UNIVERSITAT DE BARCELONA

Essays on the Mexican Stock Market

César Amador Ambriz

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PhD in Economics | César Amador Ambriz

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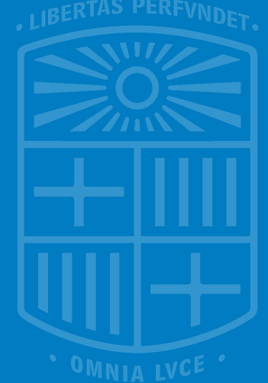

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A mi familia

Lo peor y lo mejor de ser un obrero de la pasión,
es que los frutos dolorosos de tu poca o mucha inteligencia
son tu único, tu verdadero salario.
Mercedes Oliver

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Por mi propio derecho y para los fines legales a que haya lugar, de conformidad con lo dispuesto en el Artículo 19, Fracción XI, del Reglamento de Becas del CONACYT y el Reglamento de Operación del PRODEP, agradezco a estas dos instituciones el apoyo financiero brindado, haciendo mención del crédito respectivo para la realización de los estudios del programa de Doctorado en Economía y el presente trabajo de Tesis. Agradezco también el apoyo brindado por la Universidad Autónoma del Estado de Hidalgo. Se da cumplimiento así a lo convenido en los contratos respectivos y al objeto de los apoyos.

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General Introduction

Raising living standards has been the focus of economic development theories, in this regard there is a whole range of analysis and proposals that countries can adopt to accelerate the rates of economic growth, reduce poverty levels, and create more and better employment opportunities. But to achieve these goals, according to Meier (1989), countries will have to eliminate what he calls the four constraints for development:

1. Low savings[1].

2. Foreign Exchange Constraint

3. The low level of agricultural development

4. Underdevelopment of human resources.

Eliminating such restrictions in various fronts, will contribute to economic development. To this end, financial sector reforms can be linked to strategies to eliminate or alleviate the first two restrictions. The fundamental aspect of financial reform is to mobilize more resources through savings and in turn, funding the most attractive investments.

In Mexico financial liberalization policies were designed to eliminate the so-called problem of financial repression[2] and left the resource allocation to market forces. In order to reform the financial sector, several measures were undertaken, the liberalization of interest rates, the reduction of reserve ratios, and the elimination of discretionary allocations of credit; in Mexico these measures were further complemented with bank privatization (Hernandez-Murillo, 2007). After implementing the macroeconomic stabilization policies, several countries have undertaken measures to liberalize trade and the capital account in order to achieve greater efficiency and economic growth.

[1] ... a vicious circle of poverty that runs from low real income to low savings to low investment to low productivity and then back to low real income (Meier, 1989, p. 64).

[2] The term "financial repression" was coined by McKinnon (1973) and Shaw (1973) and is defined as follows: “When governments tax and otherwise distort their domestic capital market, the economy is said to be financially repressed”.

With all these measures, there was a large capital inflow to Mexico. However, after the 1994 crisis, the country lost its attractiveness to investors. The rise of other emerging markets, the lack of confidence in the Mexican economy, weak institutions to protect investors' rights, unethical practices and corporate scandals within the country, finally undermined its position in international portfolios.

Economic literature provides different perspectives on the theoretical link between financial development and economic growth and there is still a lively debate on whether financial liberalization measures accelerate growth; or, the sector's development is simply a consequence of economic growth that creates a demand for more sophisticated financial products. Until now, the empirical evidence remains mixed.

The literature identifies four perspectives regarding the direction of causality between financial sector development and economic growth. The first of these postulates that improved financial intermediation contributes to the growth in two ways: a) improving the accumulation and the marginal productivity of capital, b) increasing the rate of savings and investment. The most well-known proponents of this position are McKinnon (1973) and Shaw (1973). The second corresponds to the case where causality goes from the economy to the financial sector (Robinson, 1952). The third says that causality is bidirectional, Demetriades and Hussein (1996), Greenwood and Smith (1997). Finally, the fourth corresponds to the Lucas critique (1988), stating that there is no causality.

Tests done in developing countries to determine causation are not entirely conclusive, mainly due to lack or insufficient data, Wolde-Rufael (2009), Ortiz et al (2002), Federici and Caprioli (2009), Hondroyiannis and Lolos (2005). Usually the econometric technique utilized to test causality relies on Vector Error correction (VEC) or Vector Autoregressive (VAR) models that with a limited number of observations, the degrees of freedom of the model rapidly diminish. Therefore it forced to include only the most relevant variables; or to use quarterly or monthly data, or explore this relationship using panel data models, Demetriades and Hussein (1996), Baltagi et al (2009), Pradhan et al (2015).

The objective of the first chapter is to determine if in México the financial sector causes economic growth as postulated in the "supply leading

hypothesis" of McKinnon (1973) and Shaw (1973). To test this hypothesis, a VEC model is employed using a longer period, from 1960 to 2013. The results of an Autoregressive Distributed Lag (ADL) model are presented as well as super exogeneity tests, developed by Pesaran et al (2001) and Engle & Hendry (1993) respectively; both barely used in this context with the notable exceptions of Ang (2008) and Yang & Hoon-Yi (2008).

The motivation to utilize VEC and ADL models is to contrast the results of both, and denote the superiority of the second, in terms of parsimony, simplicity, robustness and capability to explain satisfactorily the dependent variable; because in detriment of VEC estimates, they usually present low R^2.

According to the results, VEC and ADL models confirm that the stock market causes economic growth, whereas only the VEC estimates confirm that banks contribute to growth. Causality is unidirectional.

The second chapter of this work analyzes the impact in profitability of affiliated firms to a business group and listed in the Mexican stock exchange. The aim of this chapter is twofold: a) provide evidence if affiliated firms are more profitable and b) if firms belonging to a business group carry out the rent extraction practice known as tunneling.

Early analyses on the subject were made with cross sectional models but the trend quickly moved to the usage of panel data Lemmons and Lins (2003), Santiago-Castro and Brown (2007), although limiting the sample of companies from each country or varying the number of countries.

Other studies have focused on single country analysis, but have included a greater number of firms Pombo and Gutierrez (2011), Liu and Hyan (2008). The case of Mexico has been studied by Castaneda (2002) and Chong et al (2009), but their work has considered a short period of time or included a small sample of firms.

This work presents evidence from a large data collection covering all the firms still and once listed in the local stock market from 1990 to 2012. Consequently, is important to mention that an unbalanced panel is utilized, and to avoid endogeneity bias the Generalized Method of Moments of

Arellano & Bond (1991) and Blundell & Bond (1998) that allow the use of instruments is employed.

Corporate governance is related with a firm's policies to achieve its profitability goals, or in other words, is the way a firm establishes how to generate and distribute profits. The pioneering work of Jensen and Meckling (1976) determined that when separation of ownership and control takes place, agency problems arise and that the plundering of resources reduces the value of the firm. This may occur if a manager diverts resources to purposes other than profit maximization. In OECD (2004) and Francis et al (2013), the positive influence of good corporate governance on company performance, and therefore on economic growth, is also evident. Limiting rent extraction in listed firms is a desirable objective because can result in improved performance and therefore induce economic growth, Maher and Andersson (2000), OECD (2004). In this respect, Claessens and Yurtoglu (2013) concluded that better corporate governance mechanisms increase access to external financing, leading to more investment, more growth and hence more employment. So, if the stock market can spur growth, then one way to achieve it comes from the improvements to corporate governance of firms, IMF-World Bank (2013). This is also important considering that private pension funds are now allowed to include shares in their portfolios. This is the connection between the issues analyzed in chapters 1 and 2.

In the economic literature, business groups can be seen as ''paragons'' or ''parasites'' (Khanna and Yafeh, 2007), which means that affiliated firms may yield an acceptable payout to their minority shareholders or may have a rent seeking behavior in detriment to them. This organizational behavior is related with the governance mechanisms of the firm.

According to the results, firms affiliated to business groups tend to have higher levels of profitability, however during recessions they carry out the practice of tunneling. Although this is undesirable, is pertinent to say that this phenomenon is not permanent.

The Third chapter of this thesis is related with price discovery. In financial econometrics there are two branches related with the modeling of prices of financial assets: price discovery and price predictability Narayan and Smyth

(2015). The first is related to the analysis of transmission of information within or across markets and how information is incorporated into share prices, for citing one example: sometimes in the commodities markets, the futures' prices drive the formation of spot prices, or vice versa. If the information in other variables affects stock prices, then those variables can be used as predictors. Models focused on price predictability can use those variables to assist investors to make better informed decisions. In other words price predictability models have been focused on stock returns, both using past returns and incorporating other variables, or, in the terminology of Fama and French (1993), other "factors".

Looking back to Fama & Macbeth (1973), their attempt to empirically validate the CAPM was conducted 1) estimating a time series regression using the market model, and then 2) performing a cross section regression to obtain the market risk premium of shares. Since the results were not inconclusive, other factors were incorporated in addition to Beta following those steps, Fama & French (1992) and Fama & French (1993). Since then, other works had tried to demonstrate the superiority of their factors. And the quest for the Holy Grail began!

Regarding step 1, most of the research done is circumscribed to incorporate other factors in addition to index market returns to improve the regression results. A classical example of this corresponds to Fama and French (1993). Then follows that the task within price predictability has been to successfully incorporate those factors to the unconditional and conditional CAPM. For example Subramayan (2010) documented over fifty variables, highlight expected inflation, interest rates, output gap, consumer confidence, term spreads, default spreads, etc., besides the most known factors as Size, Momentum, B/M ratio. For recent research with a focus on emerging markets we have Soon-Ho et al (2012), Harshita & Yadav (2015) and Bajpai & Sharna (2015).

In other lines of research, if Beta is stable we are talking about the unconditional CAPM; if the reported Beta exhibits a time varying pattern then we are talking about the conditional CAPM, where most of the new techniques have been applied, Subramayan (2010), Narayan and Smyth (2015). Within the analysis of conditional Beta models, two approaches can be distinguished: a) beta can be regarded as a function of time, neglecting

any economic influence on changing betas; and b) betas can be affected by some relevant economic variables, Cai et al (2015).

Concerning step 2, the cross section regression presents other drawbacks that will not be addressed other than mentioning that up to this point, quantile regression seems to be the most suitable econometric technique to deal with nonlinearity of the risk premium.

The problems to validate the CAPM still continue in the step 1, (that may difficult the estimation of step 2). Since the early work of Jensen (1968) until very recent papers Bajpai & Sharna (2015), Soon-Ho et al (2012), the most notorious weakness are: a) low R^2, b) possibility of non-normality of residuals, c) undesirable effects of outliers. In the cases when the stock market return is the only explanatory variable, these problems may become acute, that's why other factors were incorporated.

The Transfer Function Model (TFM) never has been employed in the analysis of CAPM, so this paper is the first work that attempt to apply this econometric technique. In this regard, the objective of chapter 3 is to present evidence that market return is the only pricing factor needed for modeling stock returns.

The TFM is a mix of ARIMA and structural regression models, developed by Box and Jenkins (1976) and enriched by the contributions of Liu and Hanssens (1982), Liu (1991), Liu et al (2010). This model was designed to exploit the structure of current and lagged information of one explanatory variable and the ARIMA terms.

Those who have tried to model stock returns, will immediately agree that, in using either structural or univariate ARIMA models, it is very difficult to achieve an acceptable adjustment between estimated and observed data, especially if the data corresponds to emerging markets.

As a contribution, this work can offer a new methodology for price discovery that improves the market model estimations in step 1, which are necessary for the validation of CAPM in step 2; or to provide accurate predictions or be used on Value at Risk (VaR) where Beta is necessary to gauge the incremental VaR, but you better judge the results.

The graphs in chapter three show the adjustment achieved using TFM, employing only one factor (IPC, the market index) as explanatory variable and the ARIMA terms. For the modeling of monthly returns, the longest data set available is employed (June 1997 to April 2015); with the last six observations are reserved for the out-of-sample forecasting (May to October 2015).

Thus, this work can be seen as a collection of three papers analyzing several facets of the Mexican stock market, each of them with their own objectives, hypothesis and methodology, with particular and general conclusions presented respectively.

Chapter 1: The Stock Market and Economic Growth in Mexico

Section I: Introduction

Generally, banks have been the predominant activity in comparison with other financial activities, therefore the stock markets were not recognized as promoters of growth. This work is intended to present evidence that the stock market can contribute to economic growth in Mexico.

The causal relationship between financial activities and economic growth, still presents mixed results. The vector error correction model (VECM) is the most used econometric technique to establish the direction of causality. In this context, the Autoregressive Distributed Lag Model (ADL) and superexogeneity tests are barely used.

Mexico has been studied mainly in panel data models, and consequently shorter time periods are covered. For example Baltagi et al (2009), covered a time span from 1980 to 2003, they used for their analysis bank credit to private sector and stock market capitalization as percentage of GDP. For emerging countries before 1980, there is no information for the latter variable, which drastically limits the number of observations available. However the value of stocks traded can be tracked several years before that date. In fact this analysis is performed considering a yearly time series from 1960 to 2013.

Ortiz et al (2007) employed a bivariate VECM to assess the impact of Mexico's stock market on its economy using the Stock Market Index and data on Industrial Production. They utilized monthly data from 1978 to 2002 and detected a bidirectional causality. Levine and Zervos (1995) recommended that the value of stocks traded (as percentage of GDP) is a better predictor of economic activity than other stock market variables. Demetriades and Hussein (1996) stated that it is preferable to conduct this analysis using yearly[3]. However, references are still scarce for the country.

The aim of this chapter is to determine if in México the financial sector causes economic growth as postulated in the "supply leading hypothesis" of McKinnon (1973) and Shaw (1973). A VEC model is employed using a longer period, from 1960 to 2013. The results of an ADL model are presented as well as super exogeneity tests, developed by Pesaran et al

[3] "In fact it is preferable to use data sets containing fewer annual observations over a long time period than data sets containing more observations over a shorter time period." Demetriades and Hussein (1996, p. 389).

(2001) and Engle & Hendry (1993) respectively; and following the methodology of Ang (2008) and Yang & Hoon-Yi (2008).

In a VEC model can be shown that banks contribute to growth, but in an ADL model their contribution is not significant. With respect to the Mexican stock market, both models indicate a significant contribution to the growth of the economy. The causality goes from financial sector to the real economy, but not vice versa.

Section II: Theoretical Foundations

2.1 The link between stock markets and economic growth

For Schumpeter (1911) the financial sector is an important factor for growth, since it promotes productive investment and innovation. Patrick (1966) and Goldsmith (1969) indicate that countries with higher growth rates also experienced financial sector expansions; McKinnon (1973) and Shaw (1973) emphasized that financial sector development enhances savings, capital accumulation and therefore economic growth; King and Levine (1993) show evidence of a robust relationship between the level of financial development and current growth rates, as well for subsequent periods. Levine and Zervos (1995) showed that the development of the market, particularly the liquidity indicator[4], is robustly correlated with future economic growth. Their analysis also showed that even after adding banking development indicators, market indicators remain significant, which means that both financial activities have a complementary role.

The empirical findings of the link between financial sector development and growth; Bencivenga, Smith y Starr (1992), Levine (1991), Greenwood y Jovanovic (1990), Saint-Paul (1992), showed that a liquid secondary market helps allocate funds to projects with the highest marginal productivity, stimulating economic growth.

Long-term investments in physical capital may have higher returns than short term investments. A liquid market lowers the cost of capital and fosters investments in more productive projects and for longer terms, thereby contributing to the economy to expand at higher growth rates. When equity markets become more liquid, it also contributes to increasing capital productivity through better portfolio diversification and thus lower risks.

Capital markets also encourage risk diversification and thus ease the specific risks of investing in one particular company. This allows each company to specialize and increase productivity without increasing systemic risk. Stock markets also generate incentives to acquire information about the companies in which individuals invest[5].These incentives in turn generate more research and monitoring on firms, improving the role of market for resource allocation.

[4] To measure the degree of liquidity in a market, the value of stocks traded as a percentage of GDP is used.

[5] Stock markets may also influence the acquisition and dissemination of information about firms. As stock markets become larger and more liquid, market participants may have greater incentives to acquire information about firms. Intuitively, with larger and more liquid markets, it is easier for an agent who has acquired information to disguise this private information and make money (Levine, 1997, p. 695).

As equity markets were recognized as promoters of growth; Levine (2002) tried to assess whether banking or stock markets are better to boost growth. The evidence provided by this author states that is indifferent if an economy relies their funding in one or another. Demirgüc-Kunt and Maksimovic (2002) indicated that to finance firms, banks are better to provide short-term capital; but stock markets are more efficient for long-term horizons. Equity markets may be better to diversify risk, while banks are more efficient to reduce informational asymmetries between lenders and borrowers.

The reason that the financial sector in general and the stock market in particular, are important for growth, has to do with the functions they perform. According to Levine (1997), markets perform five functions which can generate greater economic growth, acting through two channels: capital accumulation and innovation.

First, financial intermediaries facilitate risk management. To facilitate diversification, financial intermediaries allow the economy to invest more in new production technologies even with the risks involved, and then boost economic growth. Without financial markets, investors facing liquidity problems would be forced to withdraw funds from long-term investment projects. The premature withdrawal of these resources reduces economic growth. Stock markets can remedy this situation by giving shareholders immediate access to their resources while simultaneously offering businesses a source of long-term capital. Investors in the market also wish to diversify the risk of productivity associated with individual investment projects. Without financial markets, investors would be required to buy whole pieces of capital. The markets allow investors to hold small parts of a large number of firms[6]

Second, by acquiring ex-ante information from investment projects, the financial intermediaries improve the allocation of funds. Information asymmetries give firms with prospective investment projects seeking financing an advantage about the quality of their potential investments. As companies go to the market to obtain financing, the ability to assess and allocate resources to the most promising projects, leads to economic growth.

[6] Besides reducing liquidity risk, financial systems may also mitigate the risks associated with individual projects, firms, industries, regions, countries, etc. Banks, mutual funds, and securities markets all provide vehicles for trading, pooling, and diversifying risk. The financial system's ability to provide risk diversification services can affect long-term economic growth by altering resource allocation and saving rates.
Besides the link between risk diversification and capital accumulation, risk diversification can also affect technological change. Agents are continuously trying to make technological advances to gain a profitable market niche (Levine, 1997, p. 694).

Third; ex-post monitoring on firm's management also induces the need for financial services. For individual investors, it is difficult and expensive to appraise the projects and monitor their management. The costs of acquiring information (screening cost) create incentives for the emergence of financial intermediaries: they reduce the cost of monitoring to prevent such efforts from being duplicated, Diamond (1984). In the stock market, brokerage and / or rating firms perform this function, and this information is reflected in prices. An example of this is an IPO when its placement price is fixed, the issuance of recommendations to buy or sell, etc. By the way, the assessment of information disseminated, is another activity carried out in the sector. Stock markets introduce the possibility of aligning the interests of managers and shareholders, as for example the partial compensation of managers with shares or options of the firm, that mitigates the principal-agent problem generated by the separation of ownership and control. In firms with concentrated ownership, the agency problem is less acute, but the agency problem is transferred between the majority and minority shareholders.

Fourth, financial markets mobilize savings efficiently. Capital markets establish conditions where investors feel comfortable with renouncing control of their resources. If securities are of low denominations, a greater number of potential participants in the market are allowed. By reducing transaction costs, the liquidity of stock markets is also encouraged [7].

Fifth, financial markets foster specialization. The markets can contribute to the production specialization, by channeling savings to projects that use a new technology and / or expand the scale of production. Also, financial

[7] The possibilities of reducing transaction costs and thereby improving the performance of stock markets, can best be seen in the following passage:

"By facilitating trade, stock markets reduce liquidity risk. As stock market transaction costs fall, more investment occurs in the illiquid, high-return project. If illiquid projects enjoy sufficiently large externalities, then greater stock market liquidity induces faster steady-state growth… Trading costs can also highlight the role of liquidity. For example, different production technologies may have a wide array of gestation periods for converting current output into future capital, where longer-run technologies enjoy greater returns. Investors, however, may be reluctant to relinquish control of their savings for very long periods. Thus, long-gestation production technologies require that ownership be transferred throughout the life of the production process in secondary securities markets. If exchanging ownership claims is costly, then longer-run production technologies will be less attractive. Thus, liquidity -as measured by secondary market trading costs- affects production decisions. Greater liquidity will induce a shift to longer-gestation, higher- return technologies (Levine, 1997, p. 693).

products (new and existing) can encourage specialization and therefore trade of goods. Townsend (1979) argues that the formation and development of stock markets occurs endogenously once the per capita income levels of an economy reach a certain threshold, so in these markets subsequently by reducing transaction costs liquidity can be increased, and then promoting specialization of firms and, therefore trade.

A key feature of equity markets which distinguishes them from other financial markets, such as credit, is that it emerges from a different contractual relationship. Investor revenues are in the form of dividends or capital gains, depending on the performance of the firms. Thus, the stock markets, by promoting investment, also encourage economic activity by increasing the scale of existing businesses and through the creation of new firms.

2.1.1 Macroeconomic and microeconomic perspectives

There is evidence that high inflation rates have adverse effects on growth (Barro, 1996), but also for the banking and stock market Boyd et al (2001). By reducing the return on investments in financial assets, bank and stock market activity decreases, with a consequent decline in investment and hence economic activity in general.

More recently, Pradhan et al (2015) found that economic growth causes the development of capital markets and vice versa, but also there is a bidirectional causality between inflation and stock markets.

It is noteworthy that macroeconomic stability[8] is a necessary condition for a) a successful implementation of a financial liberalization program, and b) and setting up a safe economic environment for promoting private sector investment, Karnameh Haghighi et al (2012).

As an example, in the late seventies Mexico experienced the excessive expansion of public spending and generated a high fiscal deficit to

[8] For macroeconomic stability is understood that an economy is able to minimize the impact on the product from shocks, such as changes in international interest rates and exchange rates, etc., and also presents a) low and stable rates of inflation, b) low interest rates for the long term, c) low levels of debt measured as a percentage of GDP, d) low levels of public deficit, also measured as percentage of GDP, e) exchange rate stability. The above recommendations are in line with the Maastricht Criteria.
See: http://glossary.reuters.com/index.php?title=Maastricht_Criteria

counteract the decline in private investment, along with loose monetary policy, this led to an inflationary spiral that overvalued exchange rate. Ultimately, appreciation of the peso generated a growing deficit in the balance of payments that led to the debt crisis of 1982. This macroeconomic scenario resulted in a decline of the financial intermediation measured as a percentage of GDP.

During the seventies, in Latin American economies, and Mexico, foreign capital flows came from bank loans. In the following two decades they were replaced by foreign direct investment and portfolio investment, the latter directed to the bond market and the stock market, Bekaert and Harvey (2003). While emerging economies can benefit from capital flows from developed countries, they may eventually face exchange rate shocks that affect the real economy, excessively appreciating or depreciating the local currency.

At the end of the eighties, The World Institute for Development Economic Research (WIDER) one of the most influential think tanks, suggested that emerging countries should liberalize their financial markets to attract capital flows, especially to the equity markets; under the argument that investment funds and pension funds in developed countries had accumulated large sums of capital, and by the downward flow of international bank lending (WIDER, 1990).

During the eighties and nineties, several countries had embarked on economic liberalization programs that included the removal of restrictions on international trade, deregulation and internationalization of the financial sector, privatization and generally the elimination of market-distorting regulations. In fact after the debt crises, loans to Latin American economies from multilateral agencies such as the IMF were conditioned on the implementation of stabilization and liberalization programs. Thus, in many emerging economies during the eighties these measures were implemented as part of their structural adjustment programs.

Measures to eliminate preferential credit for the government, the elimination of controls on interest rates, and the privatization of financial institutions were the main recipe for the development of local financial markets. Also, the capital account was liberalized.

WIDER's (1990) recommendations for the development of stock markets, were as follows:
1. Restrictions that limit foreign investment should be removed.
2. The limits for foreigners on share ownership and participation in boards need to be revised, as well as the holding of shares without voting rights.

3. The taxes that discourage investment must be eliminated, and taxes on capital gains and dividends should be at levels in line with international standards.
4. The protection that limits foreign participation in the financial activities was of doubtful necessity and needs to be revised.
5. Restrictions limiting participation in the stock market are part of a wider set of constraints that affect capital flows and therefore countries should eliminate these barriers.
6. To develop emerging markets a combination of legal and supervisory framework is required, along with sound fiscal and monetary policies.

Financial reforms instituted within economies were expected to interact with the liberalization of the capital account, so that foreign investment flows could contribute to the enlargement of stock markets as controls on the capital account were removed and limitations on foreign ownership in local firms were eliminated. The result was the development of local equity markets, whether measured by capitalization ratios, liquidity or the number of companies listed on the stock exchange.

Financial liberalization measures integrated local markets to international financial markets and channeled capital flows from developed to emerging markets. Those flows were subject to factors that propel his departure from the first (Push Factors) or factors attracting those resources to the second (Pull Factors) thereby generating an acceleration of resources invested outside the advanced economies, Fernandez-Arias and Montiel (1996). Some of the push factors that act in advanced markets are low interest rates, lower growth expectations, and the availability of institutional investors' resources to place and diversify portfolios abroad. Regarding the pull factors, they act in emerging economies to attract investment, including the economic fundamentals, but also the political, regulatory and legal framework of the host country, and of course returns.

The liberalization of the economy implies liberalization of international trade, financial deregulation and liberalization of the capital account, listed in the order posed by McKinnon (1973) and Shaw (1973). Results of financial reforms in Taiwan are analyzed by Liu and Hsu (2006) and Yu (1999), this case is considered the most successful, and most orthodox, by reason of being the least vulnerable country to the Asian crisis of 1997[9].

[9] "We could find that the financial liberalization process in Taiwan comparing with that of Japan or Korea during the last two decades followed the order suggested by McKinnon to transform the economy from a financial control economy to a market-oriented one... Taiwan's deregulation of the financial system had followed an appropriate sequence. Before opening of international market, Taiwan had just begun to deregulate the domestic

While a reform of financial activities has the task of increasing the volumes of savings and investment, Mishkin (2009) also notes that the effectiveness of these measures depends in turn on the coexistence of the following factors:

a. Defined property rights.
b. An efficient legal system.
c. Low or zero levels of corruption.
d. Quality of the financial information
e. Good corporate governance practices
f. Sound and prudent regulations of the financial system.

In Mexico, and several emerging economies, financial liberalization measures lacked or had lacked some of these conditions.

At the microeconomic level, transaction and information costs cause frictions in financial markets that hinder their proper functioning (Levine, 1997). To illustrate this, note that principal-agent problems, either by moral hazard or adverse selection, may represent an obstacle in emerging economies ability to develop their markets.

Following Lombardo & Pagano (2002) and Stiglitz & Weiss (1981), adverse selection problems arise from a situation where the riskiest borrowers are those who usually are more willing to seek external financing (and often those most likely to default and more willing to not return the loans). While higher interest may be charged to them, this does not mean that one can avoid financing risky projects. In fact the theory states that a higher interest induces those agents with the riskiest projects to seek resources. The way in which this problem is avoided is in charging a higher interest, but rather in the rationing of available resources to finance investment.

The moral hazard problems in the world of finance have to do with the potential situation where once the resources to a project are granted, they are used for purposes other than those agreed originally, whether it is used in riskier activities, or simply who is granted, flee with the money. The problem will become more acute as it becomes difficult for the principal (who provides the resources) to monitor the behavior of the agent (who receives the resources). Even in absence of information asymmetries, if the costs to enforce a contract are high this problem can prevail. Generally, the

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financial industry and to decontrol its domestic market. It had also followed an appropriate sequence to open up its financial account. The current account should be liberalized before the financial account, and the long term-capital, before the short-term capital" (Liu y Hsu, 2006, pp. 676-677).

problems of moral hazard are more present in the equity markets and to reduce them is to align the interests of the agent with the principal (it means shareholders versus managers). When this is not achieved, the resources are simply not granted.

Moreover the problem of transaction costs can arise from deficiencies in the institutions, market failures and other informational problems. This makes obtaining information on projects and borrowers too expensive. It makes difficult to access markets, value assets, monitor firms and enforce contracts, etc., thus hindering the market development.

The institutional framework of the economy also affects the flow of information, transaction costs and the way the contracts are enforced: Institutions have an impact on the development of financial markets and access to sources of financing, so, countries with efficient legal systems that safeguard shareholders' and lenders' property rights have more developed financial markets.

In environments with weak institutions, it is difficult to ensure that contracts are honored, information on listed companies is scarce and not always reliable. As a result, agency problems tend to be mitigated through mechanisms that rely on personal relationships, use of collateral, and group supervision.

Thus, countries with better institutional frameworks have better mechanisms to reduce agency problems and transaction costs so that someone who needs funding for a project depends less on personal relationships and having collateral.

2.1.2 The functions of financial markets and growth

For a long time, the effects on growth attributable to banking and stock markets were not distinguished, primarily by the lack of indicators, and the short extension thereof. Financing for investment projects primarily comes from internal funds, then from external funding; the external funds used first being bank loans and then the issue of shares. Therefore, note that in the financial system, banking activities are the first to develop and then the stock market. These activities generally are complementary to facilitate business expansion.

In an effort to establish channels of causation of the financial sector to the real economy Pagano (1993) established first, that the monitoring and supervision of those seeking funds could lead to a better allocation of resources; second, the provision of financial services can encourage the

mobilization of idle resources; and third, more efficient ways of sharing risks can reduce the costs of financing projects and thereby encourage savings rates and promote innovative startup projects.

Following Rousseau and Wachtel (2000) the role of markets in growth may be due to the following factors:

a. The stock markets provide investors a mechanism for entry and exit.
b. Foreign capital flows are a major source of funding, either in the form of direct investment or portfolio investment. Moreover, in emerging economies they provide a source of foreign exchange.
c. Liquidity in stock markets enables national and international investors to transfer their surplus from short-term assets to those with long term maturities. In addition liquidity encourages the diversification of portfolios and capital flows.
d. The existence of equity markets generates information of listed companies, enabling investor to monitoring their performance and assessing its ability to generate value.

2.2 Causality between financial sector development and economic growth, does the financial sector cause growth, or follow it?

The link between financial deepening and economic growth has generated a lively debate on whether it promotes growth or whether the sector's development is simply a consequence of economic growth that creates a demand for more sophisticated financial products. Until now, the empirical evidence has been mixed.

The literature identifies four perspectives regarding the direction of causality between financial sector development and economic growth. The first of these postulates that improved financial intermediation contributes to the growth in two ways: a) improving the accumulation and the marginal productivity of capital, b) increasing the rate of savings and investment. The most well-known proponents of this position are McKinnon (1973) and Shaw (1973). The second corresponds to the case where causality goes from the economy to the financial sector (Robinson, 1952). The third says that causality is bidirectional, Demetriades and Hussein (1996), Greenwood and Smith (1997). Finally, the fourth corresponds to the Lucas critique (1988), stating that there is no causality.

Patrick (1966) was among the first authors to try to empirically establish the relationship between finance and growth. In fact, these four visions are related to the so-called "Patrick's Problem". That is, the attempt to establish

that causal link. This author identified two possible causal relationships between finance and growth: the "supply leading hypothesis", which postulates that financial development generates growth: and, the "demand following hypothesis". The second simply posits that the financial sector has a passive response to the economic growth, "where enterprise leads, finance follows" noted Robinson (1952); considering that development of the financial sector depends on real output growth.

The causal relationship between growth and finance has important policy implications. If there is causality from the financial sector to growth, then promoting and reforming financial institutions will be a desirable objective since greater financial deepening increases the supply of products and financial resources available in the economy.

To understand why the financial sector can be positively related to economic growth, Stiglitz (1998) points out that savers can select investments more in line with their risk tolerance. Moreover, a group of savers can hardly take advantage of higher returns derived from investments on a larger scale. In addition, entrepreneurs often lack sufficient capital of their own to launch their projects. In light of the foregoing, capital markets and other intermediaries can provide the services that make it possible to channel resources from savers to investments with higher rates of return, thus increasing productive specialization. With the development of financial markets, the risk can be pooled and transferred through the use of more sophisticated financial products. This increases investment efficiency (enabled by greater savings) in new innovative projects, and drives growth progressively. It should be noted that the above argument assumes that markets are free of distortions caused by any government intervention[10], McKinnon (1973) states that the flows of savings and investment should be voluntary, and equilibrium interest rates determined by the market. The literature that promotes liberalization of financial markets indicates that to operate efficiently and profitably, financial institutions need to work in an environment free from distortions and not repressed by government policies, such as interest rate ceilings[11] or

[10] The measures of financial repression were present in the economies of developing countries during the period in which the import substitution model was implemented. Giovannini and de Melo (1990) note that controls on international capital flows, coupled with controls on domestic financial intermediaries, generated distortions in the money market which were reflected in negative real interest rates for savers.

[11] The government not only creates restrictions in the credit market by implementing interest rate control, but also by inhibiting competition in the financial industry or possessing banks. High reserve requirements are also a mechanism that illustrates how government raises funds at low interest forcing banks to hold government bonds in their

excessive reserve requirements. Therefore reforms are considered necessary to liberalize the financial sector and contribute to economic growth.

The proponents of liberalizing financial markets indicated that if repressive policies are continued, and the macroeconomic environment is unstable, the result would be a severe contraction of savings and therefore a reduction of available funding.

A wider range of products and financial resources could be allocated to traditional economic activities and gradually place a greater share of these resources to the most modern or innovative sectors. Access to financing for new activities could foster entrepreneurship and generate sufficient economic benefits to justify the launch of a public intervention for the development of the financial system[12] .

2.3 Reforms to the financial sector in Mexico: some relevant issues

In recent times the world stage has had a dynamic of constant change, driven by financial and technological innovation and the participation of new actors. In addition the past 20 years has been characterized by the financial crisis and contagion across international markets. All these events have been accompanied by deregulation and financial liberalization driven by the process of globalization, the emergence of new financial instruments and increasing resources available from the international financial market Mishkin (2009).

Until the early seventies, Mexican banks had an acceptable role regarding their main social function, mobilize savings and provide credit to the private sector. Activity flourished in a stable macroeconomic environment, especially in the sixties, under the old Law of Credit Institutions and Auxiliary Organizations in force since 1941, which regulated the sector in a specialized banking system.

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portfolios. Through controls for capital inflows and outflows, a government can pay lower rates in the domestic market than those prevailing in the international debt market.

[12] In Mexico, the Entrepreneur Fund is an example of a government initiative for financing companies with public funds. Other private financial institutions has joined, see:
http://www.soyentrepreneur.com/21388-10-instituciones-para-conseguir-credito.html
http://www.cnnexpansion.com/economia/2015/02/11/gobierno-lanza-creditos-para-los-jovenes-emprendedores
But perhaps the most successful public policy in Mexico is the housing loans program administered by INFONAVIT. After its implementation, the supply of private credit complemented those public funds.

This law, in addition to regulating the financial system, allowed the government to channel resources to certain economic activities designated as strategic to achieve industrialization. While the resources obtained in this way were used to finance those strategic activities and build public infrastructure at a low cost; progressively they were used to finance the public deficit.

In the period between the forties and early seventies, the deficit incurred by the government represented a small percentage of GDP, meaning that borrowing requirements were not in competition for resources from the banking system and other intermediaries. However, this situation began to change since the mid-seventies when public spending began to replace private investment as the engine of growth. Recurrent public deficits demanded increasing resources both from commercial banks and the Bank of Mexico. The consequences were soon manifested in the functioning of the banking system: the resources destined to the government represented a greater proportion of available credit, at the same time inflationary pressures emerged and became chronic. When combined with fixed nominal interest rates paid to savers, they eventually obtain lower, and several times, negative real interest rates that reduced bank deposits in real terms and therefore the credit to the private sector, both measured as a percentage of GDP. Thus, the banking system experienced a period of financial disintermediation during 1976-1988.

To contain the financial disintermediation, was promoted the transformation of specialized banks towards commercial banks. Savers were allowed to possess accounts in US dollars, even if the deposits had been made in pesos. The adaptation of the legal framework during 1976 to 1982 had given the national banking system tools to reverse the declining trends in credit and modernize the sector, but this process would be stopped with the bank expropriation decreed by Jose Lopez Portillo in September 1982, the last day of his term (Hernandez-Murillo, 2007).

The nationalized banks facilitated the financing of a public deficit that reached 18 percent of GDP in 1982. Given the stringency of loanable funds in international markets, and locked in a tight monetary policy aimed at reducing inflation, the government of President Miguel de la Madrid (1982-1988) financed the huge government deficit inherited by his predecessor with unprecedented increases in reserve requirements, so that the availability of bank financing to the private sector decreased considerably[13].

[13] The bank expropriation brought a loss of human capital and technological backwardness. In addition, the appointments of management positions were granted from

While Mexican banks were nationalized, the government allowed the private sector to continue operating in other financial sector activities such as brokerage, foreign exchange, insurance, etc. Although the size of these businesses was small compared with banks; however, at the end of the eighties brokerage firms where competing with the former. In the absence of credit, non-bank intermediaries, especially brokerage firms were replacing state banks in terms of attracting savings and channeling resources for investment.

During the period 1988-1992, the regulatory framework of the financial system was upgraded and new laws were designed to improve the performance and competitiveness of the financial intermediaries.

At that time of the financial reforms, the money market had become more liquid and active, so the government had significantly increased the issuance of short term treasury bills (created in 1978), and therefore depended less on mandatory loans from banks. In 1989, Mexico had returned regained access to international capital markets, having been excluded from this market from 1982 to 1988, after having launched a new stabilization plan implemented in December 1987 and ensuring the payment of external public debt through the so-called Brady Plan.

In 1989, at the beginning of the presidential term of Carlos Salinas de Gortari, controls on interest rates and mandatory bank lending to the government were removed. In 1990, financial groups were allowed under the scheme of universal banking, where these groups could be integrated with all the branches of financial intermediation: banks, insurance, brokerage, leasing, factoring, foreign exchange, etc. Reserve requirements on private deposits were eliminated in 1991. These reforms led to the privatization of banks between 1991 and 1992. Also in 1989 the capital account was liberalized.

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the spheres of political power. Moreover, while international financial institutions made technological improvements in providing financial services, Mexican government-owned banks -insolated from competition- had no incentive to improve their services (Hernandez-Murillo, 2007).

The most relevant financial liberalization measures for the Mexican economy[14]*:*

Liberalization of Interest Rates
The existence of interest rate ceilings in an environment of rising inflation caused an erosion of bank deposits in pesos, because savings had taken refuge in dollar-denominated instruments, or channeled to non-bank institutions able to provide better conditions for savers during the time the banks were expropriated. Interest rates were freed in 1989, resulting in an increase in savings in the form of bank deposits and expansion of credit.

Suppression of the legal reserve
The mandatory reserve requirement was suspended and replaced in 1989 by the so-called liquidity ratio, which would be in operation during two years. In 1991, it was substituted by a voluntary reserve ratio. With these provisions, the authorities limited themselves to the purchase and sale of government bonds. Thus, banks could expand credit rapidly.

The deregulation of credit
In 1989, mandatory credit which the authorities required since 1941, was removed. The arrival of the CETES (Treasury Bills) in 1978 gave the government a privileged instrument for domestic debt financing and for open market operations development. As the market for government debt securities matured, mandatory credit was relegated to second place. As the reduction in public deficit was achieved, mandatory credit fell into disuse until it finally ceased to be an instrument of monetary policy and source of public financing. In 1993, domestic public debt was composed entirely of government bonds, while by 1988 represented only 40 percent. As immediate consequence, banks channeled more credit to the private sector.

Liberalization of the capital account
With the Law on Foreign Investment of 1989 controls on the capital account were eliminated, allowing free inflows and outflows of capital. For stock market was allowed the cross listings of shares leading to the first issuance in 1991 of a Mexican ADR (and by the way the first one that proceeded from an emerging country. This is important to note because Bekaert and Harvey (2000) detect a structural break in 1989 for the Mexican stock market, while Hargis (1998) signaled that with the launching of Telmex ADR in 1991 was what really triggered the growth of the stock

[14] http://www.banxico.org.mx/sistema-financiero/disposiciones/resumen-principales.html

market[15]. With these measures, bank lending to the private sector, as well as market capitalization and value of traded stocks, increased significantly.

Regardless, the rapid expansion of credit and poor banking supervision mechanisms, lead to the crisis of 1994 (Hernandez-Murillo, 2007).

Continuing with the financial reform, in 1994 the corresponding law amendments established the independence of the central bank with the objective to maintain low levels of inflation. In 1997, the reform of the pension system allowed private enterprises to manage these resources, although at that time they were only allowed to invest in government bonds. It wasn't until 2005 that pension funds were allowed have in their portfolios, shares and other financial assets of the domestic market and from abroad. In 1998, the Mexican derivatives market was created.

Since most of the reforms have impacted mainly the banking field, it is clear that the Mexican authorities must still continue with the process of financial reform to strengthen the stock market.

[15] "Integration should stimulate stock market development by increasing the size of the market and enhancing the liquidity of companies traded, helping the market to provide the diversification, liquidity and informational roles which stimulate economic growth" (Hargis, 1998, p. 305-306).

Section III: Econometric Analysis

3.1 The Vector Error Correction Model (VECM)

In many cases, the economic variables in levels are not stationary. When this occurs, they must be differentiated "d" times before they become stationary. So, it is said that one variable is integrated of order "d", such that if $Y_t \sim I(d)$, then $\Delta^d Y_t \sim I(0)$. Other variable of interest could also be integrated with the same order "d" as $X_t \sim I(d)$. Thus, if the variables are of the same order of integration, a set of variables may be cointegrated if the linear combination between them is stationary. This is the definition of cointegation of Engle and Granger (1987) [16].

Suppose that there is a set of variables g such that $g \geq 2$, and both are I (1), VAR representation of them in matrix form is:

$$Y_t = \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \cdots + \beta_k Y_{t-k} + u_t \quad (1)$$

To use the Johansen test, the VAR model has to become a vector error correction model:

$$\Delta Y_t = \Pi Y_{t-k} + \Gamma_1 \Delta Y_{t-1} + \Gamma_2 \Delta Y_{t-2} + \cdots + \Gamma_{k-1} \Delta Y_{t-(k-1)} + u_t \quad (2)$$

Alternatively:

$$\Delta Y_t = \Pi Y_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta Y_{t-i} + u_t \quad (3)$$

Where $\Pi = \sum_{i=1}^{k} \beta_i - I_g$, *and* $\Gamma_i = -\sum_{j=i+1}^{k} \beta_j$.

Equation (3) has g variables in first differences on the left side, and k-1 variables in lagged differences on the right side, with a matrix Γ associated with each lagged term. Meanwhile, the matrix Π is associated with the lagged levels of the variables; then, Π can be interpreted as the long term coefficient matrix.

The Johansen test is calculated by means of the rank of the matrix Π , so the rank of the matrix equals the number of nonzero eigenvalues, which are denoted as λ_i, ordained high to low, until as many g variables are contained in the system: $\lambda_1 \geq \lambda_2 \geq \ldots \geq \lambda_g$.

The values of λ_i, must be positive and less than unity (in absolute value) so that $1 \geq \lambda_i \geq 0$, the first λ's are those whose value is closer to 1, and the last whose value is closer to zero. If the variables that are part of the VEC are

[16] Typically variables can be I (1), and only in the event that these variables are cointegrated the error term will be I (0).

not cointegrated, the rank of the matrix Π is not significantly different from zero, such that $\lambda_i \approx 0, \forall$ i.

For the Johansen cointegration test there are two statistics: the trace and the eigenvalue, which can be formulated respectively as:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{g} \ln(1 - \hat{\lambda}_i) \quad (4)$$

$$\lambda_{max}(r, r+1) = -T \ln(1 - \hat{\lambda}_i) \quad (5)$$

Where r is the number of cointegrating vectors, and $\hat{\lambda}_i$ are the estimated values of the ith eigenvalue of matrix Π, so that each eigenvalue is associated with a different cointegration vector.

λ_{trace} is a statistic to test the null hypothesis where the number of cointegrating vectors is less than or equal to r, against the alternative hypothesis that there are more than r.

With the statistic λ_{max} , the null hypothesis is that the number of cointegrating vectors is r, against the alternative of the existence of r + 1 vectors.

The work of Johansen and Joselius (1990) include the critical values for the two test statistics, the trace and eigenvalue, although Osterwald-Lenum (1992) provides a more complete set of critical values for the Johansen test. It is pertinent to note that this statistical distribution is not normal, and critical values depend on the value of g-r, the number of non-stationary components, and on whether intercepts are included in the cointegrating vectors or in the model in differences (the inclusion of an intercept in the model in differences equals a trend in the data generating process). The tests are conducted sequentially for r = 0, 1, 2 ..., g-1, and it is important to note that the matrix Π cannot be of full range g, since this corresponds to a set of stationary variables.

If the rank of the matrix Π is zero (r = 0), ΔY_t depends only on the lagged differences of the system (ΔY_{t-j}) and therefore there would be no long-term relationship. But if the range is between $1 \leq r < g$, there will be r cointegrating vectors.

Defining the matrix Π as the product of two matrices, α and β ', with dimension (gxr) and (rxg) respectively, such that $\Pi = \alpha\beta'$; in which α represents the adjustment coefficients associated each variables of the VEC system, while β is composed with the cointegrating vectors.

Let g = 3, the matrix Π will be composed of the elements associated with the 3 variables of the system and their representation looks like:

$$\Pi = \begin{pmatrix} \pi_{11} & \pi_{12} & \pi_{13} \\ \pi_{21} & \pi_{22} & \pi_{23} \\ \pi_{31} & \pi_{32} & \pi_{33} \end{pmatrix} \quad (6)$$

If r (Π) = 1, then there will be one cointegrating vector and the matrix Π can be decomposed into two matrices , α and β.

$$\Pi = \alpha\beta' = \begin{pmatrix} \alpha_{11} \\ \alpha_{12} \\ \alpha_{13} \end{pmatrix} (\beta_{11} \quad \beta_{12} \quad \beta_{13}) \quad (7)$$

If r (Π) = 2, then:

$$\Pi = \alpha\beta' = \begin{pmatrix} \alpha_{11} & \alpha_{21} \\ \alpha_{12} & \alpha_{22} \\ \alpha_{13} & \alpha_{23} \end{pmatrix} \begin{pmatrix} \beta_{11} & \beta_{12} & \beta_{13} \\ \beta_{21} & \beta_{22} & \beta_{23} \end{pmatrix} \quad (8)$$

Note that this matrix can be generalized to more variables and therefore include more cointegrating vectors, β, while $1 \leq r < g$. Assuming g = 3, r = 1, and having the following system variables: $Y_{1\ t-1}$, $Y_{2\ t-1}$ and $Y_{3\ t-1}$, its representation would look like:

$$\Pi\, Y_{t-1} = \alpha\beta' Y_{t-1} = \begin{pmatrix} \alpha_{11} \\ \alpha_{12} \\ \alpha_{13} \end{pmatrix} (\beta_{11} \quad \beta_{12} \quad \beta_{13}) \begin{pmatrix} Y_{1\ t-1} \\ Y_{2\ t-1} \\ Y_{3\ t-1} \end{pmatrix} \quad (9)$$

To determine if there is a long-term relationship, it can be observed with the significance of the parameters in the cointegrating vectors. For testing short run causal relationships, it would be made on the equations (10) and (11) (considering only two variables):

$$\Delta Y_{1t} = a_{10} + \sum_{j=1}^{p-1} a_{11j}\, \Delta Y_{1\ t-j} + \sum_{j=1}^{p-1} a_{12j}\, \Delta Y_{2\ t-j} + u_{1t} \quad (10)$$

$$\Delta Y_{1t} = a_{10} + \sum_{j=1}^{p-1} a_{11j}\, \Delta Y_{1\ t-j} + u_{1t} \quad (11)$$

Finally, if the Error Correction Term is non-significant, it is said that the variable is weakly exogenous with respect the long run parameters. Additionally, if the lagged differences are not significant, it is said to be strongly exogenous.

3.2 The Autoregressive Distributed Lag model (ADL)

The ADL model includes a mixture of the lagged values of X and Y on the right side of the equation. An example of this equation, with two lags for the explanatory variable (X), and one lag for the dependent variable (Y) entering as explanatory, would be:

$$Y_t = \gamma + \alpha_1 Y_{t-1} + \beta_0 X_t + \beta_1 X_{t-1} + \beta_2 X_{t-2} + u_t \quad (12)$$

Features of the ADL model:

- It is parsimonious
- It is easy to implement and interpret.
- It is a dynamic model.
- A long-term relationship can be established with it.

Also, the following variants can be obtained from equation (12), depending on the values of the above parameters (except for γ):

1. When $\alpha_1 = \beta_1 = \beta_2 = 0$, it is a static model.
2. When $\beta_0 = \beta_1 = \beta_2 = 0$, it represents an autoregressive model.
3. When $\beta_1 = \beta_2 = 0$, it is transformed to a partial adjustment model.
4. When $\alpha_1 = 0$, the model takes the form of a finite distributed lag model.
5. When $\alpha_1 = 1$, $\beta_1 = -\beta_0$, $\beta_2 = 0$, it takes the form of a model in first differences.
6. Also, as can be seen below, this model has equivalence with the Error Correction Model (ECM).

The basic form of the error correction model is:

$$\Delta Y_t = \beta_0 + \beta_1 \Delta X_t + \phi_1 \mathrm{EC}_{t-1} + \mathrm{u_t} \quad (13)$$

Where EC is the error correction term lagged one period. All variables in (13) are stationary.

According with Pesaran et al (2001), an alternative representation to the previous model, would be:

$$\Delta Y_t = \beta_0 + \beta_1 \Delta X_t + \phi_1 \left(Y_{t-1} - \phi_2 X_{t-1}\right) + \mathrm{u_t} \quad (14)$$

The ADL model is equivalent to the EC model, this can be shown as follows, departing from:

$$Y_t = \gamma + \alpha_1 Y_{t-1} + \beta_0 X_t + \beta_1 X_{t-1} + \varepsilon_t \quad (15)$$

And solving for Y we get:

$$Y_t - \alpha_1 Y_{t-1} = \gamma + \beta_0 X_t + \beta_1 X_{t-1} + \varepsilon_t$$

Knowing that $Y_t = Y_{t-1} + \Delta Y_t$, and therefore that $X_t = X_{t-1} + \Delta X_t$, and substituting them in the above equation, it can be formulated as:

$$Y_{t-1} + \Delta Y_t - \alpha_1 Y_{t-1} = \gamma + \beta_0 (X_{t-1} + \Delta X_t) + \beta_1 X_{t-1} + \varepsilon_t$$

Simplifying and arranging terms, we have:

$$\Delta Y_t + (1 - \alpha_1) Y_{t-1} = \gamma + \beta_0 X_{t-1} + \beta_0 \Delta X_t + \beta_1 X_{t-1} + \varepsilon_t$$

$$\Delta Y_t = \gamma + \beta_0 \Delta X_t - (1 - \alpha_1) Y_{t-1} + (\beta_0 + \beta_1) X_{t-1} + \varepsilon_t$$

$$\Delta Y_t = \gamma + \beta_0 \Delta X_t + (\alpha_1 - 1) Y_{t-1} + (\beta_0 + \beta_1) X_{t-1} + \varepsilon_t$$

$$\Delta Y_t = \gamma + \beta_0 \Delta X_t + (\alpha_1 - 1)[Y_{t-1} + \frac{(\beta_0 + \beta_1)}{(\alpha_1 - 1)} X_{t-1}] + \varepsilon_t$$

Let $\phi_1 = (\alpha_1 - 1)$ and $\phi_2 = -\frac{(\beta_0 + \beta_1)}{(\alpha_1 - 1)}$, *then:*

$$\Delta Y_t = \gamma + \beta_0 \Delta X_t + \phi_1 [Y_{t-1} - \phi_2 X_{t-1}] + \varepsilon_t \quad (16)$$

Also, have in mind that - $\phi_2 = \frac{(\beta_0 + \beta_1)}{(\alpha_1 - 1)}$, *or that* - $\phi_2 = \frac{(\beta_0 + \beta_1)}{-(1 - \alpha_1)}$).

So starting from (15), an ADL model; we arrive to (16), an EC model.

The solution for long-term equilibrium can also be obtained from (15), it is enough to define that $Y_t = Y_{t-1} = Y^E$, and $X_t = X_{t-1} = X^E$, which means that the variables have remained in their respective equilibrium values through time. If we insert these expressions in equation (15) and solve for Y^E, we have:

$$Y^E = \gamma + \alpha_1 Y^E + \beta_0 X^E + \beta_1 X^E.$$

$$Y^E (1 - \alpha_1) = \gamma + (\beta_0 + \beta_1) X^E$$

Then the long-term solution would be:

$$Y^E = \frac{\gamma}{(1 - \alpha_1)} + \left(\frac{\beta_0 + \beta_1}{1 - \alpha_1}\right) X^E \quad (17).$$

Note that equation (17) can include more lags of Y and X.

Thus, Pesaran et al (2001) propose a model they call "conditional error correction model" that can take the following form:

$$\Delta Y_t = \gamma + \sum_{i=1}^{p} \alpha_i \Delta Y_{t-i} + \sum_{j=0}^{q} \beta_{1j} \Delta X_{1\,t-j} + \cdots + \sum_{j=0}^{q} \beta_{n\,j} \Delta X_{n\,t-j} +$$

$$\theta_0 Y_{t-1} + \theta_1 X_{1\,t-1} + \cdots + \theta_n X_{n\,t-1} + \varepsilon_t \quad (18)$$

Note that in the methodology used by Engle and Granger (1987), the lagged differences and the error correction term (lagged one period) are stationary in order to make inferences about the respective parameters. The model of Pesaran et al (2001) can also be considered an error correction model, however instead of using estimated errors, the model incorporates (one period) lagged variables in levels. Some variables in equation (18) may be I(1) and/or I(0), which is the advantage of the ADL model.

To determine the overall significance of the θ's, Pesaran et al (2001) developed the "bound test". It is an F-type test, establishing both a lower and an upper limit. The null hypothesis is Ho: $\theta_0 = ... = \theta_n = 0$, so that if it is rejected; it is said that there is a long-term relationship between the variables in levels[17]. A T-type test is also proposed for the individual parameters such as Ho: $\theta_0 = 0$. Considering that the asymptotic distribution is not normal, Pesaran et al (2001) obtained the corresponding critical values.

3.3 Superexogeneity: the conditional equation, the marginal equation and stability of the parameters

This methodology was developed by Engle, Hendry & Richard (1983) and Engle & Hendry (1993), and is used to determine if one variable causes and controls another. Conceptually, what these authors propose, is that the joint probability distribution of Y and X can be broken down at time t, in a conditional distribution and a marginal distribution, such that:

$$D_J(Y_t, X_t|Z_t; \lambda_t) = D_C(Y_t\ |X_t, Z_t; \lambda_{1t}) D_M(\ X_t|Z_t; \lambda_{2t}) \quad (19)$$

Where D_J , D_C and D_M respectively represent the joint distribution of Y_t and X_t, the conditional distribution of Y_t given X_t (and other variables), and the marginal distribution of X_t (and other variables).

In addition, Z_t represents a set of information including past values of Y and X, as well as the present and past values of other variables of interest. λ_t, λ_{1t} and λ_{2t} represent parameter vectors that may be constant or time varying.

These authors define that X_t is superexogenous in respect to λ_{1t} if there is no loss of information by ignoring D_M (that is, X is weakly exogenous to

[17] If the statistic is less than the lower limit, all the variables are I(0). If that statistic is greater than the upper limit, all the variables in levels are I(1). If the value falls between these limits the test is not conclusive (Pesaran et al, 2001).

λ_{1t}), and if changes in λ_{2t} do not involve changes in λ_{1t} (λ_{1t} is invariant to changes in λ_{2t}).

Assuming that the errors are normally distributed, the conditional distribution (D_C) of Y_t given X_t and Z_t, can be represented in a linear regression model as follows:

$$Y_t = \beta X_t + Z'_{1t}\gamma + \varepsilon_t \quad (20)$$

Considering also the normality of the error term, the marginal distribution (D_M) of X_t given Z_t, can also be represented in the following model:

$$X_t = Z'_{2t}\pi + u_t \quad (21)$$

Take into account that $Z_{1t}(\subseteq Z_t)$ and that $Z_{2t}(\subseteq Z_t)$.

In other words, returning to equation (20), wherein Y_t is conditional to X_t and Z_t; X_t is defined as superexogenous with respect to β, if after including in D_C the error and the squared error (u_t and u_t^2 obtained from D_M), their parameters are statistically **non-significant**; it implies that X_t is superexogenous. If parameters β and γ are **stable**; then X_t **causes and controls** Y_t.

Section IV: Estimation Methodology

4.1 Description of data and descriptive statistics

The data used in this work come from two sources, the World Development Indicators published by World Bank, and the Mexican Stock Exchange, covering the full period of 1960-2013.

Table 1: Definition of the Financial and Economic Variables

Variable	Description	
BC	Bank Credit to the Private Sector as % of GDP	World Bank, World Development Indicators
GCF	Gross Capital Formation as % of GDP	World Bank, World Development Indicators
GOVFCE	Government Final Consumption Expenditure as % of GDP	World Bank, World Development Indicators
LGDPCLC	Natural logarithm of GDP in local currency and constant terms.	World Bank, World Development Indicators
LGDPPCCLC	Natural logarithm of the GDP per capita in local currency and constant terms.	World Bank, World Development Indicators
LITdeCR	Natural logarithm of the Index of Real Exchange Rate	Adapted from the nominal exchange rate and consumer price indexes of the US and Mexico; World Bank, World Development Indicators
M2	Money and quasi money (M2) as % of GDP	World Bank, World Development Indicators
ST	Value of transactions on the stock market as % of GDP	Statistical Yearbook of the Mexican Stock Exchange.

Levine and Zervos (1995) proved that Value of Stocks Traded (ST) is a good predictor of economic growth rates. This measure of market liquidity is available from 1960[18].

Following the methodology of Hondroyiannis and Lolos (2005), for VEC estimation, only BC, ST, and GDP are employed. In an alternative estimation, the GDP can be substituted by GDP per capita.

Instead, for the ADL model all the variables in table 1 are included: Capital formation, government expenditure, money supply and the real exchange rate index. These variables are included in the ADL model to estimate their impact on growth and financial activity, as in the works of Yang & Hoon-Yi (2008) and Liu & Hsu (2006).

[18] It's worth mentioning that market capitalization records are only available from 1978 when the index for the Mexican stock market was created.

Table 2: Descriptive Statistics of the Financial and Economic Variables

	BC	GCF	GOVFCE	LGDPCLC	LGDPPCCLC	LITDECR	M2	ST
Mean	20.8574	21.4437	9.6952	29.4159	11.2654	4.4647	27.7161	5.7926
Median	19.5192	21.7696	10.3936	29.5174	11.3455	4.4447	27.0444	4.2544
Maximum	34.1441	27.3839	13.1706	30.2282	11.6075	4.8827	38.7332	20.3899
Minimum	11.1140	16.4322	5.6414	28.1280	10.6572	4.2173	11.0369	0.0595
Std. Dev.	6.4676	2.3342	2.0771	0.6058	0.2667	0.1380	4.3922	5.9133
Skewness	0.4681	0.1965	-0.4203	-0.5904	-0.8096	1.0811	-0.9140	0.7215
Kurtosis	2.1363	3.0521	2.0517	2.2382	2.6053	4.4626	6.1347	2.3080
Jarque-Bera	3.6505	0.3536	3.6135	4.4424	6.2497	15.3312	29.6275	5.7627
Probability	0.1612	0.8380	0.1642	0.1085	0.0439	0.0005	0.0000	0.0561
Sum	1126.3000	1157.9600	523.5433	1588.4580	608.3298	241.0919	1496.6690	312.7985
Sum Sq. Dev.	2217.0020	288.7640	228.6559	19.4512	3.7709	1.0090	1022.4640	1853.2270
Observations	54	54	54	54	54	54	54	54

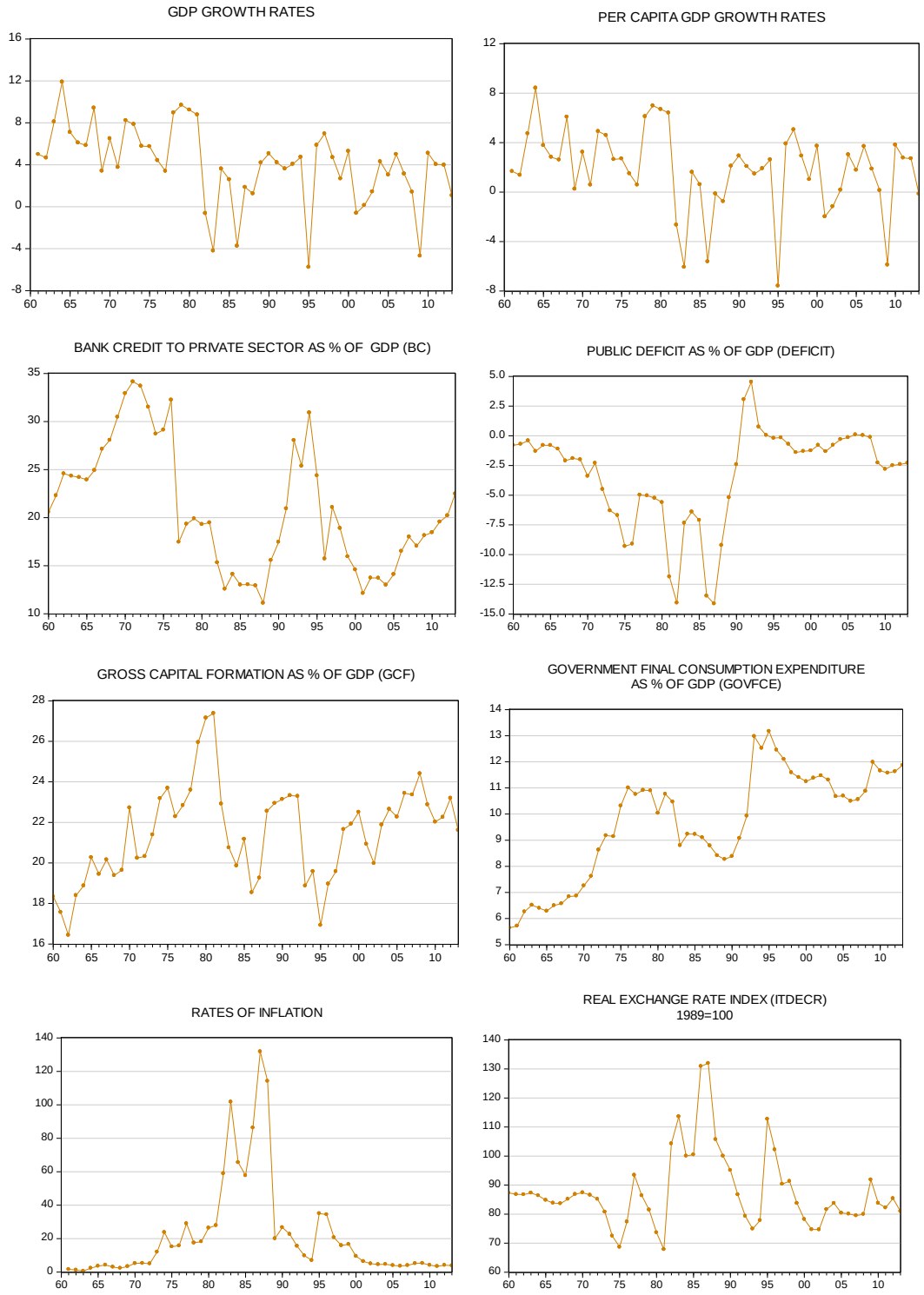
Table 3: Correlations of the Financial and Economic Variables

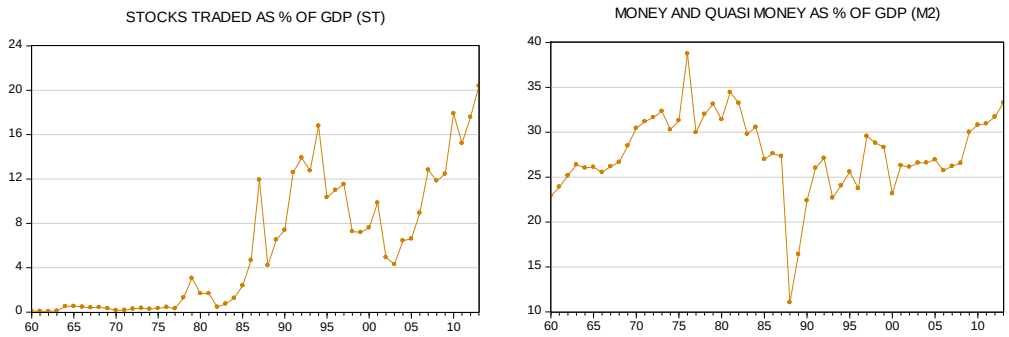
	BC	GCF	GOVFCE	LGDPCLC	LGDPPCCLC	LITDECR	M2	ST
BC	1.0000	-0.1720	-0.2900	-0.5341	-0.5259	-0.3770	0.3183	-0.2331
GCF	-0.1720	1.0000	0.3361	0.4307	0.5083	-0.4000	0.3059	0.1025
GOVFCE	-0.2900	0.3361	1.0000	0.8534	0.8540	-0.1478	0.2390	0.6497
LGDPCLC	-0.5341	0.4307	0.8534	1.0000	0.9909	-0.0218	0.0372	0.7695
LGDPPCCLC	-0.5259	0.5083	0.8540	0.9909	1.0000	-0.0409	0.1064	0.7165
LITDECR	-0.3770	-0.4000	-0.1478	-0.0218	-0.0409	1.0000	-0.2493	-0.0116
M2	0.3183	0.3059	0.2390	0.0372	0.1064	-0.2493	1.0000	-0.0945
ST	-0.2331	0.1025	0.6497	0.7695	0.7165	-0.0116	-0.0945	1.0000

The observations used in this analysis exhibit a high degree of variability, showing the disruption of economic fundamentals during the seventies caused by populist policies, and the painful stabilization of the economy during the eighties. This can be seen in table (2) and the graphs presented below. Loose fiscal and monetary policies accelerated the rates of inflation, and were responsible for the appreciation of the real exchange rate. Also, public deficit and debt soared during this time. After the debt crisis in 1982, the economy stabilized until the end of the eighties. These events are responsible for Bank Credit (BC) having not achieved, even now, the level registered in the first half of the seventies. It is also the reason that other countries, comparable in size to the Mexican economy, have a bigger banking sector today. A similar argument can explain the evolution of the Mexican stock market.

A visual inspection of the graphs below also shows that these variables are not stationary, and that their evolution over time represents a challenge for econometric modeling.

Figure 1: Temporal evolution of financial and macroeconomic variables





The Dickey-Fuller and Phillips-Perron tests are used here to perform unit root tests. In the two tables below, the value of the test statistic for the variables in levels and in first differences are presented respectively (tables 4 and 5).

From these tables, it can be seen that all variables are stationary in first differences, without any contradiction on the results. An advantage of ADL model is that a mixture of I(0) and I(1) variables can be estimated, unlike of the VEC models, where all their variables must be I(1).

Table 4: Unit root tests, Financial and Economic variables in levels

Test Type		Augmented Dickey Fuller		Phillips-Perron	
Variable	Equation Type	Value of the test statistic	Proba-bility	Value of the test statistic	Proba-bility
BC	Intercept	-1.947488	.3087	-2.066573	0.2587
GCF	Intercept and trend	-2.837349	0.1910	-2.903653	0.1697
GOVFCE	Intercept and trend	-2.014633	0.5800	-2.329696	0.4111
LGDPCLC	Intercept and trend	-1.7821	0.6994	-1.780572	0.7001
LITDECR	Intercept and trend	-3.139878	0.1080	-3.123895	0.1115
M2	Intercept	-3.098815	0.1172	-2-990614	0.1445
ST	Intercept and trend	-2.689833	0.2449	-2.712606	0.236

Table 5: Unit root tests, Financial and Economic variables in first differences

Test Type		Augmented Dickey Fuller		Phillips-Perron	
Variable	Equation Type	Value of the test statistic	Proba-bility	Value of the test statistic	Proba-bility
BC	Intercept	-7.874619	0.0000	-7.854086	0.0000
GCF	Intercept and trend	-6.236785	0.0000	-6.850259	0.0000
GOVFCE	Intercept and trend	-6.451795	0.0000	-6.48381	0.0000
LGDPCLC	Intercept and trend	-5.837336	0.0001	-5.758937	0.0001
LITdeCR	Intercept and trend	-7.299703	0.0000	-10.14074	0.0000
M2	Intercept	-8.852920	0.0000	-9.593666	0.0000
ST	Intercept and trend	-9.626321	0.0000	-9.789359	0.0000

4.2 Model Specification

To perform the respective analysis of the data and determine the causality between variables, a VEC model is estimated as described in equation (3). While for the ADL model is used equation (18), we have respectively:

$$\Delta Y_t = \Pi Y_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta Y_{t-i} + u_t \quad (3)$$

$$\Delta Y_t = \gamma + \sum_{i=1}^{p} \alpha_i \, \Delta Y_{t-i} + \sum_{j=0}^{q} \beta_{1j} \, \Delta X_{1\,t-j} + \cdots + \sum_{j=0}^{q} \beta_{n\,j} \, \Delta X_{n\,t-j} +$$

$$\theta_0 Y_{t-1} + \theta_1 X_{1\,t-1} + \cdots + \theta_n X_{n\,t-1} + \varepsilon_t \quad (18)$$

In the case of VEC model, the variables involved can be represented in the following vector. Of course, it can easily be established following the specification in equation (3) how they enter the model either in levels or in differences:

$$\Delta Y = \begin{bmatrix} \Delta LGDPCLC \\ \Delta ST \\ \Delta BC \end{bmatrix}$$

Alternatively, for both models, GDP (LGDPCLC) can be substituted by GDP per capita (LGDPPCCLC) as a dependent variable, since two

regression results are presented, using each one of them in the left hand side of VEC and ADL.

For the ADL model, the following variables are used:

Dependent Variable	Explanatory Variables
LGDPCLC	BC, ST, GOVFCE, GCF, M2, LITDECR

The ADL model described in equation (18), serves to establish the conditional distribution (D_C). While for the marginal distribution (D_M), the auxiliary regression incorporates ΔST_t as a dependent variable, and the remaining variables are used as regressors, except GDP, either in levels or differences. Also, an alternative estimation is presented using GDP per capita.

4.3 Results

4.3.1 VECM estimation

Regarding VEC model, estimation involves five steps: a) implement the unit root tests to determine the order of integration of the variables used, b) perform the cointegration test of Johansen-Joselius, c) estimate the model parameters, d) perform the Granger causality tests, and e) specify the long run relationship of the variables.

After determining that all variables involved to estimate the VECM are stationary in first differences; then the trace statistic and eigenvalue statistic are obtained, to determine whether there is a cointegrating relationship between the variables of the system. Only the first test is conclusive to point out that, at a significance level of 5%, there is one cointegrating vector (see tables 6 to 9).

Table 6: Cointegration Test (Trace), for LGDPCLC, ST, BC; 3 lags, model 3.

Ho:	Ha:	Eigenvalue	Trace Statistic	0.05 Critical Value	p-value
r=0	r≥1	0.306176	**30.13744	29.79707	0.0457
r≤1	r≥2	0.153939	11.86056	15.49471	0.1637
r≤2	r≥3	0.067651	3.502396	3.841466	0.0613

***Significant at 1%, **Significant at 5%.

Table 7: Cointegration Test (Maximum Eigenvalue) for LGDPCLC, ST, BC; 3 lags, model 3.

Ho:	Ha:	Eigenvalue	Max Eigenvalue Statistic	0.05 Critical Value	p-value
r=0	r=1	0.306176	18.27688	21.13162	0.1198
r≤1	r=2	0.153939	8.358163	14.2646	0.3435
r≤2	r=3	0.067651	3.502396	3.841466	0.0613

***Significant at 1%, **Significant at 5%.

Table 8: Cointegration Test (Trace), for LGDPPCCLC, ST, BC; 4 lags, model 3.

Ho:	Ha:	Eigenvalue	Trace Statistic	0.05 Critical Value	p-value
r=0	r≥1	0.341167	**34.44837	29.79707	0.0136
r≤1	r≥2	0.212868	14.00139	15.49471	0.0829
r≤2	r≥3	0.045324	2.272757	3.841466	0.1317

***Significant at 1%, **Significant at 5%.

Table 9: Cointegration Test (Maximum Eigenvalue) for LGDPPCCLC, ST, BC; 4 lags, model 3.

Ho:	Ha:	Eigenvalue	Max Eigenvalue Statistic	0.05 Critical Value	p-value
r=0	r=1	0.341167	20.44698	21.13162	0.0621
r≤1	r=2	0.212868	11.72864	14.2646	0.1213
r≤2	r=3	0.045324	2.272757	3.841466	0.1317

***Significant at 1%, **Significant at 5%.

Next, the results from modeling the data with the VECM are presented. The short run parameters are not shown. Following the methodology used by Hondroyiannis and Lolos (2005), the Wald test statistics for each block of short run parameters are presented in table 10, with the corresponding statistic related with the error correction terms. After that, the granger causality tests are performed.

Table 10: Short run dynamics of VEC estimates (p-values)

	Model 1						Model 2				
	D(LGDPCLC)	D(ST)	D(BC)	ECT			D(LGDPPCCLC)	D(ST)	D(BC)	ECT	
D(LGDPCLC)		0.5862	0.3852	0.009	**	D(LGDPPCCLC)		0.7453	0.4568	0.029	**
D(ST)	0.9424		0.2709	0.084	*	D(ST)	0.4278		0.2542	0.019	**
D(BC)	0.3738	0.6421		0.233		D(BC)	0.5499	0.6722		0.660	

Significant at: *** 1%, **5%, *10%

The null hypothesis is that all the parameters of the lagged differences of each variable entering the model are zero. If they are statistically different from zero, the p-value will be less than 0.10.

Two VEC models are presented in table 10, namely model 1 and model 2, and the only difference between them is that the first uses GDP and the second the GDP per capita as dependent variable. ST and BC are included in both specifications, as can be seen in the first column of each model.

For model 1, the p-value of ST is 0.5862; whereas the joint test for the lagged differences of ST in model 2, the corresponding p-value is 0.7453. In the case of BC, in model 1 the result is 0.3852, and for model 2 is 0.4568 (see the first row of table 10). The tests conducted, indicate that all the lagged differences of ST and BC aren't significant to influence either GDP or GDP per capita, in other words there aren't short run impacts. The same conclusion can be drawn for ST, since BC and GDP don´t affect it in the short run (see the second row of table 10). In fact, none of the explanatory variables of the system affects their corresponding dependent variable in the short run.

Regarding the error correction term in model 1, the ECT parameter of the GDP equation is statistically different from zero. Also, the ECT parameter of the ST equation is significant. The same conclusion can be obtained for model 2 from the corresponding ECT parameter of GDP per capita and that of ST. In the case of BC, in both models, their ECT is not significant.

Table 11: Granger causality tests

Model 1			R^2	Model 2			R^2
D(LGDPCLC)	0.0000	***	0.317	D(LGDPPCCLC)	0.0659	*	0.238
D(ST)	0.2259		0.248	D(ST)	0.1496		0.341
D(BC)	0.634		0.185	D(BC)	0.821		0.207

Ho: short run parameters and ECT are zero, P-values reported.
Significat at: *** 1%, **5%, *10%

The significance of the error correction term incorporated in each system equation, enables us to determine if one variable is endogenous or (weakly) exogenous. The only significant and therefore endogenous variables are LGDPCLC, ST and LGDPPCCLC if looking at model 2.

The joint significance of the lagged differences of the explanatory variables and the ECT, tells us if there is Granger causality. Table 11 presents those results. For model 1, the lagged differences of ST and BC and their corresponding ECT are statistically different from zero, the p-value is 0.000. For model 2, the p-value is 0.0659 (see the first row of table 11). In both models, when ST and BC are the dependent variables, the joint test indicates that the null hypothesis, that all the parameters are equal to zero, cannot be rejected.

From the results of table 11, it can be said that ST and BC Granger cause to GDP (also GDP per capita if we look into model 2). Instead, GDP and BC do not Granger cause ST. As well, ST and GDP do not Granger cause BC (see the second and third rows of table 11). This test concludes that the causal relationship goes from the financial sector to the real economy, but not vice versa.

Table 12: ECT parameters of VEC estimates

	Model 1						Model 2					
	D(LGDPCLC)		D(ST)		D(BC)		D(LGDPPCCLC)		D(ST)		D(BC)	
CointEq1	-0.027526	**	1.375104	*	1.328397	CointEq1	-0.064839	**	5.286516	**	1.465325	

Significat at: *** 1%, **5%, *10%

Concerning the signs in the row of table 12, the negative one associated to LGDPCLC tells us about the adjustment from previous deviation of equilibrium of the national product, even though at a low pace; nonetheless the other parameters are positive. It is said that a variable is strongly exogenous if the error correction term is not significant and also are not statistically significant the lagged differences of the variables, such is the case of BC. We have ST as weakly exogenous.

Although cointegration implies the presence of Granger causality, it does not necessarily identify the sign of this causality; however this can be captured in the cointegrating vector.

In table 13 the long run parameters of the system are presented, from the cointegrating vector, it can be seen that ST and BC are significant according to the chi-squared test shown in the last row (the p-values are shown).

Table 13: Log run VEC equations

Cointegrating Eq:	Model 1		Cointegrating Eq:	Model 2	
LGDPCLC(-1)	1		LGDPPCCLC(-1)	1	
ST(-1)	-0.0618		ST(-1)	-0.043312	
	[-2.3112]			[-4.5887]	
BC(-1)	-0.0506		BC(-1)	-0.013632	
	[-2.2037]			[-1.6127]	
C	-28.0640		C	-10.76581	
P>chi2	0.0088	***	P>chi2	0.000	***

Significat at: *** 1%, **5%, *10%

Finally the next long term equations can be drawn:

$$LGDPCLC = 0.061ST \quad + 0.0506BC + +28.0640$$

$$LGDPPCCLC = 0.043312ST \quad + 0.013632BC + 10.76581$$

Fortunately, the evidence presented is that the stock market has contributed positively to economic growth in the long run, as well as the banking system. However, the objection that might be made is that R^2 is reduced (see table 11). Another drawback of VEC model lies in the lag selection since results may vary depending on them. For these reason an alternative methodology is employed.

4.3.2 ADL estimation

The ADL model of Pesaran et al (2001) is a parsimonious alternative to the EC models. This technique has been employed successfully in all sorts of works (for example money demand analysis), in this area there are few references, where the work of Ang (2008) is highlighted. At this point is important to note that the general to specific approach of Engle & Hendry (1993) and that of Perez (2002) is also followed. The results of this specification are presented below in table 14, in the corresponding columns of model 1a for GDP and in Model 1b for GDP per capita.

The outcomes of model 1a are presented in three sections. The first corresponds to the intercept and a dummy variable called CRISIS, which takes value of 1 for the years when the economy experienced negative rates of growth, zero otherwise. The second block corresponds to the lagged differences. The third presents the lagged levels of the implied variables.

Considering the short run effects, the stock market (ST) contributes to the growth of the economy and the same can be said for bank credit (BC), the money supply (M2) and gross capital formation (GCF). On the other hand, LITCDER shows that a devaluation of the peso negatively affects the rate

of growth (considering that the dependent variable is the difference of the log of GDP). Government expenditure shows also a negative effect.

The same story applies to model 1b, where the dependent variable is GDP per capita (part 2 of table 14).

Passing to the third block, the long run effects can be seen. Setting all differences to zero, and solving for LGDPCLC, the following long run equation is obtained:

$$LGDPCLC = 0.0156\boldsymbol{ST} - 0.0032BC - 0.7784\boldsymbol{LITDECR} + 0.0393\boldsymbol{GCF} - 0.0085M2 + 0.1310\boldsymbol{GOVFCE} - 0.1372\boldsymbol{CRISIS} + 31.5592$$

Regarding GDP per capita the long run equation is:

$$LGDPPCCLC = 0.0199\boldsymbol{ST} - 0.0083BC - 1.0249\boldsymbol{LITDECR} + 0.0396\boldsymbol{GCF} - 0.0090M2 + 0.1457\boldsymbol{GOVFCE} - 0.1637\boldsymbol{CRISIS} + 32.3693$$

In both specifications, BC and M2 were the only non-significant parameters. The stock market contributes positively in the long run to the growth of the economy, the negative sign of BC (if significant) is indicative that banks are a substitute of stock market. As expected GCF, contributes to the growth of the economy. The CRISIS dummy is significant and useful to improve the model estimates due to the pronounced swings in GDP.

To validate if there is a level relationship, and following Pesaran et al (2001) and Ang (2008), two tests are performed: a) the F-type test where Ho: $\theta_0 = \theta_1 = \ldots \theta n = 0$, and b) the t-type test for $\theta_0 = 0$ (for the parameter of LGDPCLC, located in the term $\theta_0 Y_{t-1}$ of equation (18)). Note that there are 7 variables in levels (k+1), so the test is applied using k=6 (not considering LGDPCLC because this is the dependent variable).

The critical values calculated by Pesaran et al (2001) are presented next and correspond to tables CI(iii) and CII(iii):

Table 14: ADL and Superexogeneity regressions

Model 1ª				**Model 2**				**Model 3a**			
Dependent Variable: D(LGDPCLC)				Dependent Variable: D(ST)				Dependent Variable: D(LGDPCLC)			
Variable	Coefficient	t-Statistic	Prob.	Variable	Coefficient	t-Statistic	Prob.	Variable	Coefficient	t-Statistic	Prob.
C	4.3456	6.8126	0.0000	C	-55.0497	-3.9543	0.0003	C	4.2618	6.3030	0.0000
CRISIS	-0.0189	-1.9787	0.0574					CRISIS	-0.0228	-2.3076	0.0289
				D91	2.5541	2.6400	0.0122				
D(LGDPCLC(-1))	-0.2063	-2.0589	0.0486					D(LGDPCLC(-1))	-0.2298	-2.2715	0.0313
D(LGDPCLC(-2))	-0.2482	-2.6522	0.0128					D(LGDPCLC(-2))	-0.2262	-2.3739	0.0250
D(LGDPCLC(-3))	-0.3503	-3.7445	0.0008					D(LGDPCLC(-3))	-0.3683	-3.9174	0.0006
D(ST)	0.0037	3.3597	0.0022					D(ST)	0.0036	2.3398	0.0269
				D(BC(-1))	0.2984	2.6507	0.0119				
D(BC(-2))	0.0023	2.6542	0.0128					D(BC(-2))	0.0022	2.3445	0.0267
				D(BC(-3))	0.3861	3.4696	0.0014				
D(LITDECR)	-0.1172	-4.1514	0.0003	D(LITDECR)	-8.3368	-3.0769	0.0040	D(LITDECR)	-0.1100	-3.7547	0.0008
				D(LITDECR(-2))	-8.2098	-2.5214	0.0163				
D(GCF)	0.0041	2.1015	0.0444					D(GCF)	0.0042	2.1648	0.0394
D(GCF(-3))	0.0038	2.2123	0.0350					D(GCF(-3))	0.0046	2.5704	0.0160
				D(M2)	0.4755	5.4073	0.0000				
D(M2(-1))	0.0019	2.2969	0.0290	D(M2(-1))	-0.2404	-2.1959	0.0346	D(M2(-1))	0.0020	2.4468	0.0212
D(M2(-3))	0.0024	3.1723	0.0036	D(M2(-3))	-0.2113	-2.1530	0.0381	D(M2(-3))	0.0022	2.9040	0.0073
D(GOVFCE(-1))	-0.0183	-3.4422	0.0018	D(GOVFCE(-1))	2.1525	4.5272	0.0001	D(GOVFCE(-1))	-0.0176	-2.9116	0.0071
D(GOVFCE(-2))	-0.0145	-2.9607	0.0061					D(GOVFCE(-2))	-0.0133	-2.6567	0.0131
LGDPCLC(-1)	-0.1377	-6.6610	0.0000					LGDPCLC(-1)	-0.1339	-6.0450	0.0000
ST(-1)	0.0021	2.1861	0.0370	ST(-1)	-0.2746	-3.3231	0.0021	ST(-1)	0.0019	1.8073	0.0819
BC(-1)	-0.0004	-0.6697	0.5083	BC(-1)	-0.2107	-3.9367	0.0004	BC(-1)	-0.0006	-0.8611	0.3968
LITDECR(-1)	-0.1072	-4.0554	0.0003	LITDECR(-1)	10.8731	3.9105	0.0004	LITDECR(-1)	-0.1099	-4.1424	0.0003
GCF(-1)	0.0054	3.2315	0.0031					GCF(-1)	0.0050	2.9131	0.0071
M2(-1)	-0.0012	-1.6852	0.1027	M2(-1)	0.4163	4.1571	0.0002	M2(-1)	-0.0010	-1.3529	0.1873
GOVFCE(-1)	0.0180	5.8886	0.0000					GOVFCE(-1)	0.0176	5.5177	0.0000
								E1	-0.0009	-0.4391	0.6641
								E2	-0.0011	-1.3494	0.1884

R-squared	0.9132		R-squared	0.6676		R-squared	0.9198	
Adjusted R-squared	0.8533		Adjusted R-squared	0.5476		Adjusted R-squared	0.8544	
JB p-value	0.6254		JB p-value	0.9480		JB p-value	0.9073	
LM(3) p-value	0.4070		LM(3) p-value	0.6470		LM(3) p-value	0.2173	
AE(3) p-value	0.8223		AE(3) p-value	0.427		AE(3) p-value	0.4544	

Table 14, part 2

Model 1b				**Model 2**				**Model 3b**			
Dependent Variable: D(LGDPPCCLC)				Dependent Variable: D(ST)				Dependent Variable: D(LGDPPCCLC)			
Variable	Coefficient	t-Statistic	Prob.	Variable	Coefficient	t-Statistic	Prob.	Variable	Coefficient	t-Statistic	Prob.
C	3.7631	6.2005	0.0000	C	-55.0497	-3.9543	0.0003	C	3.6840	5.6571	0.0000
CRISIS	-0.0190	-1.9405	0.0621					CRISIS	-0.0229	-2.2525	0.0326
				D91	2.5541	2.6400	0.0122				
D(LGDPPCCLC(-1))	-0.2129	-2.0389	0.0507					D(LGDPPCCLC(-1))	-0.2360	-2.2334	0.0340
D(LGDPPCCLC(-2))	-0.2514	-2.5844	0.0151					D(LGDPPCCLC(-2))	-0.2302	-2.3178	0.0283
D(LGDPPCCLC(-3))	-0.3431	-3.5539	0.0013					D(LGDPPCCLC(-3))	-0.3609	-3.7095	0.0009
D(ST)	0.0038	3.3870	0.0020					D(ST)	0.0038	2.3952	0.0238
				D(BC(-1))	0.2984	2.6507	0.0119				
D(BC(-2))	0.0025	2.7625	0.0099					D(BC(-2))	0.0024	2.4640	0.0204
				D(BC(-3))	0.3861	3.4696	0.0014				
D(LITDECR)	-0.1141	-3.9381	0.0005	D(LITDECR)	-8.3368	-3.0769	0.0040	D(LITDECR)	-0.1066	-3.5333	0.0015
				D(LITDECR(-2))	-8.2098	-2.5214	0.0163				
D(GCF)	0.0041	2.0423	0.0503					D(GCF)	0.0042	2.1006	0.0452
D(GCF(-3))	0.0035	2.0226	0.0524					D(GCF(-3))	0.0044	2.3639	0.0255
				D(M2)	0.4755	5.4073	0.0000				
D(M2(-1))	0.0020	2.3774	0.0242	D(M2(-1))	-0.2404	-2.1959	0.0346	D(M2(-1))	0.0021	2.5182	0.0180
D(M2(-3))	0.0024	3.1435	0.0038	D(M2(-3))	-0.2113	-2.1530	0.0381	D(M2(-3))	0.0023	2.8839	0.0076
D(GOVFCE(-1))	-0.0193	-3.4931	0.0016	D(GOVFCE(-1))	2.1525	4.5272	0.0001	D(GOVFCE(-1))	-0.0188	-2.9794	0.0060
D(GOVFCE(-2))	-0.0146	-2.8894	0.0072					D(GOVFCE(-2))	-0.0134	-2.5946	0.0151

LGDPCLC(-1)	-0.1163	-5.9571	0.0000					LGDPCLC(-1)	-0.1127	-5.3061	0.0000
ST(-1)	0.0023	2.2719	0.0307	ST(-1)	-0.2746	-3.3231	0.0021	ST(-1)	0.0021	1.9103	0.0668
BC(-1)	-0.0010	-1.4190	0.1665	BC(-1)	-0.2107	-3.9367	0.0004	BC(-1)	-0.0011	-1.6038	0.1204
LITDECR(-1)	-0.1192	-4.2537	0.0002	LITDECR(-1)	10.8731	3.9105	0.0004	LITDECR(-1)	-0.1221	-4.3281	0.0002
GCF(-1)	0.0046	2.7391	0.0104					GCF(-1)	0.0042	2.4288	0.0221
M2(-1)	-0.0010	-1.4632	0.1542	M2(-1)	0.4163	4.1571	0.0002	M2(-1)	-0.0008	-1.1429	0.2631
GOVFCE(-1)	0.0169	5.5362	0.0000					GOVFCE(-1)	0.0165	5.1614	0.0000
								E1	-0.0010	-0.4676	0.6438
								E2	-0.0011	-1.2767	0.2126
R-squared	0.8917			R-squared	0.6676			R-squared	0.8994		
Adjusted R-squared	0.8171			Adjusted R-squared	0.5476			Adjusted R-squared	0.8174		
JB p-value	0.6154			JB p-value	0.9480			JB p-value	0.8543		
LM(3) p-value	0.5132			LM(3) p-value	0.6470			LM(3) p-value	0.1174		
AE(3) p-value	0.7915			AE(3) p-value	0.4270			AE(3) p-value	0.3629		

Table 15: F-type critical values for level relationship

Significance	0.10		0.05		0.01	
Lower and upper limit	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
k=6	2.12	3.23	2.45	3.61	3.15	4.43

Table 16: T-type critical values for level relationship

Significance	0.10		0.05		0.01	
Lower and upper limit	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
k=6	-2.57	-4.04	-2.86	-4.38	-3.43	-4.99

The ADL model outcomes significantly outperform those obtained through the VECM. Just by judging the value of R^2 (parts 1 and 2 of table14) and the fit between the observed and estimated data (figures 2 and 3). It is an acceptable representation of the economic reality of Mexico and its financial sector considering how difficult is to model growth rates.

Table 17: F-type statistic for level relationship

Wald Test:

F Statistic	Value
Model 1a: LGDPCLC	8.588815
Model 1b: LGDPPCCLC	7.150414

Comparing the above values of 8.58 and 7.15 versus the critical value of Pesaran tables of 4.43 for the F-type test (table 15), it can be seen that the null hypothesis is rejected at a 1% level, so there is a level relationship.

With the corresponding parameter of LGDPCLC (-6.6610) in model 1a and LGDPPCCLC (-5.9571) in model 1b checked against the t-type critical value of -4.99 (table 16), the null hypothesis is also rejected at a 1% level, confirming that there is a level relationship.

Finally, several complementary tests are performed, including the Jarque-Bera to test the null hypothesis of normality of residuals; the Breusch-Godfrey test to evaluate the null of no serial correlation of order (p); and the ARCH Effects test of order (p) with the null of no presence of heteroskedacity. Table 14 (parts 1 and 2) present the p-values, all specifications do not reject the null.

4.3.3 Testing for superexogeneity

To perform this task the procedure described by Perez (2002) and Yang & Hoon-Yi (2008) is followed. As explained in the previous section, an auxiliary regression is performed for modeling the marginal distribution, which is the first step of the procedure. In this regression, ΔST is the dependent variable and the outcomes correspond to **model 2** in table 14 (since it does not include GDP or GDP per capita, there is no difference in the first and second part of table 14). The second step is to obtain the residuals and squared residuals of model 2. The third step, is to incorporate both vectors of residuals in model 1a and therefore model 1b, and the **model 3a and 3b** are obtained. If the parameter associated to the **residuals** is not significant it is said that ST is weakly exogenous; if also the

parameter of the **squared residuals** is not significant, then ST is superexogenous to $D_C(Y_t\,|X_t, Z_t; \lambda_{1t})$. Additionally, if the equation represented by **model 1a and b** is found to be stable, then ST **control causes** LGDPCLC.

Looking back to **model 1a** (table 14), the fit is acceptable. Examining all the statistics in **model 3b**, it can also be seen that the parameter associated to **e1** (the residual of model 2) is not significant, then ST is weakly exogenous. As the parameter of **e2** (the squared residuals of model 2) is also not significant, then ST is superexogenous.

Figure 2: ADL model for LGDPCLC, actual fitted residual graph

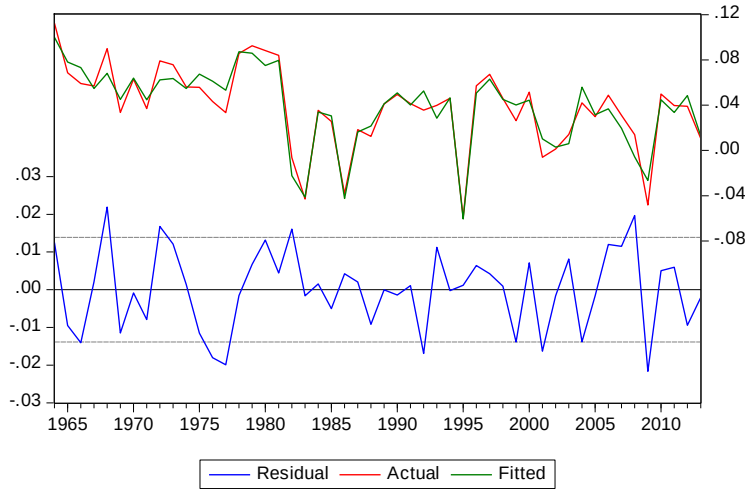
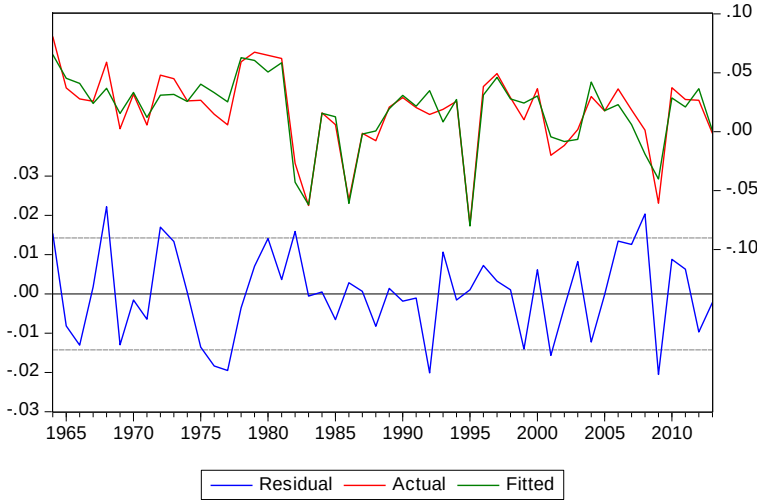


Figure 3: ADL model for LGDPPCCLC, actual fitted residual graph



Also the graphs of CUSUM and CUSUM of Squares corresponding to model 1 are presented to test the stability of the model. The cumulative sum of residuals, and of the squared residuals, remains within the confidence bands. The graphs of the recursive coefficients (of the variables in levels) also remain within the confidence bands. The results of these three stability tests imply that there is no structural break for the conditional equation (see figures 4 and 5).

Figure 4: ADL model for LGDPCLC, Cusum and Cusum-Squares stability test

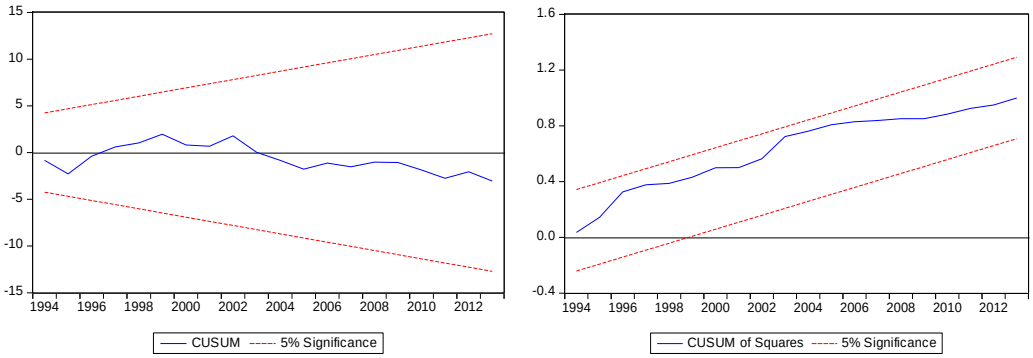
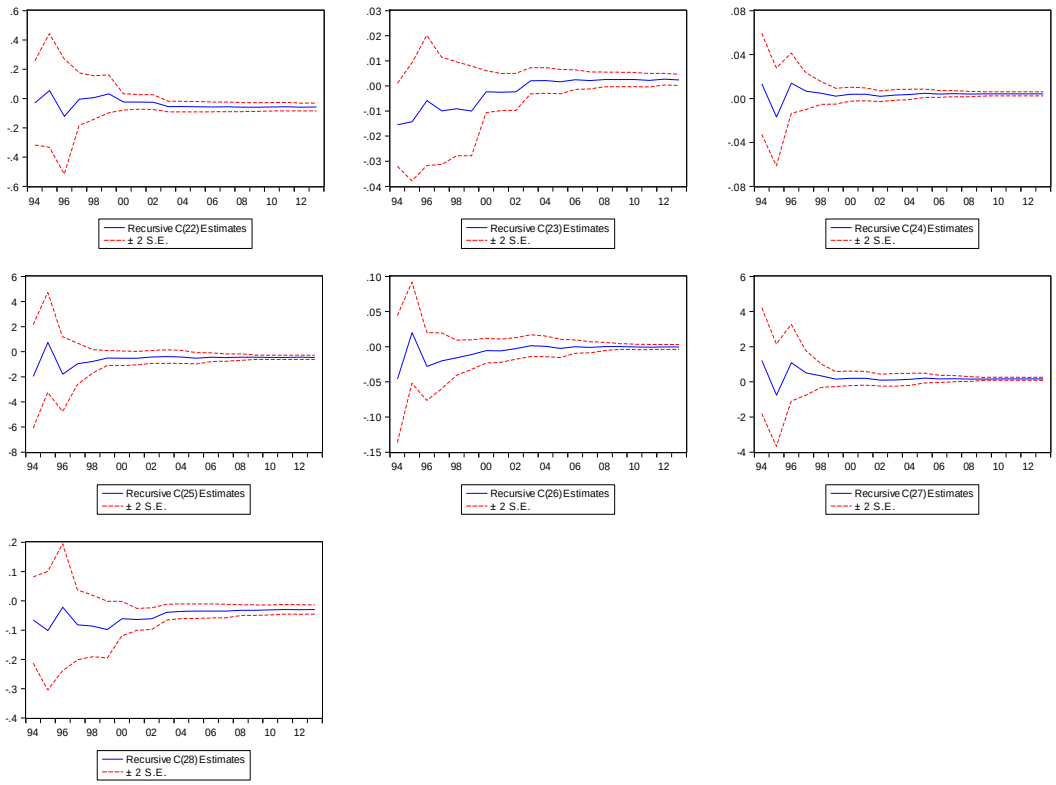


Figure 5: ADL model for LGDPCLC, recursive estimates for the coefficients of lagged variables in levels.



The superexogeneity test also proves that stock market control causes the economic growth in Mexico.

Going further, model 2 (table 14) also has interesting results to comment. Again, setting differences to zero, can be obtained the long run equation:

$$ST = -200.43 + 9.30\ \boldsymbol{D91} - 0.77\ \boldsymbol{BC} + 39.59\ \boldsymbol{LITDECR} + 1.52\ \boldsymbol{M2}$$

D91 is a dummy that assumes the value of 1 from the year 1991 until the end of the series. These years correspond to the liberalization of the Mexican financial sector, and the effect on ST is positive, which means that financial liberalization represented an increase for the value of the stocks traded of 9.3% percentage points of GDP.

Unfortunately in this case, the credit from banks is a substitute for the financing through the stock market. M2 and LITDECR have a positive long run effect in the stock market activity.

Section V: Conclusions

For a long time, financial activities were not considered essential to achieve economic growth. In fact, financial markets were repressed, because the government obtained financing in this way although it could delay the development of the financial sector. Hasn't until the work of McKinnon (1973) and Shaw (1973) that it became evident that financial liberalization policies were needed to develop the sector and achieve growth. It is important to note that many emerging countries were under a substitution of imports regime, and the form to finance industrialization was by channeling financial resources to "strategic activities".

In this sense, the primary goal to prove that the stock market promotes economic growth has been fulfilled. With it, several characteristics need to be highlighted. This work covered a long time series to demonstrate the existence of that causal relationship, and above all, the model was able to provide robust outcomes and an acceptable fit between the observed and estimated data, regarding this point the superiority of ADL is evident.

Much of the prior research relies on VECM estimates and generally the data analyzed has been quarterly, or even monthly, but only covering a time span of a few years. It is necessary to say that one cannot possibly incorporate all the relevant variables, having in mind that the availability of data and the degrees of freedom of the model impose restrictions in the empirical works. Despite this, the model shows that stock market (and the banking system) Granger causes economic growth.

Concerning the ADL model, this work contributes to the literature strand that has included macroeconomic variables, and also confirms the "supply leading hypothesis"; although it is only valid when applied to the stock market.

As in other studies, mainly in emerging markets, Mexico is illustrative of how financial repression policies have hindered or inhibited the development of the financial sector. It is also illustrative that the process of financial liberalization activated the stock market and credit.

While it is true that liberalization has exposed national economies to external shocks, some authors show that the net effect of growth despite these reversals is positive (Ranciere et al, 2006). In this sense, further studies can explore this line of research.

The financial market can be a source of instability, but it must also be recognized that financial liberalization promotes growth and that a prudent

economic policy is necessary to ensure the stability of the financial system and the economy.

The size of Mexico's stock market is still small compared to countries of similar size, whether measured by market capitalization or the value of transactions, so there are opportunities for improvement. I hope these findings will generate a reflection on the subject and encourage the strengthening of this financial activity. Most reforms were implemented mainly between 1989 and 1992 and further measures to strengthen the stock market have been insufficient. The privatization of the pension system in 1997 may be the only exception, but it has had meager effects on the capital market to date, as stock holdings were only recently allowed in their portfolios.

One unresolved issue is corporate governance systems reform, recommended to Mexico by the OECD, which will be addressed in the next chapter. Improvements to corporate governance may enhance stock market liquidity and propel growth.

Chapter 2: Business group affiliation, corporate governance and firm profitability in Mexico

Section I: Introduction

In emerging markets, a limited number of people have a majority stake of company shares, including those listed on the stock exchange. In other countries, such as the USA and the UK, shareholding is highly fragmented and firms are not grouped in networks. A third scenario is represented by countries like Germany and Japan, that have some corporate structures where shareholders have significant shareholding, generally greater than 20%. Additionally, it can be noted that the majority shareholders may be institutions (as in the case of commercial banks in Germany and Japan), be individuals or a group of individuals that may have family ties (as in Mexico), Castaneda (1998).

The existence of these business networks, with individuals owning a significant shareholding, originated in the kind of legal systems that regulate economic activity (La Porta, Lopez-de-Silanes, Shleifer, and Vishny, 1997). Deficiencies in the legal system and law enforcement are contributors to the underdevelopment of stock markets, as well as a cause for shareholding concentration.

In the literature on business groups, the problem of rent extraction (tunneling) to the detriment of minority shareholders is a recurrent issue. This topic is important as corporate governance systems can affect shareholder wealth, since profits (and risks) are not distributed equally between majority and minority shareholders. This problem can be manifested in lower profitability.

On the other hand, firm membership in a business group may be associated with better returns if the majority shareholders effectively oversee the firm's operations (Castañeda, 1998).

The objective of this chapter is twofold: a) provide evidence that affiliated firms are more profitable and b) determine if firms belonging to a business group carry out the rent extraction practice known as tunneling.

In this study, 196 firms listed on the Mexican Stock Exchange during the period 1990 to 2012 were analyzed through the generalized method of moments, a methodology developed by Arellano & Bond (1991) and Blundell & Bond (1998).

Section II: Literature Review

2.1 On the importance of corporate governance for firm's growth, soundness of the financial markets and economic development

This section is intended to highlight the importance best corporate governance practices have in financial market development, and thus, the national economy.

With the tequila crisis of 1994, the Asian crisis of 1997 and later with the bankruptcy of Enron, it was evident that corporate governance systems should be improved (OECD, 2004). For example, in South Korea, the collapse of its financial market during the Asian crisis was linked to macroeconomic problems, but also was perceived as mismanagement in Korean conglomerates (chaebols). At the time, their CEOs allowed a high debt burden and low profitability and, when investors became aware of the situation, they sold those shares massively, precipitating the collapse of the stock market. Better governance practices may have prevented such collapse, (Claessens and Yurtoglu, 2013).

After these crises, investors are increasingly paying more attention to the profitability and risk of their investments, accurate and timely disclosure of financial statements, involvement of minority shareholders in firms' decision making, issuance of shares with same voting rights, etc. In other words, better corporate governance[19].

More recently, in 2007 Taiwan's stock market collapsed after the bankruptcy of one of the country's largest conglomerates that had tried to hide their debts. The bankruptcy resulted in a heavy loss of its shareholder wealth, consequent substantial job loss, and a reduction in the ability of the market to attract new investors (Liu and Yang, 2008).

Claessens and Yurtoglu (2013) show that better corporate governance mechanisms increase a firm's access to external financing. This leads to more investment, more growth and hence more employment. OECD (2004) states that good corporate governance positively influences company

[19] "Definitions of corporate governance vary widely. They tend to fall into two categories. The first set of definitions concerns itself with a set of behavioral patterns: that is, the actual behavior of corporations, in terms of such measures as performance, efficiency, growth, financial structure, and treatment of shareholders and other stakeholders. The second set concerns itself with the normative framework: that is, the rules under which firms are operating with the rules coming from such sources as the legal system, the judicial system, financial markets, and factor (labor) markets." (Claessens and Yurtoglu, 2013, p. 1)

performance, and therefore, economic growth[20]. More recently, Francis et al (2013) analyzed 362 companies in 14 emerging markets and concluded that companies that improve their corporate governance systems have greater access to foreign capital.

Several other authors have noted the importance of financial sector development as a way to promote economic growth. For example, King and Levine (1993) presented evidence suggesting that liberalization of the financial sector has a positive effect on productivity and hence economic growth; arguing that these improvements are the result of the creative activity of "entrepreneurs" who embark on innovative projects[21].

In this respect, financial system influences investment decisions that encourage productivity through two mechanisms: financial institutions evaluate entrepreneurs' projects and provide funding to the most attractive ones.

The role of the legal system is also a factor in the development of the financial sector. Countries with better legal systems have larger and more active stock markets, consequently offering more access to external financing. Moreover, the resources channeled through financial intermediaries are offered to entrepreneurs with better terms[22].

La Porta et al (1997) show that countries with legal systems originating from the French system (in which Mexico is included) have the least

[20] "The importance of financial markets is supported at both the macroeconomic and microeconomic level: financial development is related to economic growth per capita and total factor productivity though its influence on fixed investment and by other channels such as better resource allocation" (OECD, 2004, p. 24).

[21] "In focusing attention on the nexus of finance, entrepreneurship, and innovation, our model thus stress that the financial system is a lubricant for the main engine of growth. Better financial services expand the scope and improve the efficiency of innovative activity; they thereby accelerate economic growth. Financial repression, correspondingly, reduces the services provided by the financial system to savers, entrepreneurs, and producers; it thereby impedes innovative activity and slows economic growth". (King y Levine, 1993, p. 517)

[22] "Presumably, the willingness of an entrepreneur to sell his equity, or to assume debt, depends to a large extent on the terms at which he can obtain external finance. For equity, these terms are reflected by valuation relative to the underlying cashflows; for debt, they are reflected by the cost of funds. If the terms are good, an entrepeneur would sell more of his shares or raise more debt" (La Porta, Lopez-de-Silanes, Shleifer, and Vishny, 1997, p.1132).

developed securities markets and weaker investor protection, especially with regard to legal protection to prevent rent extraction by "insiders"[23].

It can be inferred that limiting rent extraction could improve the performance of the financial sector and induce economic growth. This idea can be found in the work of Maher and Andersson (2000) [24], as well as in Berndt (2000) who also argues that the ownership structure is linked to the liquidity of capital markets[25].

The emergence of large corporations, and therefore the separation of ownership and control, has prompted scholars to further analyze the set of mechanisms that facilitate the achievement of objectives of the firm. Generally, a company was seen as a black box (Hart, 1995), where just a flow of inputs becomes a flow of outputs. Therefore in the absence of agency problems and incomplete contracts, company corporate governance is irrelevant.

Agency problems between the owners (principal) and managers of firms (agent) arise when the principal cedes control to the agent. The contracted managers must make an effort to maximize firm's profits. As the effort of managers is not observable by the principal, the compensation of managers depends (under a contract) on realized profits. Since contracts are incomplete and do not fully consider all eventualities to ensure that a profitability objective is fulfilled, then steps must be taken to avoid

[23] The authors call "insiders" to managers and controlling shareholders (La Porta, Lopez-de-Silanes, Shleifer, and Vishny, 2000).

[24] "Since expropriation by controlling shareholders can deter minority investors, the result is often a small and illiquid public equity market. This would explain why in countries where expropriation is a major problem, capital markets remain relatively underdeveloped". (Maher, and Andersson, 2000, p.28).
"One of the consequences of rent extraction by controlling shareholders is that it raises the cost of equity capital as minority shareholders demand a premium on shares issued. This problem may become particularly acute when small investors do not have enough legal rights to secure a return on their investment. This leads to a lack of liquidity in secondary markets as investors withhold funds, and a lack of opportunities for risk diversification as a consequence of illiquid markets. Capital markets in insider systems therefore tend to be much less well developed than those found in outsider systems". (Maher and Andersson, 2000, p.18)

[25] "Thus, ceteris paribus, firms' choice of corporate governance influences the liquidity of capital markets. If more firms choose concentrated control as their corporate governance strategy, liquidity decreases". (Berndt, 2000, p.33).

deviations from this objective[26]. Both moral hazard and adverse selection may be the cause of an underdeveloped stock market, as mentioned in the previous chapter.

In other words, the importance of corporate governance for companies arises from the need of owners to ensure that the objectives are met when delegating decision-making to managers in a situation where there are problems of asymmetric information and incomplete contracts, see Hart (1995), Holmstrom (1982) and Salas (2002).

When investors are simply shareholders of a company and do not participate in decision making, they expect that their profitability targets will be met. There are a number of mechanisms that serve as safeguards for their interests, even when they are not explicitly mentioned in a contract, and this set of mechanisms is known as corporate governance. In this respect the fullest possible definition of corporate governance would be:

"The words 'corporate governance' make reference to the entire inner mechanisms of the company (voting power and effective influence of shareholders, composition and functioning of the Board, remuneration system and career ...) and outside it (capital markets, labor and products, bankruptcy laws, public regulation ...) through which seeks to protect investors from the risks of abuse after losing control over financial resources invested, increasing their confidence in getting a satisfactory return for investment, and simultaneously enabling professional management of enterprises and the development of entrepreneurial talent" (Salas, 2002, p. 6).

The efficiency of enterprises to create social wealth depends on its corporate governance and can be seen as the institutional arrangement within a company to resolve conflicts arising from the interaction of the actors involved (shareholders, managers, workers, etc.)[27]. Such actors, despite having a common goal that unites them to the organization (income creation), they have specific interests according to their role in the company (income distribution). Such arrangements, or rules, are not limited to the

[26] "Since optimal principal-agent contracts are comprehensive, it is hard to find a role for governance structure (or asset ownership). The reason is that governance structure matters when some actions have to be decided in the future that have not been specified in an initial contract: governance structure provides a way for deciding these actions" (Hart, 1995, p. 679).

[27] Holmstrom (1982) analyzes the agency problem (and incentives) in the firm when there are multiple agents in the organization.

existence of legal contracts, but also to cultural patterns arising from daily operations of the company and beyond it. Moreover, the corporate structure is formed within the institutional framework in which the company operates, that is, the legal and political system of the country. The corporate governance of a company must specify the way in which the benefits and risks of the business are shared, always looking to motivate their players to make the best effort in order to achieve the objectives of the firm.

2.2 Corporate governance and rent extraction

Corporate governance systems can be distinguished by the degree of concentration of stock ownership. Maher and Andersson (2000) label companies that are controlled by majority shareholders as an "insider system", while companies where ownership is dispersed are an "outsider system". The share ownership, either concentrated or diffused, that a company adopts depends in part on the structure of other firms in the economy [28].

Firms that can be categorized as an "insider system" are companies controlled by individuals, families, banks and other corporations, and even by the government; and usually grouped in networks [29]. That is, the company doesn't act as an isolated entity, instead participants of a network make their transactions based on interpersonal trust. Firms that form a business network - usually diversified - are called a business group.

According to Jensen and Meckling (1976), the separation of ownership and control in companies generates agency problems [30] between the actors

[28] "There is an advantage to using the dominant form in the economy and the one with players are most familiar. Thus, diffuse ownership may be less costly for a firm if other firms are diffusely owned. This consideration might make it efficient for a firm to choose a controlling share holder structure if other firms in the economy have such structure" (Bebchuk and Roe, 1999, p.12).

[29] The majority shareholders of a company belong and establish relationships with members located in the upper echelons of the country. In order to develop joint ventures, one (or several) of them invests in the partners' firm, and vice versa, in doing so, they create a business group and they become the controlling shareholders of several firms that form the group (Castañeda, 1998).

[30] "We define an agency relationship as a contract under which one or more persons (the principal(s)) engage another person (the agent) to perform some service on their behalf which involves delegating some decision making authority to the agent. If both parties to the relationship are utility maximizers there is good reason to believe that the agent will not always act in the best interests of the principal". (Jensen and Meckling, 1976, p. 308)

involved in the management (directors) and shareholders (majority and minority). This separation generates agency costs [31] arising from the divergence of interests between ownership rights and cash flows rights. These agency costs influence the ownership structure; and may decrease the value of the firm.

In other words companies with a broad base of investors need to align the interests of managers with those of shareholders. To this end, several mechanisms[32] must be implemented to ensure profitability targets. In the case of companies with concentrated ownership, to mitigate the agency problem majority shareholders may monitor managers more closely, or manage the company themselves in order to increase profitability or valuation of the firm (Denis and McConnell, 2003); thus benefitting all shareholders[33].

On the other hand, in companies with concentrated ownership, the appropriation of private benefits of control[34] may occur by the majority

[31] The *principal* can limit divergences from his interest by establishing appropriate incentives for the agent and by incurring monitoring costs designed to limit the aberrant activities of the agent. In addition in some situations it will pay the *agent* to expend resources (bonding costs) to guarantee that he will not take certain actions which would harm the principal or to ensure that the principal will be compensated if he does take such actions. However, it is generally impossible for the principal or the agent at zero cost to ensure that the agent will make optimal decisions from the principal's viewpoint. In most agency relationships the principal and the agent will incur positive monitoring and bonding costs (non-pecuniary as well as pecuniary), and in addition there will be some divergence between the agent's decisions and those decisions which would maximize the welfare of the principal. The dollar equivalent of the reduction in welfare experienced by the principal as a result of this divergence is also a cost of the agency relationship, and we refer to this latter cost as the "residual loss."
We define agency costs as the sum of:
(1) the monitoring expenditures by the principal,
(2) the bonding expenditures by the agent,
(3) the residual loss. (Jensen and Meckling, 1976, p.308)

[32] "These methods include auditing, formal control systems, budget restrictions, and the establishment of incentive compensation systems which serve to more closely identify the manager's interests with those of the outside equity holders, etc." (Jensen and Meckling, 1976, p. 323)

[33] Benefits of good administration are reflected in higher dividend payments and revaluation of equity securities (Denis and McConnell, 2003).

[34] Private benefits are a function of the legal system. If there is investor protection, these benefits tend to be small and therefore the companies will tend to have dispersed ownership structure. If private benefits are high, a product of a lax legal system and

shareholders which may affect adversely the value or profitability of the firm through so-called tunneling[35]. These private benefits are always available for those running a business, and may be pecuniary and nonpecuniary.

Family businesses are common globally and are defined as ones where family members have a majority stake in the organization (even those listed in emerging markets), usually with a major presence on its board, and engaged in its management Castaneda (1998). One way large family corporations grow is through pyramiding and issuing dual class shares (Denis & McConnell, 2003, p.25).

In such organizations, the so-called agency problem between shareholders and managers could be reduced, because controlling shareholders exert a closer operational control. However, the agency problem can occur between the majority and minority shareholders. The conflict of interest between them may have the following variants: resources can be employed in unprofitable projects, differences in risk tolerance and investment time horizons, or worse, subject to scams, see Castañeda (1998), Wiwattanakantang (1999), La Porta et al (2000).

Bebchuck (1999) has shown that the value of companies with concentrated ownership is smaller than those with dispersed ownership. In other words: the presence of a controlling group may be related to lower profitability. However, (Denis and McConnell, 2003) suggest that companies with concentrated ownership tend to show higher returns, especially when an institutional investor (usually a financial institution) is actively involved in the Board. According to Khanna and Yafeh (2007), when examining businesses in emerging economies, belonging to a business group is linked to increased profitability as compared to those that are not affiliated with one.

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corporate governance, companies will tend to have a concentrated structure. Bebchuk (1999), Lamba and Stapledon (2001)

[35] "Tunneling is defined as the transfer of assets and profits out of firms for the benefit of their controlling shareholders" (OECD, 2004, p.30).
"The insiders who control corporate assets can potentially expropriate outside investor by diverting resources for their personal use or by committing funds to unprofitable projects that provide private benefits. By diverting resources for private benefit, controlling managers have the opportunity to increase their current wealth or perquisite consumption without bearing the full cost of their actions" (Lemmon & Lins, 2003, p. 1445).

2.3 Business Groups

In developing economies, there is a pattern that seems to dominate the private sector activity: Business Groups. The definition of business group varies between researchers and countries. Leff (1978) refers to them as “a group of companies doing business in different markets under a common administrative or financial control”, and states that its members are "bound by relations of interpersonal trust”. Strachan (1976) defines a business group as a long-term partnership of firms. Encarnation (1989) refers to the Indian business houses, emphasizing the social ties between members of the Group: "In each of these houses, strong social ties of family, caste, religion, language, and ethnicity; strengthen the financial and organizational ties between the member companies”. There is a voluminous literature on Japanese corporate groups, or "Keiretsu", which share some of the characteristics of the business groups in less developed economies. For example, Gerlach (1992) mentions that the Keiretsu is characterized by long term relationships between companies in a broad spectrum of markets.

Business groups are characterized by a system of internal networks composed of companies from different areas of economic activity. A characteristic feature is that the ownership and control of the group is concentrated, and in most cases, families have a decisive influence on the board of directors, and therefore in financing and investment decisions of each company of the group. In economies with a poor legal system, such groups can be seen as a form of organization that helps companies cope with market failures and malfunction (or absence) of certain institutions.

To Ghemawat and Khanna (1998), the problems of asymmetric information (especially in the labor and capital markets) and entrepreneurial talent shortages are the cause for different companies join under one organization. To Khanna and Palepu (2000), affiliation of a company to a group allows them to better manage market risks. For this reason, business groups are integrated by firms operating in diverse sectors of economic activity. Khanna and Yafeh (2000) stated that being a member of a business group helps to minimize revenue fluctuations and reallocate money from one subsidiary to another in difficult times.

2.3.1 Advantages of business groups

Availability and shared use of resources. Fisman and Khanna (1998) postulate that for diversified business groups is profitable the use of certain resources, such as technology, infrastructure or specific capital. Also, where entrepreneurial talent and managerial skills are scarce, the group structure

makes possible the rotation of personnel in various areas within a firm or companies of the group.

Reputation. In developing countries, funding may be difficult to obtain, and, reputation can play a major role in the granting of loans or equity placement to undertake new projects. A good image also improves relations with customers, suppliers, creditors and shareholders.

Strategic inputs. For scarce inputs, groups can establish supply chains through an affiliated company.

Solvency. Business groups are better able to bear risks due to their size and diversification. In an unstable economic environment, they can be better prepared to cope with economic fluctuations.

Ownership and control. Majority stockholding isolates the management team from hostile takeovers. Agency problems are diminished significantly due to a closer monitoring of the operations of the firm.

2.3.2 Disadvantages of business groups

Tunneling. The problem of rent extraction may limit the participation of new investors, whilst an inadequate distribution of benefits and risks can be present.

Equity participation lower than voting rights. Dual class shares, and sparse representation on boards, limits participation of minority shareholders in the firm's decision making.

Prone to insider trading. In emerging markets many controlling shareholders do not necessarily report their trades, especially when a transaction occurs based on the use of privileged information.

Lack or restricted access to timely and accurate information. Although financial statements reports have improved, certain procedures, such as the full agenda of general meetings and the information regarding the issues to be decided in such meetings, must be enhanced. In general, the involvement of minority shareholders is necessary in deciding the fundamental corporate strategies.

Controlling shareholders reluctant to lose control over the family enterprises. Salas (2002) has shown that (Spanish) family businesses reluctant to lose control have lower profitability relative to those that decide to give more room to new shareholders.

2.4 Business Groups in Mexico

As in other Latin-American countries, in the early twentieth century the Mexican government adopted a policy of import substitution: incentives to foster industrialization which led to the formation of the business groups, Pombo and Gutierrez (2011). It is worth mentioning that the flowering of this nascent industry was linked to the relationships these entrepreneurs had with the politicians (or politicians themselves), resulting favored with contracts, grants, loans, tariff protection and other economic stimuli, Castaneda (1998). With the opening of the economy in the eighties, some of these companies have successfully ventured into the international market, while others that remained oriented towards the domestic market have disappeared, were sold to foreigners, or have established alliances with foreign firms to survive.

The affiliated companies are owned and managed by a small group of persons. These persons are generally individuals who have kinship, and/or business relationships that eventually consolidate trust between them, to share economic interests in several companies not necessarily related with their core business[36]. An example of this is Grupo Carso, which, together with control exercised by other families, have business interests in fixed telephony (Telefonos de Mexico), mobile (America Movil), a chain of retail and restaurants (Sanborns), banking, insurance and securities (Grupo Financiero Inbursa), the construction sector (Cementos Moctezuma, IDEAL and INCARSO), and mining (MFRISCO). In addition, they are partners of the company that manages the Mexican Stock Exchange (BOLSA), have participation in a Pension Funds firm (ACTINVER), and control a holding of manufacturing companies (GCARSO)[37]. The peculiarity of this business group is that its main shareholder is the wealthiest Latin American, and in recent years, according to Forbes magazine, is one of the three richest in the world.

In Mexico, the family is the most cohesive social group, a cultural trait that has been an ingredient for companies to also have a family type

[36] This characterization for Japanese and German companies, also applies for Mexican firms. The difference (very subtly by the way) is that Mexican ones do not have a relational investor and that their workers do not participate in some of the company's decisions, as in the German case, Salas (2002).

[37] Like others, this group is diversified. Khanna and Yafeh (2005) indicate that unlike the United States, where a diversified conglomerate creates negative effects on the valuation of the firms, there is a positive effect, generating a "premium" for business groups in Asia, Europe and Latin America.

management. Many companies in Mexico are managed by their owners, and consequently several members of the family are also involved. As businesses grow, and more capital injections are needed; rarely do the founders lose majority control, even those large corporations listed in the stock market. Another cultural trait is related with the social status of being one of their shareholders.

Chong et al (2009) point out that in the Mexican stock market, groups account for 68% of stock ownership, ranking third worldwide in terms of the degree of concentration, just behind Greece and Colombia. If it is also considered that such companies may issue dual class shares, controlling shareholders may overwhelmingly exercise the control of the firm[38].

With the recent liberalization of the capital account, some Mexican companies have issued debt and equities, mainly through the local stock market and New York under the scheme of the American Depositary Receipts (ADR) that has served to finance the growth of its operations, but the founding families have only lost control of the companies as a result of bankruptcy or acquisition.

In sum, group affiliation may have a positive influence on the profitability of businesses[39]. However, the possibilities of extracting rents and acting in detriment of other economic agents remain latent.

Obviously, this situation has its nuances; there are some companies with good corporate practices, especially companies with equity placements in New York (such as BIMBO, CEMEX, GRUPO MODELO, TELMEX). Meanwhile, other firms have experienced unethical practices[40]. For example, one financial scandal in the media was the case of TV Azteca and Unefon (both owned by Salinas Pliego family). This case began in 2003, when TV Azteca allegedly illegally used inside information to buy Unefon debt at discount (owned by Nortel) through a company called Codisco. It

[38] Previously, companies listed on the stock exchange were not required to itemize the shareholding of the control group, only after the reform of the Securities Exchange Act of December 2005, that the participation of the majority shareholders had to be publicly known.

[39] Because the presence of relational investors may bring longer term investments, Salas (2002).

[40] It is highly unlikely to consider rent extraction as a continuous practice but rather sporadic, and may occur limiting profits in the expansionary phase of the economic cycle, or exaggerating losses in the downturn. (See Castaneda, 1998, pp. 181-183)
In this sense, Khanna & Yafeh (2007), note that the mechanisms of reputation limit or prevent the rent extraction phenomena.

ended with fines to the companies involved and the delisting of their ADRs. Prior to this case, the collapse of SYNKRO and SITUR resulted in the defrauding of their shareholders, unpaid taxes, and non-payment to their workers. Similarly, when the AHMSA bankruptcy occurred, its principal shareholder departed from the country evading pre-trial detention, and he still lives in Israel waiting for sentence.

The reform of the Securities Exchange Act of December 2005 sought to increase the investor base and the number of companies listed. Companies already trading had to meet several measures to improve their corporate governance systems (especially concerning protection for minority investors). To remain listed, a company must have at least 100 investors and have shares outstanding of at least 12% of its capital. After a period of transition, and due to the failure to comply with this and other provisions, companies such as ALMACO, BIPER, DERMET, GMODERN, GCORVI, PYP, were de-listed. New firms have entered the Mexican stock exchange, although the delay of reforms to improve transparency and information quality have retarded the development of the stock market, causing it to lose the luster it had in the nineties among investors.

Section III: Econometric Analysis

3.1 Estimation Technique

A Dynamic Panel Data (DPD) model has been used to carry out the analysis. The Generalized Method of Moments (GMM) offers several advantages to estimate the parameters: it can incorporate lags of the dependent variable as a regressor; solve problems originated by the presence of unobserved individual effects and endogeneity of the explanatory variables see Laeven (2000), and also Levine, Loayza, and Beck (2000); and, define instruments from the lags of the variables involved in the model.

Among the advantages of panel data, Pindyck and Rubinfeld (1998) point out the following:

a) Panel data can provide a broader set of information, since they have a greater number of observations that ultimately increase the degrees of freedom of the model;

b) Incorporating both cross-sectional and time series information diminishes the problem of omitted variables in the model, and

c) One can get estimates that cannot be obtained only from cross-section or time series.

Additionally, Baltagi (1995) states that: 1) with panel data the effects associated with individual heterogeneity can be controlled, and 2) better estimated parameters of variables to a microeconomic level can be obtained, avoiding the bias caused by the aggregation of such units[41].

In some panel data models, the one-way component error model is used[42] that involves having:

$$Y_{it} = \delta Y_{it-1} + \beta' X_{it} + \mu_i + v_{it}, \quad \textbf{(i)}$$

In equation (i), we have records of individuals through time such i = 1, 2, ... N, and t = 1, 2, ... T, where μ_i captures the unobserved individual effects,

[41] This can be done either through a model of fixed effects or one of random effects.

[42] "For example, in an earnings equation in labor economics, Y_{it} will measure earnings of the head of the household, whereas X_{it} may contain a set of variables like experience, education, union membership, sex, race, etc. Note that μ_i is time-invariant and it accounts for any individual effect that is not included in the regression. In this case we could think of it as the individuals' unobserved ability. The remainder disturbance v_{it} varies with individuals and time and can be thought of as the usual disturbance in the regression". (Baltagi, 1995, p.9)

and v_{it} considers pure random shocks. The dependent variable Y_{it} is explained by the X_{it}, but Y_{it-1} (lagged one period) also enters the model as a regressor.

When the lag of the dependent variable is introduced as explanatory, one can see that it is correlated with the error term. Thus, the use of ordinary least squares generates estimated parameters that are biased and inconsistent.

The use of GMM is the appropriate estimation method for dynamic panel data models mainly because it allows the use of instruments obtained from the variables of the model itself: either the lags of level variables or the lagged differences thereof. Using these instruments allows us to get estimates that are highly correlated with the instrumented explanatory variable but uncorrelated with the error term.

There are three types of GMM models, which are described below. Different moment conditions must be met in all these cases to ensure consistency and efficiency of the estimators[43]: a) GMM levels, b) GMM in differences, c) GMM system.

3.2 GMM levels

Using the above model: $Y_{it} = \delta Y_{it-1} + \beta' X_{it} + \mu_i + v_{it}$. **(i)**

Where: i=1, 2,… N, t=1,2,… T.

The consistency condition implies that:

$E(v_{it} \mid X_{i0}, X_{i1},.....X_{iT}, \mu_i) = 0$ **(ii)**

Additionally, the following assumptions are made: a) weak exogeneity of the model's variables, b) unobserved individual effects are not present, and c) the error term is not serially correlated, or, it at least follows a moving average process of finite order. Under these assumptions, the following observations can be used as valid instruments:

$(Y_{it-2}, Y_{it-3},\ldots Y_{i1})$, $(X_{it-2}, X_{it-3},\ldots X_{i1})$.

[43] It is said that an estimator is unbiased when the expected value of the parameter is equal to the true population parameter. An estimator is efficient as well as being unbiased their variance is minimal. It is consistent when the estimators converge toward their real population values as the sample size increases (Pindyck and Rubinfeld, 1998).

3.3 GMM differences

When problems associated with the presence of unobserved individual effects persist, the first differences of the model can solve them. Laeven (2000) mentions that when these effects are present, inconsistent estimators are obtained. One way of detecting the problem is through persistence of the serial correlation of the residuals.

After obtain the first differences, we have the following model:

$$\Delta Y_{it} = \alpha \Delta Y_{it-1} + \beta' \Delta X_{it} + \Delta v_{it} \qquad \textbf{(iii)}$$

While the first differences model can overcome the problem of the presence of unobserved individual effects, the problem of correlation between this new error term (Δv_{it}) and the new lagged variable still persists (ΔY_{it}). Therefore, the use of instruments is necessary.

If the following additional moment conditions are met:

$$E(Y_{it-s} \Delta v_{it}) = 0 \quad \text{for all } s \geq 2, \text{ and } t=1,2,\ldots T \quad \textbf{(iv)}$$

$$E(X_{it-s} \Delta v_{it}) = 0 \quad \text{for all } s \geq 2, \text{ and } t=1,2,\ldots T \quad \textbf{(v)}$$

Then, under the assumption that the explanatory variables are weakly exogenous and the Δv_{it} is serially uncorrelated, the following observations can also be used as valid instruments:

$$(Y_{it-2}, Y_{it-3}, \ldots Y_{i1}) \text{ , } (X_{it-2}, X_{it-3}, \ldots X_{i1}).$$

While GMM differences, can solve the problem of unobserved individual effects after obtain the first differences model, Gallego and Loayza (2000); Laeven (2000); Levine, Loayza and Beck (2000); Blundell and Bond (1998) note that the lagged variables in levels can be weak instruments and generate biased estimators, this problem can be corrected by using GMM system.

3.4 GMM system

This estimation incorporates the previous two regression equations (i and iii) where the valid instruments for the difference equation are the lags of the variables in levels, while for the level equation, the valid instruments are the lagged differences.

In GMM system correlation between the variables in levels and the unobserved individual effects μ_i may exist:

$E(Y_{it}\ \mu_i) = E(Y_{is}\ \mu_i)$ for all s and t **(vi)**

$E(X_{it}\ \mu_i) = E(X_{is}\ \mu_i)$ for all s and t **(vii)**

However, correlation between the differenced variables and the unobserved individual effects is not allowed.

If the following moment conditions are met:

$E(\mu_{it}\ \Delta Y_{it-1}) = 0$ **(viii)**

$E(\mu_{it}\ \Delta X_{it-1}) = 0$ **(ix)**

Then, the valid instruments for the difference equation are:
$(Y_{it-2}, Y_{it-3}, \ldots Y_{i1})$, $(X_{it-2}, X_{it-3}, \ldots X_{i1})$.

While, the valid instruments for the level equation are:
ΔY_{it-1} y ΔX_{it-1}

To verify that the moment conditions are met, the Sargan test of over-identifying restrictions is used, in which the null hypothesis is the validity of the instruments. The serial correlation test examines the null hypothesis that the errors do not exhibit second order serial correlation. Therefore, we expect p-values greater than 0.1 to accept that these specifications are adequately met, as indicated by Arellano and Bond (1991).

Section IV: Estimation Methodology.

4.1 Data

A data panel is used to estimate the model, collecting annual information for 196 firms that traded their securities on the Mexican Stock Exchange during the period between 1990 and 2012. The data collected come from the Financial Yearbook (published by the Mexican Stock Exchange) and correspond to the Financial Statements at the end of each year.

Following the methodology suggested by Leaven (2000) and Levine, Loayza, & Beck (2000), only those companies that list their securities for at least three consecutive years are included in this sample. Therefore, parameters must be obtained from an unbalanced panel. The tickers of companies analyzed in this study are listed in **Table 18**.

Table 18: Ticker of companies under profitability and affiliation analysis

AATENSA	CAMESA	EATON	GIDUSA, CODUSA, PAPPEL	IUSACEL	PARRAS	SITUR
ACCELSA	CAMPUS	ECE	GIGANTE	JDEERE	PASA	SORIANA
ACCO	CEMEX	EDOARDO	GISSA	KIMBER	PENWALT	SORIMEX
ACERLA	CERAMIC	EKCO	GMACMA	KOF	PEÑOLES	SPORT
ACMEX	CHDRAUI	ELEKTRA	GMARTI	LAB	PEPSIGX	SUDISA
AEROMEX	CIDMEGA	EMPAQ	GMD	LAMOSA	PERKINS	SYNKRO
AGRIEXP	CIE	EMVASA	GMDR	LATINCA	PLAVICO	TAMSA
AHMSA	CIERRES	EPN	GMEXICO	LINDE	PONDER	TEKCHEM
ALFA	CINTRA	ERICSON	GMODELO	LIVEPOL	PORCE	TELECOM
ALMACO	CMA	FEMSA	GMODERN	LUXOR	POSADAS	TELMEX
ALSEA	CMOCTEZ	FERIONI	GOMO	MADISA	PROCORP	TEXEL
AMX	CODUMEX	FIASA	GPH	MAIZORO	PYP	TLEVISA
APASCO	COFAR	FOTOLUZ	GPQ	MARTIN	QBINDUS	TMM
ARA	COLLADO	FRAGUA	GRUMA	MASECA	QTEL	TREMEC
ARGOS	COMERCI	FRISCO	GSANBOR	MAXCOM	QUMMA	TRIBASA, PINFRA
ARISTOS	CONTAL, AC	GACCION	GSYR	MAYA	RCENTRO	TTOLMEX
ASUR	CONVER	GAM	GVIDEO	MEDICA	REALTUR	TUACERO
AUTLAN	COVARRA	GAP	HERDEZ	MEGA	REGIOEM	TVAZTCA, AZTECA
AXTEL	CRISOBA	GCALIND	HILASAL	MEXCHEM	SABE, SAB	UNICA
BACHOCO	CYDSASA	GCARSO	HOGAR	MINSA	SANBORN	URBI
BAFAR	DATAFLX	GCC	HOMEX	MOVILA	SANLUIS	VALLE
BEROL	DERMET, POCHTEC	GCORVI	HYLSAMX	NACOBRE	SARE	VASCONI
BEVIDES	DESC, KUO	GEASA	IASASA	NADRO	SAVIA	VIDEO
BIMBO	DIANA	GEO	ICA	NALCO	SEARS	VIRREAL
BIPER	DINA	GEUPEC, CULTIBA	ICH	NUTRISA	SELMEC	VISA
BOLSA	DINE	GFAMSA	IEM	OHLMEX	SIDEK	VITRO
BUFETE	DIXON	GGEMEX	IMSA	OMA	SIGMA	WALMEX
CABLE	DUTY	GICONSA	INDETEL	OXY	SIMEC	WINGS, CMR

The shaded cells represent companies still listed in the Mexican stock exchange. If there is more than one name in a cell, the last one corresponds to the most recent ticker registered, and is the result of a name change derived from restructuring, mergers or acquisitions.

The dependent variable is:
Return on Assets (ROA)[44]. Net profit divided by total assets and is the variable that represents company profitability.

As regressors, the following variables are used:
ROA (-1) represents the first lag of ROA

Leverage. The ratio of total liabilities to total assets.

Cash Stock. The proportion of cash and securities to total assets. This variable represents the availability of liquid assets of the firm.

Asset Turnover. The ratio of sales to total assets, measuring the efficiency with which company resources are used to generate income.

It is important to mention that the previous three variables can enter the econometric model as lagged regressors.

Dummy Group. For the companies that are part of a business group in a certain year, it is assigned the number one, or is assigned zero value if the company does not belong to any group.

Dummy Crisis and Group. This variable takes the value of one if a company belongs to a business group in any of the years in which the Mexican economy suffered a contraction of GDP: 1993, 1995, 2001, 2002, 2003, 2008 and 2009, zero otherwise.

Given the definition of business group proposed by Castaneda (1998), this variable was created to distinguish the presence of two or more individuals in the boards of directors of two or more companies, namely, if the director of the company "X" serves on the board of directors of Company "Y", and someone from the latter company also sits on the board of directors of the

[44] ROA is the only measure of performance of enterprises used here, instead of using Tobin's Q. An advantage of using ROA is it measures the skill and efficiency of the company to generate profits in relation to the assets at its disposal to generate them; the downside is that this measure does not consider intangible assets and the income derived from their use Wiwattanakantang (1999). The most serious disadvantage with Tobin's Q is that in emerging markets it does not adequately represent the value of the firm; Khanna and Rivkin (1999); Maher and Andersson (2000); Wiwattanakantang, (1999); because the markets are illiquid. Accounting measures of profitability are better to guide business operations and investments Blanchard, Rhee and Summers (1993).

first, it is said that those two companies are a business group. Of course, this criterion applies to more people and / or companies; so that the network can extend further. For the construction of the dummy group, individuals in the various Boards of Directors were identified year after year and company by company. Usually people who are part of the Boards are individuals who have a significant equity stake in the firm. This approach to construct this variable may be justified because of the unavailability of the specific shareholding of one or more individuals and/or their families. **Table 19**, lists the business groups identified by this method, and are ordered from the largest to the smallest.

Table 19: Business Groups in México

GROUP 1 AMX, ACTINVER, AEROMEX, BOLSA, CMOCTEZ, GCARSO, GFINBURSA, GMODELO, IDEAL, INCARSO, KIMBER, MFRISCO, TELMEX
GROUP 2 ACTINVR, AEROMEX, BOLSA, GCARSO, GMODELO, KIMBER, MEXCHEM, SORIANA, TELMEX
GROUP 3 AC, AUTLAN, CABLE, INVEX, GFREGIO, GISSA, MEXCHEM, POCHTEC, TLEVISA
GROUP 4 DINE, GCARSO, GMEXICO, GNP, HERDEZ, KIMBER, KUO, PEÑOLES, TLEVISA
GROUP 5 ASUR, BIMBO, FEMSA, KOF, GNP, GPH, GPROFUT, PEÑOLES, TLEVISA
GROUP 6 BACHOCO, GEO, GMEXICO, HERDEZ, KIMBER, MEXCHEM, SANLUIS
GROUP 7 GFINTER, GFNORTE, GIGANTE, GRUMA, INVEX, LIVEPOL, MASECA
GROUP 8 ALFA, CYDSASA, LAMOSA, GMEXICO, GFNORTE, KIMBER, VITRO
GROUP 9 BOLSA, ICA, GBM, GMODELO, OMA, SANMEX, TLEVISA
GROUP 10 AXTEL, CEMEX, GCC, PASA, TEKCHEM
GROUP 11 CERAMIC, CMR, GMARTI, POSADAS
GROUP 12 ALSEA, HOMEX, LAB, SPORT
GROUP 13 GFMULTI, REALTUR
GROUP 14 MONEX, VASCONI
GROUP 15 CONVER, MINSA
GROUP 16 AZTECA, ELEKTRA

GROUP 17 GAM, GEUPEC
GROUP 18 BEVIDES, SAB
GROUP 19 GMD, GMDR
GROUP 20 ICH, SIMEC

To build the dummy group and crisis, a dummy of time was first created to distinguish the years 1993, 1995, 2001, 2002, 2003, 2008 and 2009 in which the Mexican economy experienced a recession. Then this variable is multiplied by the dummy group, creating a dichotomous variable that will serve us later to characterize the profitability of the groups and their affiliates in adverse economic conditions.

Table 20 shows the descriptive statistics. All variables have been divided by total assets, thus representing a fraction of them. The exceptions are: the size of the firm, which was obtained by calculating the natural logarithm of net sales; and in the case of foreign sales, it is a fraction of net sales; and, of course, the dichotomous variables.

On average, the profitability of companies during this period is 3.2%. While a relatively low number, one must bear in mind the great crises of 1995 and 2008-2009. Chong et al (2009) report records of 2.3% during this same timeframe.

Liabilities represent 46.2% of assets, 22.7% of them are contracted debts in the banking and stock market, which in turn are composed of 9.3% of short term borrowings and the remaining 13.4% to long term liabilities; financing from suppliers adds 8.8%.

The availability of cash and securities averages 7.6% of assets, while sales reached 80.8% of assets, and credit to its customers reached an average of 11.7%.

Foreign sales were, on average, 16.0% of revenues; 10.4% of those foreign sales correspond to firms where 50% or more of their sales were devoted to the foreign market.

Finally, 65.9% of the observations corresponded to companies affiliated with any group.

Table 20: Descriptive Statistics of variables for profitability and affiliation analysis

Variables:	**Mean**	**Std. Dev.**	**Maximum**	**Minimum**
ROA	0.032	0.103	0.524	-1.689
Leverage	0.462	0.211	1.889	0.001
Cash Stock	0.076	0.079	0.758	0.000
Asset Turnover	0.808	0.514	5.346	0.008
Debt	0.227	0.181	1.468	0.000
Short Term Debt	0.093	0.124	1.468	0.000
Long Term Debt	0.134	0.138	1.222	0.000
Tangibility	0.488	0.215	0.988	0.000
Foreign Sales	0.160	0.218	1.000	0.000
Exports Dummy	0.104	0.306	1.000	0.000
Size	15.105	1.789	20.468	7.901
Credit to Customers	0.117	0.104	0.671	0.000
Credit from Suppliers	0.088	0.087	0.705	0.000
Working Capital	0.047	0.187	0.897	-1.437
Group Dummy	0.659	0.474	1.000	0.000
Group & Crisis Dummy	0.155	0.362	1.000	0.000

Description:

ROA: Net Profit / Total Assets
Leverage: Total Liabilities / Total Assets,
Cash Stock: Money and Securities / Total Assets,
Asset Turnover: Sales / Total Assets,
Debt: Credit from Banks and Debt Notes / Total Assets,
Short Term Debt: Bank Loans and Short Term Securities / Total Assets,
Long Term Debt: Bank Debt and Long-Term Securities / Total Assets,
Tangibility: Fixed Assets / Total Assets,
Foreign Sales: Sales Abroad / Net Sales,
Size: Natural logarithm of net sales.
Credit to Customers: Customer loans / Total Assets,
Credit from Suppliers: Credit Suppliers / Total Assets,
Working Capital: (Current assets minus current liabilities) / Total Assets,
Dummies in this table have been explained in Section IV.

Something that can be seen in Table 20 is the large degree of variability of the variables mentioned in the preceding paragraph. This is very characteristic of economies in developing countries, where economic instability generates an environment of much uncertainty for businesses operating in these markets.

For the analysis of the financial statements, a lot of financial ratios can be used to assess the performance of a firm. Block and Hirt (1998) grouped these into a) ratios of profitability, b) asset utilization, c) liquidity and d) the use of liabilities. One must have in mind, however, that ratios within each category could be highly correlated, causing multicollinearity problems.

De et al (2011) indicate that for purposes of regression analysis, of 44 financial ratios only 8 are useful. According to these authors; in a model where Return On Assets (ROA) is the dependent variable, one ratio from each category must be used as control variable. **Table 21** contains the correlation coefficients of the variables used in the regression model.

Table 21: Correlation Coefficients, variables used for profitability and affiliation analysis

	ROA	L	CS	AT	ROA (-1)	L(-1)	CS (-1)	AT (-1)	GD	GCD
ROA	1.000	-0.391	0.212	0.189	0.493	-0.223	0.173	0.177	0.018	-0.051
L		1.000	-0.193	-0.022	-0.386	0.851	-0.182	-0.036	0.003	0.065
CS			1.000	0.034	0.218	-0.151	0.753	0.054	0.090	0.021
AT				1.000	0.177	-0.003	0.028	0.935	-0.087	-0.063
ROA (-1)					1.000	-0.386	0.217	0.211	0.034	-0.084
L (-1)						1.000	-0.186	-0.023	0.005	0.059
CS (-1)							1.000	0.030	0.087	-0.001
AT (-1)								1.000	-0.080	-0.060
GD									1.000	0.308
GCD										1.000

Description:
ROA: Return on Assets, L: Leverage, CS: Cash Stock, AT: Asset Turnover,
GD: Group Dummy, GCD: Group Crisis Dummy.
The value in brackets (-1) means that the variable was lagged one period

4.2 Performance Model

To analyze the determinants of profitability, we must estimate the parameters of the following model:

$$Y_{i,t} = \alpha_0 Y_{i,t-1} + \beta'_1 X_{i,t} + \beta'_2 X_{i,t-1} + \mu_i + \upsilon_{it} \qquad \textbf{(x)}$$

With i = 1,2,… 196,and t =1990,1991,… 2012.

Thus we have Dynamic Panel Data expressed in matrix form, where ROA is the dependent variable. Following Castaneda (2002), the autoregressive term can capture an inertia effect on ROA, and if the values are less than unity, this implies an adjustment to their long-term value.

The explanatory variables capture the contemporary and lagged effects of leverage, asset turnover and cash stock. Thus, this empirical model includes typical control variables and those that were built to classify firms affiliated to one group (group dummies) to test the hypothesis that membership affects their profitability and that business groups carry out the practice of extracting rents. In addition, the use of GMM system[45] should provide robust estimates compared with those of least squares.

4.3 Results

Knowing the linkages and economic activities of the companies forming each of the identified groups, it can be seen that they are quite diversified. The exceptions are group 18 (pharmaceuticals) and group 20 (metalworking). Likewise, the largest of these groups (group 1) corresponds to the Slim family, in second place is found the group of the Aramburuzabala, Martin and Diez families, in third place is the group dominated by the Azcarraga and Garza families. This list could be extended by highlighting the names of the leading businessmen who run these firms, and discovering the network and interests they have in various companies, whose continued interaction has solidified the trust between these actors to engage in several businesses together.

Of course such groups have evolved over time: some companies have joined these groups and others have left them. For example, the partnership between Slim and Azcarraga family has ended as a result of a conflict of interest, the Zambrano family (that controls Cemex) now participates in fixed telephony business, joining the company Axtel to the group. Bimbo,

[45] The advantage of using GMM system is that it avoids the problem of autocorrelation of residuals and correlation of individual effects with the explanatory variables to improve the significance of estimated parameters. Also instrumental variables from the lagged level and lagged differences are available Blundell and Bond (1998), Roodman (2006).

who had remained independent for a long time, now is part of a group (5), and new groups have been formed, such is the case with groups 12 and 18.

Table 22: Regression Results, profitability model

One-step estimation using DPD (Using robust variance-covariance matrix)			
	Dependent Variable: ROA		
Explanatory Variables	Model 1	Model 2	Model 3
ROA(-1)	0.115113 *(0.056)	0.261759 ***(0.000)	0.149085 ***(0.008)
Leverage	-0.168978 ***(0.000)		-0.422826 ***(0.000)
Leverage (-1)		0.0803066 **(0.037)	0.348095 ***(0.000)
Cash Stock	0.332650 ***(0.000)		0.204070 ***(0.000)
Cash Stock(-1)		0.235482 **(0.018)	0.0799700 (0.224)
Asset Turnover	0.0406587 **(0.036)		-0.00711754 (0.850)
Asset Turnover (-1)		0.0622452 ***(0.001)	0.0570179 *(0.091)
Group Dummy	0.0377445 **(0.045)	0.0332080 *(0.057)	0.0296568 *(0.077)
Group & Crisis Dummy	-0.0133923 ***(0.009)	-0.0161417 ***(0.003)	-0.0156229 ***(0.002)
Constant	0.0224657 (0.407)	-0.104287 ***(0.007)	-0.0174409 (0.420)
No. of observations	2435	2435	2435
No. of individuals	196	196	196
Longest time series	21 (1992-2012)	21 (1992-2012)	21 (1992-2012)
Shortest time series	2 (unbalanced panel)	2 (unbalanced panel)	2 (unbalanced panel)
Wald (joint):	Chi^2(6)= 246.8 [0.000] ***	Chi^2(6)= 140.3 [0.000] ***	Chi^2(9)= 336.6 [0.000] ***
Wald (dummy):	Chi^2(1)= 0.6872 [0.407]	Chi^2(1)= 7.273 [0.007] ***	Chi^2(1)= 0.6508 [0.420]
AR(1) Test:	N(0,1)= -4.307 [0.000] ***	N(0,1)= -4.137 [0.000] ***	N(0,1)= -4.722 [0.000] ***
AR(2) Test:	N(0,1)= -1.610 [0.107]	N(0,1)= -1.109 [0.267]	N(0,1)= -0.4452 [0.656]
Sargan Test:	Chi^2(1002)= 192.2 [1.000]	Chi^2(1002)= 184.1 [1.000]	Chi^2(999)= 190.8 [1.000]
Transformation used: first differences GMM-SYS estimation combines transformed and level equations			
Instruments for transformed equation: Gmm(ROA,2,99) Gmm(Leverage,2,99) Gmm(Cash Stock,2,99) Gmm(Asset Turnover,2,99)			
Instruments for level equation: GmmLevel(ROA,1,1) GmmLevel(Leverage,1,1) GmmLevel(Cash Stock,1,1) GmmLevel(Asset Turnover,1,1)			
*Significant at 10%, **Significant at 5%, ***Significant at 1%. p-values in parenthesis.			
For Wald test, Ho: parameters are zero. Wald test for Model 3, Ho: $Leverage_{i,t} + Leverage_{i,t-1} = 0$, Chi^2(1) = 69.1323 [0.0000] *** For AR test, Ho: No serial autocorrelation of errors. For Sargan test, Ho: Instruments are valid.			

Continuation Table 22

One-step estimation using DPD (Using robust variance-covariance matrix)			
	Dependent Variable: ROA		
Explanatory Variables	Model 4	Model 5	Model 6
ROA(-1)	0.166742 ***(0.003)	0.168123 ***(0.004)	0.166071 ***(0.004)
Leverage	-0.429482 ***(0.000)	-0.431976 ***(0.000)	-0.433582 ***(0.000)
Leverage (-1)	0.356430 ***(0.000)	0.358501 ***(0.000)	0.358192 ***(0.000)
Cash Stock(-1)	0.197010 **(0.013)	0.185059 **(0.011)	0.202033 **(0.020)
Asset Turnover	0.0380589 **(0.029)	0.0379435 **(0.022)	0.0402682 **(0.039)
Group Dummy	0.0305608 *(0.069)	0.0275465 (0.129)	0.0304918 *(0.069)
Group & Crisis Dummy	-0.0143131 ***(0.007)	-0.0137445 **(0.011)	-0.0149715 ***(0.004)
Tangibility		-0.0374357 (0.453)	
Size		-0.000564731 (0.899)	
Export Dummy		-0.00345528 (0.847)	
Communications & Transports Dummy			0.0777264 (0.159)
Construction Dummy			-0.00618845 (0.913)
Extractive Industry Dummy			0.00882802 (0.871)
Manufacturing Industry Dummy			0.0236655 (0.461)
Services Dummy			0.0790974 (0.362)
Unclassified Industry Dummy			0.0184585 (0.641)
Constant	-0.00344518 (0.881)	0.0267794 (0.731)	-0.0274065 (0.425)
No. of observations	2435	2427	2435
No. of individuals	196	196	196
Longest time series	21 (1992-2012)	21 (1992-2012)	21 (1992-2012)
Shortest time series	2 (unbalanced panel)	2 (unbalanced panel)	2 (unbalanced panel)
Wald (joint):	Chi^2(7)= 293.7 [0.000]***	Chi^2(10)= 343.2 [0.000]***	Chi^2(13)= 373.2 [0.000]***
Wald (dummy):	Chi^2(1)= 0.02228 [0.881]	Chi^2(1)= 0.1186 [0.731]	Chi^2(1)= 0.6365 [0.425]
AR(1) Test:	N(0,1)= -4.677 [0.000]***	N(0,1)= -4.633 [0.000]***	N(0,1)= -4.695 [0.000]***
AR(2) Test:	N(0,1)= -0.4511 [0.652]	N(0,1)= -0.4358 [0.663]	N(0,1)= -0.4447 [0.657]
Sargan Test:	Chi^2(1001)= 193.2 [1.000]	Chi^2(998)= 192.2 [1.000]	Chi^2(995)= 190.1 [1.000]
Transformation used: first differences GMM-SYS estimation combines transformed and level equations			
Instruments for transformed equation: Gmm(ROA,2,99) Gmm(Leverage,2,99) Gmm(Cash Stock,2,99) Gmm(Asset Turnover,2,99)			
Instruments for level equation: GmmLevel(ROA,1,1) GmmLevel(Leverage,1,1) GmmLevel(Cash Stock,1,1) GmmLevel(Asset Turnover,1,1)			
*Significant at 10%, **Significant at 5%, ***Significant at 1%. p-values in parenthesis.			

For Wald test, Ho: parameters are zero.
Wald test for Model 4, Ho: Leverage $_{i,t}$ + Leverage $_{i,t-1}$ = 0, Chi^2(1) = 89.3872 [0.0000] ***
For AR test, Ho: No serial autocorrelation of errors.
For Sargan test, Ho: Instruments are valid.

Table 22 presents different variants of equation (x), in all of them the autoregressive term Yi, t-1 is included as an explanatory variable, as well as the dummy variables. The Models, 1 to 6, can include contemporaneous and/or lagged terms of other explanatory variables. P-values are reported in parentheses.

Between different models tested, the parameters of the first lag of ROA were statistically significant, positive, and their values were between 0 and 1, confirming that this parameter can capture an inertia effect (Castaneda, 2002). In order to explain that if in previous periods strategic decisions generated profits, these must persist in subsequent periods. Thus, the autoregressive term in equation (x) allows having a dynamic version of profitability and partial adjustment.

For the leverage ratio, the level of indebtedness at time t is negative, while in the previous period, t-1, the value is positive. In order to indicate the net effect of financial leverage, a linear constraint is tested, so that Ho: Leverage $_{i,\ t}$ + Leverage $_{i,\ t-1}$ = 0. You can see at the end of Table 22 (referring to the models 3 and 4) that the null hypothesis is rejected in favor of the alternative, where the sum of both parameters is negative and statistically different from zero (p -value is less than 0.05).

It is known that if debt increases the profitability of a firm, then it serves as a lever for creating value and thus promoting growth. However, this applies only when the additional return achieved exceeds the cost of the financing. The opposite can happen when profits from new investment projects are not able to offset that cost. With the above test can be mentioned that financial leverage in Mexican companies had not been effective in increasing rates of profitability[46].

There is a positive relationship between Cash Stock and ROA and, as in the work of Love (2000), availability of liquid assets makes feasible embark on new investment projects, especially when access to external financing is complicated. Therefore, if a company has a cash surplus, it may be used for

[46] In times of economic turmoil, ambivalence in the sign of the leverage parameter could be explained by the fact that companies experience first a decline in their liquidity, when aggravated, is accompanied by acceleration in the level of indebtedness, thus subsequently reducing profitability rates.

its investment plans, or simply to solve temporary liquidity problems. In sum, the availability of liquidity is indicative of the health of a company.

Regarding asset turnover as a measure of efficiency in the use of the company assets, their contribution is also significant to explain the profitability ratio in the expected direction. Better management can be captured in this variable, which enables the company to generate value with the given resources (Block and Hirt, 1998).

For testing the hypothesis of this paper, in first instance it can be seen that belonging to a business group positively affects the profitability of enterprises, such membership means having an additional return of 3%. This association was relevant in determining profitability as stated by Khanna and Yafeh (2007). Membership in a group can be a strategy that improves the performance of the firm by taking advantage of the business network and resources of the group. However, if we consider group membership during recession years, the negative sign indicates the presence of the phenomenon of rent extraction, as was theorized by Castaneda (1998). These firms have an exaggerated drop in profits of approximately 1.5%.

Several other variables were used, including: Size, Tangibility, Exports Dummy, but their parameters were not significant, and therefore not presented here. The dummies of economic activity were not significant either. Other variables from table 20 were discarded because of potential problems of multicollinearity.

Section V. Conclusions

Among the various measures that can be implemented to achieve economic growth, a corporate governance reform can improve access into financial services to increase investment and improve resource allocation to the most attractive projects, either through banks or the stock market.

In the same sense, several additional measures can be undertaken to improve the functioning of the financial sector:

a) Providing effective legal protection for investors.

b) Listed companies must adopt and enforce better corporate governance codes in order to ensure confidence to the new shareholders and investors, including: fair treatment for all shareholders, clear definition of the functions of the board of directors and senior executives, accurate and timely dissemination of financial statements and integrity.

The proper management of firms may generate greater access to external financing, and lower the cost of capital.

The concern to strengthen the financial sector was most noticeable after the Asian crisis of 1997, when it became clear that the management of the firms, and therefore the resources of shareholders and creditors, was far from ideal; as demonstrated by the great losses in several companies of the countries most affected by the crisis (Thailand, South Korea, Indonesia, Taiwan).

As corporate governance defines how companies are organized to produce and distribute the wealth generated, it follows that improved governance practices will increase the valuation of firms, maximize shareholder wealth, and limit the practice of tunneling.

This paper makes several contributions to the study of Business Group affiliation and profitability of firms.

First, it is a country study that covers all the companies listed during a relatively long period.

Second, in line with the work of Khanna and Yafeh (2007), the evidence shows that affiliation to one of these groups enhances profitability in comparison to companies that remain isolated.

Third, according to the work of Chong et al (2009), the existence of a pernicious corporate practice is proven. However, unlike these authors, it could be observed as a temporary phenomenon, as was theorized by Castaneda (1998), and only occurs during periods of economic contraction.

One would expect that belonging to a business group in Mexico enables companies to address a somewhat conducive business environment and, to some extent, it has been a valid survival strategy, although this strategy also imposes costs.

Fourth, GMM System allows the use of instruments to cope with possible problems of endogeneity.

Fifth, Cash Stock is an important variable to explain the profitability of companies. Liquid assets are crucial to keep a firm operating (especially when loanable funds are difficult to obtain) and enables a firm to invest in profitable projects using internal resources. Liquidity has a positive effect on profitability and tends to last in the long run.

Sixth. Leverage, while significant, is negative. This makes us think of failures in management to achieve higher levels of profitability with the use of borrowed funds, mainly because they are not invested in the most attractive projects to offset the costs of such funding. Even though the negative impact on profitability is pronounced in the short run, it is attenuated in the long run, but still is negative.

Seventh. Regarding Asset Turnover, the estimated parameter was significant and with the expected sign (positive). To that extent, a financial manager that efficiently plans the use of resources to generate revenue should result in a higher profitability and value of the firm. Although the effect is smaller in comparison with cash stock, the impacts are positive in the short and long run.

Given that the law recently mandated that independent board members must be included to protect minority shareholders, as a future line of research one could validate empirically if this legal provision is effective.

Chapter 3: On using a Transfer Function Model for the price discovery of stock returns: maybe Beta is all that matters.

Section I: Introduction

The Capital Asset Pricing Model (CAPM) is criticized for its assumptions and lack of explanatory power. Thus, the objective of this chapter is to present empirical evidence that only one pricing factor is needed and to demonstrate that, despite criticism, maybe this model is still valid for portfolio management.

The attempt of Fama & Macbeth (1973) to empirically validate the CAPM is conducted as follows: 1.- estimate a time series regression using the market model, 2.- perform a cross section regression to obtain the market risk premium of the stocks (or portfolios). As the results were not promising, following those steps other factors were incorporated in addition to market return, Fama & French (1992) and Fama & French (1993). Since then, many works tried to demonstrate the superiority of their factors.

Regarding step 1, most of prior research had focused in incorporating other factors to improve the regression results, either in unconditional or conditional CAPM; see for example Subramayan (2010) that documented over fifty variables. He highlights expected inflation, interest rates, output gap, consumer confidence, default spread, term spread, momentum, E/P ratio, etc., in addition to the most common factors such as Size and B/M ratio. For recent research in emerging markets we have Soon-Ho et al (2012), Harshita & Yadav (2015) and Bajpai & Sharna (2015).

In my view, the problems to validate the CAPM still continue in step 1, from the early work of Jensen (1968) until the very recent papers of Bajpai & Sharna (2015) and Soon-Ho et al (2012). The most recurrent problems are: a) low R^2, b) non normality of residuals, and c) undesirable effects of outliers.

The scope of this chapter is to propose the use of an estimation methodology for the analysis of time series with the following features: parsimony, simplicity and their dynamic nature. In the context of CAPM, to the best of my knowledge, the Transfer Function Model (TFM) has not

been applied. This seems to be the ideal model to test whether the market index is enough to explain asset returns in a time series setting. In fact, while there might be other factors explaining stock returns, the model performs well just using market returns and their lags as independent variable. This structure of contemporaneous and lagged variables (X_t, X_{t-1},.. X_{t-n}, to explain Y_t) suggest that there is some sort of short run beta and a long run beta.

The sample used herein covers monthly data from June 1996 to April 2015. It corresponds to the longest data available, and covers three major crises affecting stock markets worldwide: the Asian Crisis, the Dot Com Bubble Burst, and the most recent crisis originated with the bankruptcy of Lehman Bros.

Another characteristic to mention is that in emerging countries, when compared to developed markets, stock prices are subject to a greater volatility. This posits a major challenge in trying to model stock returns.

Section II: Theory and Evidence of the CAPM

2.1 The Model assumptions

Given the purpose of this study, the assumptions on which CAPM was constructed must be identified. Rational investor behavior is based on an individual acting on the basis of only two parameters: expected value and variance (or standard deviation). That is, an investor chooses an efficient portfolio represented in the efficient frontier.

This explicitly appeared in Markowitz (1952)

I. "We assume static probability beliefs" [47]. The model assumes that only two characteristics for the selection of financial assets are relevant to investors, namely, the expected rate of return and the variances associated with such assets.

Sharpe (1964) made the following assumptions:

I. "Assume that an individual views the outcome of any investment in probabilistic terms; that is, he thinks of the possible results in terms of some probability distribution. In assessing the desirability of a particular investment, however, he is willing to act on the basis of only two parameters of this distribution –its expected value and standard deviation".

II. "We assume a common pure rate of interest, with all investors able to borrow or lend funds on equal terms".

III. "We assume homogeneity of investor expectations: investors are assumed to agree on the prospects of various investments -the expected values, standard deviation and correlation coefficients described in the model".

[47] "We assume that the investor does (and should) act as if he had probability beliefs concerning these variables. If the investor were consistent in his opinions on such matters, he would possess a system of probability beliefs. We cannot expect the investor to be consistent in every detail. We can, however, expect his probability beliefs to be roughly consistent on important matters that have been carefully considered. We should also expect that he will base his actions upon these probability beliefs -even though they be in part subjective. This paper does not consider the difficult question of how investors do (or should) form their probability beliefs" (Markowitz, 1952, p. 81).

Finally, Lintner's (1965) assumptions were:

I. Each individual can invest any part of his capital in certain risk-free assets.
II. Each individual can invest any fraction of his capital in any or all of a given finite set of risky securities.
III. Those risky securities are traded in a single purely competitive market, free of transactions costs and taxes, at given market prices.
IV. Individuals can borrow or lend funds to the risk-free rate.
V. Any individual makes all purchases and sales of securities and all deposits and loans at discrete points in time.
VI. Each investor has already decided the fraction of his total capital he wishes to hold in cash.
VII. Each investor will have assigned a joint probability distribution incorporating his best judgments regarding the returns on all individual stocks, or at least will have specified and expected value and variance to every return and a covariance or correlation to every pair of returns.

2.2 The Markowitz and Sharpe Models

In the theoretical foundations of modern portfolio management, the Capital Asset Pricing Model (CAPM) stems from the works of Markowitz (1952), Sharpe (1964), Lintner (1965), Mossin (1966) and is a static version for portfolio management. The most commonly known model in the textbooks of corporate finance, however, is the Markowitz-Sharpe version. Its usefulness consists of the ability to determine investor's resource allocations between different securities available in the market at any given time, and, despite theoretical and empirical criticisms[48], don't exist yet a better model for replacing it. Therefore, on certain assumptions about the behavior of

[48] "These assumptions represent a highly simplified and idealized world, but are needed to obtain the CAPM in its basic form. The model has been extended in many ways to accommodate some of the complexities manifested in the real world. But under these assumptions, given prevailing prices, investors all will determine the same highest Sharpe Ratio portfolio of risky assets. Depending on his/her risk tolerance, each investor will allocate a portion of wealth to this optimal portfolio and the remainder to risk-free lending or borrowing. All investors will hold risky assets in the same relative proportions" Perold (2004, pp. 15-16).

investors and the market, a linear relationship between return and risk is established.

Defining R_p as the portfolio return, and R_i the return of the individual security i, and X_i the weights invested in those securities, such that $\sum_i^N X_i = 1$:

$$E(R_p) = \mu_p = \sum_i^N X_i \mu_i \quad (1)$$

In matrix form can be represented as:

$$E(R_p) = [X_1 \quad X_2 \dots \quad X_N] \begin{bmatrix} R_1 \\ R_2 \\ \vdots \\ R_N \end{bmatrix} = X'R \quad (2)$$

While for the variance of the portfolio we have:

$$V(R_p) = \sigma_p^2 = \sum_{i=1}^N X_i^2 \, \sigma_i^2 + 2 \sum_{i=1}^N \sum_{j>1}^N X_i X_j \, \sigma_{ij} \quad (3)$$

Also in matrix form, equation (3) can be represented as:

$$\sigma_p^2 = [X_1 \quad X_2 \dots \quad X_N] \begin{bmatrix} \sigma_1^2 & \sigma_{12} \dots & \sigma_{1N} \\ \vdots & & \\ \sigma_{N1} & \sigma_{N2} \dots & \sigma_N^2 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_N \end{bmatrix} = X' \sum X \quad (4)$$

Finding the optimal weights given expectations and the variances of the securities will depend on:

Min σ_p^2, subject to $\sum_i^N X_i = 1$,

Let ι be a vector of ones, in matrix form $\sum_i^N X_i$ is equivalent to $X'\iota = 1$; let also $X'\mu = \bar{\mu}_p$ where $\bar{\mu}_p$ represents the return of the portfolio, the Lagrangian would be:

$$L = \frac{1}{2}X'\sum X + \lambda_1\left(\bar{\mu}_p - X'\mu\right) + \lambda_2(1 - X'\iota) \quad (5)$$

And find

$$\frac{\partial L}{\partial X} = \sum X + \lambda_1(-\mu) + \lambda_2(-\iota) = 0 \quad (6)$$

$$\frac{\partial L}{\partial \lambda_1} = \bar{\mu}_p - X'\mu = 0 \quad (7)$$

$$\frac{\partial L}{\partial \lambda_2} = 1 - X'\iota = 0 \quad (8)$$

Solving for X from (6), we have:

$$X = \sum^{-1}[\mu \quad \iota]\begin{bmatrix}\lambda_1\\ \lambda_2\end{bmatrix} \quad (9)$$

From (7) and (8) we obtain:

$$[\mu \quad \iota]'X = \begin{bmatrix}\bar{\mu}_p\\ 1\end{bmatrix} \quad (10)$$

Pre-multiplying (9) by $[\mu \quad \iota]'$ yields:

$$[\mu \quad \iota]'X = \underbrace{[\mu \quad \iota]'\sum^{-1}[\mu \quad \iota]}_{A}\begin{bmatrix}\lambda_1\\ \lambda_2\end{bmatrix} \quad (11)$$

Where

$$A = \begin{bmatrix}\mu\sum^{-1}\mu & \mu'\sum^{-1}\iota\\ \mu'\sum^{-1}\iota & \iota'\sum^{-1}\iota\end{bmatrix} \quad (12)$$

Since $[\mu \quad \iota]'X = \begin{bmatrix}\bar{\mu}_p\\ 1\end{bmatrix}$ then we can make:

$$\begin{bmatrix}\bar{\mu}_p\\ 1\end{bmatrix} = A\begin{bmatrix}\lambda_1\\ \lambda_2\end{bmatrix} \quad (13)$$

From (13) is obtained:

$$\begin{bmatrix}\lambda_1\\ \lambda_2\end{bmatrix} = A^{-1}\begin{bmatrix}\bar{\mu}_p\\ 1\end{bmatrix} \quad (14)$$

Substituting (14) in (9) we have:

$$X^* = \sum^{-1}[\mu \quad \iota]A^{-1}\begin{bmatrix}\bar{\mu}_p\\ 1\end{bmatrix} \quad (15)$$

Thus, the optimal portfolio weights are obtained. Note that in the above equation, this model shows us how to obtain optimal allocations, but where the **expectations and variances** of returns **are just inputs**. In other words, Markowitz did not mention how must be obtained[49] as his intention was to develop a normative model to determine the optimal weights of a portfolio and in doing this, he established the foundations of modern finance[50].

The theory developed from Markowitz (1952) states that return [51] on financial assets may covariate with each other, so that a linear combination of these assets could generate the same performance with a lower risk[52].

[49] "To use the E-V rule in the selection of securities, we must have procedures for finding reasonable, μ_i and σ_{ij}. These procedures, I believe, should combine statistical techniques and the judgment of practical men. My feeling is that the statistical computations should be used to arrive at a tentative set of μ_i and σ_{ij}. Judgment should then be used in increasing or decreasing some of these μ_i and σ_{ij} on the basis of factors or nuances not taken into account by the formal computations. Using this revised set of μ_i and σ_{ij}, the set of efficient E, V combinations could be computed, the investor could select the combination he preferred, and the portfolio which gave rise to this E-V combination could be found" (Markowitz, 1952, p. 91).

[50] "One suggestion as to tentative μ_i, σ_{ij} is to use the observed μ_i, σ_{ij} for some period of the past. I believe that better methods, which take into account more information, can be found. I believe that what is needed is essentially a "probabilistic" reformulation of security analysis. I will not pursue this subject here, for this is "another story." It is a story of which I have read only the first page of the first chapter" (Markowitz, 1952, p. 91).

[51] It should be noted that when Markowitz refers to the returns of the securities, as the expected return adjusted for a discount rate (Markowitz, 1952, p.77).

[52] When the correlations between assets are zero, there are no benefits of diversification and the variance of a portfolio is simply the weighted average of the individual risks. When correlations are perfect, if positive, two different assets are substitutes and move in the same direction; while if negative, the value of an asset increases the other descends, so that invest in one of them may serve to insure against adverse movements on the other.

He also pointed out that it is possible to obtain a specific combination of optimal portfolio weights that have minimal risk and the highest rate of return from a variance covariance matrix of all risky assets[53]. Portfolios built with the optimal weights are what he called "efficient portfolios", and a graphic representation of different combinations of risks and returns are symbolized in a curve he called "the efficient frontier".

To complement, he assumed that investors are risk averse, meaning that for a specific level of return, they prefer the portfolio with the least risk. This assumption implies that investors will choose a portfolio of the efficient frontier that best suits their risk-return profile. As a result, investors' decisions in building their portfolio will lead them to sell or buy assets in the capital markets, subsequently establishing market equilibrium.

The theoretical foundations of the model of Markowitz were taken up by Sharpe (1964). In fact, despite the contributions of Lintner (1965) and Mossin (1966), this version is the one that has prevailed to this day.

Mossin improved the framework for determining market equilibrium, while Lintner's model uses a number of assumptions that can be categorized as more realistic by allowing short selling, differences between lending and borrowing interest rates, etc. The relative disadvantage of Lintner's model is that rather than working with returns, it uses yields in monetary units[54]. This may represent an inconvenience when dealing with non-stationary time series. The assumption that considers a normal probability distribution function is mistakenly identified with the Markowitz-Sharpe version.

The benefits of diversifying a portfolio arise when $\rho_{1\,2} < 1$, which incidentally is the most common case, in this case the variance of the portfolio will always be lower than individual variances (Jorion, 2002).

[53] Having N titles, the variance covariance matrix would have N^2 elements, of course the elements above and below the main diagonal are equal, so then there will be ½ N (N-1) covariances. In the case of 10 titles, one have to obtain 45 covariances when N = 50 then there are 1225 elements, if N = 100 should be calculated 4950, and so on (Jorion, 2002).

[54] "In the rest of the paper, we assume that investors' joint probability distributions pertain to dollar returns rather than rates of return, and for simplicity we assume that all investor assign identical set of means, variances and covariances to the distribution of these dollar returns." (Lintner, 1965, p.14)

Although incidentally, it is a necessary ingredient for Value at Risk (VaR) models.

The standard version of the textbooks and most of empirical evidence, relates mainly to the Markowitz and Sharpe version.

Speaking of Sharpe's contribution, to generate the capital market line, we start from

$$\sigma_p^2 = [X_1 \quad X_2 \ldots \quad X_N] \begin{bmatrix} \sigma_1^2 & \sigma_{12} \ldots & \sigma_{1N} \\ \vdots & & \\ \sigma_{N1} & \sigma_{N2} \ldots & \sigma_N^2 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_N \end{bmatrix} = X' \sum X \quad (4)$$

Incorporating into the model the risk-free asset, we have:

$$X'\mu + (1 - X'\iota)R_f = \mu_p$$

The Lagrangian can be expressed as:

$$L = X' \sum X + \delta\left(\mu_p - X'\mu - (1 - X'\iota)R_f\right) \quad (16)$$

Whereupon

$$\frac{\partial L}{\partial X} = 2 \sum X + \delta\left(-\mu + \iota R_f\right) = 0 \quad (17)$$

$$\frac{\partial L}{\partial \delta} = \mu_p - X'\mu - (1 - X'\iota)R_f = 0 \quad (18)$$

Rearranging terms:

$$\mu_p - R_f = X'\mu - X'\iota R_f \quad (19)$$

While equation (17) can be expressed as:

$$2 \sum X = \delta\left(\mu - \iota R_f\right)$$

In order to have:

$$\frac{2 \sum X}{\delta} = \left(\mu - \iota R_f\right) \quad (20)$$

Pre-multiplying by X' the above equation, we get:

$$\frac{2X'\sum X}{\delta} = X'\mu - X'\iota R_f \quad (21)$$

Equating (21) to (19):

$$\frac{2X'\sum X}{\delta} = \mu_p - R_f \quad (22)$$

Solving for δ from (22)

$$\frac{2X'\sum X}{\mu_p - R_f} = \delta \quad (23)$$

And substituting (23) into (20):

$$\frac{2\sum X}{\frac{2X'\sum X}{\mu_p - R_f}} = \mu - \iota R_f \quad (24)$$

Rearranging terms:

$$\mu - \iota R_f = \frac{\sum X}{X'\sum X}\left[\mu_p - R_f\right] \quad (25)$$

Finally, we arrive to:

$$\beta = \frac{\sum X}{X'\sum X} \quad (26)$$

It is known that β measures the contribution of one stock to the total risk of the portfolio. β is the basis for asset valuation in the model developed by Sharpe, in which the risk premium depends only on this pricing factor. By the above, the estimated betas of a portfolio are crucial for asset valuation.

2.3 The literature review

The CAPM of Markowitz (1952) and Sharpe (1964) are used extensively in portfolio management, risk management and capital budgeting applications. Jensen (1968) is one of the first researchers that used the market model to determine whether investment funds have systematically higher returns than those of the market, by simply testing if the intercept parameters were statistically different from zero. The corresponding R^2 values were ranging from 0.44 to 0.97. He was aware of potential problems of non-normality of residuals.

Black, Jensen and Scholes (1972), verified the linear relationship between return and risk. They also founded that the low risk securities earned more than the amount predicted by the model and vice versa. They noticed the possibility of non-normality of residuals and the problems of time-varying coefficients.

Fama and MacBeth (1973) were among the first to test the empirical validity of the CAPM, confirming the existence of the Capital Market Efficiency[55] and proving a lineal (and positive) relationship between returns and risks. Although, their R^2 values were ranging from 0.22 to 0.44. In the CAPM, expected returns of a security (or a portfolio) can be explained by the expected market risk premium. However, it was realized later that the expected returns might be explained by more than one factor, since then, multi-factor models have prevailed until now. New theoretical models were developed to address this issue. Merton (1973) developed the intertemporal CAPM, in which state variables (other than market returns) can be incorporated for a dynamic modeling of stock returns. Moreover, the development of the Arbitrage Pricing Theory (APT) of Ross (1976) established that portfolio returns could be explained by a linear combination of "n" risk factors, as well as by the market risk premium[56].

[55] "The model, and especially the underlying assumption of a perfect market, implies a capital market that is efficient in the sense that prices at every point in time fully reflect available information" (Fama and MacBeth, 1973, p. 612).

[56] Assessing risks is one of the main purposes of VaR: not only market risk, but also the risks of liquidity, credit, operational and legal faced by economic agents (Jorion, 2002), although the analysis has focused on the first.

In order to derive investment strategies, implement techniques to forecast returns, or simply, to improve estimation results, Basu (1977) found that stocks with lower P/E ratios provided higher risk adjusted returns than stocks with higher P/E ratios. Banz (1981) found that firm's stocks of smaller size provided higher risk adjusted returns than those of larger size. Similar anomalies were found with respect to other fundamentals as B/M ratio in the work of Stattman (1980) and leverage as stated by Bhandari (1988). Keim and Stambaugh (1986) incorporated variables such as interest rates of government and corporate bonds; they also analyzed the effects of seasonality in such returns. Campbell and Shiller (1988) used dividend-to-price ratio for the analysis of rational bubbles. A similar approach can be seen in the three-factor model of Fama and French (1992) using variables such as Market Returns, Size, B/M ratio. As well as in the five-factor model of Fama and French (1993) including also in addition to the above, to term spread and default spread. Subramayan (2010) have identified about fifty variables used as explanatory variables. However, given the high and growing volume of factors to explain returns, for an investor might seem unclear which set of variables is the more appropriate.

One of the principles of the CAPM is that any asset return needs to be compared with the representative market portfolio; however, it has never been clearly established which is precisely the representative portfolio[57]. This topic has relation with the so-called Roll Critique (see Roll, 1977), which questions whether the market portfolio is observable, because, in his view, it should include other assets in addition to financial assets.

Generally, beta is not constant over time[58]. This problem is due to changes, during bear or bull markets, in the covariance and correlations between

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[57] "For the market to be in equilibrium, the price (that is, the expected return) of each asset must be such that investors collectively decide to hold exactly the supply of the asset. If investors all hold risky assets in the same proportions, those proportions must be the proportions in which risky assets are held in the market portfolio—the portfolio comprised of all available shares of each risky asset. In equilibrium, therefore, the portfolio of risky assets with the highest Sharpe Ratio must be the market portfolio" Perold (2004, p.16).

[58] "The hardest of all parameters to estimate is usually the market risk premium. The historical risk premium is estimated from the average of past returns and, unlike variance-related measures like beta, average returns are very sensitive to the beginning and ending

different assets and the market. Since the work of Fabozzi and Francis (1977) it has been evident. The threshold model of Hansen (2000) has been successful to deal with time varying betas and non-linearity between risk and return. In this model a threshold variable is used to control slow changes in betas due to changes in the economic environment. As threshold variable can be used interest rates, term spreads, default spreads, exchange rates, volatility, among others Arisoy et al (2015). The rolling window model is also very popular for beta estimation. It can be seen as a practical approach to deal with the issue of time-varying betas and to incorporate a sort of dynamic estimation Bajpai and Sharma (2015), but a small determination coefficient represents a drawback for modeling stock returns. The conditional CAPM model also can be used to cope with the problem of time-varying beta, for econometric modeling two approaches can be distinguished: a) beta can be regarded as a function of time, neglecting any economic influence on changing betas; and b) betas can be affected by some relevant economic variables, Cai et al (2015).

Regarding heteroskedasticity, the ARCH model of Engle (1982), the GARCH model of Bollerslev (1986) offered tools to gauge implied volatility for financial assets. Jorion (2002) describes, in the VaR setting, the problems associated to changes in correlations and volatility affecting financial assets. In the presence of correlation changes, Bollerslev and Wooldrige (1992), Bollerslev (1992), Bollerslev et al (1998), Kroner and Ng (1998), and more recently Engle (2002) have made improvements to univariate and multivariate GARCH models. These models are more suited to model volatility, as well as asymmetric effects of risk on financial assets. Chen et al (2012) contributed with the asymmetric GARCH threshold model.

Koenker and Bassett (1978) developed the quantile regression model. This kind of model is very useful to perform a cross section regression analysis to capture differences in valuations or size effects on asset returns, as described in the review done by Fama and French (2004).

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level of stock prices. The risk premium must therefore be measured over long periods of time, and even this may not be sufficient if the risk premium varies over time" (Perold, (2004, p. 21).

There are few works supporting the CAPM, the paper of Bod'a and Kanderová (2014) is one exception, in which the linear relationship between risk and return holds. They use bootstrap methods in order to solve any problem concerning the non-normality of residuals.

It may be noted that many of the studies on stock markets, in addition to validate or reject empirically the CAPM, have also opened up the possibility of incorporating relevant variables for price discovery or price predictability of returns, and explore new methodologies to increase the body of knowledge on investment strategies Narayan and Smyth (2015) or demonstrate the superiority of their factors, Subramayan (2010), Bianchi et al (2014) [59].

In words of Ramiah et al (2015) the works of Markowitz (1952), Sharpe (1964), Lintner (1965), Fama and MacBeth (1973), Fama and French (1993) constitute the core of Neoclassical Finance. However, other works have exposed anomalies of the CAPM. These are useful to understand the strengths and challenges faced by the model.

In order to classify the main empirical drawbacks of CAPM, they may be listed as follows:

1) Poor adjustment of models.
2) Non-linearity in the risk – return relationship.
3) Non-normality of residuals in OLS regression (leptokurtic density probability function).
4) Presence of outliers.
5) Time varying betas.
6) Heteroskedasticity and/or presence of volatility clustering suggesting ARCH effects.
7) Seasonal patterns.
8) Correlations changing through time.
9) Model uncertainty.

[59] Note that factor models, à la Fame and French (1993), must comply with the following characteristics:
"A valid asset pricing model which captures the systematic risks of these returns would observe significant betas, high R^2 values and insignificant intercept terms" (Bianchi et al, 2014, p. 317).

Most of these problems have been detected and a solution has been offered[60]. The models have evolved from different paths, those against the CAPM have neglected: the linearity in the risk - return relationship, the lack of adjustment, the modeling using one single factor and the existence of outliers. This work is intended to cope with these three issues.

The model of Fama and French (1993) has been applied in several countries. However, the following problems persist: a) for some percentiles, the R^2 values are still low, b) not always the factors used by them, turn out to be the most suitable, forcing researchers to include other factors to improve their results, see Soon-Ho et al (2012), Harshita & Yadav (2015) and Bajpai & Sharna (2015).

This work is not intended to replicate the methodology of Fama and Macbeth (1973); rather, it presents an alternative model to improve the regression results in the mentioned step 1.

[60] Until now, I haven't seen any work using Box-Cox transformations to deal with non-normality issues.

Section III: The Transfer Function Model.

TFM models are a mix of ARIMA[61] and traditional regression models and were developed by Box and Jenkins (1976), Liu and Hanssens (1982), Liu (1991) and Liu et al (2010). These models are designed to exploit the current and lagged values of one explanatory variable and the ARIMA terms.

First, departing from a standard econometric model, we have:

$$Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \cdots + \beta_m X_{mt} + \varepsilon_t \ (27)$$

Where the dependent variable Y_t is explained by a set of "m" X variables, which have a contemporaneous effect on the former. However, it is possible that Y_t presents a dynamic dependence from the explanatory variables, and even Y itself.

Assuming that equation (27) only has two variables Y and $X_{1,}$ but no other X's, the previous model, would be expressed as follows:

$$Y_t = \beta_0 + \beta_1 X_{1t} + N_t \ (28)$$

Where N_t represents the combined influence of all the omitted variables and the error term. Assuming that the missing variables are not available (as is often the case in the empirical works), if $N_t = \phi_1 N_{t-1} + u_{t,}$ and B is the difference operator then:

$$N_t = \phi_1 B N_t + u_t \ (29)$$

Solving for N, we have:

$$N_t = (1 / 1- \phi_1 B) * u_t \ ^{62}. \ (30)$$

In the above specification the term u_t is serially correlated, because it follows an AR (1) process caused by the problem of omitted variables.

Note that if the parameter ϕ is zero, it becomes the classical linear regression model.

[61] One reason why univariate ARIMA models are not as popular in modeling stock returns is that the results are meager in terms of fit with respect to the observed data.

[62] This structure can be generalized to more lags of N, but also of X.

The essence of the TFM is to solve the absence of other regressors, as follows:

Substituting (30) in (28), we have:

$$Y_t = \beta_0 + \beta_1 X_{1\,t} + (1 / 1- \phi_1 B) * u_t \quad (31)$$

In (31) X_{1t} affects contemporaneously Y_t, but Y_t can also be influenced by other lags of X_1, giving a dynamic character to the model[63] such that (31) can be re-expressed as:

$$Y_t = \alpha + \beta_0 X_{1t} + \beta_1 X_{1t-1} + \beta_2 X_{1t-2} + \frac{1}{1-\phi_1 B} u_t \quad (32)$$

Using the difference operator B again, the model can also be represented as follows:

$$Y_t = \alpha + (\beta_0 + \beta_1 B + \beta_2 B^2) X_{1t} + \frac{1}{1-\phi_1 B} u_t \quad (33)$$

In a compact form is represented as:

$$Y_t = \alpha + T(B) X_{1t} + \frac{1}{1-\phi_1 B} u_t \quad (34)$$

Where T (B) $= (\beta_0 + \beta_1 B + \beta_2 B^2)$. This polynomial is known as the transfer function.

It is common that the lagged effect of the independent variable gets diluted as the lags tend to be more remote in time. If we define ω as an initial effect and then let $\beta_0 = \omega$, $\beta_1 = \omega\delta$, $\beta_2 = \omega\delta^2$, and let $0<\delta<1$ where δ is a weighting to indicate that the effect of the farthest lags of X_1 are losing influence on Y_t, then T(B) can be written as:

$$T(B) = \omega + \omega\delta B + \omega\delta^2 B^2 + \ldots = \omega (1 + \delta B + \delta^2 B^2 + \ldots).$$

It may occur that the impact of ω on Y_t, is not immediate but rather takes some time to manifest and then have subsequent effects in Y_t, although declining. Departing from

[63] If the term N_t is a white noise process, it can be represented as a distributed lag model.

$$Y_t = \alpha + \beta_2 X_{1t-2} + \beta_3 X_{1t-3} + \frac{1}{1-\phi_1 B} u_t \quad (35)$$

An alternative representation is:

$$Y_t = \alpha + (\beta_2 B^2 + \beta_3 B^3) X_{1t} + \frac{1}{1-\phi_1 B} u_t (36)$$

So that

$$T(B) = (\beta_2 B^2 + \beta_3 B^3)$$

By doing $\beta_2 = \omega$, and $\beta_3 = \omega\delta$, with $0<\delta<1$.

$$T(B) = (\omega B^2 + \omega\delta B^3) = \omega B^2 (1 + \delta B) \quad (37)$$

Re-expressing equation (37), we have:

$$T(B) = \frac{\omega B^2}{1 - \delta B} \quad (38)$$

Substituting equation (38) in (36), we have the following model:

$$Y_t = \alpha + T(B) X_{1t} + \frac{1}{1-\phi_1 B} u_t \ (39)$$

So that:

$$Y_t = \alpha + \frac{\omega B^2}{1 - \delta B} X_{1t} + \frac{1}{1-\phi_1 B} u_t \quad (40)$$

It may be noted that the transfer function T (B) now has the form of a ratio, and of course it can be generalized to more lags of X.

Similarly, the N_t can have more lags so that the autoregressive term may have (p) lags; but it can also be expressed as a moving average process with (q) lags, in general:

$$Y_t = \alpha + \frac{\omega(B)}{\delta(B)} X_{1t} + \frac{\theta(B)}{\phi(B)} u_t \quad (41)$$

Where:

$\omega(B) = (\omega_0 + \omega_1 B + \omega_2 B^2 + \ldots + \omega_{h-1} B^{h-1}) B^r$

$\delta(B) = 1 - \delta_1 B - \delta_2 B^2 - \ldots - \delta_r B^r$

$\phi(B) = 1 - \phi_1 B - \phi_2 B^2 - \ldots - \phi_p B^p$

$\theta(B) = 1 - \theta_1 B - \theta_2 B^2 - \ldots - \theta_q B^q$

With these considerations in mind, $\mathbf{u_t}$ is a sequence of random shocks i.i.d $N(0, \sigma_u^2)$ and independent of $X_{t.}$ The stationarity condition required for $\phi(B)$, is also necessary for $\delta(B)$, such that if all the roots of this polynomial lie outside the unit circle, then the ratio of the transfer function can be expressed linearly:

$$V(B) = v_0 + v_1 B + v_2 B^2 + \cdots \quad (42)$$

Where $v_{0,}$ $v_{1,}$ $v_{2,}$ ... are known as the weights of the transfer function.

Then equation (41) may be represented as:

$$Y_t = C + V(B) X_{1t} + N_t \quad (43)$$

Following the methodology proposed by McDowell (2002), the estimation of this model requires performing the following steps: 1) verify that the series are stationary, 2) perform the pre-whitening of the series, 3) obtain an impulse response function, 4) estimate the weights of the transfer function, 5) determine the most suitable lag structure for the N_t term.

For model verification purposes, we must a) confirm the theoretical validity of the model, b) check if it is parsimonious c) verify that the model assumptions are met, namely that u_t is a white noise process and is also normally distributed.

Section IV: Results

4.1 Data

For the empirical tests presented here, the excess returns of the following firms' shares are used:

Table 23: Firm ticker and activity

Ticker	Economic Activity
CEMEX	Cement
FEMSA	Bottled Beverages, Beer
GFNORTE	Financial Services
GMEXICO	Mining
IPC	Stock Market Index

These firms were chosen randomly to conduct this study, the only requirement for choosing them was the availability of the largest data set. The prices of these financial assets were obtained from the INFOSEL data bank and correspond to the closing price on the last business day of each month.

The data cover the period from June 1997 to April 2015, there are 227 monthly observations, and the excess returns were calculated from the difference of the logarithms of the prices minus the risk free rate (taken from the one month government bill, known as CETES). Six observations are reserved for the out-of-sample forecasting (May to October 2015), except FEMSA that was delisted in January 2015. In its case observations between October to December 2014 were used.

Table 24: Unit root test for variables used in TFM

Ticker	Augmented D-F Test	p-value
CEMEX	14.1691	0.0000
FEMSA	16.9290	0.0000
GFNORTE	14.7258	0.0000
GMEXICO	8.7040	0.0000
IPC	15.2707	0.0000
Critical value 1%	3.4592	

By the above results can be seen that the variables are stationary at a 1% level.

Table 25: Descriptive statistics of variables used in TFM

	CEMEX	FEMSA	GFNORTE	GMEXICO	IPC
Mean	-0.003369	0.007955	0.008526	0.004452	0.003305
Median	0.002552	0.008553	0.012185	0.005292	0.007583
Maximum	0.347871	0.264541	0.360583	0.511194	0.147097
Minimum	-0.674722	-0.517983	-0.603057	-0.395143	-0.380452
Std. Dev.	0.118018	0.089429	0.115348	0.121925	0.066638
Skewness	-1.313408	-1.027178	-0.617460	0.068178	-1.153209
Kurtosis	9.193981	8.198941	7.005535	4.372415	7.408140
Jarque-Bera	420.5925	290.3587	163.2484	17.67383	229.9804
Probability	0.000000	0.000000	0.000000	0.000145	0.000000
Sum	-0.751248	1.774047	1.901362	0.992708	0.737058
Sum Sq. Dev.	3.092085	1.775470	2.953757	3.300184	0.985825

In the above table can be appreciated that returns don't follow a normal distribution. The downturns are more pronounced than the upturns judging for the maximum and minimum values registered during that period. Considering the standard deviations, returns are subject to pronounced swings.

4.2 Transfer function model estimation

The market model can be expressed in terms of equation (43) as follows:

$$R_{it} = \alpha_i + V(B)IPC_t + N_t \quad (44)$$

Where IPC (the input variable) represents the stock market returns. Whereas R_{it} (the output variable) represents to the returns of stock "i". N_t represents the combined influence of all the omitted variables and the error term. The intercept parameter is the Jensen's alpha for each security. In $V(B)$ are contained the weights of the transfer function. It may be observed that $V(B)$ can also include lags of the input variable.

This methodology involves then the ARIMA modeling of the stock market returns (IPC).

With the assistance of a correlogram, it was determined that IPC follows an AR(3) and MA(3, 4, 10, 11) process. Two dummies are included to control

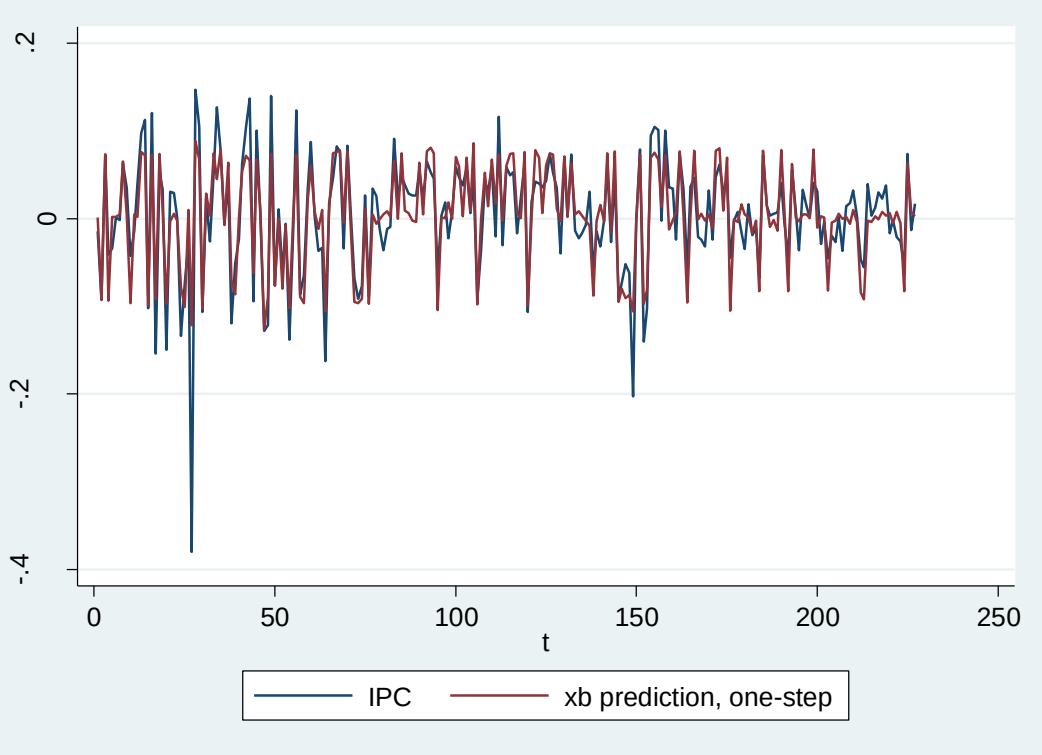
the adverse effect caused by the outliers: one for the negative and another for the positive extreme movements. The adjustment of the model is acceptable.

Table 26: ARIMA model for IPC

IPC	Coefficient	P>Z
DAONN	-.0939028	0.000
DAOPP	.0716462	0.000
C	.0013104	0.757
AR 3	-.6856131	0.000
MA 3	.7802969	0.000
MA 4	-.0860762	0.092
MA 10	.1590974	0.002
MA 11	-.0957677	0.049

Adj. R^2 = 0.9355.

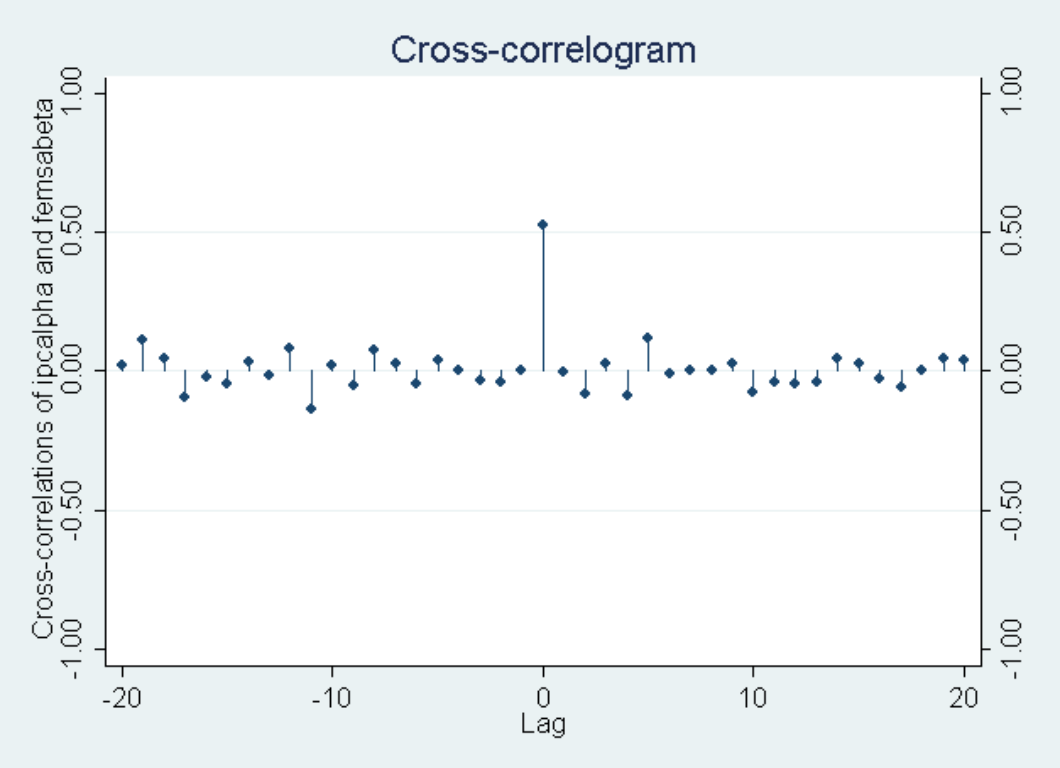
Figure 6: Actual and fitted values for IPC.



Following the methodology of McDowell (2002), from the above estimates the residuals of IPC are obtained. Then the same filter is applied to the

output variable (the dependent variable), in this case the individual stock returns. After that, the corresponding residuals are obtained.

In the next step, an impulse response function is constructed using a cross-correlogram between the residuals of the market returns and each individual stock returns. The impulse response function is used to determine the number of weights of the transfer function, in other words determine the number of lags for the input variable (IPC) used to explain the returns of each stock, in this case for FEMSA.



The above graph indicates that we must include IPC as explanatory variable in the FEMSA model, with no lags.

The rest of impulse response functions are not shown, but in the case of CEMEX and GFNORTE, IPC_t and IPC_{t-1} enter as explanatory variables. For GMEXICO IPC_t, IPC_{t-1} and IPC_{t-2} are used. In all estimations dummies are included to control the effects of outliers.

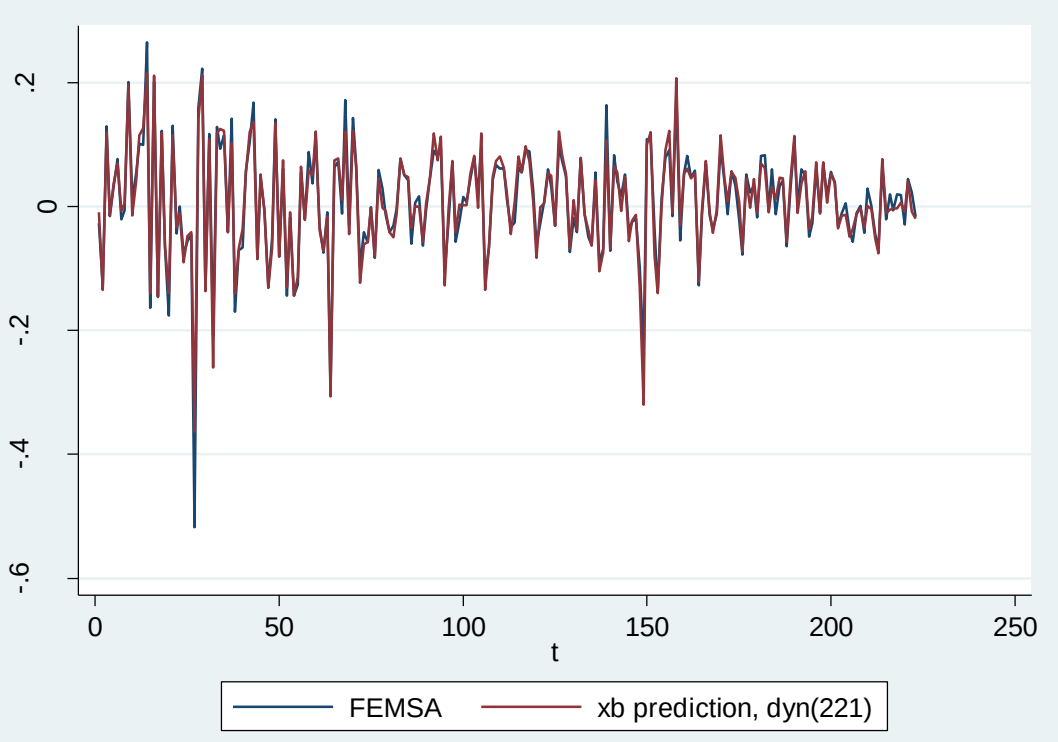
Once the lags of the input variable are determined, the next step is to obtain the lag structure of N_t. This means incorporate the AR and MA terms. After that, the corresponding results are:

Table 27: TFM for FEMSA

FEMSA	Coefficient	P>Z
D18NF	-.1502127	0.000
D18PF	.1360139	0.000
IPC	.8377356	0.000
C	.0045327	0.133
AR4	-.167073	0.015

Adj. R^2 = 0.9389.

Figure 7: Actual and fitted values for FEMSA



In modeling FEMSA returns, it can be seen that IPC_t (the market return) is the only factor explaining the output variable. According to the economic activity of the company, the value of beta corresponds to a defensive stock.

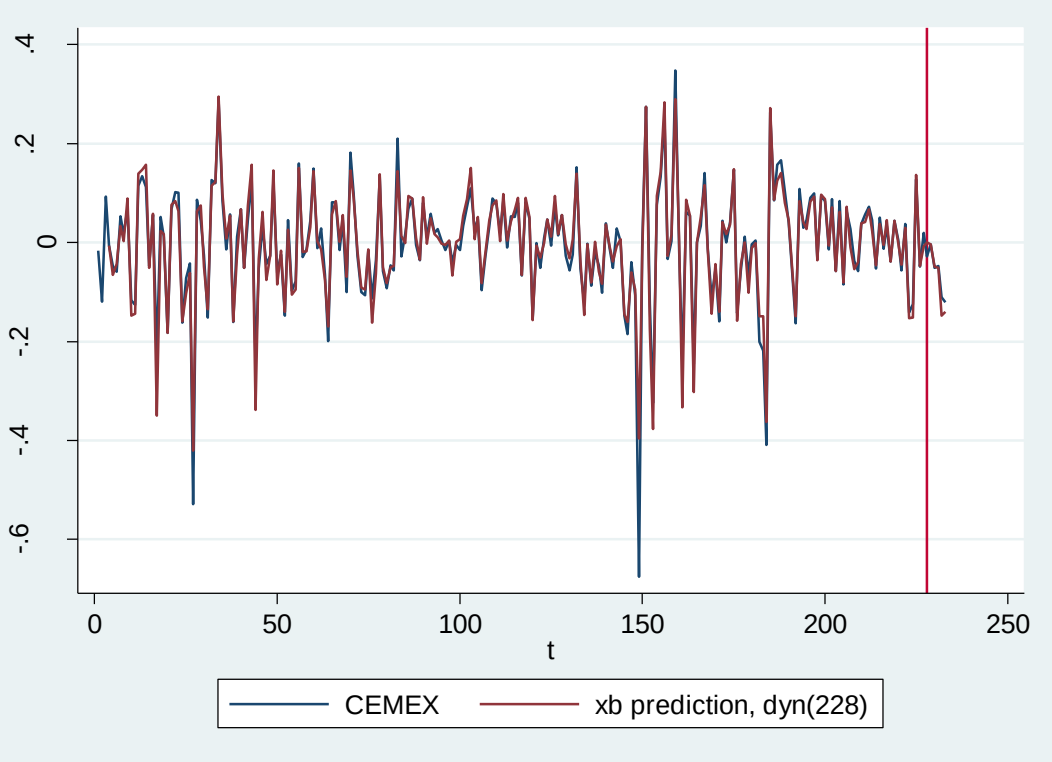
Also, the AR(4) term is included in the regression results.. Observations 221 to 223 (October to December 2014) correspond to the forecasting values.

Table 28: TFM for CEMEX

CEMEX	Coefficient	P>Z
D22NC	-.233051	0.000
D22PC	.2078636	0.000
IPC	.932945	0.000
IPC (-1)	.1612705	0.052
C	-.0034469	0.422
AR4	-.1070227	0.095

Adj. R^2 = 0.9188.

Figure 8: Actual and fitted values for CEMEX



CEMEX is explained by the contemporaneous effect of IPC (the market return) and its first lag. It is evident that the contemporaneous effect of beta is coherent with the theory. But have in mind that we have one parameter

associated to IPC_t and another associated to IPC_{t-1}, and the long term beta value is higher when both parameters are considered. Additionally, the AR(4) term contributes to explain the evolution of CEMEX itself.

The expression dyn(228) means that from this observation until the last one, the forecasted data and the actual data are graphed.

For the rest of the stock returns, the estimated parameters are presented, as well as the corresponding graphs.

Table 29: TFM for GFNORTE

GFNORTE	Coefficient	P>Z
D22N	-.1729541	0.000
D22P	.2230275	0.000
IPC	.9427141	0.000
IPC (-1)	.2449871	0.000
C	.0042841	0.262
AR4	-.1947814	0.001
AR12	-.1467877	0.026
AR17	.1665908	0.013

Adj. R^2 = 0.9396.

Figure 9: Actual and fitted values for GFNORTE

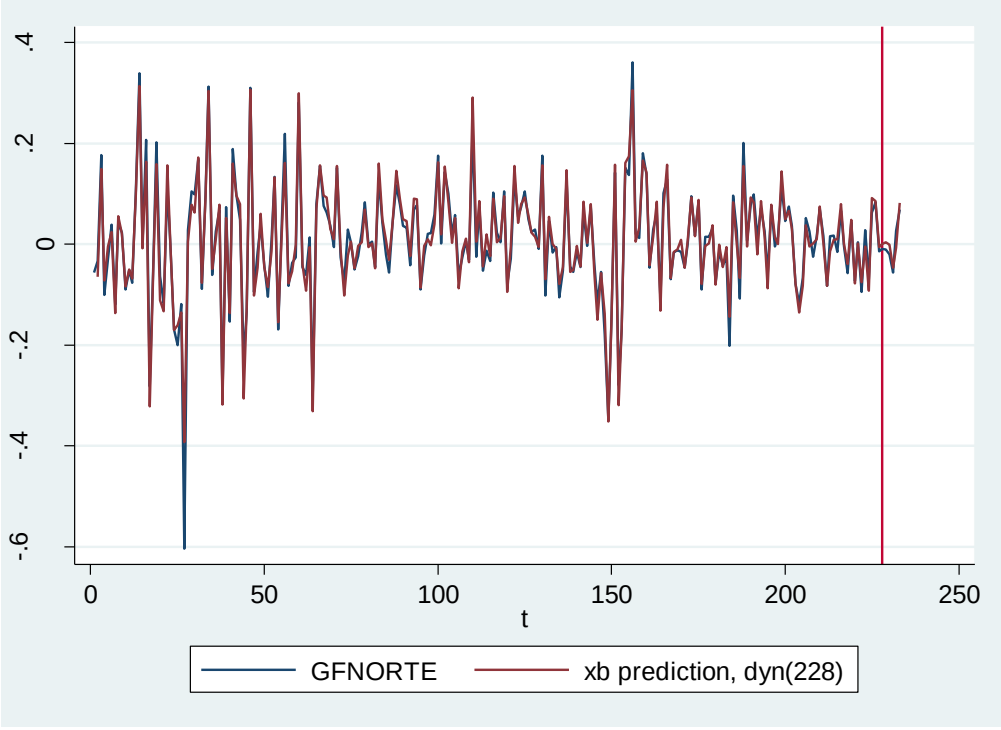


Table 30: TFM for GMEXICO

GMEXICO	Coefficient	P>Z
D22NG	-.198528	0.000
D22PG	.2615855	0.000
IPC	.6922268	0.000
IPC(-1)	.1258226	0.074
IPC(-2)	.192164	0.010
C	.0011826	0.840
AR1	-.180572	0.005
AR4	.2172411	0.001
AR13	.1965531	0.003
AR17	-.1439243	0.020

Adj. R^2 = 0.9477.

Figure 10: Actual and fitted values for GMEXICO

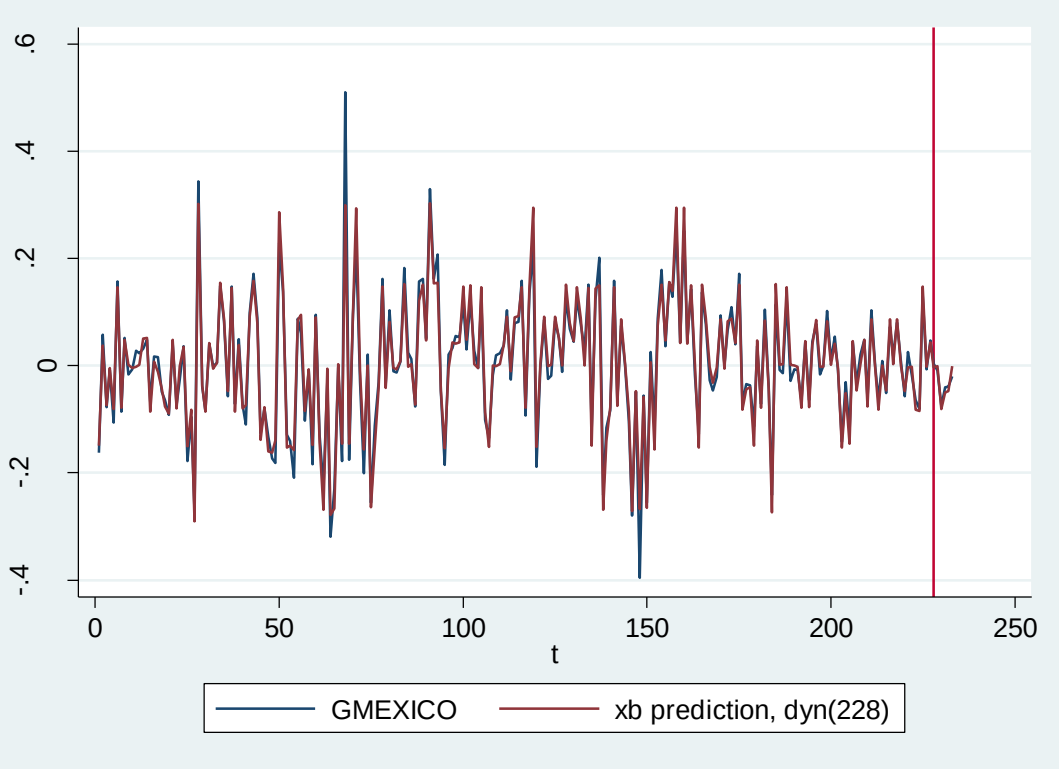


Table 31: Test of normality and presence of white noise residuals

Ticker	S-Wilk Normality Test (p-value)	Portmanteau (Q) Test (p-value)
CEMEX	0.7698	0.1098
FEMSA	0.8626	0.8128
GFNORTE	0.2533	0.8177
GMEXICO	0.6894	0.6954
Ho:	Normality of residuals	White Noise Residuals

Finally, it can be verified that the assumptions of the TFM are met, namely we have normality in the residuals, and they are a white noise process.

Section V: Conclusions

The CAPM has been subject of several empirical tests, and most of the time the outcomes are adverse. For this reason, I suppose this work lies on the side of their supporters, because the contemporaneous effect corresponds with their theoretical value (beta around one, and the intercept is statistically equal to zero). More importantly, the lagged effects also exert influence, increasing the value of beta and improving the estimates. The adjusted R^2 are above 0.9.

It is also shown, in accordance with the objective of the chapter, that only one relevant factor for pricing assets is needed, even in a volatile environment as an emerging market.

The modeling of stock returns is a true challenge due to the presence of outliers, however once they are taken into account; the TFM seems to perform fairly well. The estimated coefficients of the dummies also tell us that increases and decreases of stock returns are asymmetric. The AR term can be interpreted as an inertia effect.

Also, the TFM may be used in step one of Fama and MacBeth's model to improve the validation of CAPM and solve the main problem of lack of adjustment. Also, the forecasts of the model can be used as inputs in the Markowitz or Sharpe models.

With the purpose of validating the usefulness of TFM in the field of price discovery, the model should be tested in other firms, industries and countries, but above all by the traders in the stock market. In other lines of research, TFM might be tested in unconditional or conditional CAPM.

General Conclusions

The role of stock markets in explaining economic growth has been increasingly recognized. Stock markets can transform indivisible physical assets into divisible and marketable securities, and thus companies get the necessary financing for investment projects in addition to offering a long term source of capital. Moreover, capital markets allow risk diversification with the issue of shares, so that long-term investment is also promoted and, ultimately, growth. If markets are also liquid, firms are able to issue shares quickly and inexpensively.

Most of the models used to explore the nexus between financial development and economic growth rely on the VECM model, which clearly specifies the direction of causality, but has the drawback that the lag length selection and model selection can lead to different results. Another fact to mention is that ADL fits the data quite well.

VECM and ADL models support the hypothesis that the stock market promotes economic growth, and that causality goes only from this market to the real economy.

In VECM, Bank Credit Granger causes growth, but not vice versa. However, its contribution to growth is not significant in the ADL model.

In the case of ADL, other macroeconomic variables are included. In the long run, money supply does not contribute to growth, instead the government expenditure and the Gross Capital Formation affect growth positively. A devaluation of the peso reduces the GDP.

The ADL models are a parsimonious alternative to model short run and long relationships in economic variables, and provide robust estimations.

This work covers a longer period of time than prior research and is also the first to use ADL in exploring the nexus between the financial sector and economic growth in the case of Mexico.

With regard to financial liberalization, a positive effect on the value of stocks traded (ST) can be confirmed. Although the Mexican economy

liberalized the capital account in 1989, the impact in the stock market coincides with the successful issuance of shares in the US market in 1991, and since then massive inflows of resources from international financial markets have been experienced. This reform increased the value of stocks traded, and represents 9 percentage points of GDP.

As in other models analyzed in the literature review, it is confirmed that liquidity in the capital markets (ST) is a good predictor of growth. Moreover, this work can prove, using tests of superexogeneity, that ST causes and controls economic growth.

In my view, more reforms are needed to re-launch the capital market because there is still room for reforms at microeconomic level to improve the functioning of the stock market, such as adapting the institutional and legal frame, lowering transaction costs, promoting more access to market, enhancing corporate governance systems, etc.

Two thirds of the firms listed in the Mexican Stock Exchange are part of a Business Group, where a few shareholders have the majority stake; their greater size can help them to attract capital through stock markets; their organization in networks may also result in synergies and efficiency gains by reducing information asymmetries and achieve corporate objectives acting as a sole firm. After controlling for other factors affecting profitability, it was shown that firms belonging to a business group tend to have better financial performance; the increase attributable to this fact is 3% in the ROA.

Considering other economic factors within the firms, the availability of liquid assets is considered as a sign of the firm health. However, financial leverage is not accompanied with better returns for the firm. Also, asset turnover was an important factor to determine firm's profitability.

In several works has been stated that in Mexican corporations have systematically carried out rent extraction to the detriment of minority investors. This perception amongst investors led to a decline of Mexican securities participation in international portfolios. However, it was

demonstrated that this practice has been solely employed in times of economic distress. The effect on profitability means a 1.5% reduction in ROA.

In order to prove this hypothesis, the dynamic panel data technique was used, covering the period 1990 to 2012 and including all the companies listed during this period in the Mexican stock exchange.

A strategy to implement in the Mexican stock market should be improving legal provisions to protect minority investors. Although it was pointed out from the Asian crisis, until 2005 the first amendments to the Mexican law were made to allow representation of minority investors on Boards, making the supervision of an auditor compulsory and considering certain unethical practices illegal. But essentially, the involvement of minority shareholders is necessary in deciding the fundamental corporate strategies aimed to set and achieve desirable returns on investment. Although is noteworthy that some business groups have voluntarily shown their commitment in implementing and enforcing good governance practices in order to attract investors, and thus lowering the cost of capital.

One unresolved issue is complete the reform of corporate governance systems that the OECD recommended to Mexico. The improvements on corporate governance may enhance the liquidity on stock markets and propel growth.

Soon after its publication, the CAPM was subject to empirical validations, and received much criticism. In order to improve their estimates, several authors (the pioneering and most representative works were reviewed) incorporated other pricing factors in their models and/or applied other techniques already outlined in the third chapter, but often denying the validity of the CAPM.

The main contribution of this work is to present an econometric technique for modelling asset returns using one single factor, and useful to forecast returns.

The transfer function model is an alternative for modeling various lags structures found in the data of stock and market returns. This technique has never been used in the context of the CAPM, and the results are quite satisfactory. This model seems to be well suited to capture the swings of financial assets returns; moreover, it offers a linear representation between two variables. In this sense, it is the ideal model to explain individual stock returns solely with the market return.

Considering that emerging markets are more volatile than developed markets, this econometric technique proved to be sufficiently useful to be considered in the price discovery literature.

The economic interpretation of the transfer function model supports the CAPM, in spite of only using one pricing factor for modeling stock returns. In the empirical approach done here, can be highlighted the following characteristics:

- It is a parsimonious model,
- It has a simple linear specification,
- It is a dynamic model.
- The estimate parameters are coherent with the theory: alpha equals zero and beta is around one.
- Finally, as stated in the objective of the corresponding chapter, this work is intended to ameliorate one capital problem: the lack of adjustment in other models.

As a contribution, in order to validate the CAPM as originally proposed by Fama and MacBeth (1973), that until now is an unfinished issue, this estimation methodology can improve the results of the market model (the first step), and their results can be used in the cross section regression (the second step).

References:

Chapter 1

Ang, J. B. (2008). What are the mechanisms linking financial development and economic growth in Malaysia? Economic Modelling, 25, pp. 38-53.

Baltagi, B. H., Demetriades, P. O. and Law S. H. (2009). Financial development and openness: evidence from panel data. Journal of Development Economics, 89, pp. 285–296.

Banco de Mexico. (2009). Exchange rate regimes in Mexico since 1954.

Barro, R. J. (1996). Inflation and growth. Federal Reserve Bank of St. Louis Review, 78, pp. 153-169.

Bencivenga, V., Smith, B. and Starr, R. (1992). Liquidity of secondary capital markets: allocative efficiency and the maturity composition of the equity stock. CAE Working Paper 92-115.

Bekaert, G. and Harvey, C. R. (2003). Emerging markets finance. Journal of Empirical Finance, Vol 10, pp. 3-55.

Bekaert, G., and Harvey C. R. (2000). Foreign speculators and emerging equity markets. Journal of Finance, 55, pp. 565-614.

Boyd, J. H., Levine, R. and Smith, B. D. (2001). The impact of inflation on financial performance sector. Journal of Monetary Economics, pp. 221-248.

Demetriades, P. O., and Hussein, K. A. (1996). Does financial development cause economic growth? Time-series evidence from 16 Countries. Journal of Development Economics, Vol. 51, pp. 387-411.

Demirgüc-Kunt, A. and Maksimovic, V. (2002). Funding growth in bank-based and market-based financial systems: evidence from firm level data. Journal of Financial Economics, 65, pp. 337-363.

Diamond, D. (1984). Financial intermediation and delegated monitoring. Review of Economic Studies, pp. 393-414.

Engle, R. F., and Granger, C. W. J. (1987). Co-integration, and error correction: representation, estimation and testing. Econometrica, 55, pp. 251-276.

Engle, R., Hendry, D. F., and Richard, J. F. (1983). Exogeneity. Econometrica, Vol. 51, no. 2, pp. 277-304.

Engle, R., and Hendry, D. F. (1993). Testing superexogeneity and invariance in regression models. Journal of Econometrics, 56, pp. 119-139.

Federici, D. and Caprioli, F. (2009). Financial Development and growth. Economic Modelling, 26, pp. 285-294.

Fernandez-Arias, E. and Montiel, P. J. (1996). The arises in capital inflows to developing countries: an analytical overview. The World Bank Economic Review, 10 (1), pp. 51-80.

Giovannini, A. and de Melo, M. (1990). Government revenue from financial repression. World Bank, Working Paper WP0533.

Goldsmith, R. (1969). Financial structure and development. New Haven, Yale University Press.

Greenwood, J., and Smith, B. D. (1997). Financial markets in development and the development of financial markets. Journal of Economic Dynamics and Control, pp. 145-181.

Greenwood, J., and Jovanovic, B. (1990). Financial development, growth and distribution of income. Journal of Political Economy, pp. 1076-1107.

Hernandez-Murillo, R. (2007). Experiments in financial liberalization: the Mexican banking sector. Federal Reserve Bank of St. Louis Review, 89 (5), pp. 415-432.

Hondroyiannis, G. and Lolos, S. (2005). Financial markets and economic growth in Greece, 1986-1999. Journal of International Markets Institutions & Money, 15, pp. 173-188.

Johansen, S. and Juselius, K. (1990). Maximun likelihood estimation and inference on cointegration with applications to the demand of money. Oxford Bulletin of Economics and Statistics, 52, pp. 169-210.

Karnameh-Haghighi, H., Majid Sameti, M. and Dallali-Isfahani, R. (2012). The effect of macroeconomic instability on economic growth in Iran. Research in Applied Economics, Vol. 4, No. 3, pp. 39-61.

King, R. and Levine, R. (1993). Finance and growth: Schumpeter may be right. Quarterly Journal of Economics, pp. 717-737.

Levine, R. (1991). Stocks markets, growth and tax policy. Journal of Finance, 46, pp. 1445-1465.

Levine, R. (1997). Financial development and economic growth: views and agenda. Journal of Economic Literature, 2, pp. 688-726.

Levine, R. (2002). Bank-based or market-based financial systems: which is better? Journal of Financial Intermediation, 11, pp. 398-428.

Levine, R. and Zervos, S. (1995). Stocks markets and banks: reviewing the engines of growth from 1989 to 1994. World Bank Working Paper.

Liu, W. and Hsu, C. M. (2006). The role of financial development in economic growth: the experiences of Taiwan, Korea and Japan. Journal of Asian Economics, 17, pp. 667-690.

Lombardo, D. and Pagano, M. (2002). Law and equity markets: a single model. In McCahery, J., Moerland, P., Raaijmakers, T. and Renneboog, L. (eds.) Corporate Governance Regimes: Convergence and Diversity, UK, Oxford University Press.

Lucas, R. E. (1988). On the mechanics of economic development. Journal of Monetary Economics, pp. 3-42.

McKinnon, R. (1973). Money and capital in economic development. Washington, Brookings Institution.

Meier, Gerald M. (1989). Leading issues in economic development. USA, Oxford University Press.

Mishkin, F. S. (2009). Globalization and financial development. Journal of Development Economics, 89, pp. 164-169.

Ortiz, E., Cabello, A. and de Jesus, R. (2007). The role of Mexico´s stock exchange in economic growth. The Journal of Economic Asymmetries, Vol. 4, No2, pp. 1-26.

Osterwald-Lenum, A. M. (1992). A note with quantiles of the asymptotic distribution of the ML cointegration rank test statistics. Oxford Bulletin of Economics and Statistics, 54, pp. 461-472.

Pradhan, R. P., Arvin, M. B. and Bahmani, S. (2015). Causal nexus between growth, inflation and stock market development: the case of OECD countries. Global finance Journal, 27, pp. 98-111.

Pagano, M. (1993). Financial markets and growth: an overview. European Economic Review, 37, pp. 613-622.

Patrick, H. (1966). Financial development and economic growth in underdeveloped countries. Economic Development and Cultural Change.

Perez, S. (2002). Monetary policy does matter: control causality and superexogeneity. Oxford Bulletin of Economics and Statistics, 64, 5, pp. 473-486.

Pesaran, M. H., Shin, Y. and Smith, R. J. (2001). Bounds testing approaches to the analysis of levels relationships. Journal of Applied Econometrics, 16, pp. 289-326.

Phillips, P. C. B. and Perron, P. (1988). Testing for a unit root in time series regression. Biometrika, 75, pp. 335-346.

Ranciere, R., Tornell, A. and Westermann F. (2006). Decomposing the effects of financial liberalization: crises vs growth. Journal of Banking & Finance, Vol. 30, pp. 3331-3348.

Robinson, J. (1952). The generalization of the General Theory. The rate of interest and other essays. London, Macmillan.

Rousseau, P. L. & Wachtel, P. (2000). Equity markets and growth: cross-country evidence on timing and outcomes, 1980-1995. Vol. 24. Journal of Banking & Finance, 24, pp. 1933-1957.

Saint-Paul, G. (1992). Technological choice, financial markets and economic growth. European Economic Review, 36, pp.763-781.

Schumpeter, J. A. (1911). The theory of economic development. Cambridge, MA, Harvard University Press.

Shaw. E. (1973). Financial deepening in economic development. New York, Oxford University Press.

Stiglitz, J. E. and Weiss, A. (1981). Credit rationing in markets with imperfect information. American Economic Review, 71, pp. 393-410.

Stiglitz, J. E. (1998). The role of the financial system in development. World Bank, Forth Annual Bank Conference on Development in Latin America and the Caribbean.

Townsend, R. (1979). Optimal Contracts with an competitive markets costly state verification. Journal of Economic Theory, 21, pp. 1-26.

WIDER, (1990). Foreign portfolio investment in emerging equity markets. Study Group Series No. 5, Helsinki.

Woulde-Rufael, Y. (2009). Re-examining the financial development economic growth nexus in Kenya. Economic Modelling, 26, pp. 1140-1146.

Yang, Y. Y. and Hoon-Yi, M. (2008). Does financial development cause economic growth? Implication for policy in Korea. Journal of Policy Modelling, 30, pp. 827-840.

Yu, T. (1999). The evolution of commercial banking and financial markets in Taiwan. Journal of Asian Economics, 10, pp. 291-307.

Chapter 2

Arellano, M. and Bond S. (1991). Some test of specification for panel data: Monte Carlo evidence and an application to employment equations. Review of Economic Studies 58, pp. 277-297.

Baltagi, B. H. Econometric analysis of panel data. Great Britain, John Wiley & Sons, 1995.

Bebchuk, L. A. (1999). A rent – protection theory of corporate ownership and control. Working Paper 7203, National Bureau of Economic Research.

Bebchuk, L. A. and Roe M. J. (1999). A theory of path dependence in corporate governance and ownership. Working Paper No. 131, Columbia Law School, The Center for Law and Economic Studies.

Block, S. B. y Hirt, G. A. Fundamentos de administración financiera. México, CECSA, 1998.

Blundell, R. and Bond S. (1998). Initial conditions and moment restrictions in dynamic data panels. Journal of Econometrics, 87, pp. 115-143.

Berndt, M. (2000). Global differences in corporate governance systems. Discussion Paper No. 303, John M. Olin Center for Law, Economics and Business, Harvard University.

Calvo, G. A. and Mishkin, F. A. The mirage of exchange rate regimes for emerging market countries. Journal of Economic Perspectives, 17, 4, pp. 99-118.

Castañeda Ramos, G. La empresa mexicana y su gobierno corporativo. Antecedentes y Desafíos para el Siglo XXI. México, Alter Ego, 1998.

Castaneda Ramos, G. (2002). Consequences of firms' linkages in the aftermath of the Mexican banking crisis of 1995. Mimeograph, Universidad de las Américas - Puebla.

Chong, A., Guillen, J. and López-de-Silanes, F. (2009). Corporate governance reform and firm value in Mexico: an empirical assessment. Journal of Economic Policy Reform, 12:3, pp. 163-188.

Claessens, S. and Yurtoglu, B.(2013). Corporate governance in emerging countries: a survey. Emerging Markets Review, 15, pp. 1-33.

De, A., Bandyopadhyay G. and Chakraborty B. N. (2011). Application of the factor analysis on the financial ratios and validation of the results by the cluster analysis: an empirical study on the Indian cement industry. Journal of Business Studies Quarterly, Vol. 2, No. 3, pp. 13-31.

Denis, D. K. and McConnell J. J. (2003). International corporate governance. The Journal of Financial and Quantitative Analysis, Vol. 38, No. 1, pp. 1-36.

Encarnation, D. (1989). Dislodging multinationals: India's comparative perspective. Cornell University Press, Ithaca NY.

Fisman, R. and Khanna T. (1998). "Facilitating development: The role of business groups", Harvard Business School Working Paper.

Francis, B., Hasan, I., Liang Song, I. and Waisman, M. (2013). Corporate governance and investment-cash flow sensitivity: evidence from emerging markets. Emerging Markets Review, 15, pp. 57-71.

Gallego, F. and Loayza, N. (2000). Financial structure in Chile: macroeconomic development and microeconomic effects. Mimeograph, Central Bank of Chile.

Gerlach, M. (1992). Alliance capitalism: The social organization of Japanese business. University of California Press, Berkeley CA.

Ghemawat, P. and Khanna T. (1998). The nature of diversified business groups: a research design and two case studies. Journal of Industrial Economics, Vol. 46, Issue 1, pp. 35-61.

Hart, O. (1995). Corporate governance: some theory and implications. The Economic Journal, Vol. 105, No. 430, pp. 678-689.

Holmstrom, B. (1982). Moral hazard in teams. The Bell Journal of Economics, Vol. 13, No. 2, pp. 324-340.

IMF-World Bank (2013). Mexico Capital Market Development, Technical Note. Financial Sector Assessment Program.

Khanna, T. and Rivkin J. W. (1999). Estimating the performance effects of networks in emerging markets. Mimeograph, Harvard Graduate School of Business Administration.

Khanna, T. and Palepu K. G. (2000). "Emerging market business groups, foreign intermediaries and corporate governance" in Randall Morck (ed.) Concentrated Corporate Ownership. University of Chicago Press.

Khanna, T. and Yafeh Y. (2000). Business groups and risk sharing around the world". Working Paper No. 01-041, Harvard Business School.

Khanna, T. and Yafeh Y. (2007). Business groups in emerging markets: paragons or parasites? Journal of Economic Literature, 45 (2), pp. 331–372.

King, R. G. and Levine R. (1993). Finance, entrepreurship and growth. theory and evidence. Journal of Monetary Economics, 32, pp. 513-542.

Jensen, M. C. and Meckling W. H. (1976). Theory of the firm: managerial behavior, agency costs and ownership structure. Journal of Financial Economics, Vol. 3, No 4, pp. 305-360.

Laeven, L. (2000). Financial liberalization and financing constraints: evidence from panel data on emerging economies. Mimeograph, World Bank.

Lamba, A. and Stapledon G. (2001). The determinants of corporate ownership structure: Australian evidence. Working Paper No. 20, Faculty of Law, The University of Melbourne.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A. and Vishny R. W. (1997). Legal determinants of external finance. Journal of Finance, Vol. LII, No. 3, pp. 1131-1150.

La Porta, R., Lopez-de-Silanes, F., Shleifer A. and Vishny R. W. (2000). Investor protection and corporate governance. Journal of Financial Economics, Vol. 58, Issues 1-2, pp. 3-27.

Leff, N. H. (1978). Industrial organization and entrepreneurship in the developing countries: the business groups. Economic Development and Cultural Change, Vol. 26, No. 4, pp. 661-675.

Lemmon, M. L. and Lins K. V. (2003). Ownership structure, corporate governance, and firm value: evidence from the East Asian financial crisis. The Journal of Finance, Vol. LVIII, No. 4, pp. 1445-1468.

Levine, R., Loayza, N. and Beck, T. (2000). Financial intermediation and growth: causality and causes. Journal of Monetary Economics, Vol. 46, pp. 31-77.

Love, I. (2000). Financial development and financing constraints: international evidence from the structural investment model. Job Market Paper, Graduate School of Business, Columbia University, New York.

Love, I. (2010). Corporate governance and performance around the world: what we know and what we don't. The World Bank Research Observer, Vol 26, No. 1, pp. 42-70.

Liu, J. S. and Hyan, Y. (2008). Corporate governance reform in Taiwan: could the independent director system be an effective remedy? Asian Survey, Vol. 8, No. 5, pp. 816-838.

Maher, M. and Andersson, T. (2000). Corporate governance: effects on firm Performance and economic growth. Mimeograph, Organization of Economic Co-operation and Development.

OECD (2004). Corporate governance: a survey of OECD countries. OECD publications.

Pombo, C. and Gutierrez, L. H. (2011). Outside directors, board interlocks and firm performance: Empirical evidence from Colombian business groups. Journal of Economics and Business, 63, pp. 251–277.

Pindyck, R. S. & Rubinfeld. D. L. Econometría: modelos y pronósticos. 4ª Ed. Singapore, Mc Graw Hill, 1998.

Roodman, D. (2006). How to do xtabond2: an introduction to “difference” and “system” GMM in Stata. Center for Global Development, Working Paper 106.

Salas Fumás, V. El gobierno de la empresa. España, Caja de Ahorros y Pensiones de Barcelona –Servicio de Estudios-, 2002. (Colección Estudios Económicos Núm. 29).

Santiago-Castro, M. and Brown, C. J. (2007). Ownership structure and minority rights: A Latin American view. Journal of Economics and Business, 59, pp. 430–442.

Strachan, H. W. (1976). Family and other business groups in economic development: the case of Nicaragua. New York, Praeger Press.

Varian, H. Microeconomía Intermedia. 4ª Ed., España, Antoni Bosch, 1996.

Wiwattanakantang, Y. (1999). The effects of ownership structure and corporate governance on the performance of Thai firms. Working Paper, Department of Economics, Hitotsubashi University.

Chapter 3

Arısoy, Y. E., Altay-Salih, A., and Akdeniz, L. (2015). Aggregate volatility expectations and threshold CAPM. North American Journal of Economics and Finance, 34, pp. 231–253.

Bajpai, S. and Sharma, A. K. (2015). An Empirical Testing of Capital Asset Pricing Model in India. Procedia - Social and Behavioral Sciences, 189, pp.259 – 265.

Banz, R. W. (1981). The Relationship between Return and Market Value of Common Stocks. Journal of Financial Economics, 9, pp. 3-18.

Basu, S. (1977). Investment Performance of Common Stocks in Relation to Their Price-Earnings Ratios: A Test of the Efficient Market Hypothesis. The Journal of Finance, 32, 663-682.

Bhandari, L. C. (1988). Debt/Equity Ratio and Expected Common Stock Returns: Empirical Evidence. The Journal of Finance, 43, pp. 507-528.

Bianchi, R. J., Bornholt, G., Drew, M. E. and Howard, M. F. (2014). Long-term U.S. infrastructure returns and portfolio selection. Journal of Banking & Finance, 42, pp. 314-325.

Black, F.; Jensen, M. C.; and Scholes, M. (1972.) The capital asset pricing model: Some empirical tests. In Studies in the theory of capital markets, ed. Michael Jensen, New York: Praeger, pp. 79–121.

Bod'a M. and Kanderová, M. (2014). Linearity of the Sharpe – Lintner version of the Capital Asset Pricing Model. Procedia – Social and Behavioral Sciences, 110, pp. 1136-1147.

Bollerslev, T. (1986). Generalized Autoregressive Conditional Heteroskedasticy. Journal of Econometrics, 31, pp. 307-327.

Bollerslev, T., Engle R. F. and Wooldridge, J. M. (1988). A capital asset pricing model with time-varying covariances. Journal of Political Economy, Vol. 96, No. 1, pp. 116-131.

Bollerslev, T. and Wooldridge, J. M. (1992). Quasi-Maximum Likelihood Estimation and Inference in Dynamic Models with Time-Varying Covariances. Econometric Reviews, 11 (2), pp. 143-172.

Bollerslev, T. Chou, R. Y. and Kroner, K. F. (1992). Arch modeling in finance: a review of the theory and empirical evidence. Journal of Econometrics, 52, pp. 5-59.

Box, G. E. P. and Jenkins, G. M. (1976). Time series analysis, forecasting and control. USA, Holden-Day. USA, Holden-Day.

Cai, Z., Ren, Y. and Yang, B. (2015). A semiparametric conditional capital asset pricing model. Journal of Banking & Finance, 61, pp. 117–126.

Campbell, J. and Shiller, R., (1988).The dividend–price ratio and expectations of future dividends and discount factors. Review of Financial Studies 1, pp. 195–228.

Chen, C. W. S., Lin, S. and Yu, P. L. H. (2012). Smooth Transition Capital Asset Pricing Model with Heteroskedasticity. Springer, Comput Econ 40, pp. 19-48.

Engle, R. (1982), Autoregressive conditional heteroskedasticity with estimates of the variance of United Kingdom inflation. Econometrica, 50, pp. 987-1007.

Engle, R. (2002). Dynamic Conditional Correlation: a single class of multivariate generalized autoregressive conditional heteroskedasticity models. Journal of Business and Economic Statistics, 20, pp. 339-350.

Fabozzi, F. J. and Francis J. C. (1977). Stability tests for alphas and betas over bull and bear markets. Stability tests for alphas and betas over bull and bear markets. The Journal of Finance, Vol. 32, 4, pp. 1093-1099

Fama, E. F. and MacBeth, J. D. (1973). Risk, return, and equilibrium: Empirical tests. Journal of Political Economy, Vol. 81, 3, pp. 607-636.

Fama, E. and French, K. R. (1992). The cross section of expected stock returns. Journal of Finance, Vol. 47, pp. 427–66.

Fama, E. F. and French, K. R. (1993). Common Risk Factors in the Returns of Stocks and Bonds. Journal of Financial Economics, 33, pp. 3-56.

Fama, E. F. and French, K. R. (2004). The Capital Asset Pricing Model: Theory and Evidence. Journal of Economic Perspectives, Vol. 18, 3, pp. 25-46.

Hansen, B. E. (2000). Sample splitting and threshold estimation. Econometrica, Vol. 68, 3, pp. 575-603.

Harshita, S. S. and Yadav, S. S. (2015). Indian stock market and the asset pricing models. Procedia Economics and Finance, 30, pp.294 – 304.

Jensen, M. C. (1968). The performance of mutual funds in the period 1945-1964. The Journal of Finance, Vol. 23, 2, pp. 389-416.

Jorion, P. Valor en Riesgo. Limusa, México, 2002.

Keim, D. B. and Stambaugh, R. F. (1986). Predicting returns in the stock and bond markets. Journal of Financial Economics, 17, pp. 357-390.

Kroner, K. F. and Ng, V. K. (1998). Modeling asymmetric comovements of asset returns. The Review of Financial Studies, Vol. 11, 4, pp. 817-844.

Lintner, J. (1965). The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets. The Review of Economics and Statistics, Vol. 47, 1, pp. 13-37.

Liu, L. M. and Hanssens, D. M. (1982) Identification of multiple-input transfer function models. Communications in Statistics, A11, pp. 297-314.

Liu, L. M. (1991). Use of linear transfer function analysis in econometric time series modeling. Statistica Sinica, 1, pp. 503-525.

Liu, J. M., Chen, R. and Yao, Q. (2010). Nonparametric transfer function models. Journal of Econometrics, 157, pp. 151-164.

Markowitz, H. (1952). Portfolio Selection. Portfolio Selection. The Journal of Finance, Vol. 7, 1, pp. 77-91.

McDowell, A. (2002). From the help desk: transfer functions. The Stata Journal, 2, N. 1, pp. 71-85-

Merton, R. C. (1973). An Intertemporal Capital Asset Pricing Model. Econometrica, Vol. 41, 5, pp. 867-887.

Mossin, J. (1966). Equilibrium in a Capital Asset Market. Econometrica, Vol. 34, 4, pp. 768-783.

Narayan, S. and Smyth, R. (2015). The financial econometrics of price discovery and predictability. International Review of Financial Analysis, 42, pp. 380–393.

Perold, A. F. (2004). The Capital Asset Pricing Model. Journal of Economic Perspectives, Vol. 18, 3, pp. 3-24.

Ramiah, V., Xu, X. and Moosa, I. A. (2015). Neoclassical finance, behavioral finance and noise traders: A review and assessment of the literature. International Review of Financial Analysis, 41, pp. 89–100.

Roll, R. (1977), A critique of the asset pricing theory's tests Part I: On past and potential testability of the theory. Journal of Financial Economics, 4 (2), pp. 129–176.

Ross, S. A. (1976). The Arbitrage Theory of Capital Asset Pricing. Journal of Economic Theory, 13, pp. 341-360.

Sharpe, W. F. (1964). Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk. The Journal of Finance, Vol. 19, 3, pp. 425-442.

Soon-Ho, K., Dongcheol K. and Hyun-Soo S. (2012). Evaluating asset pricing models in the Korean stock market. Pacific-Basin Finance Journal, 20, pp. 198–227.

Stattman, D. (1980). Book values and stock returns. The Chicago MBA: A Journal of Selected Papers 4, pp. 25-45.

Subrahmanyam, A. (2010). The cross-section of expected stock returns: What have we learnt from the past twenty-five years of research? European Financial Management, 16, pp. 27–42.