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Effect of the Business Cycle on Investment Strategies: Evidence from Mexico.

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Abstract

The main objective of this research is to analyze whether the business cycle has an effect on investment strategies. In order to ascertain this, we use as methodology, a multifactorial time series analysis. Specifically, we test whether short-term cycle investment strategies and long-term cycle investment strategies can be observed. We use data from the Mexican Stock Exchange, for the period 1993 - 2006. Our results show statistical evidence of short-term cycle but not for long-term cycle investment opportunities. One of the implications of this discovery is that these results add to the works that challenge the efficient market hypothesis. As a conclusion, this work adds some evidence to the writing that link the financial sector with economic activity. In particular, we found some evidence of a relationship between business cycle and short-term investment strategies.

JEL Classification: F30, G11, G12, G14.

Key Words: International Finance, Investment Decisions, Asset Pricing, Market Efficiency.

Efecto del Ciclo Económico sobre Estrategias de Inversión: Evidencia para México

Resumen

El objetivo principal de ésta investigación es analizar si el ciclo económico tiene un efecto sobre las estrategias de inversión. Para conseguir el objetivo usamos como metodología un análisis de series de tiempo multifactorial. En particular, buscamos verificar si las estrategias de inversión de ciclos de corto plazo y las estrategias de inversión de ciclos de largo plazo se observan en la Bolsa Mexicana de Valores. Usamos como muestra datos de la Bolsa Mexicana de Valores, del periodo de 1993 - 2006. Los resultados muestran evidencia estadística de oportunidades para estrategias de inversión de ciclos de corto plazo, pero no para estrategias de inversión de ciclos de largo plazo. Una de las implicaciones de estos hallazgos es que estos resultados se suman a los trabajos que cuestionan la hipótesis de mercados eficientes. En suma, este trabajo aporta más evidencia a la literatura que ha encontrado una relación entre el sector financiero con la actividad económica, en particular se documenta evidencia de una relación entre el ciclo económico y estrategias de inversión de corto plazo.

Clasificación JEL: F30, G11, G12, G14.

Palabras Clave: Finanzas Internacionales, Decisiones de Inversión, Valuación de Activos, Eficiencia de Mercados.

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I. Introduction

The hypothesis that stock market returns from momentum strategies are positive only during expansionary periods and negative during recession, has recently been tested and yielded mixed results. For example, Chorida and Shivakumar (2002) show that profit-to-momentum strategies can be explained by a set of macroeconomic variables related to the business cycle. Following on from this, Fuentes *et al.* (2009) found that momentum portfolios tend to be riskier during economic expansion, as they are long (short) stocks with relatively higher (lower) market beta, and are skewed negatively (positive) during recession.

Antoniou *et al.* (2007) questions whether business cycle variables can explain the profitability of momentum-trading in European markets. Their findings show that momentum is not attributable to the business cycle directly, but to the asset mispricing that systematically varies with global business conditions, and this is attributable to the business cycle. Griffin *et al.* (2003) examined whether macroeconomic risk could explain momentum profits internationally, but did not ultimately find any evidence that this was the case.

In México, Erquizio, (2007) found eight business cycles between 1949 and 2006, the average of which was 27 semesters, with some ascents longer than descents. This suggests the presence of short-term cycle strategy profits (short momentum) or long-term cycle strategy profits (long term reverse effect) in the Mexican stock exchange, an anomaly of financial markets that challenges the hypothesis of market efficiency. Bearing this in mind, López-Herrera et al. (2012) decided to test the behavior of volatility in the presence of long-memory effects on returns from the Mexican stock market, and they found significant evidence of long-memory returns (long-term cycles) from the return series. This implies that it is possible to predict future prices and extraordinary gains, contrary to what efficient-market theory points out. Meanwhile, García, Cruz and Venegas-Martínez (2014) show that for the Mexican stock market, periods of severe crisis are related to sharp declines in entropy, ie, runs on the stock market are driven by surprise, making performance temporarily predictable.

The main objective of this research is to analyze, for the Mexican stock market, whether the business cycles affect capital market investment strategies. In order to reach this end, we will test if short-term cycle investment strategies (short momentum) and long-term cycle investment strategies (long term reverse effect) are observed on the Mexican Stock Exchange, and, if so, evaluate their magnitude and significance. The rest of the paper is organized as follows: The next section is a literary review, section III presents data and methodology, section IV presents and discusses the empirical results, and finally section V presents our concluding remarks.

II. Literature Review

DeBondt and Thaler (1985) provide empirical evidence of the tendency of people to overreact to unexpected dramatic events affecting stock prices, which is consistent with a weak form of market inefficiency. They point out that in revising their beliefs individuals tend to overweight recent information and underweight prior data. Moreover, security analysts and economics forecasters suffer from the same overreaction bias. Investors in general seem to attach disproportionate importance to short-run economic

developments. They note that if stock prices systematically overshoot, their reversal should be predictable. The overreaction hypothesis also predicts that subsequent price reversal will be more pronounced for stocks that experience more extreme returns.

Jegadeesh (1990) finds strong twelve-month serial correlations with individual securities returns, which could challenge the efficient market hypothesis since it suggests that security returns could be predicted. Because the evidence is found to be both statistically and economically significant, alternate asset pricing model specifications should be called for to help explain this empirical regularity.

Jegadeesh and Titman (1993) document positive returns in portfolio strategies that buy securities which have performed well in the past, and sell those that have performed poorly over three and twelve months. However, part of the predictable abnormal return dissipates in two years. They attribute the results to delayed price-reactions to firm-specific information.

Lakonishok, Shleifer and Vishny (1994) indicate that contrarian strategies of investing disproportionally in stocks that are underpriced and underinvesting in stocks that are overpriced can outperform both market and extrapolation (momentum) strategies. Contrarian investors bet against those who extrapolate past performance too far into the future. The prices of past losers and winners are likely to reflect the failure of investors to impose mean reversion on their forecasts. They claim that the market learns only slowly about its mistakes since its expectations of high (low) returns for winners (losers) are confirmed in the short run but are erroneous in the long run. They conclude that momentum strategies rely on the markets failure to recognize a trend in the short term. It seems that market participants appear to consistently overestimate future growth rates of winners relative to losers, whereas contrarian strategies are driven by the markets unwarranted belief in the continuation of a long-term trend and the gradual abandonment of that belief beyond the first couple of years. The authors speculate as to why both individual and institutional investors may prefer winners to losers. Individual investors extrapolate past growth rates even when such growth rates are unlikely to persist in the future, putting excessive weight on recent past history. In addition, they equate well-run firms with good investments, regardless of price. Institutional investors are expected to be freer from judgement bias than individuals. However, they prize investments that seem prudent, and picking a winner is easier to justify since winners erroneously appear to be safer. Because of career concerns money managers may tilt towards winners even though they are not necessarily less risky and they may earn a low rate of return. However, many investors have shorter time horizons than those required for contrarian strategies to pay off. For instance, institutional investors cannot afford to underperform the index or their peers for too long, otherwise the funds they manage would be withdrawn. A contrarian strategy may underperform in the market for too long and risk the money manager's job security.

Rouwenhorst (1998) obtained similar results with a sample of 12 European countries during the 1978 - 1995 period. Hong, Lim and Stein (2000) suggest that heterogeneity among investors who observe different pieces of private information at different times, explains the momentum effect.

They assume that information gradually spreads among investors and that they cannot form rational expectations.

Jegadeesh and Titman (2001) evaluate a number of plausible explanations for momentum strategies. Their sample test results partially support behavioural explanations, which implies that the momentum effect is caused by delayed overreaction to information. Behavioural hypotheses also predict that the profit momentum will eventually reverse. Indeed, Jegadeesh and Titman (2001) document a reversal of returns in the second through fifth years. Nevertheless, they conclude that positive momentum returns are only sometimes associated with post holding-period reversals, thus the behavioural models provide just a partial explanation of the anomaly in momentum.

Cui, Titman and Wei (2003) find that momentum strategies are profitable in Asian stock markets with the exception of Japan. They report a relationship between the legal system in the country and the momentum effect. Consistent with behavioural models, they also find return reversals ten months after portfolio formation. Business group firms (*keiretsu* in Japan and *chaebol* in Korean) show a stronger momentum effect. The present research paper analyzes Mexican securities of which some at least are associated with business groups. The business groups which exist in Mexico, although important, are of a different nature to those in Japan and Korea.

Cui, Titman and Wei (2010) examine the cultural differences that influence the returns of momentum strategies in a number of markets including Mexico. Individualism, which is related to overconfidence and self-attribution bias, is positively associated with momentum profits. Individualism measures the degree to which people focus on their own internal attributes and abilities. In individualist cultures people tend to view themselves as autonomous and independent. They aspire to be distinct from and better than others; therefore they tend to overestimate their own abilities. Some investors may overweigh their own information because they are over-optimistic. In individualist cultures, people tend to believe that their abilities are above average. The related self-attribution bias consists of people taking credit for success and denying responsibility for failure. Overconfidence and self-attribution bias can generate momentum and long-term return reversals. The authors find a positive relation between individualism and momentum profits. They also find that the magnitude of the reversals tends to be higher in countries with high individualism.

III. Data and Methodology

This paper goes one step further than previous research, avoiding at the same time the use of excessively-mined U.S. data. The sample consists of 122 securities traded on the Mexican Stock Exchange, for an average of 16 years between 1993 and 2009. All the stocks with available returns for at least five months in the year preceding the portfolio formation date are included in the sample. In Table 1 we show some data of the Mexican Stock Exchange. The sample includes delisted firms as well as new listings during the period to avoid survivorship bias. As a comparison, the Mexican sample in Cui, Titman and Wei (2010) includes between 37 to 47 firms.

Table 1. Activity Level of the Mexican Stock Exchange (BMV)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
IPC (percentage change)	-15.0	-24.4	18.4	51.2	-37.9	86.7	-21.2	18.0	-14.8	31.8	46.5	44.0	47.2	11.8	-39.2	48.8
Total Value Issue (billion USD)	3.8	1.1	1.9	2.5	1.2	2.2	1.9	4.7	6.1	7.5	12.4	12.5	13.0	15.1	12.2	16.8
Traded Stock (billion USD)		32	36	49	30	35	41	38	29	25	44	53	83	130	129	110
Foreign Investment (billion USD)	55	28	34	52	33	67	52	55	45	57	74	107	154	154	80	n/d
Foreign Investment/ Capital Market (percentage)	26	27	29	31	35	43	41	43	43	46	43	45	44	39	33	n/d

IPC (Índice de Precios y Cotizaciones) is a daily weighted-average index of prices and quotes from the Mexican Stock Exchange.

Source: Bolsa Mexicana de Valores, S.A.B. de C.V. (2009)

Annual returns (R_{it}) are obtained from Economatica. First, securities are ranked according to their annual returns. Three equally-weighted annual return portfolios are formed: $MO1_t$, $MO2_t$ and $MO3_t$ every year. Cui, Titman and Wei (2003, 2010) also form three portfolios because of the small samples available in emerging markets. Hong, Lim and Stein (2000) also analyzed three portfolios. $MO1_t$ is the portfolio of the securities in the top third of annual returns in year $t-1$. $MO3_t$ is the portfolio of the securities in the bottom third of annual returns in year $t-1$. Lakonishok, Shleifer and Vishny (1994) also assume annual periods, which produce returns close to those that investors actually gain because of market microstructure issues and transaction costs. In addition, Jegadeesh (1990) argues that infrequent trading of securities induces negative first-order serial correlation in returns, which could overstate the profits from the trading strategies. However, the extent of bias due to this source and to measurement error is likely to be small when annual returns are used.

Similarly, average annual returns over the previous five years are also calculated. Every year three additional portfolios are formed based on five years of average annual returns: $MO1\_5t$, $MO2\_5t$ and $MO3\_5t$. $MO1\_5t$ is the portfolio of securities in the top third for an average of five years when annual returns are computed at $t-1$. $MO3\_5t$ is the portfolio of securities in the bottom third for an average of five years when annual returns are computed at $t-1$. This approach is inspired by DeBondt and Thaler (1985), who find an inverse effect with a lag of five years, meaning that winners tend to become losers over this time period. Jegadeesh and Titman (2001) also use post-holding periods of 5 years.

In order to facilitate our study we constructed factors that represent short-term cycle investment strategies and long-term cycle investment strategies (long term reverse effect). $MOM1_t$ is the annual return of a self-financing strategy that takes a long position in $MO1_t$ and a short position in $MO3_t$. Similarly, MOM_5_t is the annual return of a self-financing strategy that takes a long position in $MO1\_5_t$ and a short position in $MO3\_5_t$. In

Table 2 we present the average annual portfolio returns ($MO1_t, MO2_t, MO3_t$) as well as the average annual 5-year returns ($MO1\_5_t, MO2\_5_t, MO3\_5_t$) for the periods 1998-2009, 1998-2001, 2002-2005 and 2006-2009. On average, over the post-formation period the losers have an annual return of 28.51 percent and the winners have an annual return of 14.92 percent, for a difference of 13.59 percent. This large difference pre-empts the presence of the momentum effect in the context of the Mexican Stock Exchange, since past winners do not outperform past losers. However, the annual 5-year return differences are considerably shorter. The short-term cycle investment strategies factor, $MOM1_t$, is negative in contrast with Jegadeesh and Titman (1993) and Rouwenhorst (1998), who find it positive. A close examination of Table 3 shows that average short-term cycle investment strategies are strongly influenced by the highly negative returns in the sub-period 2007-2009, which encompasses the beginning of the global financial crisis. Therefore our analysis focuses on the period 1993-2006. The return of the $MOM1_t$ portfolio from 1993 to 2006 is 2.75 percent and statistically significant. In addition, most of the individual years in that period show positive, though small, returns, which is consistent with previous published research.

Table 2. Average and Standard Deviation of Annual Returns of Portfolios and independent variables (factors).

PORTFOLIOS	Average returns *Standard deviation* 1998-2009	Average returns *Standard deviation* 1998-2001	Average returns *Standard deviation* 2002-2005	Average returns *Standard deviation* 2006-2009
$MO1_t$	15.62 *25.26*	1.14 *28.15*	30.79 *17.92*	14.92 *28.11*
$MO2_t$	17.37 *24.65*	-2.05 *28.07*	29.06 *16.45*	25.09 *27.23*
$MO3_t$	20.00 *36.93*	2.39 *33.13*	29.11 *16.83*	28.51 *38.59*
$MO1\_5_t$	18.39 *27.81*	0.68 *30.69*	27.33 *18.06*	27.17 *32.32*
$MO2\_5_t$	15.99 *24.62*	4.99 *30.08*	26.48 *15.65*	16.50 *25.97*
$MO3\_5_t$	23.29 *29.01*	1.42 *34.41*	39.95 *22.42*	28.49 *28.41*
VARIABLES (factors)				
R_{Mt}	16.21 *30.59*	9.64 *38.79*	24.20 *20.70*	14.70 *30.07*
$MOM1_t$	-4.39* *17.11*	-1.25 *18.69*	1.68 *13.92*	-13.59 *** *20.02*
$MOM5_t$	4.89* *17.63*	0.75 *19.32*	12.62 *** *18.51*	1.31 *14.91*

***Significant at the 1 percent level, ** 5 percent, * 10 percent

$MO1_t$ is the portfolio of securities in the top third of annual returns in year $t-1$. $MO2_t$ is the portfolio of securities in the middle third of annual returns in year $t-1$. $MO3_t$ is the portfolio of securities in the bottom third of annual returns in year $t-1$. $MO1\_5_t$ is the portfolio of securities in the top third five-year average of annual returns computed at $t-1$. $MO2\_5_t$ is the portfolio of securities in the middle third five-year average of annual returns computed at $t-1$. $MO3\_5_t$ is the portfolio of securities in the bottom third five-year average of annual returns computed at $t-1$. $MOM1_t$ is the annual return of a self-financing strategy that takes a long position in $MO1_t$ and a short position in $MO3_t$. $MOM5_t$ is the annual return of a self-financing strategy that takes a long position in $MO1\_5_t$ and a short position in $MO3\_5_t$. R_{Mt} is the annual return of the daily weighted-average index of prices and quotes from the Mexican Stock Exchange.

Table 3. Average and standard deviation of annual returns of Independent Variable (Factor) $MOM1_t$. January 1993 to December 2009.

MOM1$_t$	Average returns *Standard deviation*		Average returns *Standard deviation*
Year		**Year**	
1993	29.05 *** *28.67*	2003	-29.38 *** *12.56*
1994	7.95 ** *19.92*	2004	25.27 *** *10.82*
1995	23.40 *** *17.08*	2005	6.68 *** *15.05*
1996	8.73 ** *24.38*	2006	1.08 *12.78*
1997	-33.49 *** *50.29*	2007	-21.04 *** *12.01*
1998	5.50 * *20.97*	2008	-0.30 *11.99*
1999	-25.76 *** *21.17*	2009	-23.21*** *27.18*
2000	23.74 *** *18.36*	1993-2006	2.75 *** *22.00*
2001	-8.47 *** *12.10*	2007-2009	-18.47 *** *22.53*
2002	4.14 ** *13.61*	1993-2009	-1.00 *22.05*

***Significant at the 1 percent level, ** 5 percent, * 10 percent

$MOM1_t$ is the annual return of a self-financing strategy that takes a long position in $MO1_t$ and a short position in $MO3_t$. $MO1_t$ is the portfolio of securities in the top third of annual returns in year $t-1$. $MO3_t$ is the portfolio of securities in the bottom third for annual returns in year $t-1$.

IV. Empirical Results

To continue the analysis, we used the time series of a multifactor model (1) to explore market inefficiencies in annual excess returns $(R_{pt} - R_{ft})$ of portfolios of securities traded on the Mexican Stock Exchange. Rouwenhorst (1998) also uses a multifactor model including an international version of the size factor. In addition to the excess market returns over the risk-free rate $(R_{Mt} - R_{ft})$, $MOM1_t$ and $MOM5_t$ are included to represent short-term cycle investment strategies and or long-term cycle investment strategies. R_{pt} is the annual return on portfolio p in year t. R_{Mt} and R_{ft} are respectively the annual returns of the IPC^2 of the BMV, and 10-year US t-bills, which are available for trade on both local and foreign markets. The portfolios under scrutiny consist of the top $(p = 1)$, middle $(p = 2)$ and bottom $(p = 3)$ thirds of Mexican securities, ranked by returns from the previous year. The returns are all measured in U.S. dollars. Our results are not altered if we measure returns in local currency.

The construction of short-term cycle investment strategies or long-term cycle investment strategy factors is one of the contributions of this research. Our portfolio formation strategies require one and five years of past data respectively. Therefore, including the $MOM1_t$ factor reduces the sample to the period 1994 to 2006, while including the $MOM5_t$ factor reduces the sample to the period 1998 and 2006. We examine the subsequent performance of the portfolios in the year following portfolio formation using returns data from Economatica. In Table 4 the correlation between the three independent variables R_{Mt}, $MOM1_t$ and $MOM5_t$ is very low.

Table 4. Correlation Matrix between independent variables (factors). January 1998 to December 2009.

	R_{Mt}	$MOM1_t$	$MOM5_t$
R_{Mt}	1.000		
$MOM1_t$	-0.125	1.000	
$MOM5_t$	-0.03	-0.020	1.000

IPC (Índice de Precios y Cotizaciones) is a daily weighted-average index of prices and quotes from the Mexican Stock Exchange.

$MOM1_t$ is the annual return of a self-financing strategy that takes a long position in $MO1_t$ and a short position in $MO3_t$. $MO1_t$ is the portfolio of securities in the top third of annual returns in year $t-1$. $MO3_t$ is the portfolio of securities in the bottom third of annual returns in year $t-1$. $MOM5_t$ is the annual return of a self-financing strategy that takes a long position in $MO1\_5t$ and a short position in $MO3\_5t$. $MO1\_5t$ is the portfolio of securities in the top third five-year average of annual returns computed at $t-1$. $MO3\_5t$

is the portfolio of securities in the bottom third five-year average of annual returns computed at $t-1$. R_{Mt} is the annual returns of the daily weighted-average index of prices and quotes from the Mexican Stock Exchange.

$$R_{pt} - R_{ft} = \alpha_p + \beta_{p1}\left(R_{Mt} - R_{ft}\right) + \beta_{p2}MOM1_t + \beta_{p3}MOM5_t + u_{pt} \quad (1)$$

We used this formulation to test whether short-term cycle investment strategies or long-term cycle investment strategies are captured as part of the pricing mechanism in the Mexican Stock Exchange. The intercept represents an estimation of the abnormal return. Under the null hypothesis the abnormal returns are equal to zero. We tested the predictability of one- and five-years lagged returns (momentum effect and long-term reverse effect). The estimates of abnormal returns on the portfolios (α) along with estimated coefficients of the market factor (β_{p1}), the short term cycle investment strategies (β_{p2}) and the long-term cycle investment strategies (β_{p3}), for the period 1998-2006 are shown in Table 5. The coefficients of the market factor and MOM1t are significantly different from zero for all three portfolios, whereas the coefficients of MOM5 are not significant.

Table 5.Multifactorial model regression.
January 1994 to December 2006.

	α	β_{p1}	β_{p2}	β_{p3}	R^2
R_{1t}	0.00309	0.72394	0.15019	0.05759	.75
	0.99	*20.76**	*2.49**	*0.95*	
R_{1t}	0.00267	0.71192			.74
	0.85	*20.24**			
R_{2t}	0.00337	0.66693	-0.20474	0.00190	.74
	1.07	*18.91**	*-3.35**	*0.03*	
R_{2t}	0.00446	0.68174			.72
	1.39	*18.89**			
R_{3t}	0.00055	-0.27554	-0.85113	*0.06024*	.63
	0.17	*-7.87**	*-14.05**	*1.07*	
R_{3t}	0.00553	-0.21535			.60
	1.16	*-4.014**			

***Significant at the 1 percent level, ** 5 percent, * 10 percent

$MOM1_t$ is the annual return of a self-financing strategy that takes a long position in $MO1_t$ and a short position in $MO3_t$. MO1t is the portfolio of securities in the top third of annual

returns in year $t-1$. $MO3_t$ is the portfolio of securities in the bottom third of annual returns in year t-1. MOM5t is the annual return of a self-financing strategy that takes a long position in $MO1\_5_t$ and a short position in $MO3\_5_t$. $MO1\_5_t$ is the portfolio of securities in the top third five-year average of annual returns computed at $t-1$. $MO3\_5_t$ is the portfolio of securities in the bottom third five-year average of annual returns computed at $t-1$. R_{Mt} is the annual return of the daily weighted average index of prices and quotes from the Mexican Stock Exchange. R_{ft} is the annual return of the 10-year US t-bills. α is the intercept.

V. Concluding Remarks

We examined the influence on portfolio returns of both short-term cycle investment strategies or long-term cycle investment strategies in the Mexican Stock Exchange over a long time period, prior to the recent global crisis. The returns of three portfolios are examined one year after the portfolio-formation periods. Risk-adjusted returns are estimated as the intercepts from a multifactor model regression. The portfolios show no abnormalities in the returns, which is consistent with the efficient-market proposition. The factor-mimicking portfolios seem to actually reflect short-term cycle investment strategies, but not long-term investment cycle strategies. Therefore it is expected than in Mexico the magnitude of short- term cycle investment strategies profits is lower and less persistent than the effect found in previous studies on developed markets. Complementarily, infrequent trading may contribute as a potential measurement problem. The effect of short-term cycle investment strategies upon Jegdeesh and Titman (1993) is a major challenge to the efficient market hypothesis. In tests conducted in the United States results have been both strong and persistent. The results for the 1993-2006 period suggest that neither a momentum strategy nor a contrarian strategy would yield significant returns in the Mexican Stock Exchange.

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