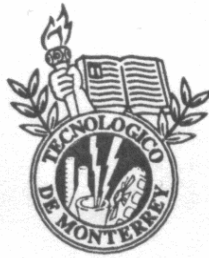


**INSTITUTO TECNOLÓGICO Y DE ESTUDIOS  
SUPERIORES DE MONTERREY**

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**CAMPUS CIUDAD DE MEXICO**



**“VALUE RELEVANCE OF THE OHLSON MODEL  
WITH MEXICAN DATA”**

**DOCTORADO EN ADMINISTRACIÓN**

**TESIS PRESENTADA POR:**

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**ABRIL 2005**

I dedicate this work to my beautiful family: to my parents Ma.Guadalupe and José M., and to my brother Rodrigo; as a signal of gratitude for their love, care and encouragement in every moment of my life.

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# Value Relevance of the Ohlson model with Mexican data

Rocío Durán Vázquez

## ABSTRACT

In this study, the value relevance of Mexican accounting variables is tested under econometric terms<sup>1</sup>. The aim of the study is to provide evidence of the ability of Mexican accounting numbers to summarize the information underlying stock prices. The accounting variables used are from companies listed in the Mexican stock market from 1991 to 2003. The value relevance was operationalized using the Ohlson model criteria (1995) from the market-based accounting research field. The methodology employed is that described by Collins, Maydew, and Weiss (1997) and Collins, Pincus, and Xie (1999).

The econometric results show that, under Panel Data Analysis, book value and earnings are value relevant in Mexican stock market companies, and only the book value is value relevant under Ordinary Least Squared Regression Analysis<sup>2</sup>.

In addition to the Ohlson model results, an alternative model is presented as a better proxy of the value relevance of the characteristics of Mexican information. The first approach was to verify the explanation power of other variables (EBITDA<sup>3</sup>, Dividends, Operative Cash Flow and Net Cash Flow) rather than earnings in the original Ohlson model; however, according to Dechow (1994), none of them were significant because of the accruals importance (earnings). The second approach was to add an additional variable that provides further information to the original Ohlson model.

Finally, an operative cash flow variable per share was identified as the third variable to be considered, and together with book value and earnings, constitutes the alternative model. The proposed alternative model was tested under the full-sample and Intangible versus Tangible economical classification. In these tests, the alternative model provides extra information and better statistics than the original Ohlson model.

Research line: empirical market based accounting, Ohlson model application with Mexican Data.  
This study was written in English in order to make easy the comprehension of literature references.

<sup>1</sup> According to T-statistic significance and Adjusted  $R^2$ , under Ordinary Least Square Regression and Generalized Least Square Panel Data criteria.

<sup>2</sup> Using the first difference information based approach.

<sup>3</sup> See the notation on page 5 of this study.

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## B - NOTATIONS AND ACRONYMS USED IN THE STUDY

### Variables:

$P_{it}$  = the price of a firm  $i$  share three months after fiscal year-end  $t$

$E_{it}$  = the earnings per firm  $i$  share during the year  $t$

$BV_{it}$  = the book value per firm  $i$  share at the end of year  $t$

$\varepsilon_{it}$  = other value-relevant information for firm  $i$  for year  $t$  orthogonal to earnings and book value

$EBITDA_{it}$  = Earnings Before Interest, Taxes, Depreciation and Amortization, per firm  $i$  share during the year

$OCF_{it}$  = Operative Cash Flow per firm  $i$  share during the year

$NCF_{it}$  = Net Cash Flow per firm  $i$  share during the year

### General Concepts and Institutions:

GAAP = General Accounting Accepted Principles

OLS = Ordinary Least Squared

GLS = Generalized Least Squared

FE = Fixed Effects

RE = Random Effects

B-P test = Breusch and Pagan Test

BMV = Mexican Stock Market (Bolsa Mexicana de Valores)

NSBC = National Banking and Securities Commission of Mexico (Comisión

Nacional Bancaria y de Valores de México-CNBV)

### **1.1 Value Relevance Motivation**

In order to understand the functioning of capital markets, it is important to recognize that financial statements provide the most widely available data on public corporations' economic activities. Investors and other stockholders rely on these statements to assess the plans and performance of firms and corporate managers. But how can we measure the impact of these financial statements on stock market prices? In accounting research, value relevance criteria is used for this purpose.

Value relevance criteria is referred to the ability of accounting numbers (independent variables) to explain the differences in stock prices in capital markets (dependent variable) under valuation purposes. This ability can be measured with the explanatory power of the independent variables coefficient significance and the Adjusted  $R^2$  number of significance of the whole used model. In this study, the value relevance is tested under econometrical criteria of significance for Regressions and Panel Data Analysis.

The value relevance criteria are supported in the accounting system characteristics under which financial statements are developed. The accounting system has three main features: (1) Accrual Accounting Basis (this means that the financial statements include non-cash estimations and transactions that provide more complete information about a firm's periodic performance); (2) Accounting and Auditing Standards that must be fulfilled (these standards limit potential distortions that would be recorded); and (3) the Managers' Reporting Strategy<sup>4</sup> (the accounting system provides considerable leeway for managers to influence financial statement data by selecting the valuation and disclosures between different options). These three features of the accounting system aim to reduce distortion and noise in financial statements, but are unable to separate only the true information. As a result, investors can only achieve an imprecise assessment of an individual firm's results. Despite these disadvantages to financial statements, they still provide a reasonably good understanding of a firm's performance.

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<sup>4</sup> Palepu, Healy, & Bernard. (2000). Business Analysis and Valuation. South-Western , Chapter 1 pp. 5 to 7.



## **1.2 Ohlson model' use justification**

The main utility reason of accounting systems is to provide investors with relevant information that may be useful for efficient resource allocation decision making. Following this purpose, different valuation models have been used in the accounting literature in order to contrast the value relevance of each.

The first capital markets models used in empirical research has placed a major emphasis on market efficiency. This informational perspective brought little attention to fundamental analysis of determinants of the companies' value. The usefulness of accounting numbers for firm valuation focus was emphasized in the works of Ou and Penman (1989), Ohlson (1989, 1995) and Penman (1991).

This study is following valuation perspective in an attempt to explain the intrinsic value of the firm and assess to what extent accounting information may be useful to identify misspriced stocks. Book values and earnings have been suggested as the two fundamental accounting variables when trying to explain stock prices (Ohlson, 1995).

Collins, Maydew and Weiss (1997) provided evidence using the Ohlson model that the joint explanatory power of earnings and book values has not decreased in the last forty years in the United States market. They founded that the value relevance of accounting numbers has increased slightly during the last four decades. However, Brown, Lo and Lys (1998) interpret this result as a consequence of an upward bias in the  $R^2$  metric generally used in accounting research as a measure of value relevance.

The Ohlson model (1995) make a hit in the market based accounting research, because the financial information was considered as a value component. This model is underlying on the traditional belief that the company value is compounded in two main parts: the net investment value done in it (Book value) and the present value of the period benefits (Earnings) that together brings the "clean surplus" concept of the Shareholders' Equity value. In specific Ohlson (1995) motivates the adoption of the historical price model in value relevance studies, which expresses value as a function of earnings and book values (e.g., Collins et al. 1997; Francis and Schipper 1999).

However, Ohlson (2001) argues that 'other information' is ignored in these studies and the valuation model could be improved.

Book value and earnings perform a central referent in the companies' valuation process. However, the way that both variables impact in the price behavior in the market remains as a question to answer. There are empirical results of different markets that bring some references of what to expect with the Mexican data, but in general; the knowledge about how the accounting variables interact in the value generation is still restricted. This study is oriented to the use of the Ohlson model and its practical justification in the empirical application of it with the Mexican data.

Since 1995, the Ohlson model has been tested extensively with United States and Foreign Developing Countries' stock market data under different methodologies of analytical or empirical points of study. Few of the studies are analytical, such as the research of Ota (2000), who worked with the autoregression assumption, or Fukui (2001), who developed new considerations that brought about a modification of residual dynamics to the Ohlson model assumptions. However, most studies are conducted under an empirical basis. In general, these studies show evidence of the value relevance of the financial statement variables of book value and earnings on stock price. There are diverse studies that have emerged from other countries<sup>5</sup>, for example: Alford, Jones, Leftwitch, and Zmijewski (1993) for European developed countries, and Ali, and Hwang (2000), Hwa, Qi, and Wu (2001), and Sami and Zhou (2004) for the Chinese stock market. In accounting literature, there are few applications that employ Latin American data and even fewer that use information from the Mexican stock market. Examples of research studies with Mexican data are by Davis-Friday (1997) and Gordon and Davis-Friday (2002), who emphasize the inflation effect in the restatement of financial information. But there are no empirical studies that use the Ohlson model with Mexican data.

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<sup>5</sup> Chapter 3 provides detailed information on the results of the international applications of the Ohlson Model.

### **1.3 Orientation of the study**

The study is motivated because the Mexican case is not well documented in previous studies on the international accounting literature. Mexico is a relevant emerging market having an active and complex financial system as well as a professional accounting community; Mexican public companies have to publish audited financial statements.

As a consequence of the above, there is a gap that provides the perfect opportunity for conducting this study, in order to attempt to provide answers to the following questions: How relevant is accounting information in the Mexican stock market? Does the information in this market increase or decrease the relevance of accounting information<sup>6</sup>? Is the value relevance concentrated in earnings or book values? Questions like these remain essentially unanswered due to a lack of theoretical background for establishing the relevance of accounting information in emerging markets like that of Mexico. This study aims to assist this debate by providing some evidence of the value relevance of accounting information for the Mexican stock market as a proxy for an emerging market.

The intuitive idea behind the Ohlson model application is that earnings (current results) will not have value relevance and book value will, because book value provides the net value of the firm's resources primarily in terms of historical costs, and is largely independent of the success with which the firm currently employs its resources. The general expectations of this study are that the Mexican accounting variables under the Ohlson model will behave in a similar way to United States companies, that is, that book value and earnings should be relevant. The reason for this assumption is that the Mexican accounting system (according to Nobes (1983) scheme for classification)<sup>7</sup> appears under USGAAP<sup>8</sup> influence, so it seems reasonable to expect similar results. However, there are additional characteristics that could affect the expected results, such as the restatement effect of inflation, and the difference of accounting standards assumptions in the recorded transactions that affect book value and earnings.

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<sup>6</sup> By testing Book Value and Earnings as independent variables in the Ohlson Model.

<sup>7</sup> Nobes's Accounting Systems classification (1983).

<sup>8</sup> United States General Accounting Accepted Principles

The Importance and utility of this study is to bring the first approach of the value relevance of Mexican accounting variables tested under the Ohlson model under the valuation approach. This study brings a reference for the analysts, academics, shareholders and company owners by the use of the obtained coefficient numbers of the Ohlson and Alternative models to imply the behavior of the price three months later of the year-end financial statements information.

#### **1.4 Description of the Study Sections**

This study is presented as follows:

- The theoretical main framework is divided into three chapters: Chapter 2 provides a bibliographical review; Chapter 3 discusses the Ohlson model assumptions and applications; and Chapter 4 reviews the characteristics of the Mexican accounting variables.
- The empirical study is divided in two chapters: methodological issues are discussed in Chapter 5, and econometric results, related tables and details of the study's implications are provided in Chapter 6.
- Conclusions and suggestions for further research appear in Chapter 7, which also contains the study's final comments.

The econometric analysis can be divided in 3 parts:

- In the first part, the original Ohlson model is tested with Mexican accounting data for the period 1991-2003 using Ordinary Least Squared Regressions. This data base was later tested using Panel Data Analysis. In addition to these variables, other variables were tested in the panel data as alternatives to earnings in the original Ohlson model: EBITDA (Option 1), Operative Cash Flow (Option 2), Net Cash Flow (Option 3) and Dividends (Option 4).
- In the second part of the study, an alternative model (created by adding a third independent variable: operative cash flow per share) is tested versus the original Ohlson model for the full data base.
- Finally, in the third part of the study, the alternative model was tested versus the original Ohlson model using two types of economical activities classifications of the data base (Tangible and Intangible Industries).

### **2.1 Accounting Research Areas**

The objectives, methodology and underlying philosophies of accounting research have changed enormously over the past quarter-century. Today, the objective of accounting theory is more focused on explaining and predicting accounting practice, rather than being concerned with what accounting practices ought to be<sup>9</sup>.

There are three approaches to accounting theory and research: Classical Theory, Market-Based Research, and Positive Accounting. These three approaches view the underlying economic reality of a firm in different ways:

1 - In the classical approach, an underlying reality exists, and it is the role of accounting to best describe it. This approach evolves from a normative point of view. Researchers such as Edwards and Bell (1961), Chambers (1966), and Sterling (1970) evaluate accounting methods and technologies in terms of how close reported information comes to some preconceived “true” picture of the firm. In this approach, the ideal picture is viewed as determinable within the accounting system itself. Concepts such as economic profit and its relationship to accounting income are a key focus of debate. The classical approach is concerned with deducing correct accounting methods from a stated set of concepts, principles and objectives. Implicit in this approach is the view that financial statement users accept (and react to) those statements at face value; thus, great importance is attached to ensuring that statements reflect the firm’s true financial status. This approach fell out of favor in academic circles due to its lack of testability.

2 - Market-based research views reality as determined by market value and accounting alternatives *a priori*. Advances in finance theory in the mid- and late 1960s were the primary catalyst for the shift in accounting market-research; it moved from the classical deductive approach to a more empirical approach that focused primarily on

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<sup>9</sup> Holthausen & Watts (2001).

three issues: users' reactions to financial statements, whether alternative accounting methods affect users' reactions, and whether accounting methods are set to maximize the utility of financial statements to various user-groups by given users' needs. This approach is therefore empirical, and has a user-oriented perspective. Its primary focus is the market reaction to reported accounting data, in order to identify the role of accounting information.

3 - The positive approach adds a new twist: accounting alternatives (help) define and determine reality<sup>10</sup>. The positive accounting approach is referred to as "contracting theory" or as "economic consequences of accounting" literature. This approach assumes that accounting variables are not exogenous to the firm, but are an integral part of the firm and its organizational structure. The financial information interacts with the firm's investment, production and financing decisions. This information is the basis upon which resources are allocated, management is compensated, and debt restrictions are measured, and so on. Management, therefore, would be expected to take into consideration financial information effects by changing their decisions and/or altering their choice of accounting methods. Operationally, this approach moved the focus away from testing market reaction to accounting numbers, to studying the incentives underlying management's behavior in terms of their operating, investing and financing decisions and their choice of alternative accounting numbers.

This study was carried out under the principles of market-based research. This approach was influenced by two major advances in finance literature: efficient market hypothesis and modern portfolio theory. Market-based research in accounting formally began in the late 1960s, soon after the development of the efficient markets hypothesis and event study methodology. During the past 25 years, a large number of research studies have examined the relation between security returns and various types of accounting information.

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<sup>10</sup> White, Sondhi-Fried (1997). Financial Statements Analysis, Chapter 5, p. 218.

## **2.2 Market-based Accounting References**

Since the beginning of this empirical accounting research line, the role of accounting earnings to explain the price of securities has played a very important role for investors, analysts and academics. Every firm with stock that is traded on an organized stock market exchange is required to produce accounting information about its financial and operating activities. One goal of empirical accounting research is to find evidence that accounting is relevant to investors' valuation decisions. The first linking of accounting theories with financial accounting information was provided by Ball and Brown (1968), who documented the association between price (returns) of a firm's securities and the accounting earnings of the firms. They used event study techniques and found evidence that the direction of earnings surprises predict the direction of price changes. Since these findings were published, accounting research has identified a new field to observe and test.

Another approach described in the literature is evaluating other financial information besides earnings. For example, Barth, Beaver and Landsman (1998) and Shevlin (1991) indicate that stock price is associated with the book value of firms' assets, assuming that measures of assets and liabilities imply the expected results of future activities. The question about the role of accruals, as the noise added in earnings, has led to the idea that cash flows have more incremental information. Dechow (1994) makes reference to articles from the popular press, such as the one published in Chemical Week (May 8, 1991, p. 28) that states: *"Many financial analysts regard operating cash flow as a better gauge of corporate financial performance than net income, since it is less subject to distortion from differing accounting practices"*. In this study, operative cash flow and net cash flow were tested as an alternative to earnings. However, earnings showed greater significance.

Some of the most important studies undertaken are as follows: Beaver (1968), who found evidence regarding price and trading volume changes around annual earnings announcements; Beaver, Clarke and Wright (1979), who expanded on the work of Ball and Brown by showing that the magnitude of earnings changes is positively related to stock price returns; Atiase (1985), who examined differences in price responses based on the size of the firm; and Freeman and Tse (1992), who proposed

that the relation between earnings and returns is not well represented by a straight line. They found evidence that the relation is better characterized by an S-shaped curve which is steepest near the axis and flatter to the right and left. Each of these studies provides evidence that accounting information is consistent with the information set used by the market to value common stocks. In addition to the research detailed above, several other studies have emerged: the literature has increased rapidly in volume, with over 1,000 published papers in leading academic accounting and finance journals in the past three decades.

The usefulness of accounting information is an important issue, and the results of these papers so far have provided evidence that accounting can be related to security prices on at least two levels. First, accounting information may be consistent with whatever information is used by investors valuing stocks. Second, accounting information may actually be used by investors and analysts to value stocks.

Nowadays, there are many avenues of research in market-based accounting, such as valuation models, evaluating accounting information, evaluating reporting alternatives, and positive accounting theory. Kothari (2001) identifies at least four sources of the demand for capital markets research in accounting that explain its popularity: (i) fundamental analysis and valuation, (ii) tests of capital market efficiency, (iii) the role of accounting in contracts and in the political process, and (iv) disclosure regulation. Hereupon follows a description of the general characteristics of each.

(i) Fundamental analysis and valuation focuses on valuation aimed at identifying mispriced securities. Fundamental analysis involves the use of information in current and past financial statements, in conjunction with industrial and macroeconomic data to identify a firm's intrinsic value<sup>11</sup>.

(ii) Tests of market efficiency. There is a huge body of literature testing market efficiency in finance, economics and accounting. The accounting literature draws

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<sup>11</sup> The difference between the current and intrinsic value is an indication of the expected rewards for investing in the security (Kothari, 2001).



inferences about market efficiency with respect to accounting methods, and method changes and research on functional fixation.

(iii) The role of accounting in contracts and in the political process. This is linked to positive accounting, by testing the economic consequences in stock price reactions to new accounting standards and studying whether cross-sectional variation in these stock price reactions are related to financial variables that proxy for contracting and/or political costs.

(iv) Disclosure regulation. This research is focused on issues surrounding disclosure regulation and differences with other groups of standards.

The research that has evolved from these four groups has concurrent developments in finance and economics that follow another direction to the one started by both Ball and Brown (1968) and Beaver (1968). Finance and economics literature reveal at least three different areas of study: (a) the positive economics theory, (b) the efficient markets hypothesis and the capital asset pricing model, and (c) the event study of Fama, Ficher, Jensen and Roll (1969). In these studies, accounting variables were not tested. The researchers instead used ratios to test, like Fama and French (1992), who found that the book to market ratio was a strong predictor of average returns. They also tested market efficiency. Current research involves a return to the principles of valuation. In accordance with this research, fundamental analysis and the prediction of stock returns may be identified<sup>12</sup>.

An important distinction between Fama's (1992) analysis or similar studies in finance, and the return–earnings literature in accounting centers, is the maintained hypothesis and motivation for the studies. In finance literature, the maintained hypothesis is that explanatory variables like industrial production are real, economic, fundamental variables that a researcher has measured with a reasonable degree of accuracy. The motivation for their tests is to examine whether time-series or cross-sectional variation in stock returns is rational (efficient) in the sense that it is largely explained by economic fundamentals. The alternative hypothesis is that pricing in the

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<sup>12</sup> For example, Ou and Penman (1989) and Abarbanell and Bushee (1997).

market is not an outcome of the market participants' rational economic behavior. The objective of accounting literature, for example, Ball and Brown (1968), is to assess whether the accounting earnings determination process captures the factors that affect security prices, with the maintained hypothesis that capital markets are informational efficient. So, market efficiency is a maintained hypothesis, and whether or not accounting captures the underlying economic reality that moves the market is tested in the research.

Market-based research in accounting includes several topics, including research on earnings response coefficients and properties of analysts' forecasts, fundamental analysis and valuation research, and market efficiency tests. The capital market research topics of primary interest to researchers currently appear to be tests of market efficiency with respect to accounting information (e.g., accounting methods and accruals), fundamental analysis and accounting-based valuation, and value relevance of financial reporting.

Evidence of market inefficiency has created an entirely new area of research examining long-horizon stock-price performance following accounting events. This is in sharp contrast to the boom in short window event studies and studies of economic consequences of standard setting of the 1970s and 1980s.

Early capital markets research demonstrates that accounting reports have information content and that financial statement numbers reflect information that influences security prices, although not on a timely basis. The decades following the early research witnessed an explosive growth in capital markets research. Kothari (2001) categorized the demand of this research into five main areas: (1) methodological capital markets research, (2) evaluation of alternative accounting performance measures, (3) valuation and fundamental analysis research, (4) tests of market efficiency, and (5) value relevance of disclosures according to various financial accounting standards and economic consequences of new accounting standards.

This study was carried out along the research lines of evaluation of alternative accounting performance measures, and valuation research. Current research involves a return to principles of valuation, providing additional support for the orientation of this study. No longer are price or returns taken as given and accounting data just tested to justify their usefulness. The emphasis is no longer on stock behavior, but rather on forecasting future accounting attributes such as return on equity and book values. Emphasis has shifted to the information derived from accounting data and its relationship to value. Furthermore, that value may or may not be the same as that reflected in market prices. This shift signals a return to the thinking inherent in the classical approach (i.e., accounting data could yield information about value); however, with a major difference: the relationships posited have to be justified empirically, in this sense, synthesizing elements of the classical and market-based approaches.

For fundamental analysis and valuation, accounting literature relies on the dividend discounting model or some transformation of the dividend-discounting model, like the earnings model or the residual income model. This study used one of the residual income models<sup>13</sup>, the Ohlson model.

The Ohlson model formally related firm value to accounting variables and has been tested extensively, though there are other models with different variables<sup>14</sup>. The Ohlson model application took time to be accepted by the rest of the academic community, but since 1995 it has been the most tested. Several authors refer to the work by Ohlson as one of the most important developments in capital market research in the last several years<sup>15</sup>. The next chapter details the assumptions of the Ohlson model.

The Ohlson model rediscovered and expanded on valuation equations originally put forth by Edwards and Bell (1961) and Preinreich (1938). Unlike valuation models in finance literature that “undo” the accounting (accrual process), using free-cash flow to arrive at value, Ohlson’s model expresses value using basic accounting variables such as earnings, return on equity and book values. His model provides theoretical underpinnings for some of the results of market-based empirical research and

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<sup>13</sup> Chapter 3 details the assumptions of the model.

<sup>14</sup> Such as Barth, Beaver and Landsman (2001) and Dechow (1994).

<sup>15</sup> See Popova (2002).

constructs a framework for future research by directly connecting accounting variables with intrinsic value.

In addition to the Ohlson model (1995), there is the Feltham-Ohlson model (1995) that incorporates conservative accounting in the equity valuation process by modeling the “other information” variables<sup>16</sup> as a function of one and two-period-ahead residual income forecasts as well as the current period value relevant accounting variables. The Feltham-Ohlson model uses book values (segregated in operative net assets and financial net assets), expected earnings and growth in expected short term and long term earnings as the determinants of firm value. The major problem with testing or implementing this model is that the “other information” variables used (expected earnings and growth in expected short term and long term earnings) are not available for the Mexican companies in the Economatica data base<sup>17</sup>.

In the next chapter appear the assumptions, characteristics and empirical applications of the Ohlson model.

In Appendix 1 appears field of the Marketing Accounting Research used in this study and the main chronological relation of references of the Ohlson model.

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<sup>16</sup> Chapter 3 provides detailed information of this variable, also considered in the Ohlson Model.

<sup>17</sup> Chapter 5 provides of Economatica data base characteristics.

### **3.1 Ohlson Model Assumptions**

In accounting research, many equity valuation models have been used to examine the value relevance of accounting data. One such valuation model is the simple earnings capitalization model, where stock price is expressed as a function of earnings or the components of earnings under the assumption that earnings reflects information about expected future cash flow and the security price-earnings relation is both positive and homogeneous over the entire range of earnings realizations<sup>18</sup>. In addition to this model, there is one where stock price is expressed as a function of book value. Barth, Beaver and Landsman (1998) argue that the value relevance of book value stems from its role as a proxy for adaptation or abandonment value.

There are two options for the dependent variable in the regression. Some studies regress the security prices on accounting information, as in the Ohlson model, and most research studies have analyzed the relation between security returns and accounting information (eg., Dechow, 1994). Loosely speaking, these studies relate unexpected changes in security prices to unexpected accounting information. For example, some studies first divide accounting news into good news and bad news, and then determine whether good news is associated with positive security returns and bad news with negative returns. Other studies regress security returns on accounting news. Returns have been preferred to prices in those studies because the analysis of returns gives more confidence that accounting information is not only value relevant but also is used. The difference of these two approaches is that in the determination of prices, accounting information is competing with all past and current information, and in the determination of returns, accounting news is competing only with other news sources during the return period<sup>19</sup>.

There is a link between the valuation models and evaluation using other accounting information, besides earnings: the Ohlson model, which added book value as the second independent variable. Ohlson (1995) developed a formal model relating

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<sup>18</sup> Studies using this type of model include Kothari and Zimmerman (1995).

<sup>19</sup> Chambers and Freeman Class Notes: The Role of Financial Accounting in Security Valuation, Page 16 (1997)

firm value to accounting variables. This study follows this model in accordance with the methodology path used by Collins, Maydew, and Weiss (1998), in order to analyze its implications with the Mexican data.

Ohlson (1995) started with a dividend-discounting model under residual income valuation assumptions. The residual income valuation expresses value as the sum of current book value and the discounted present value of expected abnormal earnings, as forecasted earnings minus a capital charge equal to the forecasted book value times the discount rate.

The original assumptions of the Ohlson model impose a time-series structure on the abnormal earnings process that affects value. The linear information dynamics in the model specifies an autoregressive, time-series decay in the current period's abnormal earnings, and models "information other than abnormal earnings" into prices (Ohlson, 1995, p. 668). The economic intuition for the autoregressive process in abnormal earnings is that competition will sooner or later erode above-normal returns (i.e., positive abnormal earnings) or firms experiencing below-normal rates of returns eventually exit.

The Ohlson model is described under the following assumptions:

The *Present Value Relation* (PVR) of the dividend discount model stipulates that the market value of a firm's equity ( $P_t$ ) equals the present value of its expected future dividends ( $E_t [d_t]$ ) discounted at the risk-free interest rate ( $R_f$ ). Applying the risk-free rate as a discount factor reflects the assumption of risk-neutral investors. Further,  $R_f$  is assumed constant, i.e., satisfying a non-stochastic, flat term structure.

The *Clean Surplus Relation* (CSR) ties up accounting data so all flows pass through the income statement. CSR ensures that all changes in the book value of equity ( $BV_t$ ) are reported as either income (accounting earnings  $E_t$ ) or dividends ( $d_t$ ).

(CSR)  $BV_t = BV_{t-1} + E_t - d_t$ .....Initial Equation

The third and most controversial assumption of the Ohlson model approximates the time series behavior of abnormal earnings (that is, the relation between the current and the next period's abnormal earnings) as linear and stationary, denominated by Ohlson as the *Linear Information Dynamics* relation (LIDOM), where:

- Abnormal earnings are defined by the *Abnormal Earnings Relation (AER)* as the difference between accounting earnings ( $E_t$ ) and normal earnings. Normal earnings represent a firm's normal return on the capital invested at the beginning of the period, that is, the net book value of equity multiplied by the interest rate.

Ohlson's (1995) book value-abnormal earnings model can be re-expressed as a function of current earnings and lagged book value. According to Collins, Pincus and Xie's (1999) appendix, the preliminaries of the Ohlson model are based on the Clean Surplus relation that is:  $P_t = BV_{t-1} + E_t - d_t$  .....Eq. 1

where  $BV_t$  = book value of equity at time t,  $E_t$  = earnings for period t, and  $d_t$  = dividends in period t. The definition of abnormal earnings is:

$$E_t^a = E_t - (R_f - 1)BV_{t-1} \dots\dots\dots \text{Eq.2}$$

where  $R_f$  is one plus the risk-free rate. The stochastic process assumption for abnormal earnings (where  $\varepsilon_t$  is other non-accounting value-relevant information) is:

$$E_{t+1}^a = \omega E_t^a + \varepsilon_{t+1} \dots\dots\dots \text{Eq.3}$$

Ohlson's (1995) initial book value-abnormal earnings valuation model is:

$$P_t = BV_t + \sum_{T=1}^{\infty} R_f^{-T} (E_{t+T}^a) \dots\dots\dots \text{Eq.4}$$

where  $P_t$  is the firm's stock price at time t. Ohlson (1995, p. 669) shows that with the standard assumptions underlying the dividend discount model together with equations (Eq. 1 and Eq. 2), his equation can be rewritten as:  $P_t = BV_t + \alpha_1 E_t^a + \alpha_2 \varepsilon_t$  .....Eq.5

By substituting the definition of abnormal earnings ( $E_t^a$ ) from above into his equation (Eq. 5), Ohlson (1995, p. 670) shows that price can be expressed as a function of current period earnings, book value at time t, and other information. Ohlson notes that in this form, the valuation function shows how earnings and book values operate as the primary value indicators. That is:

$$P_t = \alpha_0 + \alpha_1 BV_t + \alpha_2 E_t^a + \alpha_3 \varepsilon_t \dots\dots\dots \text{Eq.6}$$

### **3.2 Used Model in this study**

The Ohlson model could be applied following Equation 5 or 6 showed above. Equation 5 use future oriented information and Equation 6 use historical information in accounting based valuation models. However, the assumptions of the Ohlson model provide little guidance on selecting an empirical proxy for expected future earnings (required in Equation 5). Tse and Yaansah (1999) examined whether and under what circumstances historical earnings and earnings forecasts offer comparable explanation of security prices, they conclude that as long as the pattern of historical earnings is consistent with the pattern of expected future earnings, historical earnings may be sufficient to explain security prices. This issue is of particular interest for this study because Mexican earnings forecasts are not available and the expected return of abnormal earnings requires the beta<sup>20</sup> for each period of each company, and the available information in Economatica is not enough for the data base. This study used Equation 6, because the data' availability.

The used equation of the Ohlson model is complying with the empirical methodology followed by Collins, Maydew and Weiss (1997) and Collins, Pincus and Xie (1999) that specify:

$$(1) P_{it} = w_{0t} + w_{1t}BV_{it} + w_{2t}E_{it} + \varepsilon_{it}$$

Where:

- $P_{it}$  the price of a firm i share three months after fiscal year-end t,
- $BV_{it}$  the book value per firm i share at the end of year t, and
- $E_{it}$  the earnings per firm i share during the year
- $\varepsilon_{it}$  other value-relevant information of firm i for year t orthogonal to earnings and book value.

All valuation models make unrealistic assumptions about the efficiency of the market or the complete panel of data. This feature is common to most theoretical models. The Ohlson (1995) model in particular imposes a particular structure on the abnormal earnings process and other information.

Many of the limitations of the Ohlson model referred in the literature are addressed to the Equation 5, described above. The limitations are in theoretical and

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<sup>20</sup> According with the Capital Assets Price Model.



empirical terms. The theoretical terms concerns to its comparison with other Residual Income Valuation (RIV) models, specially with the Discounted cash flow method<sup>21</sup>.

The empirical terms concerns in specific about the abnormal earnings calculation, because there are empirical applications problems of the use of free risk rate or the weighted cost of capital of each firm (it is not easy to obtained these information for all the companies or there are different points of view about which criteria should be followed).

According with Lo and Lys (2001) there are two big problems in translating theory to empirical analysis. The first one is to convert the model for multiple firms: the adjustments required to the model are to allow for discount rates and information dynamic parameters that are firm specific. That results in the cross sectional variation in the parameters of the information dynamics that shows differences in accounting systems. Specifically, cross-sectional aggregation is inappropriate where firms differ in earnings persistence or accounting systems has autocorrelation problems or the cross-sectional aggregation is inappropriate where firms differ in earnings persistence or accounting systems. The second one is referred to the “scale effect” on the estimated coefficients of each period of study<sup>22</sup>. This problem also affects the application of the historical model of Equation 6 described above<sup>23</sup>. The “scale effect” consequences are the inappropriate conclusions of valuation studies.

Assuming efficient capital markets, one objective of a valuation model is to explain observed share prices. Alternatively, in an inefficient capital market, a good model of intrinsic or fundamental value should predictably generate positive or negative abnormal returns.

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<sup>21</sup> Like Parienté (2003) who conclude that the superiority of RIV (Ohlson model of Residual Income Valuation) over DCF (Discounted Cash Flows) is unfounded. He states that when implemented over a finite horizon, RIV and DCF still yield the same results as long as the steady-state modelizations of the firm in the continuation period under both methods are coherent.

<sup>22</sup> Empirical analysis requires that the researcher isolate the effect due to the variables of interest from those that result from differences in “initial conditions” of the variables of the different firms. This means that there are biased coefficients and explanatory power because the scale of the observations can vary so widely.

<sup>23</sup> In specific Brown, Lo and Lys (1999) analyzed the “scale effect” problem of the Collins, Maydews and Weiss (1997) that affect the  $R^2$  parameter of the year data reference of increase/decrease on the power explanation of the independent variables.

Occasionally, data panel characteristics may be incomplete, and there may be data missing for firms that were not present in the stock market throughout the entire study period. Therefore, in the spirit of positive science, it is worthwhile examining which of these models best explains share prices and/or which has the most predictive power with respect to future returns.

### **3.3 R<sup>2</sup> Significance and the Role of the Independent Variables**

#### *R<sup>2</sup> Significance*

Adjusted R<sup>2</sup> is the explained variation in the OLS regressions and in the pool-panel data as the statistical association metrics used in this study. These metrics measure value relevance as the portion of total returns that could be earned from financial statement information and by the percentage of cross-sectional variation in price market values explained by financial statement information (the independent variables of earnings, book value and operative cash flow).

#### *Role of the Independent Variables*

Book value and earnings (independent variables of the Ohlson model) have a relative valuation role as a function of the financial health of a firm.

#### Earnings

Earnings per share are the underlying earnings (also known as persistent, continuing and core earnings) plus the transitory, nonrecurring components of earnings; this sum is the net income data of the income statement. This net income includes transitory components of earnings due to cyclicalities (business or industry cyclicalities) in quarterly information; in the annual basis, the data shows a more stable behavior without bias of transitory components. In the Ohlson model, this variable is under per share basis; there are two main options for earnings per share: basic and diluted. Basic earnings per share reflects total earnings divided by the weighted-average number of shares actually outstanding during the period and diluted earnings per share reflects division by the number of shares that would be outstanding if holders of securities such as executive stock options, equity warrants and convertible bonds exercised their

options to obtain common stock. For the purpose of the Ohlson model, the basic earnings are used adjusted by corporate actions, including cash dividends<sup>24</sup>.

Earnings per share could be analyzed under the continuing and non recurring components and under the gain and loss result per period. There are specific studies that center around this issue: Elliott and Hanna (1996) report that the market places less weight on special items than ordinary ones in the net result of the period in the income statement. Collins, Pincus, and Xie (1999) found that when the extraordinary items are loss, the value relevance of the Net result decreased (earnings of the year-period). In his model, Ohlson (1995) considered that decreased persistence can lead to less weight on earnings and more weight on book values. Haydn (1995) provides evidence that companies with a negative net result in the income statement have smaller earnings response coefficients than those reporting a positive net result. Collins, Pincus, and Xie (1999) report direct cross-sectional evidence that value-relevance shifts from earnings to book values when the net result is negative.

### Book Value

In Block's 1999 survey<sup>25</sup>, book value ranked distinctly behind earnings and cash flow, but ahead of dividends. According to the Merrill Lynch Institutional Factor Survey, in the years 1989 to 2001, the use of book value data has been only slightly less popular than earnings in the price stock multipliers used for valuation. Book value originates from the balance sheet and intuitively attempts to represent the investment that common shareholders have made in the company, on a per-share basis. Book value is defined as the shareholders' equity (total assets minus total liabilities).

On the one hand, because book value is a cumulative balance sheet amount, it is generally positive even when earnings are negative. This means that book value is more stable than earnings, thus a value relevance concentration is expected on the book value variable rather than on the earnings variable. On the other hand, accounting effects on book value may lead to its compromise as a measure of shareholders'

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<sup>24</sup> Further discussion is provided in the methodological section variables characteristics.

<sup>25</sup> Block, S. (1999). "A Study of Financial Analysts: Practice and Theory". *Financial Analysis Journal*, 55, 4: 86-95.

investment in the company, and can impair its comparability across companies and countries; as a result, book value might potentially poorly reflect the value of shareholders' investment. In balance, it can be stated that book value provides information about the long-term effect of the firm (about the firm's persistence in business) rather than the short-term effect of earnings (that show the current results achieved by the firm).

### Cash Flow Importance in Finance

Financial analysts have offered the following rationales for the use of cash flow in their analyses<sup>26</sup>:

- Cash flow is less subject to manipulation by management than earnings.
- Because cash flow is generally more stable than earnings, its price multiple is more stable than the price-earnings multiple.
- Using cash flow criteria rather than earnings addresses the issue of differences in accounting conservatism between companies (differences in the quality of earnings).
- Differences in price to cash flow may be related to differences in long-run average returns<sup>27</sup>.

Due to the fact that there is strong theoretical reference in finance literature about the value relevance of cash flow in the stock market, the decision was made to test it at the operative and net level as Option (2) and (3) rather than using earnings, as in the Ohlson model.

### **3.4 Ohlson Model Empirical Applications**

The Ohlson model is one of the most tested models in accounting research and could be used as prediction or valuation reference. This study focused only in the valuation emphasis. Under this approach we can found several empirical applications with the United States data. The work of Collins, Maydew, and Weiss (1997) should be emphasized. They tested how the relevance of these variables has changed over the

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<sup>26</sup>Stowe, Robinson, Pinto, & McLeovey. (2002) Analysis of equity investment valuation. AMIR. Chapter 4, p. 17.

<sup>27</sup> According to the empirical research of Hackel, Livnat and Rai (1995).

last 40 years, and found evidence of an increment in the relevance of book value, and how the combination of both combined variables has increased over time. They also analyzed the shift in significance of each variable according to the increasing frequency and magnitude of one-time item, negative earnings and changes in average firm size and intangible intensity across time. There are other studies from different business sectors in the United States, such as Amir and Lev's (1996) work for the wireless communication industry. In this study, non-financial variables were added to the model.

In addition to the United States data, there are several other studies that use the Ohlson model, especially in developed countries. One of the most representative is the Ali and Hwang (2000) study, in which the model was tested with European countries in order to identify the value relevance of accounting and its relation to certain country-specific factors. They identified strong relationships between the value relevance of accounting and particular country-specific factors. Initially, they found that value relevance is lower for countries with bank-oriented (as opposed to market-oriented) financial systems. In those countries, there is a lower demand for accounting information because banks and other stakeholders have direct access to this information. Accounting information has no role as a reducer of information asymmetry. Second, they discovered that value relevance is lower for countries where private-sector bodies are not involved in the standard setting process. Government bodies establish rules whose primary purpose is to satisfy regulatory needs rather than investor's demands. Third, they found that value relevance is lower for countries that adopt a Continental model, than for countries that use the British-American model. This finding is, basically, motivated by the fact that in the Continental model, countries' investors are not seen as the primary users of accounting information; or at least, they are not regarded as such by the regulatory bodies. Fourth, they found that value relevance is lower in countries where tax rules significantly influence financial accounting rules. This finding derives from the fact that tax rules reflect a broader scenario of political and cultural influences. Fifth, they found that value relevance is higher when more is spent on external auditing. In such a structure, the amount paid to external auditors reflects the importance of external investors<sup>28</sup>.

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<sup>28</sup> Broedel, 2002.

Other studies have focused on different impacts: Harris, Lang, and Möller's (1994) study with data from the German stock market tests the different laws' impact on accounting variables. Kallunki (2000) studied Finnish stock market data by analyzing the use of accounting variables as risk measures. Alford, Jones, Leftwich, and Zmijewski (1993) carried out a comparison between several developed countries by focusing on the different disclosures of each country.

However, there is relative silence on the role of accounting in emerging markets. The study of Haw, Qi, and Wu for the Chinese stock market, in which they place emphasis on the information between accruals and cash flows, is worth mentioning. There are a few studies of Latin American countries, one of which is Broedel's (2002) study, which analyzed the Brazilian stock market by focusing on ownership concentration as the most relevant factor influencing earnings quality, and found that book value is superior to earnings in terms of value relevance, consistent with the hypothesis that ownership concentration is the most relevant factor influencing earnings quality. Although Davis-Friday and Rivera<sup>29</sup> do not follow the Ohlson model per se, their study analyzes features of the Mexican accounting model and describes the effect of the accounting differences between Mexico and the United States on the relation between equity prices and accounting information reported in the two countries. The influence of United States accounting in Mexico is evident in several areas. Still, the Mexican accounting and reporting model addresses particular issues in a distinct manner to that of the United States.

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<sup>29</sup> "Inflation accounting and 20-F disclosures: Evidence from Mexico".

## CHAPTER 4: MEXICAN ACCOUNTING VARIABLES CHARACTERISTICS

### **4.1 Mexican Accounting Framework Bulletins and reference of accounting variables used in the study**

The expert authority in matters concerning generally accepted accounting principles in Mexico was (until June 2004) the *Instituto Mexicano de Contadores Públicos* (IMCP), which issues financial accounting standards through its Accounting Principles Board. Now these activities are carried out by the *Consejo de Investigación y Desarrollo de Normas de Información Financieras* (CINIF), which is a group formed by members from different financial information user groups, whose members are not merely just public accountants. Associates include representatives from the Mexican Stock Exchange Commission, the banking system, and the industrial sector<sup>30</sup>.

Accounting principles are developed by the IMCP and standards by the CINIF. This policy shift has been placed under the jurisdiction of the International Accounting Standards Board, in order to achieve harmonization of valuation and disclosure of the process. The current criteria of Mexican accounting standards are classified into fundamental concepts, accounting standards for general and specific items, circulars (interpretations) and suppletory or complementary standards.

The concepts upon which the accounting standards are based are contained principally in the A-series of the Bulletins, as well in Bulletin B-1, which includes the framework for financial accounting concepts, information objectives, quality requirements, limitations, and basic assumptions about the accounting environment and processes<sup>31</sup>. The accounting standards are included in five series: A, B, C, D and E. Series A and B contain standards referring to general issues regarding financial information. Series C details the accounting standards primarily related to balance sheet items. Series D addresses fundamental problems of the Income Statement. Series E provides references for specific accounting industries characteristics. The circulars are pronouncements of the Accounting Principles Committee which clarify the rules

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<sup>30</sup> Appendix 1 provides complete information about the functions and characteristics of the CINIF.

<sup>31</sup> The CINIF is working within the new framework of accounting standards: the Financial Reporting Standard of Series A will be introduced in 2005. For now, there are only the preliminary versions.

contained in the Bulletins, or are the Committee's interpretations, which do not constitute standards in of themselves, being only recommendations. Since 1995, Bulletin A-8 has set the suppletory nature of International Accounting Standards for issues that are not published in Mexican bulletins; these formal criteria should be followed until Mexican bulletins provide a specific standard to follow. In addition to the international framework providing a first point of reference, it is also possible to suppletorily adopt another formal standard issued as final by the respective Standard Committee.

In Appendix 2 appears the main General and specific Accounting considerations in Mexican Financial Statements.

#### ***4.1.1 Accounting criteria for Book value (Valuation and Disclosure)***

Stockholders equity is the right of the owners with respect to the net assets which arise from contributions by the owners, from transactions or other events and circumstances which affect equity, and which is exercised by means of reimbursement or distribution (Bulletin A-11, paragraph 40).

In accordance with its origin stockholders equity is made up of contributed capital and earned capital or deficit, if applicable.

Contributed capital is made up of the contributions made by the owners and donations received by the entity, as well as the adjustments to these items for the effects in changing prices (Bulletin A-11, paragraph 46).

Earned capital corresponds to the results of the entity's operating activities and to other events and circumstances which affect it. The adjustment which has to be made to this category for the effect of changing prices also forms a part thereof (Bulletin A-11, paragraph 47).

In accordance with its definition, the items which are generally included in stockholders equity are the following (according with Bulletin C-11):



## CONTRIBUTED CAPITAL:

- Capital Stock
- Contributions for future increases in capital
- Premium on the sale of shares
- Donations

## EARNED CAPITAL (DEFICIT)

- Retained earnings, including those applied to capital reserves and the Comprehensive Income of the period under the Bulletin B-4 criteria.
- Accumulated deficit
- Excess or deficit in the restatement of stockholders equity.

### Valuation issues of Book value:

Capital stock is represented by stock certificates which have been issued in the name of the shareholders or partners as evidence of their participation in the entity. The characteristics of stock issues are established in the entity's statutes, as well as by the laws which regulate them. Capital stock represents the sum of the par value of the shares subscribed and paid and the corresponding restatement from the time of issuance. Capital stock represented by shares without par value shall be considered at the value shown in the document in which the subscription or change in capital is formalized.

Premium on the sale of shares represents the excess of the payment for the subscribed shares over their par value, or their theoretical value (the amount of paid in capital divided by the number of shares outstanding, in the case of shares without par value, plus their restatement).

Donations that an entity receives shall form part of the contributed capital and are expressed at market value at the time they are received, plus the corresponding restatement.

If capital is retired, purchasing shares at amounts above their par or theoretical value, expressed in pesos with purchasing power as of the date of retirement, the excess should be considered to be a reduction of earned capital. If the latter is not sufficient, the difference reduces contributed capital.

If the shareholders decide to use part of earned capital to increase the amount of capital stock by means of distributing stock dividend, this stock dividend should be reflected in the entity's financial information as a decrease of earned capital and an increase in the subscribed and paid capital account. The maximum capitalizable amount of earned capital, as well as contributed capital, is the algebraic sum of the credit balances of the accounts subject to capitalization. Capital stock restatement may be carried out regardless of the nature of the earned capital amounts.

If the entity's statutes provide for the retirement of shares against retained earnings this retirement should be considered to reduce earned capital.

An increase or decrease in the number of shares outstanding, without modifying subscribed and paid capital, does not represent a change in the proportional interest of the shareholders in the entity's stockholders' equity nor in the value of their investment.

The amount of contributed capital updated by means of restatement in monetary units with general purchasing power as of the date of a distribution, shall be the basis for qualifying distributions which constitute reimbursements of capital for accounting purposes. Any distribution an entity makes and charges to stockholders equity, which causes it to be reduced below that base, shall be conceptualized as a reimbursement of capital for accounting purposes.

Capital accounts shall not be used to reflect income statement transactions. Prior period adjustments should be treated in accordance with what has been established in Bulletin A-7 on "Comparability" considerations.

In case the shareholders reimburse entity losses in cash or in kind, the corresponding amounts should be considered as a reduction of the accumulated deficit.

Common stock dividends declared but not yet paid, as well as preferred dividends, once the corresponding net income has been approved by the shareholders; do not form part of stockholders equity, but form part of the liabilities owned by the entity.

The excess or deficit in the restatement of stockholders equity is represented principally by the gain or loss from nonmonetary assets.

As it is established in paragraphs 54, 55 and 56 of Bulletin A-11, two criteria exist for maintenance of capital: financial and physical. In the first case, there is dealing with conserving a certain amount of purchasing power, and in the second case with a specific operating capacity. Bulletin B-10 has confirmed the application of the maintenance of capital criterion, the gain or loss from holding nonmonetary assets forms part of earned capital.

The values related to all items of stockholders equity shall be expressed in units with purchasing power as of the date of the balance sheet.

*Presentation and disclosure rules for Book value*

The presentation in the balance sheet of the various items which make up stockholders equity should be made in sufficient detail to show each of them, including in the first place those which make up contributed capital, followed by those which make up earned capital. The amounts corresponding to contributed capital, as well as earned capital may be presented as subtotals. It is also necessary to take into account all the legal aspects which affect stockholders equity.

When the shareholders do not totally pay the amount of shares subscribed, the difference between the amount paid and the amount pending payment should be considered unpaid subscribed capital and should be subtracted from capital stock.

It is not acceptable to present the unpaid amount as a receivable from the entity's stockholders, even if it is backed by debt securities.

The financial statements should disclose all the characteristics of stockholders equity and restrictions thereon, such as:

- Description of the types of capital stock (common shares, preferred shares, partnership shares).
- Classes and series of shares and partnership shares that capital stock is divided into, including their characteristics and restrictions.
- Minimum capital stock and maximum amount authorized in the case of corporations with variable capital and the restated amounts thereof.
- Number of shares issued and subscribed their par value, or a statement that they have no par value.

In the case of preferred or special shares, their rights and restrictions, such as conversion or redemption rights, guaranteed minimum dividends, as well as the amount of cumulative undeclared dividends.

Restrictions or the other situations which affect stockholders equity based on legal provisions, shareholders agreements, loan contracts or others.

Type of taxes to which distributions or reimbursements are subject.

If advances from partners or shareholders exist for future increases in the entity's capital stock, these should be presented on a separate line within contributed capital, as long as there is a resolution at a shareholders meeting that they will be applied to future increases in capital stock, otherwise, these amounts should form part of the liabilities owned by the entity.

The movements recorded during the period in the contributed and earned capital amounts shall be shown in the statement of changes in stockholders equity. Likewise, in this statement or its notes, changes in the number or class of shares or in the par value thereof, shall be disclosed.

Reductions of contributed capital, such as retirements of shares, or distributions which are considered to be reimbursements of capital, should be disclosed in the financial statements.

The amount of dividends per share and dividends paid in a form other than cash should be disclosed.

*Comparison between United States GAAP and International Accounting Standards criteria for Book value versus Mexican GAAP:*

The International Accounting Standards Board has no specific standard. There is a great similarity in the segregation of contributed capital and earned capital between Mexican and United States General Accounting Accepted Principles. Both of the standards take great care in the fair determination of an entity's results separately from the capital transactions of its owners.

Main differences: Stock dividends which involve a large number of shares are treated as splits under the United States standard. In Mexico there is no equivalent standard. In Mexico, due to its inflationary environment, the amount of contributed capital, updated by means of restatement in monetary units of general purchasing power as of the date of the distribution shall be the basis for measuring distributions which constitute reimbursements of capital.

#### ***4.1.2 Accounting criteria for Earnings (Valuation and Disclosure)***

Earnings are referred to Net Income or loss of the period, and it is the bottom line of the Income Statement. The Income Statement is a document which shows an entity's performance in monetary terms for a specific period. It represents, in very general terms, the consumption of resources in its own business activities and for other purposes, as well as the resources received as compensation for the entity's efforts.

The concepts of accrual basis on the accounting period, the identification of costs and expenses and the recognition of revenues are fundamental concepts of the Income Statement according with Bulletin B-3. And although there is a need for conservatism and an increased demand for reporting all-inclusive earnings, the standards intend to emphasize net income from operations as the income which should normally be considered by analysts in measuring an entity's earnings potential. The information is highlighted by lines dedicated to extraordinary items, discontinued operations, and changes in accounting principles used.

The Income statement is a basic financial statement in Mexico that presents relevant information about the transactions carried out by an entity during a determined period. An entity measures the results of its accomplishments and efforts made by determining its net income and identifying its components during the period established in the statement itself.

The Income Statement, upon taking into account the particular line of business of each entity, should be structured, as applicable by the following sections. The content of these sections is described in the following paragraphs:

- A. Operations.
- B. No operations.
- C. Income Tax and (statutory) Employee Profit Sharing (ISR and PTU).
- D. Discontinued Operations.
- E. Extraordinary items,
- F. Cumulative effect of Change in Accounting Principles at the beginning of the fiscal year.
- G. Earnings per share.

According with Bulletin B-3, above concepts is the minimum content of the Income Statement. The order referred to above should be respected in its presentation.

The Income Statement should be expressed in currency of the same purchasing power according with Bulletin B-10.

*Comparison between United States GAAP and International Accounting Standards criteria for Earnings versus Mexican GAAP:*

Mexican GAAP has detailed standard for the Income Statement. International Accounting Standards followed the same criteria, notwithstanding that it does not have appropriate rules regarding discontinued operations, extraordinary items and the initial effect of changes in accounting principles, at least with regard to their presentation in the Income statement. The United States standards do not contain a specific standard, rather comments on the statement of income can be found in various other standards.

Mexico, due to its inflationary economy, gives a characteristic touch to this financial statement, requiring that it be expressed in currency of uniform purchasing power. The International Accounting Standards contained the scenery for hyperinflation economies.

### **4.1.3 Accounting criteria for Cash flow (Valuation and Disclosure)**

The Cash Flow statement is a statement of changes in financial position based on cash. This statement proposes to show the effect of operating, financing and investment activities on cash. It is relevant for evaluating the capacity of the entity to provide cash to pay its debts. It is vital information for assessing the degree of liquidity of business.

In Mexico the Cash Flow statement is prepared in year-end pesos with the same purchasing power according with Bulletins B-12 and B-10.

Specific issues about its valuation under Bulletin B-12:

Classification of the Cash Flow: it shall be classify in three blocks: investing, financing, or operating activities.

#### **- Cash Flows from Investing Activities**

Investing activities include the changes in loans and acquiring and disposing of debt or equity instruments and property, plant, and equipment and other productive assets, that is, assets held for or used in the production of goods or services by the enterprise (other than materials that are part of the enterprise's inventory).

It also includes changes in the receipts from collections or sales of loans made by the enterprise and of other entities' debt instruments (other than cash equivalents) that were purchased by the enterprise. Changes from sales of equity instruments of other enterprises and from returns of investment in those instruments

#### **- Cash Flows from Financing Activities**

Financing activities include obtaining resources from owners and providing them with a return on, and a return of, their investment; borrowing money and repaying amounts borrowed, or otherwise settling the obligation; and obtaining and paying for other resources obtained from creditors on long-term credit.

#### **- Cash Flows from Operating Activities**

Operating activities include all transactions and other events that are not defined as investing or financing activities in paragraphs above. Operating activities generally

involve producing and delivering goods and providing services. Cash flows from operating activities are generally the cash effects of transactions and other events that enter into the determination of net income. The Operative Cash Flow start with the adjusting net income to reconcile it to net cash flow from operating activities (the indirect or reconciliation method). That requires adjusting net income to remove (a) the effects of all deferrals of past operating cash receipts and payments, such as changes during the period in inventory, deferred income, and the like, and all accruals of expected future operating cash receipts and payments, such as changes during the period in receivables and payables, and (b) the effects of all items whose cash effects are investing or financing cash flows, such as depreciation, amortization or impairment of goodwill, and gains or losses on sales of property, plant, and equipment and discontinued operations (which relate to investing activities), and gains or losses on extinguishment of debt (which is a financing activity).

This reconciliation reports major classes of deferrals of past operating cash receipts and payments and accruals of expected future operating cash receipts and payments, including at a minimum changes during the period in receivables pertaining to operating activities, in inventory, and in payables pertaining to operating activities, shall be separately reported. Enterprises are encouraged to provide further breakdowns of those categories that they consider meaningful. For example, changes in receivables from customers for an enterprise's sale of goods or services might be reported separately from changes in other operating receivables.

Other issues about the Income Statement:

Non-cash investment and financing transactions are not eliminated.

The cash flow should present the effects of the purchase or sale of subsidiaries during the period, in a single line that involves all the information, instead of displaying them as the individual acquisition or disposal of assets and liabilities (according with bulletin B-8).

Using the direct method to elaborate this statement is not prohibited.

Cash Flow per share is neither required nor prohibited.



Comparison between United States GAAP and International Accounting Standards criteria for Cash Flow versus Mexican GAAP:

The three set of standards are basically consistent on what constitutes cash and cash equivalents. Mexico does not set forth the three month term to define a temporary cash equivalent investment.

The three set of standards require noncash financing and investing transactions to be exclude form the statement of cash flows and disclosed elsewhere in the financial statements,.

The three set of standards required separate disclosure of interest and taxes paid.

Mexico prepares the cash flow statement in constant pesos

United States expressly prohibits disclosing cash flow per share. On the other hand Mexico and International Standards neither required nor prohibit it.

### **5.1 Research Design and Hypotheses**

#### Research Objectives:

- To provide evidence of the value relevance of accounting information for the Mexican stock exchange market prices, under the Ohlson model test for identifying the significance of book value and earnings in Mexican financial statements.

#### Research design:

- Accounting empirical study under the market-based approach for Mexican accounting data.

#### Research Questions:

- A. Is there value relevance of Mexican accounting variables from the Ohlson model?
- B. Are there other variables for Mexican accounting data that provide a better explanation power than those in the Ohlson Model? If so, what are the variables, and what is the reason for their effect?

#### Hypotheses:

H1. The Ohlson Model independent variables (Book value and Earnings) have value relevance in the price of assets in the Mexican Stock market.

H2. The Ohlson Model could be improved by replacing the independent variable of Earnings with EBITDA, Operative Cash Flow, Net Cash Flow or Dividends.

H3. The Ohlson Model could be improved with the incorporation of EBITDA, Operative Cash Flow, Net Cash Flow and Dividends as the third independent variable.<sup>32</sup>

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<sup>32</sup> Improvement to the original Ohlson model is identified as the alternative model for the Mexican data used in this study. Both models were tested under the Tangible and Intangible kind of activities classification.

## **5.2 Data Base Characteristics**

Financial accounting information and stock prices per share were taken from the 1991-2003 Mexican stock market information available in the *Economática* data base<sup>33</sup> in November 2004.

*Economática* provides information for the following countries' stock markets: the United States, Brazil, Chile, Argentina, Peru, Colombia, Venezuela and Mexico.

In order to identify the size of the Mexican stock market, Table 1 shows the number of different stocks quoted for each market and the Grouped Market Capitalization in millions of US dollars on December 31, 2003:

Country	Number of Stocks	Market Capit.
USA	951	10,039,319
Brasil	509	216,388
<b>Mexico</b>	<b>166</b>	<b>149,622</b>
Chile	267	85,659
Argentina	97	39,849
Perú	149	20,320
Colombia	68	9,194
Venezuela	50	7,701

*Economática* has data for all the types of Mexican assets quoted on the Mexican stock market (*Bolsa Mexicana de Valores*). There are 1,181 items listed under twelve different types of assets: Stocks, Stock Indexes, Inflation Index, Currencies, Commodities, Fixed Income, ADR, Options, NAV Mutual Fund, NAV Mutual Fund Fixed Income, NAV Mutual Fund Equity and Others.

The stock information includes data from 206 Mexican companies. Some companies have several share series, so only one share class was selected for each company (the one with greatest volume in October 2004). In accordance with this selection method, the data base was made up of **166** companies.

The data base of 166 companies multiplied by 13 years produces a total 2,158 year-company data; but it is incomplete, which means that it is unbalanced panel data. The reason for this unbalanced panel data is primarily due to the fact that some

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<sup>33</sup> "Economática: Tools for Investment Analysis". General information available at <http://manual.economatica.com>.

companies were only listed for certain years because they are new companies that either appeared or interrupted their operations during the study period. There are also companies that do not fulfill Ohlson Model characteristics, so the original data base is formed by 127 companies (original data base) with 704 year-company data (without outliers)<sup>34</sup>.

The statistical structure of the original data base (with missing values) can be filled using a variety of techniques<sup>35</sup>. In this study, the empty spaces of the dependent variable (price per share) were filled by taking the average of one month before and one month after March 31 of each year (the closing date reference of the dependent variable). There were 368 added data.

The main reasoning supporting the use of the selected technique is that the added data shows the stock price performance information around the first quarter of each year, and it is a proxy of the quote of the first quarter that the Ohlson model requires. In accordance with this criteria, the data base used in this study is formed by 145 companies with 1,046 year-company data (without outliers).

*Economática* presents the financial statements under different types of format reports. This study uses the Mexican Report for Industry and Commerce (this report format and its valuation criteria fulfill the characteristics of the Mexican General Accounting Accepted Principles). Financial companies have another report format and valuation methodology in accordance with Mexican Bank and Stock Commission regulations (Circular 1448 of the *Comisión Nacional Bancaria y de Valores de México* - CNBV). This format was selected for the financial sector of the data base.

The companies are classified under the NAICS (North America Industrial Classification) sector criteria of *Economática*. The NAICS sector is an international sector classification structured in multiple levels. The first level classifies all companies into 20 classifications (distinct from *Economática*'s classification). Each of the 20 NAICS classifications subdivides into a second level with 96 classifications. Similarly, at this

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<sup>34</sup> The outliers were eliminated according to the Earnings/Price ratio. If the absolute value was above 1, it was identified as an extreme value.

<sup>35</sup> Censored and Truncated techniques could be used, but according to the information available in the data base, neither of these techniques applied. An improvement would be to use a Censored scenario by adding non-financial information as an instrumental variable.

level, there is another subdivision which yields a third level with 313 classifications. The NAICS was developed in 1997 by the governments of the United States, Canada, and Mexico.

The NAICS General Classification Codes are:

11 Agriculture, Forestry, Fishing and Hunting	54 Professional, Scientific and Technical Services
21 Mining	55 Management of Companies and Enterprises
22 Utilities	56 Administrative and Support and Waste Management and Remediation Services
23 Construction	61 Educational Services
31 Manufacturing	62 Health Care and Social Assistance
42 Wholesale Trade	71 Arts, Entertainment and Recreation
44 Retail Trade	72 Accommodation and Food Services
48 Transportation and Warehousing	81 Other Services (except Public Administration)
51 Information	92 Public Administration
52 Finance and Insurance	
53 Real Estate and Rental and Leasing	

The Mexican stock market information was taken from this NAICS general classification, but the Mexican data base is not large enough to support so many sectors (there are only 145 companies to classify). For the purpose of this study, only 2 economical activities classification was used: Tangible industries and Intangible Industries.

The tangible industries are identified in 3 general sectors: Trade Activities (sector 1), Manufacturing Activities (sector 2) and Primary activities (sector 5).

The Intangible industries are identified in 2 sectors: Services Activities (sector 3) and Financial Services Activities (sector 4).

The 5 general sectors were used in accordance with the basic classification of activities of Mexican Bulletin B-2<sup>36</sup>. The specific activities that each sector involves are:

**1. Trade Activities (with 26 COMPANIES).** Specifically, this sector includes: Chemical and Allied Products Wholesalers; Department Stores; Electrical Goods Wholesalers; Electronics and Appliance Stores; Farm Product Raw Material Wholesalers; General Merchandise Stores; Grocery and Related Product Wholesalers; Health and Personal

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<sup>36</sup> Bulletin B-2 of the General Accepted Accounting Principles of Mexico details the characteristics of the Basic Accounting Principle of Entity, and provides the general classification of activities for companies.

Care Stores; Machinery, Equipment, and Supplies Wholesalers; Other General Merchandise Stores; Specialty Food Stores; Sporting Goods, Hobby, and Musical Instrument Stores; and Wholesale Trade and Durable Goods.

**2. Manufacturing Activities (with 79 COMPANIES).** This sector includes: Agriculture, Construction, and Mining Machinery Manufacturing; Animal Slaughtering and Processing; Apparel Knitting Mills; Apparel Manufacturing; Architectural and Structural Metals Manufacturing; Bakeries and Tortilla Manufacturing; Basic Chemical Manufacturing; Beverage Manufacturing; Cement and Concrete Product Manufacturing; Chemical Manufacturing; Clay Product and Refractory Manufacturing; Computer and Peripheral Equipment Manufacturing; Converted Paper Product Manufacturing; Cutlery and Hand Tool Manufacturing; Engine, Turbine, and Power Transmission Equipment Manufacturing; Fabric Mills; Fiber, Yarn, and Thread Mills; Food Manufacturing; Forging and Stamping; Fruit and Vegetable Preserving and Specialty Food Manufacturing; Glass and Glass Product Manufacturing; Grain and Oilseed Milling; Heavy Construction; Household Appliance Manufacturing; Iron and Steel Mills and Ferroalloy Manufacturing; Machinery Manufacturing; Motor Vehicle Manufacturing; Motor Vehicle Parts Manufacturing; Newspaper, Periodical, Book, and Database Publishers; Nonresidential Building Construction; Other Food Manufacturing; Other General Purpose Machinery Manufacturing; Other Miscellaneous Manufacturing; Paint, Coating, and Adhesive Manufacturing; Paper Manufacturing; Plastics Product Manufacturing; Poultry and Egg Production; Pulp, Paper, and Paperboard Mills; Residential Building Construction; Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing; Spring and Wire Product Manufacturing; Steel Product Manufacturing from Purchased Steel; and Sugar and Confectionery Product Manufacturing.

**3. Services Activities (with 39 COMPANIES).** This sector includes: Accommodation; Administrative and Support and Waste Management and Remediation Services; Amusement, Gambling, and Recreation Industries; Cable Networks and Program Distribution; Food Services and Drinking Places; General Medical and Surgical Hospitals; Insurance Carriers; Insurance Carriers and Related Activities; Management of

Companies and Enterprises; Radio and Television Broadcasting; Rail Transportation; Real Estate; Scheduled Air Transportation; Support Activities for Air Transportation; Support Activities for Transportation; Telecommunications; and Traveler Accommodation; Warehousing and Storage.

**4. Financial Services Activities (with 16 COMPANIES).** This sector includes: Banks (Depository Credit Intermediation); Banks, Credit Intermediation and Related Activities; and Securities, Commodity Contracts, and Other Financial Investments and Related Activities.

**5. Primary Activities (with 6 COMPANIES).** This sector includes: Crop Production; Greenhouse, Nursery, and Floriculture Production; Metal Ore Mining; Mining (except Oil and Gas); and Oilseed and Grain Farming.

The list of used Mexican companies, with share class selected information, appears in Appendix 3.

### **5.3 Sample Definition**

- ◆ Data base selection: Mexican stock market
- ◆ Period of time: 13 years from 1991 to 2003.
- ◆ Data characteristics: per share basis in quarterly or annual reference, in accordance with the Ohlson Model.
- ◆ Monetary denomination: in constant Mexican pesos on October 31, 2004.

The financial accounting variables are at the end of each year (4th quarterly fiscal period of the balance sheet and the accumulative year results of the income statement at the end of each year).

The market stock price information is from the first quarterly period after the end of each year of the accounting variables.

Due to inflation in Mexico, the sample data is analyzed under a constant base rather than current pesos for each year. The first step was to carry out a whole restatement of the financial information. The variables were restated with the same purchase power as on October 31, 2004. For this purpose, the Mexican General Price Index published by the Bank of Mexico was used, and the restatement process employed was in accordance with that detailed in Mexican Bulletin B-10<sup>37</sup>. The restatement data was used to control the heteroscedasticity effect of using nominal data instead of constant pesos.

#### **5.4 Variables Definitions**

The **independent variables** from the consolidated financial statements are as follows:

- "Stockholders' equity" for book value. This is listed on the 59th row of the financial statements of each company. This variable is valued in accordance with Bulletin C-11<sup>38</sup>.
- "Net gain or loss" for earnings. This is listed on the 112th row of the financial statements of each company. This variable is valued in accordance with Bulletin B-3<sup>39</sup>.

Both concepts needed to be under per share calculation, so each was divided by the number of shares (row 167). These shares were adjusted by corporate actions. The corporate actions include the following record types: Stock Dividend, Stock Split, Capital Adjustment, Capital Reduction, Reversed Split, Rights Issue, Cash Dividend, Spin-off, Change in Lot Size, Retirement, Increase in shares of a different class, Increase of shares for merger/acquisition, Change in number of shares (unspecified), Conversion of securities into shares, Placement, No exercise of Rights Issue, and Issuance of shares related to exercise of previous rights issue.

The **dependent variable** is the price per share. For this concept, the closing entry of the market stock data was used. The Mexican securities market is relatively

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<sup>37</sup> Mexican Bulletin B-10 describes the Effects of Restatement in Financial Statements by the use of the General Index Price.

<sup>38</sup> Bulletin C-11 of the General Accepted Accounting Principles of Mexico details the characteristics of Equity as the Net Asset of the Balance Sheet.

<sup>39</sup> Bulletin B-3 of General Accepted Accounting Principles of Mexico lists the characteristics of the Income Statement with specifications on how to calculate the Net Income or Loss.



confined, focused around one national exchange, the *Bolsa Mexicana de Valores* (BMV), which has only one trading floor<sup>40</sup>. This is the only exchange in the country that lists equities. This stock market is relatively centralized and basic in its structure and operation. The BMV currently has 166 listed equities and a total market capitalization of USD \$149,622 millions<sup>41</sup>. Like other countries in Latin America, Mexico's securities market is dominated by debt instruments. Investment in the securities market through the BMV has been driven by investment in mutual funds managed by local stock brokerage houses or banks.

In addition to the Ohlson model variables, the following were also used as independent variables:

- EBITDA<sup>42</sup> per share (in accordance with *Economática* calculus). **Option 1.**
- OCF = Operative Cash Flow per share. Dividing Total Operative Cash Flow (row 133 data) by Number of shares (row 167 data), in accordance with Bulletin B-12<sup>43</sup> (operative income before depreciation-interest-taxes). **Option 2.**
- NCF = Net Cash Flow per share. Dividing Total Net Cash Flow (row 155 data) by Number of shares (row 167 data), in accordance with Bulletin B-12<sup>41</sup>. **Option 3.**
- DIVIDENDS= Dividends paid per share<sup>44</sup>. These data appear on the trading ratios information of each company and annual period, in accordance with Bulletin C-11<sup>45</sup>. **Option 4.**

The above four variables - EBITDA (Option 1), Operative Cash Flow (Option 2) Net Cash Flow (Option 3) and Dividends (Option 4) - were used as an alternative to earnings in the Ohlson model because they reflect the other point of view versus the accruals considered in accounting (the cash flow basis).

In third part of the study, a comparison was carried out between the alternative model versus the original Ohlson model under the industries' economical activities

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<sup>40</sup> For more information, please refer to <http://www.cnbv.org.mx>.

<sup>41</sup> See Table 1 on Chapter 5.

<sup>42</sup> EBITDA= Earnings Before Interest, Taxes, Depreciation and Amortization.

<sup>43</sup> Bulletin B-12 of the General Accepted Accounting Principles of Mexico provides information about the characteristics of the Cash Flow Statements under the Indirect Method.

<sup>44</sup> Dividends was used because there are references that use them instead of earnings, per example Brief and Zarowin (2003), who found that dividends have stronger correlation with permanent earnings than reported earnings.

<sup>45</sup> Buletin C-11 of the General Accepted Accounting Principles of Mexico provides information about the characteristics of the Share holders' equity characteristics, including the dividends information.

classification (tangible and intangible). The purpose of this study is to emphasize the inherent differences between those industries, and to test which model (the original or the alternative) will produce a better econometrical result.

The testing of the inherent differences between intangible and tangible industries and its effect on the value-relevance of earnings and book values has been identified in recent research<sup>46</sup> as a factor that focuses on the financial statements' impact on investment and the primary operation of intangibles, which would seem to explain the huge investment in research and development, and brand development, of service and technology-based companies. For the purpose of this study, the companies listed in the economical activities of the Service sector (sector 3 of the sample data base) and Financial Services (sector 4 of the sample data base) were considered Intangible Industries. Those in sector 1 (Trade Activities), sector 2 (Manufacturing Activities) and sector 5 (Primary Activities) were considered Tangible Industries.

The main accounting difference between the intangible and tangible industries is that the intangible companies have no production cost and no cost distribution related to the service they provide, they only manage operative expenses. Specifically, there is another difference in the accounting method used by the intangibles items: Mexico capitalizes only development and investment rights, as opposed to calculating them as expenses of the period. The criteria used in following such classification and the disclosures of the accounting treatment of each intangible investment are in accordance with the new requirements for Mexican financial accounting detailed since 2002 in Bulletin C-8 regarding Intangibles<sup>47</sup>. Consistent with the valuation and operative differences, the financial accounting information of the intangible industry may produce a different effect in the Mexican stock market. Lev (1997) and Amir and Lev (1996) conclude that financial information is of limited value to investors when valuing service and technology-based companies which mainly invest and operate intangibles. The expectation is that only book value is significant in both industries. In addition, there is an economical activities increment of the intangible industries in the last decade and a decrement of the tangible ones.

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<sup>46</sup> See Collins, Maydew and Weiss (1997) and Broedel (2002).

<sup>47</sup> This bulletin follows the same accounting criteria as the United States bulletin SFAS-142 and is of recent application (since 2002).

## **5.5 Empirical Methodology Techniques Characteristics**

The econometric study initiated with a basic descriptive statistics analysis. In accordance with the accounting literature, the Ohlson model was tested first under Ordinary Least Squared Regression (OLS) using the first difference of each variable of the model<sup>48</sup>. The ordinary least squares estimator is defined as the value that minimizes the sum of the squared errors. OLS provides an unbiased, consistent, and efficient estimator for the parameters of interest (known as the classical linear regression assumptions)<sup>49</sup>. The OLS is one of the most used regressions in accounting literature; the Ohlson model alone (1995) has been mainly tested under this regression. There is evidence that this OLS estimation is effective: for example, it provides a bridge between more traditional approaches to econometrics - which treats explanatory variables as fixed - and other approaches, which are based on random sampling with stochastic explanatory variables<sup>50</sup>. There are asymptotic properties that support the OLS estimator, such as consistency characteristics, asymptotic inference using OLS, and heteroscedasticity-robust inference<sup>51</sup>.

The Mexican sample characteristics are over-time data of the same cross-section units, in this case, the linear panel or pool data is more useful than OLS regression. The main advantage of using the panel or pool data set is that it allows for control over unobserved cross-section heterogeneity. The issue at hand is “to pool or not to pool (using panel)”, so the Mexican data base needed to be tested in order to identify whether the sample characteristics are under restrictive (pooled) or non-restrictive (panel set) independent variables coefficients for each company. The pooling test refers to the restriction or non-restriction of the independent variables coefficients:

Ho : the model is restrictive:  $Y_{it} = \beta X_{it} + \varepsilon_{it}$  and Ha: the model is unrestricted:  $Y_{it} = \beta_{it} X_{it} + \varepsilon_{it}$

Where:  $Y_{it}$  = dependent variable for firm  $i$  on time  $t$

$\beta$  = beta coefficient(s) of independent variable(s)

$X_{it}$  = independent variable(s) for firm  $i$  on time  $t$

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<sup>48</sup> The unit root test was made to identify what to use if the level or the first difference information, on page 57 appears the reference of it.

<sup>49</sup> For detailed specifications of the model, see Green (1998). *Econometric Analysis*. 3<sup>rd</sup> Ed. Chapter 6.

<sup>50</sup> Depending on the characteristics of the data base.

<sup>51</sup> These properties are explained in Chapter 4 of Wooldridge (2002), MIT Press. *Econometric Analysis of Cross-Section and Panel Data*.

The above pooling test is verified under a Chow criteria (in accordance with an F-test). If the F-test result is large (small) versus the table reference, the null hypothesis is rejected (accepted), so the data sample has unrestrictive (restrictive) characteristics and a panel (pool) data technique must be used.

The data sample in this study required the use of the panel data technique. This technique provides more information, more efficiency and less multi-collinearity (Baltagi, 1995). Baltagi (1995) and Wooldridge (2001) summarize the core technologies and issues in terms of econometric methodology. Greene (2002) presents more accessible illustrations of its applications. Some of the advantages of using panel data are:

- Panel data are better able to identify and measure effects that are simply not detectable in pure cross-section or pure time-series data, and could discriminate between cases.

- Panel data studies control for individual heterogeneity and can suggest that firms are heterogeneous. If we apply time series and cross-section techniques for samples with panel data characteristics, those studies will not control the individual heterogeneity and run the risk of obtaining biased results.

- Panel data give more informative data, more variability, less collinearity among the variables, more degrees of freedom, and more efficiency than the time series and cross-section techniques for samples with panel data characteristic. Panel data is usually gathered on micro units, such as individuals, firms and households.

- Another characteristic is that panel data are better able to study the dynamics of adjustment, like inter-temporal relations, life-cycles, and inter-generational models.

Some of the general limitations of the panel data technique include:

- Design and data collection problems
- Distortions of measurement errors
- Selectivity problems like self-selectivity and non-response
- Short time-series dimension attrition.

The basic characteristics of the panel data used in this study are that the regression disturbances are homoskedastic with the same variance across time and Individuals by using the Generalized Least Squared estimator (GLS) which satisfies the classical assumptions. The OLS estimator can satisfies this assumption.

The non-restrictive panel data model is:

$$(dependent\ variable)_{it} = \alpha + \beta_i (independent\ variable)_{it} + \varepsilon_{it}$$

where:  $i$  = each firm and  $t$  = annual period.  $\alpha$  = constant

Under panel data analysis, there are fixed or random effects to be tested in the constant variable behavior of the model. These effects could relate to the firms or to time. Fixed effects relate to the identification of constant terms of a specific group of the regression model and random effects relate to the specific error of a specific group of the regression model. In addition to these effects, another alternative is to add dummies variables to the model and follow specific criteria.

How does one choose between fixed- and random-effects models? There are simple tests for assessing whether random effects<sup>52</sup>, in particular, are a good idea. In order to identify whether there are fixed effects or random effects, the Hausman test should first be employed, which implies that  $H_0$ : random effects would be consistent and efficient, versus  $H_a$ : random effects, which would be inconsistent (in accordance with this, the fixed effects would certainly be consistent). The result of the test is a vector of dimension  $k$  ( $\dim[b]$ ) which will be distributed chi-square ( $k$ ). If the Hausman test statistic is large, FE must be used. If the statistic is small, RE will suffice.

Another test to apply is the Breusch-Pagan statistic for cross-sectional independence in the residuals of a fixed effect regression model or a GLS model estimated from cross-section time-series data. Breusch and Pagan (1980) developed a test for random effects. The Breusch-Pagan test is a Lagrangian multiplier test of the hypothesis that random effects are not needed. This B-P test is similar to an F-test; it is unlikely that the null will not be rejected, especially if the statistic is large.

In terms of goodness of fit estimator, the  $R^2$  is used, which measures how successful the fit is, in explaining the variation of the data, that is, it measures the fraction of the variance in the data that is explained by the regression. In STATA, 3 types of  $R^2$  are shown for the panel data output: the overall, the within and the between. The one that produced the information for the data sample is  $R^2$  between<sup>53</sup>.

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<sup>52</sup> The Hausman and Breusch-Pagan tests are in STATA options for Panel data.

<sup>53</sup> STATA Manual for Cross-Sectional Time series, p. 194.

## CHAPTER 6 - RESULTS

In this study, two econometrical programs were used: Eviews<sup>54</sup> and Stata<sup>55</sup>. The following four tables show the descriptive statistical data and the OLS regressions and panel data results of the full sample, testing the Ohlson model. Table 5 also shows the panel data results with 3 options instead of earnings. Later, an alternative model is tested versus the original Ohlson model.

### **6.1 Descriptive Data Per Share**

Table 2, shows the descriptive statistics of the data base. The full-sample shows the high standard deviation in the dataset; which confirms the variability of a firm's size and industry classification traded on the Mexican stock market. As expected, book value and earnings are positively correlated with each other. Book value has a 0.60 index of correlation with price versus the small correlation between earnings with price. This correlation supports the intuitive idea that earnings (current results) will have less value relevance and book Value will have more. The low correlation between Book value and Earnings is an index of no collinearity problem within them.

<b>TABLE 2- DESCRIPTIVE STATISTICS <sup>a)</sup></b>							
Variables <sup>b)</sup>	PRICE	BOOKVALUE	EARNINGS	<b>COVARIANCE MATRIX</b>			
<b>Mean</b>	23.08	18.81	1.13		PRICE	BOOKVALUE	EARNINGS
<b>Median</b>	13.38	10.56	0.86	PRICE	1512.53	605.15	-7.57
<b>Maximum</b>	562.00	216.47	93.34	BOOKVALUE	605.15	674.19	22.92
<b>Minimum</b>	0.21	-120.05	-47.69	EARNINGS	-7.57	22.92	35.63
<b>Std. Dev.</b>	38.91	25.98	5.97				
<b>CORRELATION MATRIX <sup>c)</sup></b>							
	PRICE	BOOKVALUE	EARNINGS				
PRICE	1	0.60	-0.03				
BOOKVALUE	0.60	1	0.15				
EARNINGS	-0.03	0.15	1				

a) The number of firm-year observations with necessary data on *Economática* is 1,046 after deleting the following: the outliers were eliminated according to the Earnings/Price ratio. If the absolute value was above 1, it was identified as an extreme value.

b) Price is the price of a firm *i* share three months after year-end *t*. Earnings is the earnings per firm *i* share for year *t*. Book value is the book value per firm *i* share at year-end *t*.

c) Pearson correlations are in the bottom-left cells and Spearman correlations are in the upper-right cells. Due to the sample size, all of the above are significant at the 0.0001 level.

<sup>54</sup> Eviews-3.0 for the Estimation Output with Generalized Least Squared with Fixed and Dummies.

<sup>55</sup> STATA: for test Fixed versus Random Effects and the Adjusted Durbin-Watson for Panel under Baltagi criteria.

In Table 3, the firm-observations per year are recorded; each one has different number of observations. This characteristic is the main explanation for the unbalanced panel data: not all of the 145 firms in the sample appear during the study period. Only 18 firms were present in all of the years, but if only these 18 firms are used, the Ohlson model is not significant.

Year	Observations	Year	Observations
1991	26	1998	80
1992	31	1999	85
1993	34	2000	65
1994	37	2001	65
1995	55	2002	58
1996	57	2003	68
1997	94		

In Table 2, the behavior of the Mexican stock market may be observed to combine different kinds of performance, because of the high standard deviation of the variables. Table 4 details the descriptive data per sector<sup>56</sup>; according to this table, sector 4 displays the least variation on the data. The behavior of these sectors supports the idea of the use of dummies or fixed effects per firm.

<b>Descriptive Statistics of Sector 1</b>				<b>Descriptive Statistics of Sector 4</b>			
Variable	Obs	Mean	Std. Dev	Variable	Obs	Mean	Std. Dev.
bookvalue	215	8.34	8.70	bookvalue	47	11.37	6.87
earnings	215	1.09	2.11	earnings	47	0.93	2.50
price	133	18.10	15.56	price	56	13.55	9.02
<b>Descriptive Statistics of Sector 2</b>				<b>Descriptive Statistics of Sector 5</b>			
Variable	Obs	Mean	Std. Dev.	Variable	Obs	Mean	Std. Dev
bookvalue	685	26.31	175.21	Bookvalue	57	21.93	17.82
earnings	685	-3.23	111.57	earnings	57	1.60	6.11
price	376	22.77	21.04	price	39	22.62	19.15
<b>Descriptive Statistics of Sector 3</b>							
Variable	Obs	Mean	Std. Dev				
bookvalue	259	16.98	27.40				
earnings	259	-0.71	7.33				
price	151	29.12	53.80				

Sector 1 is for Trade Activities  
Sector 2 is for Manufacturing Activities  
Sector 3 is for Services Activities  
Sector 4 is for Financial Services Activities and  
Sector 5 is for Primary Activities

<sup>56</sup> The sector classification criteria appears in Chapter 5 of this study (page 46).

## **6.2 Econometrics Findings with OLS-Regressions**

In the reference works cited<sup>57</sup>, the Ohlson model was tested under Ordinary Least Squared (OLS) Regressions using the level or first difference. The unit root test was made and it shows that the first difference of each variable (dependent and independents) is needed instead of the level information. Accordingly, the estimation output of Table 5, shows that only book value is significant. This means that most of the relevance of accounting numbers is due to book values and emphasize the tradeoff of earnings, explained in terms of information asymmetry and transmission. Earnings seems to have low quality and does not incorporate economic income in a meaningful way.

Due to the tradeoff characteristic of Earnings, other variables were tested instead: EBITDA (Option 1), Operative Cash Flow (Option 2), Net Cash Flow (Option 3) and Dividends (Option 4)<sup>58</sup>.

The results show that no one of the four options is significant and there are problems of Autocorrelation showed in the Durbin Watson parameter<sup>59</sup>.

Beside the results there are econometric limitations of the OLS Regressions, because they provide incomplete information of the characteristics of the data base, which combine cross-sectional and time series data<sup>60</sup>. Additionally, the Ohlson model is restricted on the Betas coefficients; those implied by a panel data model<sup>61</sup>.

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<sup>57</sup> Collins, Maydew, & Weiss (1997) and Collins, Pincus, & Xie (1998).

<sup>58</sup> Each of these variables was under per share basis. Section 5.4 includes a definition of these variables.

<sup>59</sup> The limitations to OLS is that it is less able to estimate the econometric behavior than a panel data technique model for a panel data characteristics that combine cross-section and time-series data

<sup>60</sup> For example, there are autocorrelation problems, as we can see in the Durbin Watson result for these four OLS regressions.

<sup>61</sup> The Group Test for Poolability is a Chow F-Test. In this study, the F- test result was too large, so the study required the Panel Data Analysis.



<b>Ohlson Model:</b>	Constant	BookValue	Earnings	R <sup>2</sup> .Adj	Durbin Watson
Coefficient	-1.466	0.420	0.158	0.018	2.915
T-statistic	-1.751	3.437 *	1.465		
<b>Option 1:</b>	Constant	BookValue	EBITDA	R <sup>2</sup> .Adj	Durbin Watson
Coefficient	-2.086	0.405	0.244	0.013	2.955
T-statistic	-2.190	3.047 *	0.897		
<b>Option 2:</b>	Constant	BookValue	Op.Cash Flow	R <sup>2</sup> .Adj	Durbin Watson
Coefficient	-0.422	0.695	0.000	0.043	3.475
T-statistic	-0.502	5.981 *	0.331		
<b>Option 3:</b>	Constant	BookValue	Net Cash Flow	R <sup>2</sup> .Adj	Durbin Watson
Coefficient	-0.442	0.702	0.000	0.043	3.476
T-statistic	-0.525	6.017 *	-0.243		
<b>Option 4:</b>	Constant	BookValue	Dividends	R <sup>2</sup> .Adj	Durbin Watson
Coefficient	-1.454	0.467	-47738.584	0.016	2.915
T-statistic	-1.735	3.950 *	-0.771		

\* = Significant coefficient under 95%

a) Heteroscedasticity was controlled under the White Consistent Covariance, which was used in the Estimation Options of the OLS-Regression Estimation of Eviews

### **6.3 Econometrics Findings with Panel Data**

Table 6, provides the panel data results (under weighted criteria for unbalanced panel data): in order to consider the heteroscedasticity of the data, the White Consistent Covariance was used. This adjustment reduced the data base to 12 annual periods of analysis with 757 company-year observations and there aren't autocorrelation problems.

<b>Ohlson Model:</b>	Constant	BookValue	Earnings	R <sup>2</sup> .Adj	Durbin Watson
Coefficient	-0.710	0.422	0.340	0.233	2.191
T-statistic	-47.233 *	41.925 *	4.299 *		
<b>Option 1:</b>	Constant	BookValue	EBITDA	R <sup>2</sup> .Adj	Durbin Watson
Coefficient	-1.836	0.364	-0.049	0.546	1.958
T-statistic	-164.806 *	34.880 *	-1.038		
<b>Option 2:</b>	Constant	BookValue	Op.Cash Flow	R <sup>2</sup> .Adj	Durbin Watson
Coefficient	-0.211	0.457	9.84E-08	0.166	2.177
T-statistic	-16.347 *	25.528 *	22.413 *		
<b>Option 3:</b>	Constant	BookValue	Net Cash Flow	R <sup>2</sup> .Adj	Durbin Watson
Coefficient	-0.228	0.459	-3.71E-08	0.118	2.162
T-statistic	-22.838 *	25.050 *	-3.510 *		
<b>Option 4:</b>	Constant	BookValue	Dividends	R <sup>2</sup> .Adj	Durbin Watson
Coefficient	-0.725	0.444	-4.27E+04	0.267	2.167
T-statistic	-48.067 *	59.873 *	-3.242 *		

\* = Significant coefficient under 95%

According to Table 6, the Ohlson model tested with the Mexican accounting data shows that both of the accounting variables are significant (book value and earnings) and produce an adjusted  $R^2$  of 0.23<sup>62</sup>. The Durbin-Watson results do not display autocorrelation problems<sup>63</sup>. However, there are other variables that are significant: operative cash flow (Option 2) , net cash flow (Option 3) and dividends (Option 4), though these options produce a smaller adjusted  $R^2$  and little numerical coefficient for the model. Besides these, the negative sign of the coefficient of net cash flow and dividends are hard to explain under the Ohlson model.

Table 7, shows the descriptive statistics for the unbalanced panel data (under the stacked data common reference) and reveals diverse characteristics combined in this data base that affect the Ohlson model results. One reason for this is the different statistic behavior of each activity sector. This means that either fixed or random effects may need to be added to the panel data estimator analysis.

According to the Hausman specification test for non-systematic differences in the coefficients, and the Breusch and Pagan Lagrangian multiplier test for random effects, there is a company effect<sup>64</sup>. This data base can thus add fixed effects per firm or dummies for the different activity sectors of the Mexican companies under consideration.

TABLE 7: DESCRIPTIVE STATISTICS OF STACKED-DATA-COMMON							
	PRICE	BookValue	Earnings	EBITDA	Op.Cash Flow	Net Cash Flow	Dividends
Mean	- 1.22	- 0.96	0.02	- 0.08	229,010.49	- 58,080.81	5.54E-08
Median	- 0.50	0.04	- 0.00	0.05	14,643.47	15,368.75	0.00E+00
Maximum	247.25	52.18	61.11	48.87	47,794,036.58	21,099,992.61	2.94E-04
Minimum	- 314.01	- 51.40	- 113.54	- 43.65	- 35,974,121.56	- 16,402,081.72	-1.07E-04
Std. Dev.	24.17	7.37	7.85	3.59	3,345,749.86	2,430,786.47	1.44E-05

In Table 8, appears the fixed effect model under panel data GLS estimator. The results show that all the variables used in the Ohlson model and in the options 1, 2 and

<sup>62</sup> According to the STATA-Manual,  $R^2$  between is directly relevant for the goodness to fit measure for Panel Data (p. 196).

<sup>63</sup> By using the first difference of each variable in the tested models.

<sup>64</sup> The Hausman test reports: Prob > chi2 =0.0815, so the Ho. (difference in coefficients not systematic, meaning that there are random effects) was rejected. The Breusch and Pagan Lagrangian multiplier test for random effects reports: Prob > chi2 =0.000, so the Ho. (variance of independent variables = 0, meaning that there are random effects) is rejected. Both tests therefore support that there are fixed effects on the sample data characteristics.

3 are significant by adding the fixed effect of each company. Option 4 doesn't appear because dividends per share wasn't significant. But there are autocorrelation problems in the Ohlson model and Option 3 tests, according to the Durbin-Watson results<sup>65</sup>, so the fixed effects are not the best analysis of the data characteristics.

These results aimed to take into consideration the constant behavior effect not per firm, rather for economical sector or industrial activities classification. The first approach of the study was by adding Dummies effect per economical sector (Table 9) and the second approach was studying per Industrial activities (Table 10).

<b>Ohlson Model:</b>	<b>BookValue</b>		<b>Earnings</b>		<b>Durbin Watson</b>
Coefficient	0.132		0.332		1.602
T-statistic	7.104	*	7.092	*	
<b>Option 1:</b>	<b>BookValue</b>		<b>EBITDA</b>		<b>Durbin Watson</b>
Coefficient	0.104		0.442		2.258
T-statistic	4.871	*	7.581	*	
<b>Option 2:</b>	<b>BookValue</b>		<b>Op.Cash Flow</b>		<b>Durbin Watson</b>
Coefficient	0.413		5.39E-08		2.327
T-statistic	57.604	*	49.408	*	
<b>Option 3:</b>	<b>BookValue</b>		<b>Net Cash Flow</b>		<b>Durbin Watson</b>
Coefficient	0.412		-2.16E-08		0.542
T-statistic	54.157	*	-3.531	*	

\* = Significant coefficient under 95%

Table 9, shows the results by using dummies per sector: D1 for Trade Activities, D2 for Manufacturing Activities, D3 for Services, D4 for Financial Services and D5 for Primary Activities. According with these tables, Option 3 and 4 are not significant. Nevertheless, the Ohlson model retains a higher R<sup>2</sup> than Option 1 and 2. So, there is evidence that the Ohlson model with independent variables of book value and earnings is relevant to Mexican stock market price<sup>66</sup>.

<sup>65</sup> The Durbin-Watson used was the one modified for fixed effects The modification is tested in STATA in accordance with Bhargava (1999) and Baltagi and Wu (1999) who derive a normalized version of the Durbin Watson. STATA manual of Cross-Sectional Time Series, p. 218.

<sup>66</sup> The dependent variable used under the First Difference criteria.

Ohlson Model:	BookValue	Earnings	D1	D2	D3	D4	D5	R <sup>2</sup> .Adj	Durbin Watson
Coefficient	0.41	0.34	-0.52	-0.57	-1.45	1.05	-1.00	0.28	0.27
T-statistic	38.12 *	3.74 *	-14.61 *	-17.71 *	-54.21 *	17.77 *	-13.48 *		
Option 1:	BookValue	EBITDA	D1	D2	D3	D4	D5	R <sup>2</sup> .Adj	Durbin Watson
Coefficient	0.38	0.25	-0.72	-0.64	-1.11	6.57	-1.25	0.19	0.18
T-statistic	28.19 *	4.14 *	-18.39 *	-16.63 *	-18.74 *	30.67 *	-22.80 *		
Option 2:	BookValue	Op.Cash Flow	D1	D2	D3	D4	D5	R <sup>2</sup> .Adj	Durbin Watson
Coefficient	0.44	0.00	-0.14	-0.22	-1.43	1.35	-0.75	0.18	0.18
T-statistic	21.86 *	11.92 *	-5.24 *	-11.62 *	-59.50 *	24.93 *	-6.18 *		
Option 3:	BookValue	Net Cash Flow	D1	D2	D3	D4	D5	R <sup>2</sup> .Adj	Durbin Watson
Coefficient	0.44	0.00	-0.14	-0.19	-1.28	0.84	-0.72	0.16	0.15
T-statistic	22.00 *	-2.41	-4.67 *	-10.45 *	-45.26 *	19.70 *	-5.84 *		
Option 4:	BookValue	Dividends	D1	D2	D3	D4	D5	R <sup>2</sup> .Adj	Durbin Watson
Coefficient	0.43	-21990.81	-0.55	-0.58	-1.37	1.13	-1.00	0.29	0.29
T-statistic	61.99 *	-1.76	-15.93 *	-18.37 *	-49.64 *	21.59 *	-12.50 *		

\* = Significant coefficient under 95%

#### 6.4 Alternative Model for Mexican Data

As observed in Table 6, the independent variables of Operative Cash Flow (Option 2), Net Cash Flow (Option 3) and dividends per share (Option 4) were significant when they were used instead of earnings in the Ohlson model under Panel data. But the Adjusted R<sup>2</sup> parameter of Options 2, 3 and 4 are lower than the Ohlson model. This shows that the accruals are more relevant in Mexican financial statements, but could other information be added to the Ohlson model? In order to answer this question, an alternative model was proposed.

The alternative model to the Ohlson model that this study provides was to add a third independent variable. The accounting idea of adding a third variable was to complement the information considered in the original Ohlson model (book value and earnings). Operative cash flow provides extra information to the model that earnings do not<sup>67</sup>, hence its selection as the third variable to be added<sup>68</sup>. With the operative cash flow variable, the panel data produces better econometric results, as seen in Table 10.

<sup>67</sup> Because of the inherent difference between the Accrual and Cash Basis considerations.

<sup>68</sup> The other variables of Option 1 (EBITDA) and Option 3 (Net Cash Flow) were also tested, and they produced less econometric results to the Ohlson model in terms of the R<sup>2</sup> and coefficient significance (t-statistic).

The original Ohlson model result also appears in this table, in order to compare the higher result in the R<sup>2</sup> statistic<sup>69</sup>.

<b>TABLE 10: ORIGINAL OHLSON MODEL vs. ALTERNATIVE MODEL (full-sample)</b>									
<b>Ohlson Model:</b>	Constant		<b>BookValue</b>		<b>Earnings</b>			R <sup>2</sup> .Adj	Durbin Watson
Coefficient	-0.710		0.422		0.340			0.23	2.19
T-statistic	-47.233 *		41.925 *		4.299 *				
<b>Alternative Model:</b>	Constant		<b>BookValue</b>		<b>Earnings</b>		<b>Op.Cash Flow</b>	R <sup>2</sup> .Adj	Durbin Watson
Coefficient	-0.242		0.422		0.390		5.21E-08	0.67	2.22
T-statistic	-9.912 *		31.647 *		22.986 *		4.178 *		

\* = Significant coefficient under 95%

There are reasons that support the better econometric results of the alternative model, the main one being that the accruals importance in the Mexican accounting system and the extra information under the short term cash flows provide a more complete view of the current and expected operations of the company. The Mexican result differs from the relevance that cash flow has in other countries under regression analysis<sup>70</sup>.

Due to the combination of behaviors inherent in the Mexican stock market, both models (the original Ohlson model and the alternative model) were tested by dividing the sample in two groups of study: (a) tangible versus (b) intangible sector activities<sup>71</sup>.

The results of the two groups of study are shown in Table 11, which shows that the original Ohlson model is not relevant for the tangible Industry and displays autocorrelation problems, but is relevant for the intangible Industry. This result may be explained by the higher increase of the intangible Industry activities than the tangible Industry activities during the study period<sup>72</sup>, and the special attention that the intangible issues received in accounting at the end of the 90's. This effect seems to produce a

<sup>69</sup> The fixed effects studies were not applied in the comparison of models, because the R<sup>2</sup> is not a point of reference.

<sup>70</sup> See Dechow (1994), where the Operative and Net Cash flows are not as relevant as Earnings.

<sup>71</sup> Chapter 5 details the classification criteria.

<sup>72</sup> According with the quarterly PIB information of 1998 to 2003, the tangible industries increased 24% and intangible industries increased 38%.

decrease in the explanation power of the tangible Industry, reflected in both of the original Ohlson model's independent variables.

During the study period, the intangible Industry investment was increased, and that produce a reduction in the tangible Industry. This reduction in the tangible Industry means that book value remained with the historical cost with less or without new investment, and earnings were reduced or even became negative; this is in part the reason why the accounting numbers lost significance.

On the other hand, the alternative model is significant in both industries, and thus provides a better explanation power for the Mexican market characteristics than the original Ohlson model, though the third added variable of operative cash flow is not significant. The non significance of the operative cash flow increases its potential for use as an instrumental variable of earnings in further research.

**TABLE 11: GLS PANEL DATA –TWO GROUPS OF STUDY**

<b>(a) Tangible Industry</b>							
<b>Ohlson Model:</b>	<b>Constant</b>	<b>BookValue</b>	<b>Earnings</b>			<b>R<sup>2</sup>.Adj</b>	<b>Durbin Watson</b>
Coefficient	-1.5536	0.1229	0.006			-	1.561
T-statistic	-2.3339 *	1.1059	0.073			0.001	
<b>Alternative Model:</b>	<b>Constant</b>	<b>BookValue</b>	<b>Earnings</b>	<b>Op.Cash Flow</b>		<b>R<sup>2</sup>.Adj</b>	<b>Durbin Watson</b>
Coefficient	-0.433	0.3789	0.29	3.73E-07		0.104	2.211
T-statistic	-0.8946	4.8189 *	4.441 *	1.477			
<b>(b) Intangible Industry</b>							
<b>Ohlson Model:</b>	<b>Constant</b>	<b>BookValue</b>	<b>Earnings</b>			<b>R<sup>2</sup>.Adj</b>	<b>Durbin Watson</b>
Coefficient	-0.7293	0.5862	0.607			0.361	2.443
T-statistic	-3.8434 *	7.2926 *	4.167 *				
<b>Alternative Model:</b>	<b>Constant</b>	<b>BookValue</b>	<b>Earnings</b>	<b>Op.Cash Flow</b>		<b>R<sup>2</sup>.Adj</b>	<b>Durbin Watson</b>
Coefficient	-1.2134	0.6151	0.724	3.03E-08		0.697	2.243
T-statistic	-7.9282 *	9.8362 *	4.089 *	0.695			
* = Significant coefficient under 95%							

## 6.5 Relation Between Variables of the Alternative Model

Which measure of the alternative model, earnings or operative cash flows, is a better estimate of firm performance as reflected in stock price? Operative cash flows and earnings are set up as competing (non nested) models to explain stock prices. Table 12, shows the comparison between ratios of the three independent variables used in the alternative model. Net cash flow was added to the comparison. We may observe that net cash flow is significant neither in the regression with book value, nor by itself. That means that it does not produce any information that provides a better explanation than earnings. According to the ratios less than one of  $R^2_{OCF}/R^2_E$  and  $R^2_{NCF}/R^2_E$ , which indicates that earnings explain more of the variation in stock prices than cash flows.

<b>TABLE 12. RATIO COMPARISON</b>				
	<b>Independent Variable X</b>			
	<b>Book Value (BV)</b>	<b>Earnings (E)</b>	<b>Operative Cash Flow (OCF)</b>	<b>Net Cash Flow (NCF)</b>
<b>Intercept</b>	-0.69	-1.43	-0.50	-0.51
<b>(t-statistic)</b>	-44.72	-206.38	-35.80	-37.93
<b>Coefficient</b>	0.44	0.51	4.90E-08	-4.21E-08
<b>(t-statistic)</b>	58.30	7.49	7.58	-4.80
<b>Adj. R<sup>2</sup></b>	0.26	0.35	0.02	0.02
<b>Ratios BV</b>		$R^2_E/R^2_{BV} = 1.355$	$R^2_{OCF}/R^2_{BV} = 0.082$	$R^2_{NCF}/R^2_{BV} = 0.080$
<b>Ratios E</b>	$R^2_{BV}/R^2_E = 0.738$		$R^2_{OCF}/R^2_E = 0.061$	$R^2_{NCF}/R^2_E = 0.059$

The proposed alternative model produces better results under the goodness of the model criteria (as seen in Tables 10 and 11) in accordance with the adjusted  $R^2$  of the alternative model, which is 3 times greater than the adjusted  $R^2$  original Olhson model. The parameter significance was also tested under the Wald test<sup>73</sup> and the alternative model produces 3 significant variables that better explain the stock market price.

<sup>73</sup> The Null hypothesis of the Wald test is that every coefficient of the independent variables is 0. The results of the Wald test on both of the models report that Prob > chi2 = 0.000, so the coefficients are significant parameters for the model.

## **6.6 Analysis of the Results and Implications**

The results provided strong evidence<sup>74</sup> that both earnings and book value play an important role in Mexican stock market price. The significance of the original Ohlson model and the alternative model means that there is value relevance in Mexican accounting numbers.

The alternative model provides better statistics than the original Ohlson model. The three independent variables of the alternative model (by adding operative cash flow) are significant and achieved 67% of adjusted R<sup>2</sup> significance instead of the 23% achieved with the original Ohlson model. This result means that the short time performance of the company under the accrual basis of earnings is complemented with the operative cash flow information.

Under the Mexican accounting system, the matching principle of the accrual process is supposed to mitigate timing and matching problems<sup>75</sup> inherent in cash flows, so that earnings more closely reflects firm performance, but there are items affecting actual cash flow from operations, such as non cash revenue and net changes in working capital that are ignored under the earnings calculation. The alternative model of this study provides evidence that the operative cash flow has information content beyond earnings in explaining security returns. The econometric results obtained are generally consistent with both cash flows and earnings providing incremental information *vis à vis* one another.

The results are consistent with the role of accounting accruals in providing a measure of short-term performance that more closely reflects expected cash flows than realized cash flows. In addition, the ability of realized cash flows to measure firm performance improves relative to earnings when operative issues are added to the Ohlson model.

One possible explanation of the superiority of the intangible industry versus the tangible industry in both tested models (the original Ohlson model and the alternative

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<sup>74</sup> According to the content of Tables 9 and 10 under the panel data analysis

<sup>75</sup> In the Mexican GAAP, the matching principle is in Bulletin A-3 regarding “*realización y periodo contable*”, which also includes the accrual basis of accounting.



model) is explained by the valuation criteria in Bulletin C-8 of the Mexican GAAP<sup>76</sup>, that states that developments can be capitalized and impaired, but in the United States GAAP, the criteria to be followed requires them to be expensed. Mexican criteria allow earnings and book values to better represent the real economic picture of the firm, unlike United States companies. According to Barth et al (1998), accruals are good predictors of future cash flows, and thus, of a firm's value. In addition, the decline in the relevance of financial reporting of the tangible industry, and the increase in the relative importance of technology-based industries, also explains the different econometric results for the study time period.

The Mexican data panel of the study is unbalanced, as seen in the yearly observations of Table 3, because not every firm was included in the entire study period, or else the existing data did not comply with the Ohlson model characteristics. But the sample data used provides information of the relevance of accounting variables in Mexican stock market price. It marks the beginning of further research on this data set. The results are also supported by the Mexican General Accounting Accepted Principles, which have been consistent during the period of analysis<sup>77</sup>.

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<sup>76</sup> Since 2003, its application has been mandatory, instead of the criteria published in 1976.

<sup>77</sup> Specially about the restatement process of inflation (Bulletin B10), that since 5<sup>th</sup>.addendum is under the General Index Price application. The B (general issues) and C (for specific issues) Series have seen an increase in the detail of the criteria to follow, but have not required a dramatic change to apply.

### **7.1 Conclusions**

The first conclusion of this exploratory study is that book value and earnings have value relevance in the price of assets in the Mexican stock market.

- Both of the independent variables of the Ohlson model have statistical significance. This means that both have value relevance<sup>78</sup> in Mexican financial statements, and the accruals (considered in earnings) provide more information than cash flow, because the use of EBITDA, Operative Cash Flow and Net Cash Flow showed no significance in the Ohlson model when applied instead of earnings.
- Another important result is that there was no value concentration of book value (as in other stock market studies<sup>79</sup>); both of the independent variables are relevant in the Mexican context.

The second important conclusion is that the Ohlson model can be improved with other independent accounting variables.

- The results show that the Ohlson model cannot be improved by substituting earnings with the following variables: EBITDA, Operative Cash flow, Net Cash Flow and Dividends. The main reason is that earnings include the accrual importance explanation of the financial statements; the other three variables cannot provide the same explanation power of the accruals basis.
- The Ohlson model is improved by adding Operative Cash Flow per share as an independent variable. It provides a better explanation power in terms of the R<sup>2</sup> criteria, besides the effect of including an extra variable.
- In the economical activities test of Tangible and Intangible Industries, the alternative model's variables are significant in both sectors, as opposed to the original Ohlson model's variables, which are significant only in the Intangible Industries.

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<sup>78</sup> Value relevance criteria is referred to the ability of accounting numbers (independent variables) to explain the stock prices in capital markets (dependent variable). The model was tested using the first difference of each variable.

<sup>79</sup> See Dechow (1994) for the United States stock market, and Broedel (2002) for the Brazilian stock market.

## **7.2 Final comments**

This exploratory study evaluated the value relevance of accounting information in Mexico. Using a sample of all the firms traded in the Mexican stock market that fulfill the Ohlson model criteria, it was found that earnings and book value (at the end of each year) have explanatory power on the stock price a quarter later<sup>80</sup>. These results may help us to understand the value relevance of accounting terms for entrepreneurial finance decisions of Mexican public firms.

The study also documents the benefits of accrual accounting, by showing that earnings are a better performance measure than net cash flow or operative cash flow. This is consistent with the accounting theory that states that earnings occupy a central position in financial statements (as the summary measure of a firm's performance). The main explanation is that earnings (under the inherent accrual characteristic) have a higher correlation with value than does current cash flow.

However, theoretical financial models considered that cash flows have more value in valuation models and earnings are used in specific analysis like share valuation or to measure performance in management and debt contracts<sup>81</sup>. With the result of the alternative model tested of this study, we can see that both of these variables (earnings and cash flows) complemented each other for bringing a better analysis of the firms' current performance and both of them have value relevance depending with the study' characteristics in which are used.

The intuitive prior expectations were that earnings (current results) would not have value relevance as book value would. In this study, book value was relevant in OLS regression and in panel data analysis; earnings was relevant only in panel data analysis. This econometrical result emphasizes the additional information that earnings provides the model, besides the net value of the firm's resources primarily in terms of historical costs, and it is largely independent of the success with which the firm currently employs its resources.

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<sup>80</sup> Using the first difference of each variable.

<sup>81</sup> See Dechow, Kothari and Watts (1998).

Additionally, we need to emphasize that this study proposes an alternative model that produces better results than the original Ohlson model. The reason for adding the operative cash flow variable to the original Ohlson model was that the added variable provided additional information that the accruals data (inherent in earnings) does not display. Both models were tested under the tangible and intangible industries classification with significant results in both sectors, unlike the original Ohlson Model. The results, contrary to what is stated in the literature, show that intangible industries accounting has more explanatory power than tangible industries<sup>82</sup>. One of the reasons for this result is that intangible industries in Mexico have higher increase on their operations in the last decade than the tangible, and the models are sensitive to that economical shift behavior<sup>83</sup>.

The purpose of the study was underlying the valuation analysis of the Mexican accounting variables, but the results can be used as the first step of prediction concerns, at least it helps to identify in which companies the accounting information has explanation power in the stock price. This means that the application of the Ohlson and Alternative models brings the orientation of the price expectations for the next year in terms of the sign of the price value annual difference forecast (if it is going to increase or decrease). This is useful for the investors and shareholders because with this information they have one point of reference oriented to the investment decision that they can made.

Both models were tested with the 2004 end information in order to identify the increase or decrease of the Price expected at March 31, 2005 and it was compare with the real Price behavior. The results showed that the Ohlson model brought the same behavior of the Price in 55% of both industries and the Alternative model brought the same behavior of the Price in 53% of the tangible industry´firms and 61% for the intangible industry´firms. The price in the market is defined by the demand and supply of the future benefits of each firm and the reactions are based on the available information (financial and non financial) and speculation. The Ohlson model and the Alternative

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<sup>82</sup> See Collins, Maydew, and Weiss (1997) and Broedel (2001).

<sup>83</sup> The accounting impact of these behaviors is analyzed on page 51 of this study.

model don't provide prediction power, they help to identify in which companies the accounting information of the Book value and Earnings is relevant (explanation power) on the behavior of the price.

Other contribution of the study consists of providing evidence of using unbalanced fixed effect and dummies panel data analysis in the Ohlson model reference with the Mexican data<sup>84</sup>.

### **7.3 Further research lines**

In this research study, an alternative model is proposed as a better option to the Ohlson model's econometric results for Mexican data. However, it is not the only option to consider; there are other variables that may be used and studied with Mexican stock market information. Further work might refer to the *Economática* data base in order to increase our understanding of the determinants of accounting relevance. Possible extensions are:

- To consider Economic Value Added (EVA) per share instead of earnings per share<sup>85</sup>.
- To consider comprehensive income per share instead of earnings per share<sup>86</sup>.
- To apply censored criteria using instrumental variables that could be non-financial data, as in Amir and Lev (1996) or Riley, Pearson and Trompeter (2003).
- The testing of the feasibility of the use of dynamic panel data.
- To make comparisons of results with USA or Canadian data for the same periods of time; specially, to focus on the period before and after the NAFTA agreement. To make comparisons with a different accounting system, such as the German one.
- To test the Feltham-Ohlson model for the Mexican companies that quoted in the United States market and which data is available on the annual Compustat, monthly Center for Research in Security Prices (CRSP) data base. And we could compare the results of the Feltham-Ohlson model versus the Ohlson model as Segal and Callen (2005) did.

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<sup>84</sup> There are few studies that apply the Panel data analysis with the Ohlson model, one of them is Nacer and Goaid (2004) using Random effects.

<sup>85</sup> See Biddle, Bowen, and Wallace (1997), who found that EVA is more highly associated with stock returns and firms values than accrual earnings.

<sup>86</sup> See Dhaliwal, Subramanyam, and Trezevant (1999), who found that comprehensive income is superior for financial firms. In Mexican GAAP, Bulletin B-4 has followed the criteria of SFAS-130 since 2001.

- To continue the research analysis oriented to the prediction focus, using returns and Fama and French (1992) approach.
- To apply other analysis technique to the Mexican data, per example Event Study for the difference between the date of published and the impact of it on the price.
- To extend the study including extern factors (specially macroeconomic and the United State influence on the Mexican economy and on the Stock Market).

Research on these topics would increase understanding of the impact of Mexican accounting information and disclosures on indicators of economic performance.

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<sup>87</sup> SSRN = Social Science Research Net-Abstract Database at [www.ssrn.com](http://www.ssrn.com)

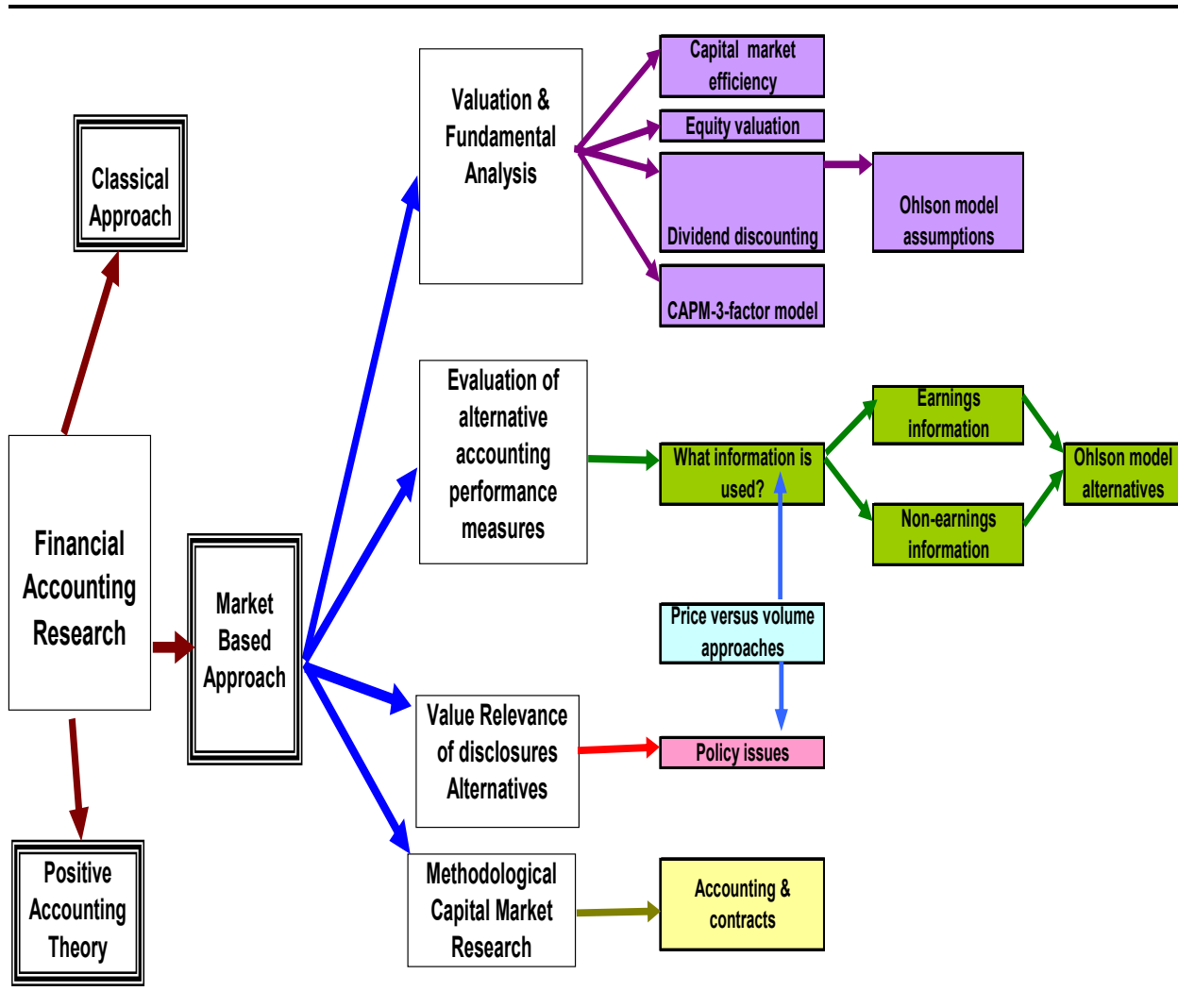


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**APPENDIX 1- Chronological relation of references of Marketing Accounting Research**

Field reference of the study:



Main chronological references and applications of the Ohlson model used in the study.

YEAR	PAPER	AUTHOR(S)	FIELD	APPROACH	FOCUS	MAIN POINTS	
1961	The theory and measurement of business Income	Edwards & Bell	Evaluating accounting information	Classical Approach	Valuation role of variables	Evaluation of how close reported information comes to some preconceived "true" picture of the firm	
1966	Accounting, Evaluation and Economic Behavior	Chambers		Classical Approach			
1970	Theory of the measurements of enterprise Income	Sterling		Classical Approach			
1968	An empirical evaluation of Accounting Income numbers	Ball and Brown		Valuation models & Evaluating accounting information		Market based Approach	First proxy of the association between price (returns) of a firm's securities and the accounting earnings of the firms.
1991	The valuation of R&D limited partnerships	Shevlin					Association of the book value with the stock price, assuming that measures of assets and liabilities imply the expected results of future activities
1998	Relative valuation roles of equity book value and net income as a function of financial health	Barth, Beaver and Landsman					The role of accounting accruals
1994	Accounting earnings and cash flows as measures of firm performance	Dechow					Valuation models & Evaluating accounting information
1995	Earnings, book values and dividends in security valuation	Ohlson	Valuation models & Evaluating accounting information	Market based Approach	Dividend discounting model under residual income valuation assumptions		
<b>EMPIRICAL APPLICATIONS OF THE OHLSON MODEL</b>							
1999	An empirical assessment of the residual income valuation model	Dechow, Hutton and Sloan	Abnormal earnings approach	Market based Approach-US DATA	<b>PREDICTION &amp; VALUATION</b>	Cross-sectional analysis. They use the analysts predictions of earnings with a 12% of cost of capital for all the companies	
2001	Linear information models in residual income based valuation	Choi, O'Hanlon and Pope		Market based Approach-US DATA		Cross-sectional analysis. They use the analysts predictions of earnings and the cost of capital is between 10-14% for all the companies and free risk rate is plus 5%	
2001	The explanatory and predictive power of different specifications of the Ohlson valuation models	McCrae and Nilsson		Market based Approach-Sweden DATA		Cross-sectional analysis. They use the analysts predictions of earnings and the cost of capital is different for each firm and the free risk rate is minus 4%	
2002	A test of the Ohlson model: empirical evidence from Japan	Ota		Market based Approach-Japan DATA		Time series. He provides a correlation adjustment to the assumptions.	
2001	A linear linear accounting valuation model	Callen and Morel		Market based Approach-US DATA		Time series and add a extra risk per industry.	
1997	Change in the value relevance of earnings and book values over the past forty years	Collins, Maydew and Weiss		Current earnings approach		Market based Approach-US DATA	<b>VALUATION</b>
1999	Equity valuation and negative earnings	Collins, Pincus and Xie	Market based Approach-Selected European countries DATA		The role of book value of equity		
2000	Country-specific factors related to financial reporting and the Value Relevance of Accounting data	Ali and Hwang	Market based Approach-Finnish DATA		They identified strong relationships between the value relevance of the accounting variables with country specific factors.		
2000	Stock market trading strategies based on earnings and cash flows in Finland: alternative risk-adjusting approach	Kallunki	Market based Approach-China DATA		The use of accounting variables as risk measures		
2001	The nature of information in accruals and cash flows in an emerging capital market: the case of China	Haw, Qi and Wu	Market based Approach-Brazil DATA		Emphasis on the information between accruals and cash flows		
2002	The Value Relevance of Brazilian Accounting Numbers: an empirical Investigation	Broedel			Focusing on ownership concentration as the most relevant factor influencing earnings quality		

## APPENDIX 2- Main General and specific Accounting considerations in Mexican Financial Statements

The major accounting approaches employed by Mexican companies can be summarized as follows<sup>88</sup>:

### General Items Accounting Policies Characteristics:

**Statement of cash flows:** the statement of changes in financial position is required under the indirect method, and the statement of cash flows must be disclosed as principal information. The classification used is the standard one separating cash equivalents in operating, investing and financing activities, though the components and process are different in each method.

**Extraordinary items, prior period adjustments, changes in accounting policy and accounting estimates:** these items (net of income tax) must be segregated from income from ordinary operations and must be reported as a separate line item in the income statement. These events must be unusual in nature and not be expected to occur frequently, as well as being material in nature. The effects of changes in the accounting practices are classified in the income statement as special or extraordinary items.

**Post period events:** these should be disclosed if significant. No adjustments to financial statements are required.

**Segment reporting:** information by segment has been required since 2004 under Bulletin B5, which adheres to the managerial focus of the United States Standard (SFAS-134).

Certain disclosures are required in explanatory notes, primarily:

The financial statements are restated by the use of the General Price Index (Bulletin B-10). There is a monetary result position at the end of each period in the

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<sup>88</sup> In accordance with the General Accounting Accepted Principles of Mexico, listed in Bulletins Series B (for general items) and Series C (for specific items). For more information, please refer to the 20<sup>th</sup> edition of Mex-GAAP (2004).

income statement. The initial effect of restatement appears in the balance sheet as an item of equity.

Retirement benefits: the method used is the projected unit credit method. The total cost is the entire periodic change in the plan liabilities less assets, aside from certain changes not fully recognized.

Foreign exchange: these are recorded in domestic currency at the exchange rate on the transaction date. Monetary items should be adjusted to reflect the exchange rate. These items are to be presented in the income statement.

Business combinations: since 2004, Mexico has had rules formulated under the same criteria as the International Accounting Standards. Joint ventures: the assets and liabilities, revenues and expenses are recognized proportionally to the equity interest of each investor and consolidated in their respective financial statements.

Consolidation: consolidation is required for publicly-held companies, including joint ventures and holding companies which retain investments in publicly-held companies under the equity method.

#### Specific Items Accounting Policies Characteristics:

Inventory: the lower of acquisition cost or market value. Finished goods and work in progress are stated at the lower of production cost or market value. Agricultural and minerals are carried at market values when reliable values are available. Obsolete items should be carried by their realizable value. Cost refers to all applicable expenditures and charges directly or indirectly incurred in bringing an item to its existing condition and location. Cost can be determined based on a FIFO, LIFO or average cost method.

Depreciation: no specific depreciation method is recommended but any method chosen must be applied consistently. The useful lives of the assets and the depreciation rates should be revised. However, enterprises usually adopt fiscal rates. Since 2004, all fixed assets need to be tested under impairment treatment.

Research and Development Expenses: all development issues are deferred assets and research issues are expensed in the income statement. These costs must be valued at cost less impairment.

Contingencies: these must be accrued when the likelihood of their occurrence is considered probable and when their value can be reasonably estimated. Gains contingencies should not be accrued in the financial statements, but disclosure is recommended.

Income Taxes: the liability method should be used and a deferred tax liability should be recognized in relation to all taxable temporary differences.

Construction contracts: there are three methods that can be used. Percentage of completion, completed contract and the installment method can be used for contracts with an expected completion period of greater than 12 months. If the contract income cannot be reliably measured, revenue is recognized to the extent of costs incurred that are recoverable.

Property, plant and equipment: these should be recorded at historical costs, including those financing costs directly attributable to the contract. Revaluation above historical cost is permitted, and revaluation reserve is credited as equity. There are no specific requirements for real estate investments. A provision for devaluation may be required if the carrying amounts are higher than the realization amounts.

Leases: all leases are considered to be operating leases. Sales revenue in a sale and leaseback transaction are recorded at nominal value, regardless of the circumstances.

Financial Instruments and Derivatives: since 2004, Mexico has followed the valuation and disclosures procedure in accordance with Bulletin C-10 (similar to the United States criteria in SFAS-133).

**APPENDIX 3 - Used Companies listed in the Mexican Stock Exchange**

LIST OF COMPANIES USED IN THE STUDY			
NAME	Specific Economic Sector	Sector N.	Industry
Accel S.A. B	Administrative and Support Services	3	Intangible
Acer Latinoamerica	Computer and Peripheral Equipment Manufacturing	2	Tangible
Agro Ind Exportador A	Crop Production	5	Tangible
Alfa S.A. A	Forging and Stamping	2	Tangible
Alsea	Food Manufacturing	2	Tangible
Altos Hornos de Mex	Iron and Steel Mills and Ferroalloy Manufacturing	2	Tangible
America Movil L	Telecommunications	3	Intangible
America Telecom A1	Telecommunications	3	Intangible
Apasco S.A.	Cement and Concrete Product Manufacturing	2	Tangible
Ara Consorcio	Residential Building Construction	2	Tangible
Arca Embotelladora	Beverage Manufacturing	2	Tangible
Argos Embotelladora B	Beverage Manufacturing	2	Tangible
Aristos Consorcio A	Traveler Accommodation	3	Intangible
ASureste B	Support Activities for Air Transportation	3	Intangible
Autlan Cia. Minera B	Metal Ore Mining	5	Tangible
Bachoco Industrias UBL	Poultry and Egg Production	2	Tangible
Bafar Grupo B	Animal Slaughtering and Processing	2	Tangible
Banamex Accival GF O	Banks (Depository Credit Intermediation)	4	Intangible
Bimbo Gpo A	Bakeries and Tortilla Manufacturing	2	Tangible
Biper S.A de C.V. B	Telecommunications	3	Intangible
Bufete Industrial CPO	Heavy Construction	2	Tangible
Cablevision CPO	Cable Networks and Program Distribution	3	Intangible
Camesa Gpo Ind	Spring and Wire Product Manufacturing	2	Tangible
Carso Global Teleco A1	Telecommunications	3	Intangible
Cementos Chihuahua	Cement and Concrete Product Manufacturing	2	Tangible
Cemex S.A. CPO	Cement and Concrete Product Manufacturing	2	Tangible
Cid Mega Resort	Traveler Accommodation	3	Intangible
Cintra S.A. A	Scheduled Air Transportation	3	Intangible
Coca Cola Femsa L	Beverage Manufacturing	2	Tangible
Collado S.A.	Wholesale Trade, Durable Goods	1	Tangible
Comercial Mexicana UBC	General Merchandise Stores	1	Tangible
Continental Grupo	Beverage Manufacturing	2	Tangible
Control de Farmacia B	Health and Personal Care Stores	1	Tangible
Convertidora Ind. B	Plastics Product Manufacturing	2	Tangible
Corp Durango A	Paper Manufacturing	2	Tangible
Corp Interam de Ent B	Amusement, Gambling, and Recreation Industries	3	Intangible
Corp Mex Restaurant B	Food Services and Drinking Places	3	Intangible



Corp Moctezuma	Cement and Concrete Product Manufacturing	2	Tangible
Covarra Grupo	Fabric Mills	2	Tangible
Cydsa S.A. A	Basic Chemical Manufacturing	2	Tangible
Dermet de Mexico SA B	Chemical and Allied Products Wholesalers	1	Tangible
Desc Soc Fom Ind B	Other General Purpose Machinery Manufacturing	2	Tangible
Diana Editorial A	Newspaper, Periodical, Book, and Database Publishers	2	Tangible
Dina Grupo	Motor Vehicle Manufacturing	2	Tangible
Dixon Ticonderoga	Other Miscellaneous Manufacturing	2	Tangible
Duty Free SA de CV	Other General Merchandise Stores	1	Tangible
Ece S.A.	Food Services and Drinking Places	3	Intangible
Edoardo S.A. B	Apparel Manufacturing	2	Tangible
Ekco	Forging and Stamping	2	Tangible
Elektra Gpo	General Merchandise Stores	1	Tangible
Embot Valle Anahuac B	Beverage Manufacturing	2	Tangible
Empaques Ponderosa B	Pulp, Paper, and Paperboard Mills	2	Tangible
Far-ben B	Health and Personal Care Stores	1	Tangible
Fomento Econ Mex UBD	Beverage Manufacturing	2	Tangible
Fragua Corporativo B	Health and Personal Care Stores	1	Tangible
GAccion B	Real Estate	3	Intangible
GAzucarero Mex B	Sugar and Confectionery Product Manufacturing	2	Tangible
GCarso A1	Management of Companies and Enterprises	3	Intangible
GCorvi UBL	Grocery and Related Product Wholesalers	1	Tangible
GEmb Unidas B	Beverage Manufacturing	2	Tangible
General de Seguros A	Insurance Carriers	3	Intangible
Geo Corporacion B	Residential Building Construction	2	Tangible
GFBanorte O	Banks (Depository Credit Intermediation)	4	Intangible
GFBBVA Bancomer B	Banks (Depository Credit Intermediation)	4	Intangible
GFBital O	Banks (Depository Credit Intermediation)	4	Intangible
GFGBM O	Securities, Commodity Contracts, and Other Financial Investments and Related Activities	4	Intangible
GFINbursa O	Securities, Commodity Contracts, and Other Financial Investments and Related Activities	4	Intangible
GFIinteracciones O	Securities, Commodity Contracts, and Other Financial Investments and Related Activities	4	Intangible
GFMultiva O	Securities, Commodity Contracts, and Other Financial Investments and Related Activities	4	Intangible
GIconsa	Heavy Construction	2	Tangible
Gigante Gpo	General Merchandise Stores	1	Tangible

GInd Saltillo	Clay Product and Refractory Manufacturing	2	Tangible
GMacma, S.A. B	Bakeries and Tortilla Manufacturing	2	Tangible
GMarti S.A.	Sporting Goods, Hobby, and Musical Instrument Stores	1	Tangible
GMex Desarrollo B	Heavy Construction	2	Tangible
GMexico B	Mining (except Oil and Gas)	5	Tangible
GModelo C	Beverage Manufacturing	2	Tangible
GModerna	Other Food Manufacturing	2	Tangible
GNacional Provincia	Insurance Carriers	3	Intangible
Gomo Gpo	Electrical Goods Wholesalers	1	Tangible
GPalacio de Hierro 1	Department Stores	1	Tangible
GpoFinancFinamex O	Banks (Depository Credit Intermediation)	4	Intangible
GProve Quim B	Chemical and Allied Products Wholesalers	1	Tangible
Gruma S.A. de C.V. B	Grain and Oilseed Milling	2	Tangible
GSanborns B-1	Other General Merchandise Stores	1	Tangible
Herdez S.A.	Fruit and Vegetable Preserving and Specialty Food Manufacturing	2	Tangible
Hilasal Mexicana A	Fiber, Yarn, and Thread Mills	2	Tangible
Hogar Consorcio B	Residential Building Construction	2	Tangible
Hylsamex L	Steel Product Manufacturing from Purchased Steel	2	Tangible
ICA Soc Controlad	Heavy Construction	2	Tangible
Imsa Gpo UBC	Iron and Steel Mills and Ferroalloy Manufacturing	2	Tangible
Ind. Automotriz S.A	Motor Vehicle Parts Manufacturing	2	Tangible
Industrias CH B	Cutlery and Handtool Manufacturing	2	Tangible
Inter de Ceramica ULD	Clay Product and Refractory Manufacturing	2	Tangible
Invex Gpo Fin O	Banks (Depository Credit Intermediation)	4	Intangible
Iusacell Gpo	Telecommunications	3	Intangible
Ixe Gpo Financiero O	Banks (Depository Credit Intermediation)	4	Intangible
Kimberly Clark Mex A	Converted Paper Product Manufacturing	2	Tangible
Lamosa Gpo B	Clay Product and Refractory Manufacturing	2	Tangible
Liverpool Puerto de 1	Department Stores	1	Tangible
Maizoro SA de CV	Grain and Oilseed Milling	2	Tangible
Maq Diesel S. A. B	Machinery, Equipment, and Supplies Wholesalers	1	Tangible
Maseca GI B	Grain and Oilseed Milling	2	Tangible
Medica Sur B	General Medical and Surgical Hospitals	3	Intangible
Minsa S.A. C	Grain and Oilseed Milling	2	Tangible
Nadro S.A. B	Farm Product Raw Material Wholesalers	1	Tangible
Nutrisa Gpo	Specialty Food Stores	1	Tangible
Opcap B	Management of Companies and Enterprises	3	Intangible

Parras Cia Indus	Fabric Mills	2	Tangible
Patria Reasegurador A	Insurance Carriers	3	Intangible
Penoles Industrias	Mining (except Oil and Gas)	5	Tangible
Pepsigx (Gemex) CPO	Beverage Manufacturing	2	Tangible
Planeacion y Proyec B	Heavy Construction	2	Tangible
Posadas Gpo L	Traveler Accommodation	3	Intangible
Procorp S.A. B	Administrative and Support and Waste Management and Remediation Services	3	Intangible
Q.B. Industrias A	Basic Chemical Manufacturing	2	Tangible
Qumma Gpo, S.A. de B	Newspaper, Periodical, Book, and Database Publishers	2	Tangible
Radio Centro A	Radio and Television Broadcasting	3	Intangible
Regio Empresas B	Basic Chemical Manufacturing	2	Tangible
Saba Casa Grupo	Farm Product Raw Material Wholesalers	1	Tangible
San Luis Corp CPO	Machinery Manufacturing	2	Tangible
Santander Serfin GF B	Banks (Depository Credit Intermediation)	4	Intangible
Sare B	Nonresidential Building Construction	2	Tangible
Savia A	Oilseed and Grain Farming	5	Tangible
Seguros Com America A	Insurance Carriers	3	Intangible
Sidek Grupo B	Traveler Accommodation	3	Intangible
Simec Grupo B	Architectural and Structural Metals Manufacturing	2	Tangible
Situr Grupo B	Traveler Accommodation	3	Intangible
Soriana Organizacio B	General Merchandise Stores	1	Tangible
Synkro Industrias A	Apparel Knitting Mills	2	Tangible
Tekchem S.A. A	Paint, Coating, and Adhesive Manufacturing	2	Tangible
Telefs de Mex L	Telecommunications	3	Intangible
Televisa Gpo CPO	Radio and Television Broadcasting	3	Intangible
TMM Grupo A	Support Activities for Transportation	3	Intangible
Tribasa Grupo	Heavy Construction	2	Tangible
Tubos de Acero Mex	Steel Product Manufacturing from Purchased Steel	2	Tangible
TV Azteca CPO	Radio and Television Broadcasting	3	Intangible
Unefon A	Telecommunications	3	Intangible
Union de Capitales B	Management of Companies and Enterprises	3	Intangible
Universidad CNCI B	Electronics and Appliance Stores	1	Tangible
US Commercial B-1	Electronics and Appliance Stores	1	Tangible
Valle Jugos del B	Beverage Manufacturing	2	Tangible
Value GF O	Securities, Commodity Contracts, and Other Financial Investments and Related Activities	4	Intangible
Vitro A	Glass and Glass Product Manufacturing	2	Tangible
Wal Mart de Mexico V	General Merchandise Stores	1	Tangible

<b>NOT USED IN THE STUDY</b>			
<b>NAME</b>	<b>Specific Economic Sector</b>	<b>Sector N.</b>	<b>Industry</b>
A C Mexicana B1	Agriculture, Construction, and Mining Machinery Manufacturing	2	Tangible
Almacenadora Acce	Warehousing and Storage	3	Intangible
Arabela	Chemical Manufacturing	2	Tangible
Campus S.A. A	Greenhouse, Nursery, and Floriculture Production	5	Tangible
Cbi Gpo Fin B	Securities, Commodity Contracts, and Other Financial Investments and Related Activities	4	Intangible
Chedraui Grupo	Other General Merchandise Stores	1	Tangible
GEI Asturiano 2	Fabric Mills	2	Tangible
GFScotialInverlat B	Banks (Depository Credit Intermediation)	4	Intangible
GNP Pensiones	Insurance Carriers and Related Activities	3	Intangible
GSerfin Gpo Fin L	Banks, Credit Intermediation and Related Activities	4	Intangible
Homex Desarrollador	Residential Building Construction	2	Tangible
Hoteles	Accommodation	3	Intangible
Iem S.A. B	Household Appliance Manufacturing	2	Tangible
Latinoamericana Seg	Insurance Carriers	3	Intangible
Mexichem S.A. de C. A	Resin, Synthetic Rubber, and Artificial and Synthetic Fibers and Filaments Manufacturing	2	Tangible
Perkins Motores B	Engine, Turbine, and Power Transmission Equipment Manufacturing	2	Tangible
Plavico, S.A. de C.	Basic Chemical Manufacturing	2	Tangible
Qtel S.A. B	Rail Transportation	3	Intangible
Real Turismo A2	Traveler Accommodation	3	Intangible
Tenedora US B-1	Electronics and Appliance Stores	1	Tangible
Urbi Desarrollos	Residential Building Construction	2	Tangible