investments at the local emerging markets have led among other benefits to greater trade and liquidity, and greater corporate financing through stock and bond issuing, both at the local and international markets. To offer greater credibility and attract investors throughout the world, emerging markets and their intermediaries and corporations also deliver information more frequently and competently. Thus markets have become more efficient. In the case of Mexico early pioneer studies confirmed that its stock market was inefficient both at the weak and semi strong forms (Ortiz, 1979; Haugen *et al.*, 1985). Price efficiency was later identified (de la Uz, 2001) and more recently empirical evidence shows that the market is predictable to a moderate degree, but predictability decreasing over time (Aguilera, 2002). Similarly, from a inward oriented market, foreign portfolio investments have increased significantly over the years. The market opened up in 1989; foreign portfolio flows then amounted to \$414 million dollars with a market value of \$808 million; in spite of a sharp downturn during the 1994-1995 peso crisis, equity investments continued to grow amounting to \$30,203 million in 1998 and a market value of \$32,613 million dollars (Cabello, 2001); currently, foreign portfolio investments amount to 62,200 billion dollars, that is 65 % of total market value. Nevertheless, the MSE remains thin and highly volatile. Only 190 firms are listed at this market; similarly, volatility remains high and it is time dependent (Ortiz and Arjona, 2000).

All these characteristics, shared with other emerging markets, should reflect in the behavior of investors. Thus, anomalies should be present reflecting existing inefficiencies; however anomalies should change over time and likely anomalies found at developed markets should become important at emerging markets, reflecting the importance of investment decisions from foreign portfolio holders and the move from segmentation towards integration of the financial markets. Furthermore, although large proportions of emerging markets trade are carried out by large financial institutions, lack of familiarity with the fundamentals of the emerging markets might be leading to overconfidence during stock market growth periods, followed by acute apprehensions at the onset of a crisis. These views would certainly lead to maintain naïve and irrational attitudes towards emerging market returns which would be accentuated by the behavior of small investors from developed markets, as well as by the behavior from local investors, both largely acting as "noise traders." These attitudes would explain not only the rise and downturn of many emerging stock markets, but also one of the roots of co-movements and contagion effects among these markets. It would also explain the recurring presence of anomalies at emerging markets.

Since any predictable pattern in stock returns might be instrumental to obtain extraordinary returns, evidence on persistent anomalies is inconsistent with market efficiency. For that reason, research on developed markets anomalies has received a great deal of attention. Evidence on day-of-the week and month-of-the year seasonal effects is wide. Indeed, there is ample evidence about daily anomalies, returns on Monday tending to be the worst of the week. Some representative studies on this anomaly include Cross (1973), Fama (1965), French,(1980), Gibbons and Hess (1981, Lakanishok and Levi (1982), Keim and Stambaugh (1984), Jaffe and Westerfield (1985), Abraham and Ikenberry (1994), and Aggarwal and Tandon (1994). The fact that stock returns tend to diminish at the end of the year and increase early in January has been documented by Chen and Singal (2001), Gütekin and Gütekin (1983), Haugen and Jorion (1996), Keim (1983), Reiganum (1981), Roll (1983), Rossef and Kinney (1976), and Watchel (1942). One explanation for the January effect asserts that it is the result of a tax-loss selling effect. Investors sell poor investments by the end of the year to realize capital loses to be set against capital gains reducing in this manner tax liabilities. Thus at the beginning of the year in the absence of selling pressure, the downward pressure on stock prices fade away and stock prices regain their real market prices, which in turn induce abnormal returns at the turn of the year.

On the contrary, although the literature on emerging markets is now considerable, little attention has been directed to studying their anomalies. Most studies have concentrated on the month-of-the year effect. Nassir and Mahammad (1987) proved that average January returns were significantly positive and higher than the other months at the Malaysian stock market for the period 1970-1986. However the tax-selling hypothesis is not supported by the data, which is consistent with the absence of capital gains tax in that country. Examining the Hong-Kong Stock Market, Pang (1988), found seasonal returns for the months of January, April and December. Similarly, using sectoral indexes from the Kuala Lumpur Stock Exchange, Wong *et al.* (1990) found a strong January effect in all six sectors analyzed, particularly in the industrial sector. Ho (1990) using daily returns for the period 1975-1987 found that six of the Asia Pacific stock markets Hong-Kong, Korea, Malaysia, Philippines, Singapore and Taiwan) had significantly higher returns during January. However, Koh and Wong (2000) found evidence of seasonality on monthly returns only for the markets from Singapore and Malaysia, in a study that also included the stock markets from Hong Kong, India, Philippines, South Korea, Taiwan and Thailand. More recently, using monthly stock returns, Fountas and Segredakis (1999) studied 18 emerging stock markets for the period 1887-1995; they found considerable evidence of seasonal behavior for the case of several countries, but little evidence in favor of the January effect and the tax-selling hypothesis. Examining a transitional market, for the case of the Polish Stock Market Henke (2001) found for the 1994-2000 period positive returns for the January and February, and negative returns for March. However, since there are no taxes in capital gains on Poland, other facts apparently contribute to the turn-of-the-year effect.

Research that includes day of the week effect are those by Aggarwal and Tandon (1994) and by Balaban (1995). Aggarwal and Tandon examined the seasonal behavior of 18 countries for the period 1971-1987; four emerging markets were included in the study: Brazil and Mexico, from Latin America, and Hong-Kong and Singapore from the Asian countries. The international evidence is mixed; in the case of the four emerging markets, the negative Monday effect holds; however statistical significance test detected strong seasonality for other days of the week, too. Concerning monthly returns, their study shows that in twelve countries show a significant monthly seasonal and a strong positive January effect. Moreover, although there is a strong January effect in the four emerging markets studied, like in the case of daily returns, there are also calendar patterns for other months, too. Analyzing the Istambul Stock Exchange, Balaban reports for the period January 1988-December 1994 significant day of the week effects. However, these effects change in direction and magnitude across years. Similarly, a positive January effect is detected along with a negative effect for the months of March and October.

3. Data and Methodology

Stock market returns in this work are computed from daily index performance of the Mexican Stock Market for the period January 2, 1986 to December 31, 2001. Data was gathered from *Economatica*. Extending other studies on calendar anomalies, and in order to unveil changing patterns of investors behavior, returns were derived not only from nominal index reports, but also for inflation adjusted index prices, and dollar adjusted index prices. All these indexes are provided by *Economatica*. Assuming that stock prices and returns follow a geometrical random walk, return is the continuously rate of change in the respective stock index:

$$R_t = (\ln(I_t/I_{t-1}))100 = a + u, \tag{1}$$

where

R_t = return on day t.

ln= neperian on day t or day $t-1$.

I = Index on day t or day $t-1$.

a = a constant.

u = a normal random variable with a mean zero.

Equation (1) implies that the average rate of change of a stock is equal for every day of the year. Monthly returns are determined in a similar way. That is, t corresponds to the last day of the month, and t-1 to the first day of the month. A buy and hold monthly strategy is assumed in lieu of averaging daily returns for each month. Returns obtained in this manner are averaged per day and per month and then analyzed to identify day of the week and month of the year effects. An F test is carried out to check the robustness of the findings. Returns each of day of the week are paired with returns of the whole sample or subsample, to determine if the behavior of the day differs from that of the market as a whole. The same tests is carried out for the month of the year effect.

Furthermore the three samples, nominal, real, and dollar adjusted, were divided into two subperiods each to detect possible changes in seasonal behavior at this market. The subperiods were determined identifying a breakpoint in the series, using Chow's breakpoint tests (Chow, 1960). The break point for the nominal returns sample was December 1989; December 1991 for the real returns sample and December 1993 for the dollar denominated returns. All breakpoints resulted statistically significant according to the F-statistic and Log-likehood ratio tests. The basic F-statistic compares the restricted and unrestricted sum of square residuals, and in the simplest case involving a single breakpoint is computed as follows:

$$F = \frac{\left(\tilde{u}'\tilde{u} - (u_1{}'u_1 + u_2{}'u_2)\right)/k}{(u_1{}'u_1 + u_2{}'u_2)/(T-2k)}, \tag{2}$$

where

$\tilde{u}'\tilde{u}$=restricted sum of squared residuals.

$u_i{}'u_i$=sum of squared residuals from the subsample i, $i = 1, 2$.

T=Total number of observations.

k=number of parameters in the equation.

It is worth noting that the 1986-2001 series breaks at different dates for each of the cases under consideration, reflecting however important highlights in the fundamentals of the economy. In nominal terms, the breakpoint for the Mexican Index (*Indice de Precios y Cotizaciones, IPC*) is December 1989. This is the index released everyday which is therefore followed closely by investors to make their decisions. The rupture in 1989 reflects the beginning of financial liberalization policies along with the arrival of foreign portfolio holdings initiated precisely during that year. Indeed, in January 1989 the 1973 regulations to control direct foreign investments were relaxed and in November a Nafinsa Trust (Nafinsa is Mexico's main development bank) was established, allowing foreign investors to purchase voting shares which formerly were off limits. Moreover, Mexico reached a favorable foreign debt restructuring which was signed on February 1990. Another important piece of information used by investors is the inflation rate. The breakpoint shown for December 1991 seems to reflect the evolution to control it. High inflation rates affected the economy from 1982 on as a result of the foreign debt crisis. Following early attempts to control it, inflation increased sharply since the mid 1980's reaching a peak of 129.7 % in 1987; the following years a "pact" between workers, peasants and entrepreneurs promoted by the government helped to lower inflation rates, decreasing to 19.7 % in 1989 but increasing the following years; however from 1992 on the government began to succeed controlling inflation. During the peso crisis inflation rates skyrocketed again but soon the government was able to control it gradually lowering it to its current rates nearing 5.0 %. In addition to the evolution of inflation, the breakpoint in the real series data might be influenced by the fact that in 1991 began negotiations for the North American Free Trade Agreement (NAFTA) which by 1992 created a climate of overconfidence in all sectors of the economy. Finally, it is worth noting that the breakpoint for dollar returns does not occur by December 1994, but one year early. This clearly reflects the awareness of investors concerning overvaluation of the peso before its macro devaluation of December 1994. Moreover, it is worth noting that during 1993 withdrawals from foreign equity holders, as well as from government bill instruments placed great pressure on Mexico's international reserves levels, particularly considering that most of these investments were made in *Tesobonos*, a dollar denominated government short term bill.

4. Basic Statistics

Previous to the analysis of the calendar anomalies identifying the stochastic characteristics of returns at the MSE is imperative to assess the nature of this market, to understand long term risk-return relationships which investors must ponder to make their decisions. Results for daily returns in Tables 1 and 2 are shown only for the overall sample, 1986-2001 and the second subperiod, 1993-2001. Some important facts must be pointed out. Concerning daily returns, first, dollar adjusted returns are higher than inflation adjusted returns. Second, the range between maximum and minimum returns is very large. For instance, in dollar terms, returns varied between 23.32 % and minus 22.71 %. The standard deviation is higher for dollar returns and lower in nominal terms. Thus, due to exchange rate risk, the premium for risk is lower than investing in the local currency. Finally, returns are not normally distributed. All series are skewed to the left and leptokurtic; lack of normality is confirmed by the Jarque-Bera and its probability tests. Similar results are present for the subperiods determined by Chow's Breakpoint tests. However, it is worth noting that for the latter subperiod samples, volatility decreased substantially, but inflation adjusted returns and dollar denominated returns were negative as shown in Table 2.

Considering, monthly returns, the basic characteristics of this market are similar. However, returns and risk are much higher than daily returns to the extent that the maximum and minimum dollar returns range between 38.90 and -95.0 points during the 1986-2001 period. Similar to the case of daily returns, for the second subperiod inflation adjusted returns and dollar returns (results not shown here) are negative, but volatility is significantly lower. In short, during the 1986-2001 returns at the Mexican equity market were highly volatile. In the long run, *i.e.* the entire period, returns were positive in nominal, inflation adjusted and dollar terms. However, due to exchange rate risk dollar returns were lower than inflations adjusted returns, both for daily and monthly returns. Surprisingly, the second subperiod series show negative returns and relatively high risk measures for adjusted inflation and dollar returns (albeit lower than for the overall period and the first subperiods analyzed), even though fundamentals of the economy have improved significantly over the years as a result of successful government policies to stabilize the economy and promote economic growth. Tables 3 presents the results for the whole 1986-2001 monthly series.

Table 1. Daily Returns: Basic Statistics (1986-2001).

	Nominal 1986-2001	Inflation Adjusted 1986-2001	Dollar 1986-2001
Mean	0.15890	0.05421	0.08360
Median	0.12993	0.07934	0.11877
Maximum	23.58231	23.58232	23.31941
Minimum	-20.24266	-20.24268	-22.71323
Standard Dev.	2.10465	2.20164	2.29972
Skewness	-0.53088	-0.83428	-1.22247
Kurtosis	18.62852	17.61491	19.18607
Jarque-Bera	40886	36054	44650
Probability	0.00000	0.00000	0.00000
Observations	3999	3999	3999

Table 2. Daily Returns: Basic Statistics (second subperiod).

	Nominal 1990-2001	Inflation Adjusted 1992-2001	Dollar 1994-2001
Mean	0.09064	-0.00023	-0.00819
Median	0.05899	-0.00133	0.02263
Maximum	12.15364	12.15364	11.71124
Minimum	-14.31388	-14.31388	-22.71323
Standard Dev.	1.75276	1.84616	2.25533
Skewness	0.00803	-0.10527	-1.12054
Kurtosis	7.94633	7.49314	14.72150
Jarque-Bera	3063.40	2112.63	11885.812
Probability	0.00000	0.00000	0.00000
Observations	3005	2506	2003

Table 3. Monthly Returns: Basic Statistics (1986-2001).

	Nominal 1986-2001	Inflation Adjusted 1986-2001	Dollar 1986-2001
Mean	3.297162	1.245191	1.721181
Median	3.138895	1.654602	3.586799
Maximum	41.23085	33.22655	38.88496
Minimum	-55.25954	-63.27105	-95.02287
Standard Dev.	12.05166	11.59550	14.14830
Skewness	-0.810543	-1.559888	-2.397874
Kurtosis	7.151742	10.03816	15.97165
Jarque-Bera	158.9191	474.1495	1530.103
Probability	0.000000	0.000000	0.000000
Observations	192	192	192

5. Empirical Findings

Tests for seasonality on daily returns are shown in Table 4. The results, with some differences in the magnitude of average returns are very similar both for the entire series and the subperiods analyzed, as well as for the nominal, inflation adjusted, and dollar returns. In all cases Monday shows the lowest and negative returns. Tuesday is a close front runner; its returns are low in nominal terms and negative in real terms. Seasonality is also present in other days of the week. However, positive returns do not take place on Friday like in the case of U.S. markets. Thursday returns are the highest, followed closely by Friday for the case of nominal and inflation adjusted returns. Wednesday is the best performing day in terms of dollars. Since Mexico is in the same time zone than the United States (Central Standard Time for Mexico City) and because local investors look up closely to market activity in the New York financial markets, the Monday effect can be partly explained by these facts. In addition local working behavior might also influence market performance during the week. Traditionally, business activity has a low start on Mondays extending the weekend to "saint Monday", in practice or at least psychologically. Furthermore, in terms of financial activity, since banking and stock markets remain closed on Saturday and Sunday, information from the slightly decaying activity on Friday is partially known during the week end. The fact that in nominal and real terms Thursday is the best day of the week could be also the result of an expected shorter labor day, due to the closeness of the week end. Indeed, mirroring the "Thank God is Friday" attitude prevailing in the United States, Friday in Mexico is a "social day"; plans for Friday and the week end might influence some rushing attitudes in investment decisions. In short the business investment week in Mexico seems to follow a S or J shaped form. Monday shows negative returns and in nominal and real terms, Thursday is the best performing day of the week. Awareness of inflation rates seemingly do not to influence the investors daily behavior. However, it is worth noting that in nominal and real terms Monday returns are negative for all subsamples. In dollar terms, Monday is also negative, but Wednesday is the peak day of the week, most likely influenced by foreign portfolio investors behavior; supply and demand in dollars for Mexican stock might increase that day because spot dollar deliveries are made 48 hours later, *i.e.*, on Friday. Delaying purchases or sales of stocks to Thursday would mean waiting till the following Monday.

Four more facts should be added to the previous analysis. First, although the evidence is similar in all cases, reflecting the high volatility of this market, returns are high, particularly considering them in annualized terms (for comparative purposes with other alternative investments). In the extreme cases potential losses on Monday are extremely high in real terms, returns for Monday corresponding to the first 1986-1991 subperiod were -.41 %, -266.23 % in annualized terms; in dollar terms, returns for the 1994-2001 subperiod amounted to -.333 % in daily terms and -119.88 % in annualized terms. The highest returns were also considerable; In real terms, for the first subsample returns on Thursday registered 191.53 % points; similarly, for dollar returns, for the second subperiod (1994-2001), Wednesday returns amounted to 81.77 %. Second, the differential between Monday and the best performing day is significantly large; the possibilities of obtaining extraordinary gains are high in this market, trading at low prices on Monday and selling on Wednesday for foreign portfolio holders and selling on Thursdays for local investors. This is true, considering that for large trade volume commissions at the MSE are 0.015 %. Investment managers could therefore benefit from trading strategies that exploit the daily seasonality of the Mexican Stock Market. Third, although the second subperiods were much more volatile than the first subperiods, reflecting the internationalization and greater dynamism of the MSE, it is worth noting that seasonality decreases in the second subperiod analyzed. The differential between Monday and the peak performing days, also diminished, although it still remains high and exploitable, particularly in dollar terms. The patterns of seasonal anomalies are well depicted in Figures 1 to 3.

Finally, as shown in Tables 4 and 5, an equilibrium risk return relationship does not exist; it is important to stress that the day of the week effect persist when risk is considered; high and low returns are not precisely a compensation for high and low risk. Indeed in nominal, real and dollar terms, the highest standard deviation corresponded to Monday (lowest and negative returns). Similarly, the highest deviation of returns is not necessarily associated with the highest return of the week. In nominal terms, underscoring only the second subperiod, Table 5, the highest standard deviation corresponded to Monday (1.83 points; staggering 658.65 point in annual terms), and the lowest standard deviation corresponded to Friday, the second best day of the week (1.64 points, 590.4 points annualized): in real terms a similar pattern is present. In dollar terms, Monday, the worst day of the week, had largest standard deviation, 2.28 points (822.42 points annualized) *vs* 2.27 points (817.02 points annualized) for Wednesday, the best day of the week. Thus risk and return seem to be rather characterized by a downward slopping relationship in the Mexican stock market.

Table 4. Seasonal Daily Anomalies.

Average Daily Returns for the Overall Sample					
	Monday	Tuesday	Wednesday	Thursday	Friday
Nominal	−0.207%	0.075%	0.274%	0.333%	0.327%
Annualized	−74.67%	27.08%	98.69%	120.01%	117.61%
Real	−0.296%	0.003%	0.215%	0.273%	0.085%
Annualized	−106.50%	1.16%	77.41%	98.14%	30.64%
Dollar	−0.297%	−0.001%	0.285%	0.227%	0.209%
Annualized	−106.83%	−0.37%	102.68%	81.66%	75.17%
Average Daily Returns for the First Subperiod					
	Monday	Tuesday	Wednesday	Thursday	Friday
Nom.1986-1989	−0.32%	0.02%	0.53%	0.78%	0.84%
Annualized	−116.13%	8.17%	190.74%	281.18%	304.20%
Real 1986-1991	−0.41%	−0.02%	0.41%	0.53%	0.24%
Annualized	−266.23%	−8.76%	146.13%	191.53%	86.67%
Dlls. 1986-1993	−0.29%	−0.02%	0.37%	0.40%	0.43%
Annualized	−102.85%	−7.98%	134.20%	142.25%	155.04%
Average Daily Returns for the Second Subperiod					
	Monday	Tuesday	Wednesday	Thursday	Friday
Nom.1990-2001	−0.19%	0.08%	0.21%	0.19%	0.16%
Annualized	−67.21%	30.04%	75.50%	68.62%	57.47%
Real 1992-2001	−0.249%	0.009%	0.124%	0.119%	−0.003%
Annualized	−89.63%	−0.46%	45.14%	42.84%	−0.90%
Dlls. 1994-2001	−0.333%	0.008%	0.227%	0.062%	−0.004%
Annualized	−119.88%	2.93%	81.77%	22.35%	−1.38%

Table 5

Standard Deviation of Daily Returns for the Subsample 2					
Mexico					
	Monday	Tuesday	Wednesday	Thursday	Friday
Nominal 1990-2001	1.8296%	1.7986%	1.7305%	1.7321%	1.6400%
Annualized	658.65%	647.48%	622.99%	623.54%	590.38%
Real 1992-2001	1.9084%	1.8459%	1.8335%	1.8188%	1.8040%
Annualized	687.01%	664.53%	660.04%	654.77%	649.42%
Dollar 1994-2001	2.2845%	2.2031%	2.2695%	2.1875%	2.3039%
Annualized	822.42%	793.11%	817.02%	787.50%	829.39%

Figure 1a. Seasonal Daily Anomalies: Overall Series.

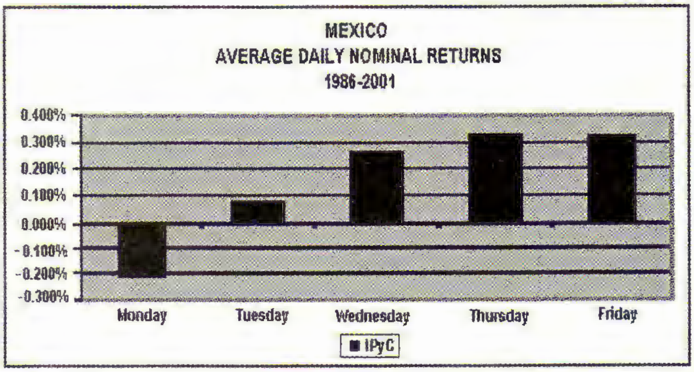


Figure 1b. Seasonal Daily Anomalies: Overall Series.

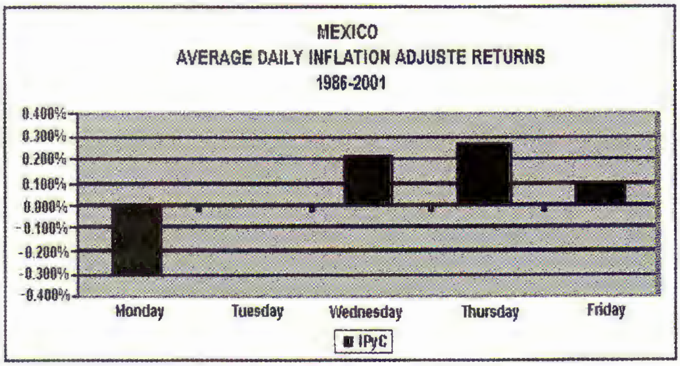


Figure 1c. Seasonal Daily Anomalies: Overall Series.

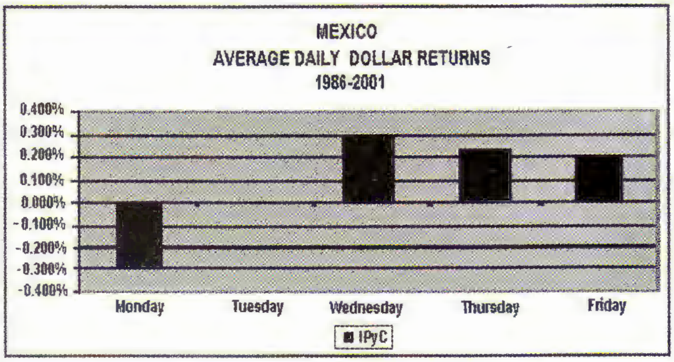


Figure 2a. Seasonal Daily Anomalies: First Subperiod.

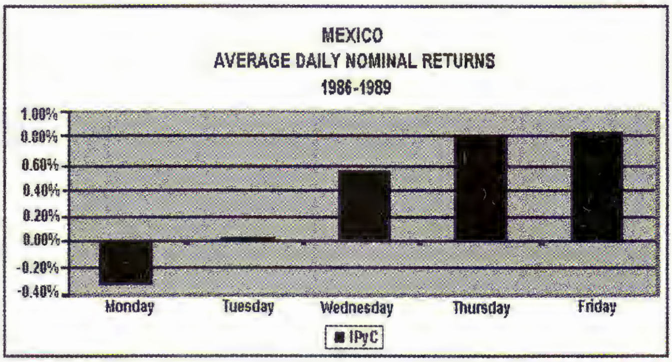


Figure 2b. Seasonal Daily Anomalies: First Subperiod.

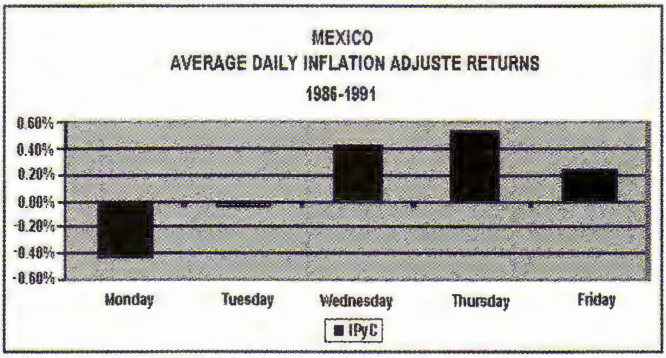


Figure 2c. Seasonal Daily Anomalies: First Subperiod.

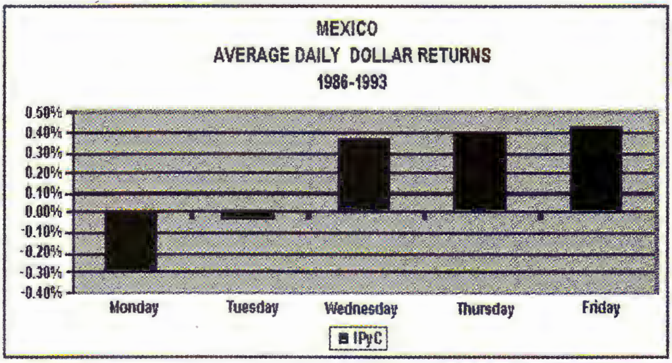


Figure 3a. Seasonal Daily Anomalies: Second Subperiod.

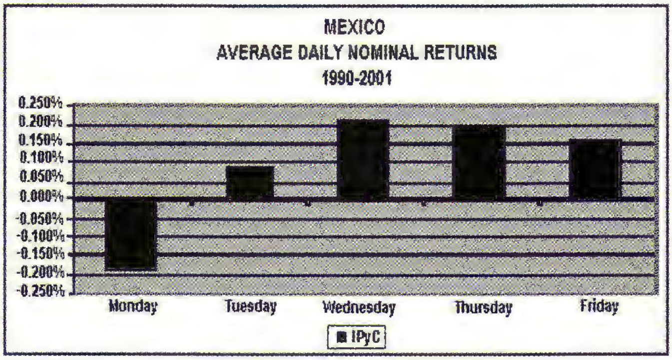


Figure 3b. Seasonal Daily Anomalies: Second Subperiod.

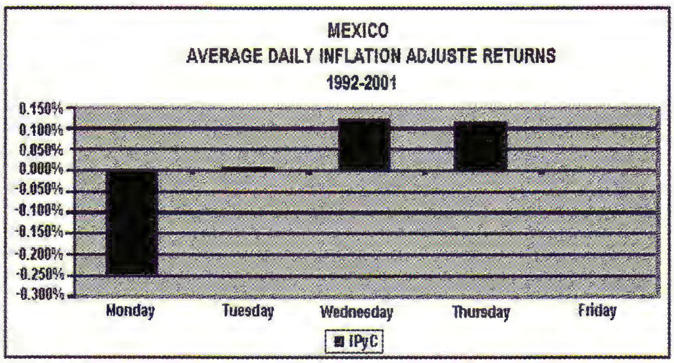
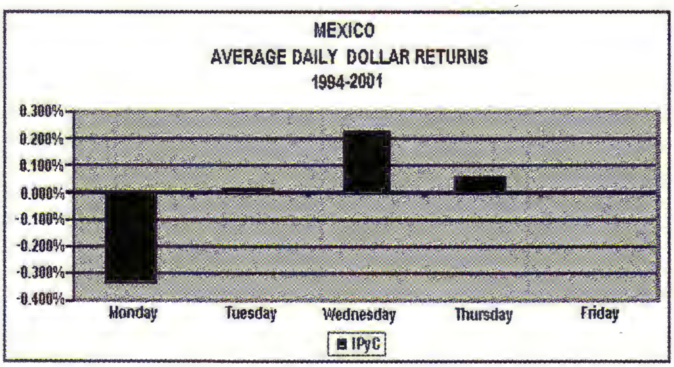


Figure 3c. Seasonal Daily Anomalies: Second Subperiod.



5.1 Month of the Year Effect

Tables 6, 7, and 8; and Figures 4, 5 and 6 summarize the findings on the month of the year effect at the Mexican Stock Exchange. Some important seasonal anomalies are present. In nominal terms, a positive January effect is confirmed for the entire sample 1986-2001; In addition, stands out the existence of a positive May effect. However, the tax-loss selling hypothesis must be discarded as an explanation since there are no taxes on capital gains in Mexico. The evidence on the seasonality of inflation adjusted returns is very revealing. The May effect is confirmed, but due to high inflation rates that characterize the Mexican economy, the January effect is lost. Indeed after the Christmas Holidays, prices tend to be high in Mexico to the extent that colloquially is known as the "January hill". Investors using inflation rates as a guide for their decisions might be restraining their investments during January. Activity in May might tend to be seasonally high due to annual information releases from Banco de Mexico (Mexico's Central Bank) and the Mexican Stock Market itself, coupled with the fact that optimism and a drive to start anew tends to prevail in the all sectors of the economy after the long Lent and Holy Week season. This behavior is consistent with the information-release hypothesis advanced to explain the January effect in the U.S. markets (Roseff and Kinney, 1976). The evidence also registers low market activity (negative in real terms) from August to November. December picks up a bit, most likely due to salary bonus paid during that month. The fall of market activity for four months might be the result of a "seasonal affective fatigue" leading to greater risk aversion, due to expectations not fulfilled, *i.e.* lack of recovery of the economy by mid year during many years, which probably was confirmed to investors by the Annual Presidential Reports on September 1, (December 1, 1995-2000). Is sum, an affective disorder might lie behind market performance during those months. Behavioral finance has studied the impact of "seasonal affective disorders" (SAD) on individual's investment decisions (Thaler, 1999), albeit there is no research relating investors decisions and recurrent and unending crisis, like the ones affecting the debt ridden countries from emerging markets. In dollar terms the results are a bit different. There is January positive effect, for the period 1986-2001, but May and July show slightly higher returns. The four months seasonal downturn is also present, November becoming a very marked negative return.

Analyzing the two subperiods previously identified, the January effect vanishes for the second subperiods. During the first period, the January effect prevails only in nominal and dollar terms; high inflation eliminates it for the adjusted inflation index. The May and July effect also persists during the first corresponding subperiods. However the four months seasonal downturn becomes tighter, affecting only October and November. In contrast, during the second observed periods (characterized by higher volatility) a change in investors attitude seems to have taken place; however seasonality is still present. The January effect disappears. Indeed in real and dollar terms, both January and February are negative and March becomes the best performing month in local currency terms (nominal and adjusted), while April is the best performing month in dollar terms. Similarly, the affective disorder has some changes, standing out August as the month with lowest returns. Here, seasonality seems to be highly related to volatility. According to the basic statistics, the second subperiods were very volatile, *i.e.* month of the year seasonality is most likely present in both return and volatility, which is consistent with recent findings on day on the week effect on the United States (Berument and Kiymaz, 2001). Thus, inflation instability influences seasonality patterns in Mexico, inducing negative effects in January and February and July-September, August being the worst performing month; similarly, exchange rate stability affected investment decisions in Mexico during the 1994-2001 period. Except for November, dollar returns tended to be negative from August to December plus the first two months of the year. The August to February poor performance of the market is unusually long; it is most likely the result of recurrent low confidence in the economy and the market possibly coupled with a credence that recovery will take place. Therefore the market seasonally switches from low returns to high returns.

Table 6. Seasonal Monthly Anomalies.

Average Monthly Returns for the Overall Sample			
	Nominal	Real	Dollar
January	6.37%	2.60%	4.25%
Annualized	76.49%	31.20%	51.00%
February	3.59%	1.14%	2.73%
Annualized	43.04%	13.69%	32.74%
March	4.99%	3.25%	3.64%
Annualized	59.84%	39.04%	43.73%
April	2.87%	0.56%	3.43%
Annualized	34.42%	6.72%	41.11%
May	6.33%	4.50%	4.44%
Annualized	75.92%	53.95%	53.32%
June	2.36%	0.51%	0.41%
Annualized	28.34%	6.11%	4.93%
July	4.07%	2.47%	4.32%
Annualized	48.85%	29.70%	51.89%
August	0.97%	-0.77%	-0.70%
Annualized	11.58%	-9.28%	-8.37%
September	1.29%	-0.44%	-0.21%
Annualized	15.45%	-5.29%	-2.53%
October	1.43%	-0.28%	-0.64%
Annualized	17.18%	-3.32%	-7.71%
November	1.15%	-0.90%	-2.26%
Annualized	13.75%	-10.78%	-27.15%
December	4.16%	2.30%	1.24%
Annualized	49.92%	27.57%	14.89%

Like in the case of daily anomalies, seasonal returns are abnormally high, but lower than day of the week returns. Assuming a buy and hold strategy for each month, annualized returns for May for the entire sample, 1986-2001, amounted to 75.92 %, 53.95 %, and 53.32 in nominal, inflation adjusted, and dollar terms, respectively. The highest losses took place in dollar terms in November, -27.15 %. However, bad performance is directly attributable to poor first period performance. For instance, the highest loss during the first period in dollar terms averaged -74.37 %. During the second subperiod the worst returns occurred in August and averaged -52.59 %. Finally, like in the case of daily seasonal returns, the differential between the lowest performing months and the best performing months is sufficiently large to become exploitable, including the most recent periods under analysis.

Table 7.

Average Monthly Returns for the First Subperiod			
	Nominal	Real	Dollar
January	20.61%	8.02%	10.67%
Annualized	247.30%	96.21%	128.03%
February	16.91%	8.93%	8.18%
Annualized	202.92%	107.11%	98.20%
March	3.50%	3.83%	5.01%
Annualized	42.04%	45.90%	60.18%
April	5.99%	3.74%	2.76%
Annualized	71.89%	44.84%	33.16%
May	16.29%	13.36%	10.25%
Annualized	195.43%	160.36%	123.04%
June	8.61%	0.44%	-1.71%
Annualized	103.26%	5.26%	-20.57%
July	13.74%	9.42%	8.74%
Annualized	164.91%	113.07%	104.89%
August	13.20%	3.95%	2.99%
Annualized	158.45%	47.42%	35.85%
September	11.11%	3.04%	1.43%
Annualized	133.37%	36.53%	17.21%
October	-9.44%	-5.45%	-0.22%
Annualized	-113.33%	-65.44%	-2.64%
November	-4.81%	-6.31%	-6.20%
Annualized	-57.76%	-75.75%	-74.37%
December	3.71%	0.62%	4.32%
Annualized	44.52%	7.49%	51.84%

Table 8.

Average Monthly Returns for the Second Subperiod			
	Nominal	Real	Dollar
January	1.63%	-0.65%	-2.17%
Annualized	19.56%	-7.81%	-26.03%
February	-0.85%	-3.53%	-2.73%
Annualized	-10.26%	-42.36%	-32.72%
March	5.48%	2.91%	2.27%
Annualized	65.78%	34.92%	27.29%
April	1.83%	-1.35%	4.09%
Annualized	21.93%	-16.16%	49.07%
May	3.01%	-0.82%	-1.37%
Annualized	36.08%	-9.89%	-16.39%
June	0.28%	0.55%	2.54%
Annualized	3.36%	6.63%	30.43%
July	0.85%	-1.69%	-0.09%
Annualized	10.16%	-20.33%	-1.11%
August	-3.11%	-3.61%	-4.38%
Annualized	-37.37%	-43.30%	-52.59%
September	-1.99%	-2.53%	-1.86%
Annualized	-23.85%	-30.38%	-22.26%
October	5.06%	2.83%	-1.07%
Annualized	60.69%	33.96%	-12.79%
November	3.13%	2.35%	1.67%
Annualized	37.58%	28.20%	20.06%
December	4.31%	3.30%	-1.84%
Annualized	51.72%	39.63%	-22.06%

As in the case of daily anomalies, monthly return anomalies are independent from risk. For example, in the second period after financial liberalization had taken place, in nominal terms the lowest performing month corresponded to August; however its standard deviation is the highest (12.13 points; 145.6 points in annual terms); to the best performing month, January, corresponded a lower standard deviation of 9.54 points (144.4 points annual). In real terms, the best performing month was May with a standard deviation of only 7.3 points (87.2 points in annual terms), vs. 8.9 points (106.2 % annual) for November, the worst and negative returns for the year. Finally, in dollar terms, May and November were the best and worst performing months of the year, too. Their standard deviation was of 9.76 points (117.0 points annual) and 7.43 points (89.2 points annualized), respectively; the highest standard deviation corresponded to August which registered negative returns, but not as high as November. Thus, it can be concluded that the Market is too slow to react to changing patterns of risk, which therefore prevents arbitrage and in turn makes anomalies more persistent.

Figure 4a. Seasonal Monthly Anomalies: 1986-2001.

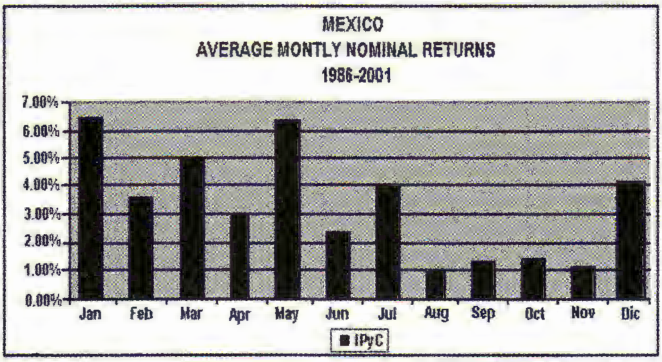


Figure 4b. Seasonal Monthly Anomalies: 1986-2001.

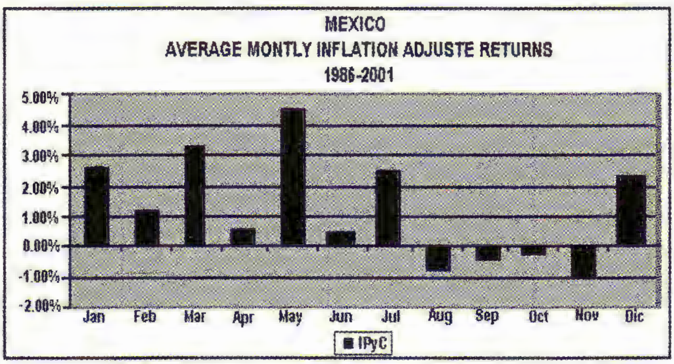


Figure 4c. Seasonal Monthly Anomalies: 1986-2001.

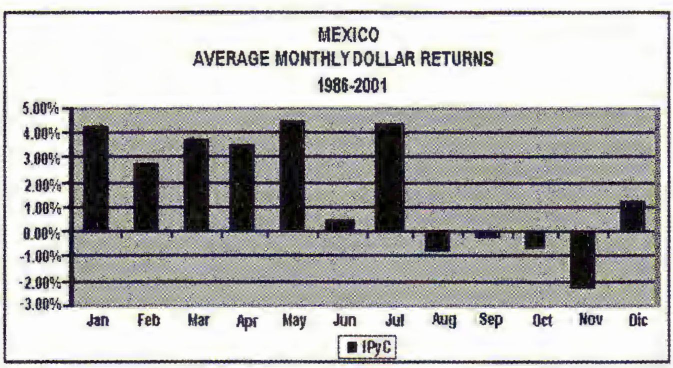


Figure 5a. Seasonal Monthly Anomalies: First Subperiod.

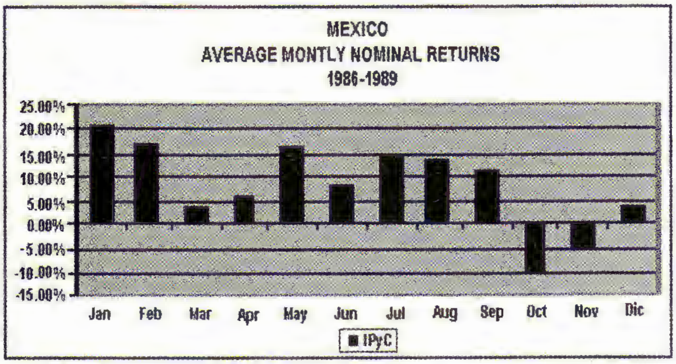


Figure 5b. Seasonal Monthly Anomalies: First Subperiod.

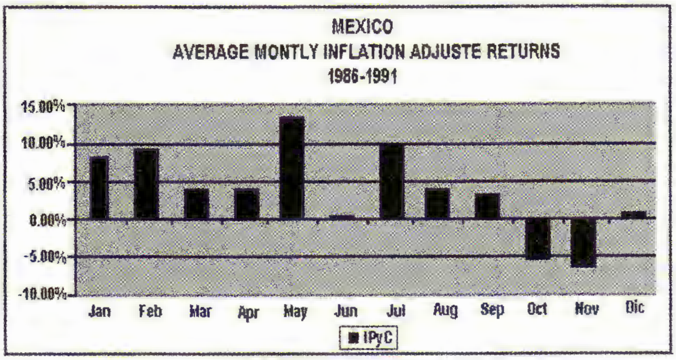


Figure 5c. Seasonal Monthly Anomalies: First Subperiod.

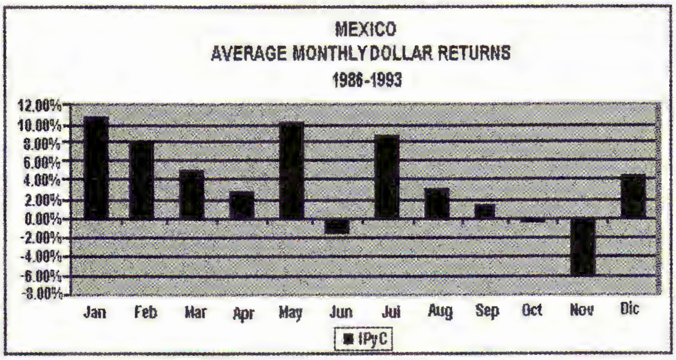


Figure 6a. Seasonal Monthly Anomalies: Second Subperiod.

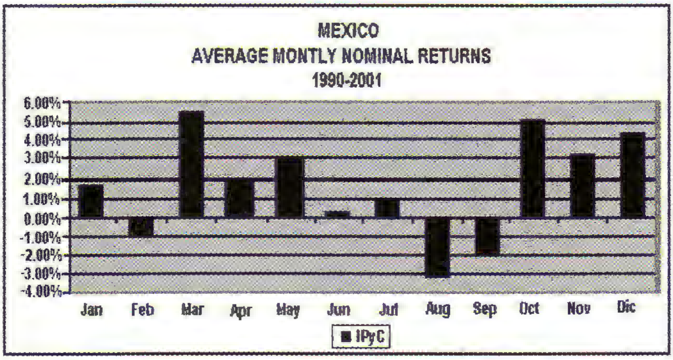


Figure 6b. Seasonal Monthly Anomalies: Second Subperiod.

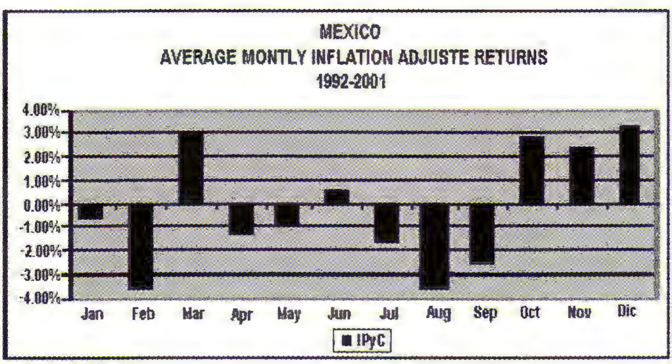
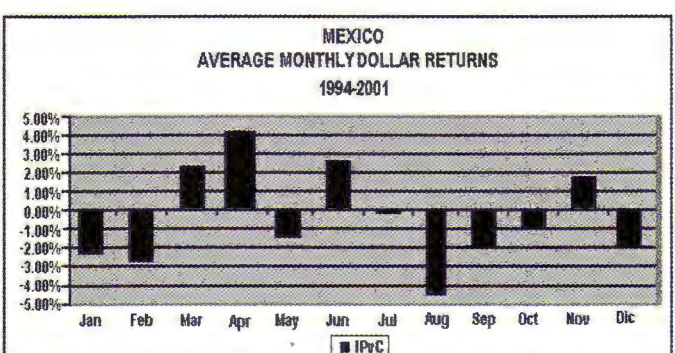


Figure 6c. Seasonal Monthly Anomalies: Second Subperiod.



The above results are, in general, statistically significant. Pairing the day of the week and month of the year results with overall performance of the Mexican stock market the null hypothesis of equal performance is rejected. Table 9 exemplifies these results. Table 10 summarizes the F-test for the month of the year effect only for the first subperiod for nominal, real, and dollar adjusted returns. Most daily results, using the F-test, are significant at either the one or five % level. However for the month of the year effect the behavior of each month in relation to the whole market was similar, but comparing the behavior among months, the F-test confirmed a differentiated behavior. Table 10 only reports the results for the best and worst performing months for the first subperiod.

Table. 9 Statistical Tests of Significance Daily Anomalies: Full Sample.

Nominal Returns			
	df	Value	Probability
Monday	(1, 4801)	19.5515	0.00001
Thursday	(1, 4786)	4.6682	0.0308
Inflation Adjusted Returns			
	df	Value	Probability
Monday	(1, 4801)	16.4165	0.00005
Thursday	(1, 4787)	6.7137	0.0096
Dollar Returns			
	df	Value	Probability
Monday	(1, 4801)	17.7936	0.00003
Wednesday	(1, 4804)	5.0412	0.0248

Table 10.

F-test Monthly Nominal Returns for the Subperiod 1986-1989			
	df	Value	Probability
January	(1, 194)	8.06346	0.00500
October	(1, 194)	3.98729	0.04724
F-test Monthly Inflation Adjusted Returns for the Subperiod 1986-1991			
	df	Value	Probability
May	(1, 196)	6.48553	0.01164
November	(1, 196)	2.25180	0.13507
F-test Monthly Dollar Returns for the Subperiod 1986-1993			
	df	Value	Probability
January	(1, 198)	3.08233	0.08069
November	(1, 198)	2.00443	0.15841

6. Conclusions

Evidence from this work proofs the existence of day of the week and month of the year effect at the Mexican Stock market. Monday is the worst performing day of the week, but seasonality is not limited to this day; Thursdays show abnormally high returns. Dividing the sample into two subperiods, the abnormal seasonal patterns subsists, but during the most recent subperiod seasonal returns are lower and the differential among them decreases, but remain exploitable. Concerning monthly returns, a January effect is detected for the entire 1986-2001 but it is attributable to a first period performance. During the most recent periods under analysis, a negative January and February effect can be identified, along with a negative seasonal effect towards the end of the year, August becoming the month with the lowest returns. Financial opening seemingly has increased the volatility of this market; however, seasonal patterns seem to be rather independent from risk. An August to February recurrent pattern of poor market returns might be related to affective fatigue resulting from a lack of recovery of the economy. Indeed, high inflation ratios and exchange rate instability induce greater market volatility. Thus, anomalies persistent in nominal terms, are also present in inflation adjusted and dollar adjusted returns, with some changes in the daily and monthly anomaly patterns. Hence the informational content of risk and returns becomes less valuable and induce market inefficiency and favor the presence of calendar anomalies. Control of inflation and exchange rate instability should therefore promote growth and efficiency of this market. Further research is necessary to identify the factors that affect efficiency and seasonality at the Mexican Stock Market. Along with economic and financial factors, diverse psychological perceptions and interests of local investors vis-a-vis foreign investors might be interacting to induce higher volatility and seasonality at this emerging market.

References

Abraham, A. and D.L. Ikenberry (1994). The Individulal Investor and the Weekend Effect. *Journal of Financial and Quantitative Analysis*, 29, pp. 263-277.

Agarwal, A. and K. Tandon (1994). Anomalies or Illusions? Evidence from Stock markets in Eighteen Countries. *Journal of International Money and Finance*, 13, pp. 83-106.

Aguilera, A. (2002). On the Predictability and Market Segmentation of the Mexican Stock Exchange. Tesis Doctoral. Instituto Tecnológico y de Estudios Superiores de Monterrey, Campus Ciudad de México.

Arbelaez, H. and J.L. Urrutia (1998). The Behavior of the Colombian Emerging Capital Market. In J.J. Choi and D.K. Ghosh (Eds.). Emerging Capital markets. Westport, CT: Quorum Books, pp. 317-324.

Balaban, E. (1995). Some Empirics of the Turkish Stock Market. Discussion Paper, no. 9508. The Central Bank of the Republic of Turkey.

Berument, H. and H. Kayimaz (2001). The Day of the Week Effect on Stock Market Volatility. *Journal of Economics and Finance*, 25(3), pp. 181-193.

Cabello, A. (2001). Financial Liberalization and the Mexican Stock Market Beyond the 1994 Crisis. In Ilhan Meric and Gulser Meric (Eds.). Global financial markets at the Turn of the Century. Pergamon, pp. 151-176.

Chen, H. and V. Singal (2001). What Drives the January Effect? Working Paper, Merrick School of Business, University of Baltimore.

Choi, J. and V. Rajan (1997). An Joint Test of Market Segmentation and Exchange risk Factor in International Capital markets. *Journal of International Business Studies*, 28(1), pp. 29-49.

Cross, F. (1973). The Behavior of Stock Prices on Friday and Monday. *Financial Analyst Journal*, 29, pp. 67-69.

De la Uz, N. (2002). La Hipótesis Martingala en el Mercado Bursátil Mexicano. *Estudios Económicos*. 17(1), pp. 7-16.

Errunza, V. and P. Padmanabhan (1992). Tests on Integration, Mild Segmentation and Segmentation Hypothesis. *Journal of Banking and Finance*, 16, pp. 949-972.

Fama, E. (1965). The Behavior of Stock Market Prices. *Journal of Business*, 38(1), pp. 34-105.

French, K. (1980). Stock Returns and the Weekend Effect. *Journal of Financial Economics*, March, pp. 55-70.

Fountas, S. and K. Segredakis (1999). Emerging Stock Markets Return Seasonalities: The January Effect and the Tax-Loss Selling Hypothesis. Working Paper, Department of Economics, University of Ireland.

Gibbons, M. and P. Hess (1981). Day of the Week Effects and Asset Returns. *Journal of Business*, 54, pp. 579-596.

Gütekin, M. and B. Gütekin (1983). Stock Market Seasonality: International Evidence. *Journal of Financial Economics*, pp. 469-481.

Haugen, R. and P. Jorion (1996). The January Effect: Still After all These Years. *Financial Analyst Journal*, pp. 27-31.

Haugen, R., E. Ortiz, and E. Arjona (1985). Market Efficiency: Mexico versus the U.S. *The Journal of Portfolio Management*, 15(1), pp. 28-32.

Henke, H. (2001). Tax-Selling and Window Dressing: An Investigation of the January Effect on the Polish Stock Market. Working Paper, Department of Economics Europa University , Viadrana-Germany.

Ho, Y. K. (1990). Stock Return Seasonalities in Asia Pacific Markets. *Journal of International Financial Management and Accounting*, 2, pp. 47-77.

Jaffe, J. and R. Westerfield (1985). The Weekend Effect in Common Stock Returns: The International Evidence. *Journal of Finance*, 40(2), pp. 433-454.

Karolyi, G. and R. Stultz (2001). Are Financial Assets Priced Locally of Globally? In G. Constantinides, M. Haris, and R. M. Stultz (Eds.). Handbook of Economics and Finance. North Holland.

Keim, D. and R.F. Staumbaugh (1984). A Further Investigation of the Weekend Effect in Stock Returns. *Journal of Finance*, 39(4), pp. 818-835.

Koh, S. and K. Wong (2000). Anomalies in Asian Emerging Stock Markets. In D. Keim and W. Ziemba (Eds.). Impercfections in Worldwide Equity Markets, pp. 433-457.

Lakonishok, J., A. Schleifer, and R. Vishny (1994). Contrarian Investment, Extrapolation and Risk. *Journal of Finance*, 49 (5), pp 1541-1578.

Nassir, A. and S. Mohammad (1987). The January Effect of Stocks Traded at the Kuala Lumpur Stock Exchange: An Empirical Analysis. *Hong Kong Journal of Business Management*, 5, pp. 35-50.

Neriz Jara, L. (2000). Mercado de Valores Chileno: Los Tests de Eficiencia. *Revista Latinoamericana de Administración*, 24, pp. 5-37.

Ortiz, E. (1980). Caminata al Azar en México: Importancia y Eficiencia de la Bolsa Mexicana de Valores. *Contaduría/Administración*, 104/105, febrero, pp. 65-109.

Ortiz, E. and E. Arjona (2000). Heterocedasticity Models for the Mexican Stock Market. In G. Meijer *et al.* (Eds.). The Maastricht ISINI Papers, vol. II, pp. 435-446. The Netherlands: Shaker Publishing.

Pang, Q. (1988). An Analysis of the Hong Kong Stock Returns Seasonality and Firm Size for the Period 1977 to 1986. *Hong Kong Journal of Business Management*, 6, pp. 69-90.

Reiganum, M. (1981). Misspecification of Capital Asset Pricing: Empirical Anomalies Based on Earnings'Yields and Market Values. *Journal of Financial Economics*, 9(1), pp. 19-46.

Roll, R. (1983). The Turn of the year Effect and the Return Premia of Small Firms. *Journal of Portfolio Management*, pp. 18.28.

Rossif, M. and W. Kenney Jr. (1976). Capital Market Seasonality: The Case of Stock Returns. *Journal of Financial Economics*, 3, pp. 379-402.

Thaler, R. and W. DeBont (1987). Further Evidence on Investors Over-reaction and Stock Market Seasonality. *Journal of Finance*, 42(3), pp. 557-581.

Watchel, S. (1942). Certain Observations on the Seasonal Movement in Stock Prices. *Journal of Business*, 15, pp. 184-193.

Wong, P., S. Neoh, K-H. Lee, and T. Wong (1990). Seasonality in Malaysian Stock Market. *Asia Pacific Journal of Management*, 7, pp. 43-62.

Zablotsky, E. (2001). Eficiencia de un Mercado de Capitales: Una Ilustración. Documento de Investigación, Universidad del CEMA, Buenos Aires.