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The efficiency of capital multiples: Case of Mexico

La eficiencia de los múltiplos de capital: caso México

Julio Téllez Pérez
Universidad Anáhuac, México

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Abstract

Capital multiples are financial ratios widely used by financial analysts for the purpose of making investment decisions in shares (S) of companies listed in stock markets. The two main indicators are the share price-to-earnings (P/E) and the market value to book value (P/B). Both multiples have the market perspective with respect to the book value of net income and the total equity as a common factor. A sample of 30 companies listed on the Mexican stock exchange between 2008 and 2016 (9 years) was taken, establishing three analysis periods of 3 years each depending on the volatility of the Mexican economy measured through the index of global economic activity (IGAE for its acronym in Spanish). The first was called crisis (1), the second recovery (2), and the third expansion (3). In order to find the possible association of P/E and P/B with S, the generalized method of moments (GMM) was used for the estimations, finding that P/B presents the highest relationship with S in the 3 economic periods, while P/E only presents a significant relationship in periods (2) and (3) concluding that this measuring device is very sensitive to economic changes, whereas P/B is robust and does not lose significance in the face of economic volatility.

JEL codes: C23, D53, E32, E44, G12
Keywords: Valuation; Financial analysis; Multiples; Volatility

*Corresponding author.
E-mail address: jtellez@anahuac.mx (J. Téllez Pérez)
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Resumen

Los múltiplos de capital son razones financieras ampliamente utilizadas por los analistas financieros con el propósito de tomar decisiones de inversión en acciones (P) de las empresas que cotizan en los mercados bursátiles. Los dos principales indicadores son el precio de la acción a utilidad neta (PU) y el valor mercado a valor en libros (P/VL). Ambos múltiplos tienen como factor común la perspectiva del mercado con respecto al valor en libros de la utilidad neta y el capital contable. Se tomó una muestra de 30 empresas que cotizaron en la bolsa mexicana de valores entre 2008 y 2016 (9 años), estableciendo tres periodos de análisis de 3 años cada uno en función a la volatilidad de la economía mexicana medido a través del índice global de la actividad económica (Igae). El primero se le denomino crisis (1), el segundo recuperación (2) y el tercero expansión (3). Para encontrar la posible asociación de P/U y P/VL con P, se utilizó el método generalizado de los momentos (GMM) para las estimaciones, encontrando que P/VL presentan la mayor relación con P en los 3 periodos económicos mientras que P/U solo presento relación significativa en el periodo (2) y (3) concluyendo que este medidor es muy sensible a los cambios económicos mientras que P/VL es robusto y no pierde significancia ante la volatilidad económica.

Código JEL: C23, D53, E32, E44, G12.
Palabras clave: Valuación; Análisis financiero; Múltiplos; Volatilidad

Introduction

The 2008-2009 subprime financial crisis in the United States directly impacted the economy of Mexico due to the high level of involvement between the two countries. One of the most important negative effects was reflected in the prices and quotations index (IPyC for its acronym in Spanish) showing a decrease of 24.2% in 2008. A large number of companies listed on the Mexican stock exchange (BMV for its acronym in Spanish) in that year were affected in their ability to generate profits, showing significant decreases and even significant losses. Consequently, financial analysts proposed new investment theses based on the new adverse economic outlook and its impact on the future results of companies.

Trejo, Noguera, and White (2015) found that the indicators most used by financial analysts to make their investment recommendations in Mexico are price-to-earnings (P/E) and price-to-book ratio (P/B) measuring devices. The importance of both multiples is significant for the valuations of analysts, since the formation of their investment positions depends on the interpretation obtain from them.

The price-to-earnings multiple is obtained by dividing the share price and earnings per share (EPS) for the last twelve months and is interpreted as the price that investors agree to pay for a given share. It can also be interpreted as the period of recovery of the investment

made by an investor in a particular company considering a stable level of profits over time. Another interpretation obtained from this multiple is the expected growth (Litzenberger and Rao, 1971; Cragg and Malkiel, 1982) of the company; the greater the ratio, greater the expected growth of net profit[1] by the investors. The price-to-book ratio multiple indicates the relationship between the market value of the company and the total equity[2,] which is traditionally interpreted as the expected return on capital (Graham, Dodd, and Cottle, 1962), growth indicator (Brief and Lawson, 1992) and is compared to Tobin's q (Bodie, Kane, and Marcus, 2008). The importance of studying the value relevance of net income and total equity during various economic scenarios is essential to find sufficient evidence to explain whether the information content of both items remains relevant and significant. If this is not the case, it can be considered that the capacity of companies to generate profits presents a totally different relationship to the information contained in the book value of total equity, making these accounting concepts totally different and the market assigns a role to each one with different interpretation attributes.

It is in this valuation process where the contribution of this research lies, this being analyzing which of the two multiples is more efficient and robust in the face of different economic impacts, in addition to differing from previous studies, the index of global economic activity (IGAE) is used to incorporate the volatility of the Mexican economy under three scenarios; the first is called crisis (2008-2010), the second recovery (2011-2013), and the third expansion (2014-2016). For the estimates, a regression model based on the generalized method of moments (GMM) was used, which when compared to the traditional method of ordinary least squares (OLS)[3] linear regression decreases the endogeneity between the explanatory variables, a recurrent problem manifested in this type of analysis. The evidence found indicates that the value relevance of the multiple price-to-book ratio is high and persistent in the three economic scenarios analyzed, while the multiple price-to-earnings loses value relevance when economic volatility increases, inferring that the profit and loss statement does not adequately reflect the economic impacts in comparison with the overall balance. A possible explanation for this difference could be the change from Mexican accounting standards (NIF for its acronym in Spanish) to international financial reporting standards (IFRS), a process that began in 2009 and ended in 2012, and which caused confusion among analysts, generating doubts that the net income reported under the new criteria really reflects the profitability of companies (Garza *et al*. 2017); however, previous studies suggest that the magnitude of the

[1] The Accounting Principles Commission of the Mexican Institute of Public Accountants (IMCP for its acronym in Spanish) defines net income as: *the residual value of the revenues of a for-profit entity, after having decreased its relative costs and expenses recognized in the statement of income, provided that the latter are less than such revenues, during an accounting period. Otherwise, i.e. when costs and expenses are higher than revenues, the result is a net loss.*

[2] *Ibid, Total equity is contributed capital, comprised of contributions from the owners of the entity, and earned capital, comprised of accumulated comprehensive profits and losses, as well as reserves created by the owners of the entity.*

[3] Econometric model widely used in reference research of the line of research that studies the value relevance of accounting information.

market value with respect to book value contains more relevant information compared to the one that the generation of profits could have.

The results and conclusions of this research work may be of interest to academia, companies, and financial analysts, understanding that economic volatility has an important impact on the value relevance of the accounting information of companies, as well as providing elements that may help researchers interested in analyzing how capital markets price the historical and current accounting values of companies, and in a practical way, financial analysts may use the appropriate multiple according to the level of economic volatility when evaluating companies. It is important to point out that the study of the value relevance of multiples with respect to share prices in Mexico is practically null, thus this contributes to the understanding of the behavior of the capital market with respect to the accounting information issued by companies.

The structure of the research is the following: first a summary is presented, which briefly shows the fundamentals of the research; next is the introduction, where the topic of value relevance is exposed in a conceptual manner; subsequently, a review is made of the main empirical works that have been carried out in this regard; it is followed by the description of the methodology used to find the possible degree of association between the dependent variable with the independent variables selected in the hypothesis to be contrasted from a sample of public companies of the Mexican stock exchange; finally, the results obtained are analyzed, comparing these with previous researches in this same line of research.

Review of the literature

Ball and Brown (1968) are considered the initiators of the line of research that aims to find the possible relationship between the accounting information of companies with the prices of shares. These authors demonstrated that the accounting results have informative content and that they affect the formation of the prices of companies listed on the capital markets. The research work of Ball and Brown led other researchers to study the relationship between prices and accounting information, highlighting studies carried out during the 1990s by Easton and Harris (1991), Ohlson and Penman (1992), Barth (1994), Dechow (1994), Ohlson (1995), Collins, Maydew, and Weiss (1997), and Easton (1999).

Specifically, in the research line of this empirical work, Nicholas Molodovsky (1953) is considered a pioneer in the research of the P/E multiple and develops the first theory that tries to explain the behavior of the multiple naming it the principle of compensation. This theory is based on comparing the expected profits with the profits obtained in a period of time. If the expected profits are below the profits obtained, the company needs to compensate the shareholders, so the behavior of the share price depends on the magnitude of the deviation between the expected and obtained profits. Basu (1977), like Molodovsky, is considered a precursor

in the study of the relationship between P/E and share performance under the perspective of efficient market. The research by Basu is based on the hypothesis that the P/E multiple is an indicator of the future investment of a company, and that companies with low levels of P/E tend to show higher returns compared to those with high levels of P/E over time. The author used the financial information of 1,400 industrial companies that were listed on the NYSE between 1956 and 1971, and through ordinary least squares (OLS) linear regressions found that the performance of companies with low multiples of P/E is, indeed, greater than that generated by companies with high multiples, coupled with the fact that the multiple acts as a bias indicator when share prices do not really reflect market information. Beaver and Morse (1978) studied the relationship between the historical growth of profits and market risk with the behavior of the P/E of companies. Through ordinary least squares linear regressions, they found a poor causal relationship of the beta coefficient and profit growth with the P/E multiple of a sample of 600 companies that were listed on the NYSE between 1956 and 1975. The authors conclude that the profits present transitory elements referring to a specific moment and that do not last in time, making the forecasts of analysts only short-term, inexact, and without any relation with the future growth of the companies. They also argue that the behavior of the P/E obeys the different accounting methods used by companies; however, Zarowin (1990) analyzes the forecast of the analysts of 175 companies that were listed on the NYSE between 1960 and 1969 through simple linear regressions, deriving that the long-term projections of the growth of profits are those that generate the changes in the P/E and not the accounting method used, differing from the results reported by Beaver and Morse (1978). Ou and Penman (1989) found empirical evidence demonstrating that the information contained in financial statements provides a historical and future perspective of firms. By studying a sample of 1,700 companies that were listed on the NYSE and AMEX between 1973 and 1983, with simple linear regressions, they state that the P/E indicator and the financial reports consider the transitory elements that affect the profits of companies. These results confirm what Beaver and Morse (1978) found, establishing that the accounting rules, instead of mutilating the financial information referring to the generation of profits of the companies, contain relevance of value at the moment of making financial projections. Fama and French (1995) are considered pioneers in the investigation of the multiple P/B and its relation with the returns of shares. Both authors found that the multiple explains the variation in the returns of the shares in a better way than the beta coefficient, besides finding empirical evidence that shows a significant relation with the persistence of the earnings. The previous results were obtained by applying the model of regressions of 3 factors of Fame and French to a group of approximately 4,878 companies grouped in 6 portfolios according to size, which were listed in NYSE, AMEX, and NASDAQ between 1963 and 1992, concluding that the companies that register low levels of P/B tend to present low levels of profitability in the future.

Penman (1996) analyzes 2,574 companies that were listed on NYSE and AMEX between 1968 and 1986, and through the use of simple regressions found that the P/E contains elements that help determine the future growth of profits, and that it presents a positive relationship with the expected return of capital and a negative relationship with the current return of capital. The P/B multiple only presents a casual significant relationship with the expected return of capital. Cheng and McNamara (2000) evaluated the accuracy of the valuation using benchmarks constructed on the basis of the P/E, P/B, and a model that combines both of comparable companies. The authors found that the P/B valuation model and the combined model show more robust results compared to the P/E model. Bradshaw (2002) examined a random sample of 103 reports prepared by financial analysts from companies that were listed between 1996 and 1999 on the NYSE, NASDAQ, and AMEX, finding that 76% of analysts use the P/E multiple to justify their sales recommendations, while only 4% use the P/B to calculate target prices. Davis-Friday and Gordon (2005) studied the relevance of the value of total equity, net income, and cash flow during the 1994 financial crisis of Mexico, finding that the relevance of the total equity informational content did not change significantly during the crisis period; on the contrary, it increased its explanatory power compared to net earnings, which lost explanatory power due to net losses. Durán *et al*. (2007) used Ohlson's model to find the relevance of the value of net income and total equity with share prices, finding that under a panel analysis both accounting items are significantly related, but when using simple regressions, only total equity is significant. Russon and Bansal (2016) argue that the minimum absolute error (MAE) nonlinear regression model, compared to the classical (OLS) linear regression model, better captures the causal relationship between share yields and P/E and P/B multiples. The authors analyzed the possible relationship of the behavior of the S&P1500, P/E, and P/B of the period 2000-2014, finding that MEA yields greater R^2 than OLS.

Empirical Analysis

Description of the methodology

Assuming that the movement in share prices (P_t) is affected by the difference between the information contained in the realized values of multiples (X_t) and market expectation $E(X_t)$ the following model is presented:

$$P_t = b_0 + b_1[X_t - E(X_t)] + \mu_t \qquad (1)$$

where t=1,…T, considering t as the time dimension, P_t is the dependent variable, b_0 and b_1 are the vectors of the coefficients $[X_t - E(X_t)]$ is the unexpected information contained in the independent variables, and are the random errors. Assuming that market expectations

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$E(X_t)$ behave like a discrete linear stochastic process (Biddle, Seow, and Siegel, 1995):

$$E(X_t) = \gamma + \partial_1 X_{t-1} + \partial_2 X_{t-2} + \partial_3 X_{t-3} + \cdots + \partial_n X_{t-n} \quad (2)$$

where γ is a constant and ∂ are the autoregressive parameters, replacing (2) in (1) the following is present:

$$P_t = b_0 + b_1[X_t - (\gamma + \partial_1 X_{t-1} + \partial_2 X_{t-2} + \partial_3 X_{t-3} + \cdots + \partial_n X_{t-n})] + \mu_t \quad (3)$$

Therefore, the movement of shares is affected only by unexpected information, which is not directly observed, of the multiple of capital at a given moment in time. In order to avoid problems arising from structural changes over time (Biddle *et al*. 1995), only one lag period is considered in $E(X_t)$ obtaining the following model:

$$P_t = b_0 + b_1(X_t) + b_2(X_{t-1}) + \mu_t \quad (4)$$

to mitigate possible problems of scale and multicollinearity, the study variables were standardized by applying the following transformation:

$$Z = x - \bar{x}/\sigma \rightarrow N(0,1) \quad (5)$$

Where Z is the standardized variable with a mean of zero and a standard deviation of one, is the real multiple in a moment in time, $\bar{x}$ is the average of x in a given period of time and σ is the standard deviation of $\bar{x}$. With the standardized coefficients a more robust basis of comparability is obtained since all the variables are in the same measurement scale.

Applying formula (5) in (4), the following standardized equation is derived:

$$(P_t - \bar{P}_t/\sigma_{\bar{p}t}) = b_0 + b_1(X_t - \bar{X}_t/\sigma_{\bar{x}t}) + b_2(X_{t-1} - \bar{X}_{t-1}/\sigma_{\bar{x}t-1}) + \mu_t \quad (6)$$

Simplifying the equation (6):

$$ZP_t = b_0 + b_1 Z(X_t) + b_2 Z(X_{t-1}) + \mu_t \quad (7)$$

To complement the analysis of the degree of incremental association that the independent variables could have with the dependent variable, statistic F was applied to reject or accept the following null hypothesis (restriction):

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$$H_0: b_1 Z(X_t) = b_2 Z(X_{t-1}) = 0 \quad (8)$$

$$H_A: b_1 Z(X_t) = b_2 Z(X_{t-1}) \neq 0$$

However, when adding a second explicative variable Y_t and its lag Y_{t-1} to equation (7) two econometric problems that need to be solved arise. The first is the possible bi-directional relationship that could exist between $[X_t - E(X_t)]$ and $[Y_t - E(Y_t)]$ making both meters related to the errors generating an endogeneity problem (Baltagi, 2005); the second problem comes from the invariant characteristics in time (fixed effects) per individual found in random errors (μ_t) of equation (1), which could be related to the independent variables:

$$\mu_t = \upsilon_i + \varepsilon_t \quad (9)$$

where are the unobservable effects derived from the individual characteristics of individuals, and ε_t represents the specific errors. To deal with both problems, a panel dynamic model was constructed based on the generalized method of moments (Arellano and Bond, 1991; Blundell and Bond, 1998) expressed in the following equation:

$$P_{it} = b_0 + b_1 P_{it-1} + b_2(X_{it}) + b_3(X_{t-1}) + b_4(w_{it}) + \upsilon_i + \varepsilon_{it} \quad (10)$$

where i=1,…,N and t=1,…T, considering i as the unit of study (cross section) and t as the dimension of time, P_{it} is the dependent variable, is its lag variable, X_{it} represents the vector of the endogenous explanatory variables, X_{it-1} the lag of endogenous variables, w_i is the vector of exogenous variables, is the individual error of the units and ε_t are the specific errors. Regardless, υ_i is correlated with P_{it-1} so a model in first differences based on equation 9 is estimated (Arellano and Bond, 1991):

$$\Delta P_{it} = b_0 + b_1 \Delta P_{it-1} + b_2 \Delta(X_{it}) + b_3 \Delta(X_{t-1}) + b_4 \Delta(w_{it}) + \Delta\varepsilon_t \quad (11)$$

With the differences of the regressors the problem of the specific fixed effects of the units of study is removed because these do not vary in time; however, ΔP_{it-1} correlates with, $\Delta\varepsilon_t$ so the use of instrumental variables (Hsiao, 1982; Arellano and Bond, 1991) based on the differences and levels of the explanatory variables is fundamental to eliminate this problem and thus obtain unbiased coefficients. The generalized model of moments (GMM) estimates the relationship between the dependent and independent variable using equations 10 and 11

together, which, combining them with equation 7, obtains the regression model to find the causal relationship of the study variables, being as follows:

$$ZP_{it} = b_0 + b_1 ZP_{it-1} + b_2 ZX_{it} + b_3 ZX_{it-1} + b_4 Zw_{it} + \upsilon_i + \mu_{it} \quad (12)$$

$$\Delta ZP_{it} = b_0 + b_1 \Delta ZP_{it-1} + b_2 \Delta ZX_{it} + b_3 \Delta ZX_{it-1} + b_4 \Delta Zw_{it} + \Delta\varepsilon_{it} \quad (13)$$

Additionally, the heteroscedastic weights matrix is considered for the estimation (two-step), making the regressors more efficient (Roodman, 2009) compared to those obtained using only the homoscedastic weights matrix (one step), using the Hensen test (Hensen, 1982) to identify overidentification problems of the instruments.

Description of the variables

As a dependent variable, the share price at the close (P_{it}) is taken to represent the price at which the trading of a financial asset, in this case shares, ends in the last session of a specific moment in time in the capital market. As independent variables, the multiple price-to-earnings (P/E_{it}) obtained by dividing the closing share price (P_{it}) and the profit per share of the last 12 months (EPS_{it}), and the multiple price-to-book value P/B_{it} resulting from the division of market value (number of shares by the closing share price) and total equity were considered. Both variables are considered endogenous because the share price is present in the calculation of both indicators, which generates chance in both directions:

$$(PU_{it} \rightarrow P/VL_{it}; P/VL_{it} \rightarrow PU_{it})$$

In order to diminish the endogeneity problem, the difference and lag of the same endogenous variables (Arellano and Bond, 1991) were established as instrumental variables, complying with the following properties:

a) The instrument (z_{it}) is correlated with the independent endogenous variable to be instrumented (P/E_{it} and P/B_{it}): $Cov(PU_{it}, z_{it}) \neq 0$ and $Cov(P/VL_{it}, z_{it}) \neq 0$. With z_{it} being the lag and differences between P/E_{it} and P/B_{it} because they are determined by their past condition.

b) The instrument (z_{it}) is not correlated with errors: $Cov(z_{it}, \mu_{it}) = 0$.

The index of global economic activity (IGAE) was taken as a control variable, which measures the behavior of the real sector of the economy in the short-term, based on two criteria: the first

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refers to all units (n) being exposed to the volatility of the Mexican economy (market risks), and the second assumes that it is an exogenous variable (w_{it}) since it has no relation with the other regressors and also does not present any correlation with the errors of the model: $Cov(w_{it}, \mu_{it}) = 0$.

Substituting the proposed study variables in equation (12) and (13), the following is obtained:

$$ZP_{it} = b_0 + b_1 ZP_{it-1} + b_2 ZPU_{it} + b_3 ZPU_{it-1} + b_4 ZP/VL_{it} + b_5 ZP/VL_{it-1} + b_6 ZIgae_{it} + v_i + \mu_{it} \quad (14)$$

$$\Delta ZP_{it} = b_0 + b_1 \Delta ZP_{it-1} + b_2 \Delta ZPU_{it} + b_3 \Delta ZPU_{it-1} + b_4 \Delta ZP/VL_{it} + b_5 \Delta ZP/VL_{it-1} + b_6 \Delta ZIgae_{it} + \Delta\mu_{it} \quad (15)$$

By estimating both equations using the panel dynamic model based on the generalized method of moments, the aim is to determine whether the level of information provided by the P/E multiple affects the behavior of share prices in a greater way than the information contained in P/B. With the analysis of the significance of the slope of the coefficients of the two study variables it is sought to contrast the following hypothesis:

H_1: The price-to-earnings (P/E) is the best capital multiple to explain the behavior of share prices (P) compared to the price-to-book value multiple (P/B) in environments of high economic volatility.

Description of the sample

The empirical research was conducted with 30 (n = 30) companies (see Annex 1) of the Mexican Stock Exchange (BMV) that were listed during the 2008 to 2016 period and which passed the following filters: 1) showing complete financial information (t = 108 months), 2) non-financial companies, 3) companies with a positive average return on equity (ROE) to avoid the bias that could cause a negative average in the estimates. The *Economática* is the database from which the monthly information was obtained to make the estimates. Table 1 shows the description of the variables, highlighting the average of the P/E that registers 27.3 times; however, it is not a conclusive result due to the fact that the average is very sensitive to extreme values, in conjunction with the fact that it considers the price-to-earnings in equal parts between each observation, making the result it registers not representative of the sample; furthermore, it is also the one that presents greater heterogeneity in comparison with the P/B when showing a variation coefficient of 4.32. The average of the multiple P/B is 3.0 times with a coefficient of variation of 0.97, showing a smaller dispersion in comparison with P/E.

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Table 1

Description of the variables 2008 – 2016

Variable	Average	Standard Deviation	Minimum	Maximum	Variation coefficient
*PB**	3.0	2.9	.23	44.9	0.97
*P/E**	27.3	117.9	-925.4	3 569.3	4.32

*Real values without transformation

Source: Own elaboration

Table 2 shows the Pearson correlation matrix, where the IGAE variable is the one with the greatest linear relationship with P when registering a positive correlation coefficient of 0.8065, following the P/E variable with a coefficient of 0.7388, and finally the P/B variable with a coefficient of 0.3957; all significant at 1%. This indicates that the variables that affect the creation of wealth in the Mexican economy directly influence the formation of share prices (external effects), as well as the internal situation of companies reflected through total equity and net income (internal effects).

Table 2

Pearson correlation matrix (R) 2002 – 2016

	P	*P/B*	*P/E*	*IGAE*
P	1			
P/B	.3957 (0.000)***	1		
P/E	.7388 (0.000)***	.3708 (0.000)***	1	
IGAE	.8065 (0.000)***	.3428 (0.000)***	.5743 (0.000)***	1

*significant at 10%; ** significant at 5%; ***significant at 1%

Source: Own elaboration

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Figure 1 shows the historical evolution of the IGAE from 2002 to 2016 with the purpose of giving a historical overview of the performance of this index, showing a compound annual growth of 2.41%. There have been several factors that have happened in this period of time, the most relevant being the political change of a party that dominated for decades the control of the country—finally changing in 2000—marking a period of prosperity in the country until 2007, where the global crisis of 2008 negatively impacted the economic performance of Mexico, causing a fall of 2.96% of the wealth creation of the country in that year, resuming growth in 2009 onwards.

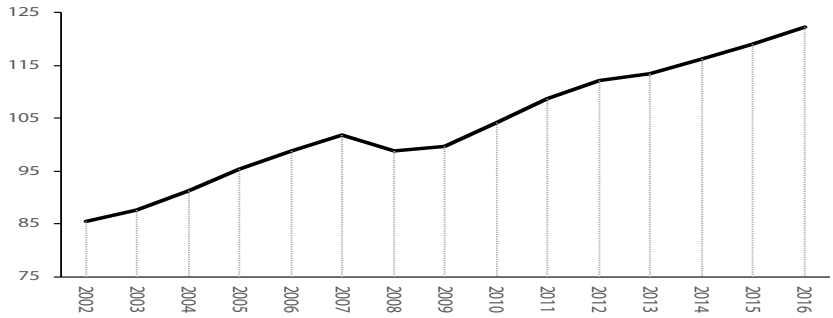

Figure 1. Index of Global Economic Activity (*IGAE*) 2002-2016
Source: own elaboration with data from INEGI.

Empirical Results

The relevance of the explanatory variables was evaluated with the performance of the shares for the 2008-2016 period (Table 3), finding that P/B_{it} and P/B_{it-1} present a higher F statistic in comparison with that shown between P/E_{it} and P/E_{it-1}, indicating that, in relative terms, the P/B multiple is the variable that provides greater information when explaining the changes in Pn during the 9-year period analyzed. The above is in line with the results shown in previous investigations (Fama and French 1995, Penman 1996, Davis-Friday and Gordon 2005) where they conclude that total equity is more robust and its value relevance does not change significantly in the face of economic impacts, a situation different from that shown by net profit. It is also worth mentioning that the lag variables of both indicators present negative

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signs indicating an inverse relationship with the share price, meaning that companies that present a low level of growth in profits during a particular year tend to register high multiples the following year, thus validating the Molodovsky effect (1953). The aforementioned can be explained from the point of view of the market and its perception of the ability of companies to obtain profits, and how the transitory elements that appear negatively affect the results, and that these disappear the following year (Beaver and Morse, 1978).

It is important to highlight that the IGAE control variable does not present any relation with the behavior of share prices, perhaps due to the lag variables of the two multiples and of the share price, which in some way already incorporate the effects of the economy.

Table 3

Generalized Method of Moments (GMM)

	Subperiods			
	(0)	(1)	(2)	(3)
P_{nit-1}	1.06*** (7.13)	1.08*** (10.89)	1.05*** (4.88)	1.01*** (24.12)
P/B_{nit}	0.23*** (7.43)	0.23*** (10.25)	0.19*** (3.16)	0.26*** (4.43)
P/B_{nit-1}	-0.22*** (-5.72)	-0.22*** (-6.90)	-0.18** (-2.32)	-0.24*** (-4.52)
F[a]	45.14*** (0.00)	91.46*** (0.00)	7.37** (0.01)	20.10*** (0.00)
P/E_{nit}	0.02*** (0.00)	-0.02 (-0.32)	0.02*** (3.48)	0.02*** (2.80)
P/E_{nit-1}	-0.01* (-1.79)	0.01 (0.13)	-0.02*** (-3.14)	-0.02** (-2.80)
F[a]	7.27** (0.01)	0.06 (0.81)	12.05*** (0.00)	9.75*** (0.00)
IGAE	-0.04 (-0.40)	-0.04* (-1.89)	-0.02 (-0.15)	0.03 (1.41)
Constant	-0.01 (-0.09)	-0.01 (-0.44)	-0.01 (-0.48)	-0.05 (-1.65)
Time period	2008-2016	2008-2010	2011-2013	2014-2016
AR(1)	0.00***	0.00***	0.00**	0.00***
AR(2)	0.792	0.93	0.21	0.11
Hansen Test[b]	0.295	0.71	0.21	0.37
Observations	3,240	1,080	1,080	1,080

Note: Coefficient and t-value shown in parentheses, significance level at: 10%*, 5%**, 1%***

[a]The p-value in parentheses represents the statistical test of two queues of the null hypothesis of no incremental information content, .

[b]Statistical test of the null hypothesis of no over-identification of the instruments (two step).

Source own preparation/Stata 14.0

In order to corroborate the results obtained, the analysis horizon is divided into 3 periods of time depending on the historical behavior of the IGAE: the first covers from 2008 to 2010, the second from 2011 to 2013, and the third from 2014 to 2016. Table 4 shows the description of each of the groups where the first is considered a period of crisis (high volatility), the second a recovery period (medium volatility), and the last an expansion group (low volatility). This allows to see if the causal relationship of multiples with respect to Pnit is persistent when there are different economic phenomena affecting a country, in this case Mexico.

Table 4
Description of the periods

		Monthly			
Period	Name	Average Monthly Growth	Standard Deviation	Variation Coefficient	Volatility
2008 – 2016 (0)	-	0.17%	0.62%	3.64	-
Subperiods:					
2008 – 2010 (1)	crisis	0.06%	0.86%	14.15	High
2011 – 2013 (2)	recovery	0.24%	0.53%	2.22	Medium
2014 – 2016 (3)	expansion	0.21%	0.36%	1.76	low

Source: own elaboration with data from INEGI.

Table 3 column (1) shows the results of the first group (2008 – 2010), showing that the indicator P/Bnit and P/Bnit-1 present coefficients t of 10.25 and -6.90, respectively, with a probability of $p > |t| = 0.000$ for both, significant at 1%. While the P/Enit and P/Enit-1 multiples lack significant relevance by showing a t coefficient of -.02 and 0.01, respectively, and a non-significant F coefficient, compared to the coefficient shown by P/Bnit and P/Bnit-1. The results obtained confirm what Davis-Friday and Gordon (2005) found, arguing that the presence of negative earnings diminishes the relevance of value when compared to these if they were positive. One possible explanation is that, in terms of the behavior of the economy, it has an important and significant impact on the financial part of the income statement (e.g. exchange rate, interest rates), which generates important negative transitory elements that surpass the permanent elements of the operating earnings. Financial analysts, faced with this situation, distrust the informative content of the profit of the period, relegating it only as a dubious and unimportant accounting data (Penman 1996). The IGAE has no significant relation with the

price of shares, perhaps because the market became irrational due to the crisis and began to make very short-term decisions aimed at reducing losses without considering the fundamentals of the economy (Davis-Friday and Gordon 2005). For the time period of 2011 - 2013, column (2), the variables P/Enit and P/Enit-1 present significant coefficients at 1%, inferring that the market after the crisis considers that the fundamental issue is the generation of profits rather than the consolidation of total equity. The past becomes important as a reference for comparison with the present. The P/Bnit and P/Bnit-1 multiples present significant coefficients at 1% and 5%, respectively, which, like the previous period, maintains its value relevance in view of the economic changes that occurred in the period analyzed. The two multiples present a statistically significant F, highlighting the one shown by P/E because it is greater than that of P/B, indicating that in relative terms it presents a greater incremental association, validating the perception of the market regarding the expected growth of profits (Ball and Brown, 1968; Basu, 1977). The IGAE variable is significant showing a negative sign, indicating that the new fundamentals of the economy are uncertain and continue to worry the financial markets.

With the value relevance obtained in the third scenario corresponding to 2014 - 2016, Table 3 column (3), it is observed that the lag variables of P/Bit and P/Bit-1 are significant when showing coefficients t of 4.43 and -4.52, significant at 1%, indicating that the market perception is positive in terms of growth in expected profits where the past is considered as a reference for comparison. Additionally, companies are not forced to manipulate accounting records since economic stability does not generate important negative transitory elements that could affect the generation of profits, where the permanent elements of profit predominate. This is a key situation that diminishes the uncertainty to obtain projections of the share price based on said multiple (Beaver and Morse, 1978).

It is worth mentioning that, for both multiples, the change of signs from the lag variable to the contemporary one in the analyzed time periods is due to the market perspective with respect to the performance of the company, where the reversal of signs can be explained by the change in the market expectations with respect to the growth of expected profits and the return of capital, reflected in the payment of dividends. If a company does not present a dividend payment policy, the expected profit would only be limited to the variation of the share price, increasing its exposure to market risks due to the implementation of a strategy of share repurchase replacing dividends (Fama and French 1992 and 1995).

By partitioning the analysis time and subjecting the relevance and persistence of the P/E indicator to different economic effects, it can be observed that it loses relevance in periods of high volatility and economic non-growth and becomes relevant in periods of economic stability. Therefore, the hypothesis is partially accepted considering that P/E only has a casual relationship with the movements of share prices in stable economic conditions only, and that P/B is a more robust and efficient measuring device that does not lose value relevance before the different economic events.

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Conclusions

The evidence found suggests that the P/B multiple does not lose value relevance in comparison with P/E, since its explanatory power disappears in conditions of high economic volatility; these results corroborate those obtained by Davis-Friday (2005). This could be explained by the process of accounting revaluation of tangible assets in Mexico, which, if positive, favors total equity to a large extent, reflecting macroeconomic conditions in the equity of shareholders, making this accounting item reliable and with valuable informative content. In periods of economic expansion, P/E becomes more relevant in comparison with P/B due to the fact that the transitory elements that affect the generation of profits disappear, reflected in a greater return to shareholders (Basu, 1977; Beaver and Morse, 1978).

This empirical work aims to contribute to the understanding of the relationship between accounting information and stock prices, where the line of formal research on this topic in Mexico is booming. A possible future line of research would be to explore the relevance of valuation multiples such as EV/EBITDA, Sales/EBITDA, free cash flow, among others, with respect to the behavior of share prices.

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Annex

Table A1

Companies that comprise the sample (n=30) Source: own elaboration with data from BMV.

id	Company	Issuer
1	Alfa, S.A.B. de C.V.	ALFAA
2	Alsea, S.A.B. de C.V.	ALSEA
3	América Móvil, S.A.B. de C.V.	AMXL
4	Consorcio ARA, S.A.B. de C.V.	ARA
5	Arca Continental, S.A.B. de C.V.	AC
6	Grupo Aeroportuario del Sureste, S.A.B. de C.V.	ASURB
7	Industrias Bachoco, S.A.B. de C.V.	BACHOCOB
8	Grupo Bimbo, S.A.B. de C.V.	BIMBOA
9	Grupo Cementos de Chihuahua, S.A.B. de C.V.	GCC
10	Coca-Cola Femsa, S.A.B. de C.V.	KOFL
11	Corporación Moctezuma, S.A.B. de C.V.	CMOCTEZ
12	Organización Cultiba, S.A.B. de C.V.	CULTIBAB
13	Cydsa, S.A.B. de C.V.	CYDSASAA
14	Fomento Económico Mexicano, S.A.B. de C.V.	FEMSAUBD
15	Corporativo Fragua, S.A.B. de C.V.	FRAGUAB
16	Grupo Carso, S.A.B. de C.V.	GCARSOA1
17	Grupo México, S.A.B. de C.V.	GMEXICOB
18	Gruma, S.A.B. de C.V.	GRUMAB
19	Grupo Kuo, S.A.B. de C.V.	KUOB
20	Industrias CH, S.A.B. de C.V.	ICHB
21	Kimberly-Clark de México, S.A.B. de C.V.	KIMBERA
22	Grupo Lamosa, S.A.B. de C.V.	LAMOSA
23	El Puerto de Liverpool, S.A.B. de C.V.	LIVERPOLC-1
24	Grupo Industrial Maseca, S.A.B. de C.V.	MASECAB
25	Mexichem, S.A.B. de C.V.	MEXCHEM
26	Industrias Peñoles, S.A.B. de C.V.	PE&OLES
27	Organización Soriana, S.A.B. de C.V.	SORIANAB
28	Grupo Televisa, S.A.B. de C.V.	TLEVISACPO
29	TV Azteca, S.A.B. de C.V.	AZTECACPO
30	Wal-Mart de México, S.A.B. de C.V.	WALMEX

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