



## Social Protection Discussion Paper Series

### **Pension Reform and Capital Markets: Are There Any (Hard) Links?**

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**February 2002**

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# PENSION REFORM AND CAPITAL MARKETS: ARE THERE ANY (HARD) LINKS?

Eduardo Walker and Fernando Lefort

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*pe'n'sion n. 1. Periodic payment made on retirement or above specified age*

**PENSION REFORM PRIMER**

*re'form n. 1. & v. 1. make (institution, procedure etc.) better by removal or abandonment of imperfections, faults or errors*

*pr'im'er n. 1. elementary book to equip person with information*

**PENSION REFORM AND CAPITAL MARKETS:  
ARE THERE ANY (HARD) LINKS?\***

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## ABSTRACT

The creation of fully funded, privately managed pension systems may have significant positive direct effects on savings, growth, and welfare. However, the indirect link, via capital market development, may be as important. This hypothesis is verified with evidence from emerging economies that have recently engaged in such reforms with a focus on Chile, Argentina and Peru. There is abundant qualitative and anecdotal evidence that relates pension reform with the accumulation of "institutional capital", with the existence of an adaptive legal framework, with increased specialization, transparency and integrity and even with better corporate governance. Evidence of increased financial innovation is also found while there is little evidence of bank disintermediation. In addition, time-series and panel data evidence is generally consistent with the following hypothetical effects: a reduction in the cost of capital; lower security-price volatility; and higher traded volumes. The evidence suggests that the indirect channel via capital market development may have important implications for economic growth and productivity.

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**PENSION REFORM AND CAPITAL MARKETS:  
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**I. INTRODUCTION**

The interest in pursuing pension reform shown by multinational organizations, developing countries and economists around the world, assumes that privatization of social security, and more specifically, the creation of fully-funded privately-managed pension systems has important positive effects on welfare. In particular, it has been argued that pension reform improves macroeconomic stability by reducing the political and demographic pressures of the standard “pay-as-you-go” systems, and by inducing fiscal reform during the transition. In addition, funding requirements associated with pension reform may help increase savings, fueling economic growth and productivity. Pension savings will increase total savings if there are liquidity constraints that do not allow individuals to borrow against future pensions. Recent evidence suggests that this effect may be more important than previously thought for developed countries.<sup>1</sup> However, other findings show that the direct effects of pension reform on savings is ambiguous and sometimes empirically unimportant.<sup>2</sup>

An increasing number of studies looking at the impact of financial development on economic growth, productivity and savings, have cited the possibility that pension reform may have an additional desirable through a positive impact on capital market development. The existence of a positive effect of capital market development on growth has its main theoretical support in endogenous growth models, whereby more liquid and efficient stock markets provide the incentives for long-run investments, thus increasing economic growth. Empirical evidence by Levine and Zervos (1998), Rousseau and Wachtel (1998) and Arestis, Demetriades and Luintel (2001) support the validity of this channel, although the latter believe that the positive effect of stock markets on growth has been exaggerated.

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<sup>1</sup> See Poterba et al (1996).

<sup>2</sup> See Coronado (1998), Morandé (1998), Hachette(1998).

Therefore, in addition to the direct effect that pension reform may have on growth and savings, the creation of a fully-funded, privately-managed pension system may also accelerate the process of capital market development, improving growth and welfare. The main question that we ask in this paper is therefore the following: If pension funds simply happen to substitute other sources of private savings, why would this reform have any beneficial effect on economic growth and productivity? Furthermore, pension reform has been accompanied in most cases by other concurrent reforms, which have their own effects. The main purpose of this paper is to verify the hypothesis that pension fund reform significantly affects the functioning of capital markets after controlling for other reforms.

Many economists have asked similar questions,<sup>3</sup> so one of the contributions of this paper is to synthesize the main hypotheses that relate capital market development with pension reform, discuss their validity, and perhaps posit new ones. We also analyze the extent to which the qualitative evidence is consistent with these hypotheses. Finally, when possible, we try to empirically assess the importance of such effects, something that has not been done so far. We consider the evidence primarily from Chile, Peru and Argentina, since these countries have the longest experience with this type of pension reform. However, even in the latter two cases this time period is relatively short, so the statistical evidence is scarce. We also analyze panel data evidence using a sample of 33 emerging economies, and a subsample of seven Latin American countries. Some of the conclusions we offer must be considered preliminary and will need to be verified again as a longer period of observation becomes available.

Overall, the evidence provided in this paper seems to be consistent with the claims by advocates of reform. Pension reform facilitates the accumulation of institutional capital through an adaptive legal framework, increased specialization in the investment decision-making process, more transparency and integrity (particularly via the mandatory risk-rating process), and also through a new corporate governance balance, particularly evident in the case of Chile.

We analyze the hypothesis that one of the main channels through which pension fund reform affects economic performance is through a reduction in the effective cost of capital for firms. The econometric analyses, with both time-series and panel data estimation techniques,

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<sup>3</sup> See for example, Valdés and Cifuentes, 1990; Arrau, 1994; Fontaine, 1996; the critique by Singh, 1996; Blommestein, 1997; Holzmann, 1997; Burtless, 1997; Uthoff, 1997; Blommestein, ed. 1998, particularly the chapters by himself, de Rick and Lannoo; Blake and Orzag, 1998; Camus and Sánchez, 1998.

indicate that dividend yields are lower (stock prices and price-to-book ratios larger) with reform. The evidence also favors the hypothesis of lower security-price volatility after reform.

We provide qualitative evidence regarding the creation of new financial instruments. In this context, the institutional environment plays a central role. One interesting result however, is that there does not seem to be bank "disintermediation", although after reform the role of banks partly changes. Perhaps one of the most important effects could be an improvement in the allocation of invested funds, which should translate into better resource allocation. This may have permanent positive effects on growth and welfare, even if total savings are not affected.

The paper is organized as follows: Section II discusses the main links between pension reform and capital market development. Section III provides qualitative and selected time series evidence. Section IV analyzes panel data, and section V concludes.

## **II. PENSION REFORM AND CAPITAL MARKET DEVELOPMENT**

In this section, we intend to clarify the rationale behind the link from pension reform to capital market development, and from that to economic growth and development. We see these links through three sets of economic phenomena related to pension fund reform. Naturally, the extent of the effect of pension fund reform on capital market development will depend upon the specific characteristics of the reform. We take as a benchmark for a reformed pension fund system one that allows the competitive allocation of pension funds in the spirit of the Chilean-style pension reform.<sup>4</sup>

There are many channels through which pension reform may support the development of capital markets. Therefore, we first present a summary of the main ideas (hypotheses or claims) presented in the specialized literature regarding this process, including a few new ones. There are many concurrent conditions to the process of pension reform that may reinforce or limit the

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<sup>4</sup> The idea behind this is that pension funds could allocate funds more efficiently only if investment in securities issued by the private sector is allowed. Alternatively, if pension reform requires fund managers to hold only government bonds one may expect very little effect of pension reform on capital market development. On the other hand, a pension fund reform Canadian style, where funds are managed by the state does not comply with the competitive allocation of funds requirement.

positive effect on capital market development. We thus also provide a list of these. Finally, the development of a capital market under some conditions may have consequences on economic growth, capital accumulation and other real effects on welfare. We also refer to them in this section.

## II.1 Processes of Capital Market Development

### A. Accumulation of ‘Institutional Capital’

Valdés and Cifuentes (1990) develop this concept, which may be particularly important in emerging markets and also in countries of Civil Law tradition, since in the latter, laws are required before certain improvements can be implemented. The accumulation of relatively large amounts of investable wealth by pension funds induces the authorities to provide and private sector participants to develop financial instruments in which pension funds can invest. Institutions issuing such instruments will have to disclose the required information. This process is also likely to improve transparency in terms of financial market practices and fund management. Therefore, the *push* provided by pension fund growth requires a (dynamic) set of regulations, labeled “Institutional Capital” (p. 39). We generalize this idea as “the regulatory and institutional environment in which investors, firms and authorities interact with each other”. Institutional Capital is thus a public good that can contribute indefinitely in the process of “modernizing” capital markets.

It can be argued that even without pension reform there may be a trend toward modernization of laws and institutions, due to increasing financial market integration and technological developments. This is certainly true, but if the legal authorities can identify significant local institutional investors acting on behalf of future pensioners as valid *clients* there will be additional support to the required reforms. In what follows, we analyze specific components of this institutional capital (also see Blommestein, 1997, 1998; Iglesias, 1998; and Vittas, 1998).

As explained, progress required in order to accommodate the growing needs of institutional investors to securitize growing portions of a nation’s capital stock.<sup>5</sup> This also leads to taking advantage of foreign expertise, although in the case of Chile, for example, many of the legal changes, including the pension reform itself, originated at home.<sup>6</sup>

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<sup>5</sup> See Pérez Mackenna (1988).

<sup>6</sup> Valdés and Cifuentes, *op.cit.*, p. 41 claim that the some of the legal changes introduced in the 1986 Chilean Bank Law took place even before the same happened in developed countries.

The enforcement of better regulations regarding disclosure, accounting and auditing standards should lead to greater capital market transparency. Also, because of practical considerations, increasing importance of pension funds may imply a trend toward self-regulation, which in turn may be a more efficient way to help the development of a capital market.<sup>7</sup> The creation of risk-rating systems provides an additional way of providing transparency to capital markets. In fact, when public trust is at stake, particularly in the case of mandatory pension systems, it is expected that some kind of certification or independent opinion regarding the riskiness of the instruments that can be used by pension funds will be required by the authorities. One such mechanism is a mandatory risk-rating requirement.

Pension fund managers are not expected to control companies but they may become important minority shareholders. If fund managers act in the interest of future pensioners, they potentially become important representatives of minority shareholder interests (Vittas, 1996; Lanoo, 1998; Blake and Orszag, 1998). In addition, common interests among pension fund managers may open the possibility of electing independent board members. Moreover, pension fund representatives are expected to have access to the regulatory authorities and to influence public opinion. Finally, since pension funds are relatively large investors for whom it is possible to coordinate certain actions, they tend to overcome the free-rider problem that plagues other minority shareholders. Thus, a positive effect on the corporate governance balance might be expected. However, it is also possible that pension fund managers do not act in the interest of their investors but in those of the manager's related businesses. In addition, the relationship between fund managers and their clients may itself be subject to different kinds of agency problems. Naturally, regulations try to limit this. If properly guided, it would seem likely that a new corporate governance balance that favored the development of capital markets would arise.

## **B. Increased specialization in the investment decision-making process**

In a pension reform that increases the degree of funding, assets typically grow during a long transitional period. Managing increasing volumes of funds justifies increasing levels of specialization and requires professional management. This effect is reinforced if the reform has a net positive effect on savings (for example, when the transition is tax-financed) and also if agents substitute individual investment management by pension fund investment management. However, there may also be a transfer from banks and savings associations to pension fund managers. Since in no case

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<sup>7</sup> Self-regulation is sometimes associated with the formation of cartels, however.

do we expect banks to be completely substituted, a different kind of expertise will be developed in addition to the existing one. Levine and Zervos (1998) point out that banks and capital markets presumably play different roles in terms of supporting growth and productivity.

This process of specialization of pension fund management also implies a “spillover effect” affecting other related agents, such as investment-bankers, firm managers and regulatory authorities. It should imply the use of more recent knowledge, as well as newer communications and information technology. At the same time, professional investors have an interest in helping authorities to determine the appropriate direction for improvements in the legal framework.

### **C. Financial innovation incentives**

Bodie (1989) argues that the accumulation of funds has been an important force shaping the evolution of financial innovation. As capital markets grow, there are bigger gains to financial innovation. However, the industry analyzed in his study consists mostly of defined-benefit pension plans in the United States. This structure implies particular kinds of incentives. In the case of Chilean-style defined-contribution systems, there may be an emphasis on shorter-term performance, as in the case of mutual funds. On the other hand, there is evidence of herd behavior among managers of defined benefit pension funds. In any event, if significant amounts of funds accumulate, there are natural incentives to creating new financial instruments, including long-term instruments, securities from new sectors of the economy, and also to allow investments in foreign markets (Iglesias, 1998).

From a different perspective, Prowse (1998) argues that in the United States pension funds have been the major source of finance for limited partnerships and joint venture funds, which operate in the private equity market, and are a major financing source for start-ups and small firms. A similar argument is made by Catalán, Impávido and Musalem (2000) for contractual savings in general: portfolio managers assume liquidity risk in exchange of higher expected returns. However, this argument might be stronger with regard to life insurance companies and defined benefit schemes. In the case of competitive defined-contribution pension systems, as in the case of mutual funds, portfolio managers face the incentives to show "attractive" returns over relatively short periods of time. This may limit the desire of portfolio managers to favor more illiquid and harder to value investments.

## II.2 Concurrent Conditions

Pension reform seldom takes place in isolation, and this has two implications. First, other reforms that take place simultaneously confound the possible incremental effects of pension reform. Second, it is possible that without other concurrent conditions, pension reform turns out not to be successful in terms of supporting the development of a capital market. Thus, it is important to identify concurrent conditions, meaning the list of institutional and economic reforms that may facilitate or condition the positive effect of pension reform on capital market development. However, in many cases these concurrent conditions might not be truly exogenous, since other reforms are required to make pension reform successful (such as the last points in this section). Here we take ideas from Fontaine (1996), Blommestein (1997) and Uthoff (1997), in addition to elaborating new ones and organizing them into a smaller number of broader categories.<sup>8</sup>

### A. Macroeconomic stability in a market environment

Macroeconomic instability is likely to reduce the positive effects of pension reform on capital market development. Since capital markets intermediate funds from different sources, well functioning credit markets and non-distorted fundamental prices are required, such as price levels, real exchange rates and real interest rates. Although not necessarily true for all economies, based on the Chilean experience with endemic inflation, we can argue that the availability of indexation (inflation-protection) helps the development of fixed income markets.<sup>9</sup> It is also likely that pension reform will directly contribute to macroeconomic stability, by alleviating the political and demographic pressures imposed by “pay-as-you-go” systems, since it usually requires significant fiscal reform. The reform requires explicit recognition of the pension system’s debt levels and raises a discussion of how this is to be financed. In the end, whether or not pension reform helps macroeconomic stability will depend on the strength of the reform and the financing of the transition.<sup>10</sup> Later, we discuss the impact of pension reform on savings.

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<sup>8</sup> For an analysis of the reforms and stabilization process of the Chilean economy, see Bosworth, Dornbusch, and Labán (1994).

<sup>9</sup> Diamond and Valdés (1994) also noted this. Walker (1998) in addition emphasizes the need of a consistent legal environment.

<sup>10</sup> However, pension reform may fail to reduce the fiscal profligacy if, for instance, fund managers are required to hold large blocks of government debt, avoiding hard fiscal decisions altogether.

## **B. Adequate tax incentives**

A well-known fact is that the development of specific financial instruments importantly depends on tax-incentives. For example, other things equal, tax advantages for debt will provide incentives to the development of a market for corporate debt. Taxes may also give advantages to using retained earnings instead of issuing equity; or related-firm lending instead of issuing new debt. Uthoff (1998) emphasizes for the case of Chile that due to tax-incentives earnings retention by firms has been one of the important sources of increased savings in Chile. Notice that earnings retention may be a policy favored by long-term institutional investors, especially under a shortage of investment alternatives, which makes these facts interdependent. Also, Walker (1998) points out that inflation-neutrality in the tax code favors the development of an indexed debt market. Therefore, the kind of tax regime in place is an important variable to be controlled for when assessing the impact of pension reform on capital markets.

## **C. Progressive capital control liberalization**

It may be debatable whether the incremental impact of pension reform on capital markets depends or not on the extent there is freedom in capital inflows and outflows, although it is likely that restrictions negatively affect the overall development of the market. There may thus be a joint positive effect. However, if both reforms tend to happen simultaneously it may be difficult to determine the impact of each.

## **D. Adequate regulation and competition in the financial services industry**

Overregulation or lack of competition in the financial services industry may limit the development possibilities of capital markets. For example, competition among security traders and stock exchanges allows for transaction costs that do not inhibit trading. Also, prudential bank regulation implies fair competition among alternative fund suppliers, including pension funds.

## **E. Property rights, bankruptcy legislation and investor protection**

In capital markets, contingent-claims on the value of firms are traded. If these claims' boundaries are not well delimited, security prices will be significantly penalized, rendering the issuance of such claims unattractive for firms seeking funds. It is thus obvious that a required condition for a capital market to develop, with or without pension reform, is that property rights are well established. La Porta et al (1996, 1997) argue that legal protection to investors has no good

substitutes, especially in Civil Law countries. This has additional implications in the case of regulated industries. In any case, it is important to keep in mind that regulators that pursue a successful pension reform must adapt investor protection and bankruptcy legislation to the needs of the new institutional investor. Lack of protection may negatively affect public trust of the reform.

## **F. Privatization of state-owned companies**

Privatization of state-owned firms is likely to have important effects on the development of capital markets. Firms that relied before on centralized credit allocation may now opt for the bond and stock markets. Also, if the privatization process purposely considers a vast dispersion of property, higher transaction volumes in stocks are expected. Pension fund participation may enhance these effects. However, privatization can be implemented in many ways, such as assigning shares of the privatized firms directly into individual accounts, with or without authorization to trade them. In addition, it could be implemented as a private transaction between the State and a single controlling shareholder. In the later two cases, no impact on capital market development is expected. Finally, reversals could take place. After the 1998 Asian crisis, many of the previously privatized firms in Latin America were purchased by private investors that bought out minority shareholders, converting them into closely-held companies, and sometimes delisted them from the exchanges. Explanations for this may be related with a lack of investor protection and rent seeking by controlling shareholders (Bebchuk 1999).

### **II.3 Consequences of pension fund induced capital market development**

Recent empirical evidence has established links between indicators of financial market development, economic growth and productivity.<sup>11</sup> In this paper, we are interested in the effect of pension reform on capital market development. Thus, we only discuss the effects on economic activity that pension reform is likely to have via capital markets. We do not analyze other channels through which pension fund reform and economic growth may be related.

From a theoretical point of view, the development of capital markets may have a positive effect on economic growth through two channels: (a) increased savings; and (b) more efficient allocation of savings.

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<sup>11</sup> See Levine and Zervos (1998), Levine, Loayza and Beck (1998), De Gregorio (1998), Rousseau (1998) and Arestis et al (2001).

## **A. Increased savings**

The effect of pension fund reform on savings depends on many characteristics of the reform and the economy. To name a few: (a) the financing of the transition towards a new pension system; (b) the extent of crowding out of voluntary savings by mandatory savings; (c) the strength of intergenerational transfer motives; and (d) redistribution effects between groups with different marginal saving rates and/or borrowing constraints.<sup>12</sup> In addition, pension reform is likely to accelerate the process of capital market development. Through this channel, the reform helps improve the process of screening and monitoring of new projects and also helps with the diversification of systemic risk. This enables individuals to participate in more investment projects, increasing the rate of investment of the economy.

At the empirical level, the effect of pension fund reform on savings is ambiguous. On the one hand, some studies analyzing the Chilean case show a negligible effect on net of Social Security saving rates and others a positive effect on saving rates among higher income households because of tax benefits (Coronado, 1999). From a list of 19 econometric studies surveyed by Schmidt-Hebbel (1998), on the response of voluntary private savings to social security contributions and benefits, 8 report lower saving rates, 3 report higher saving rates and 8 report no significant effect. The indirect impact on savings through capital market development does not seem to perform better. Levine and Zervos (1998) show that none of the financial indicators provided in their study is significantly correlated with private savings.

## **B. Cost of capital reduction for firms**

Iglesias (1998) argues that the fully funded pension systems may imply a reduction in the cost of funds for firms, and attributes this effect to the accumulation of financial savings as opposed to other types of wealth. If private savings are not intermediated by financial markets they take the form of private equity, land, gold and others.<sup>13</sup> Vittas (1996) argues that pension reform brings pooling of long-term financial savings, which can underpin capital market development.

These arguments are incomplete because it is necessary to identify the kind of structural change that need to take place in order to justify that the required rates of return may indeed decrease after the accumulation significant pension funds. This is particularly important given that,

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<sup>12</sup> For an analysis and empirical evidence on the effect of pension fund reform on savings see Coronado (1997), Schmidt-Hebbel (1998), Burtless (1997), and Mackenzie, Gerson and Cuevas (1997).

<sup>13</sup> See also Pérez Mackenna (1988).

as we pointed out above, econometric studies show only small increases in savings attributable to pension reform. In other words, if pension funds were simply to substitute other sources of private savings, why would this imply a lower cost of capital? We can think of three possible answers to this: lower direct costs of issuing securities, lower “term premia”, and lower “risk premia”. These arguments resemble the effects that usually are attributed to capital market integration (for example, see Bekaert and Harvey, 1998 and the references cited therein).<sup>14</sup>

First, due to the overall development of the capital market, the direct costs of issuing securities are likely to be lower. This naturally implies a reduction in the cost of capital. We analyze this channel in more detail later in this section.

Second, the time-horizon of pension funds is expected to be longer than that of individuals or firms that buy financial instruments. In the case of individuals, even if at aggregate levels total savings are stable over time, the average maturity of such savings (duration) is likely to be relatively short. This should indeed be the case, considering the precautionary nature of savings. In the case of firms, whose business is not financial, they transitorily invest in financial securities. Thus, by definition they are short-term investments. In contrast, and even though pension fund performance may be measured in the short term, the certainty that a large fraction of these funds need not be liquidated until the distant future, at least in the aggregate, allows pension fund managers to chose longer investment maturity. This means that even if total savings do not increase after a pension reform, the average maturity of the financial securities would be lengthened. In other words, the required “term premium” (also called “liquidity premium”) should be lower.<sup>15</sup> The next argument reinforces this idea.

Third, given that pension funds manage other people’s money and that absolute volatility is not expected to have a direct effect on the welfare of managers, it is likely that the average risk tolerance of the capital market will increase. This implies a lower equity risk premium, which also lowers the average cost of capital for firms.

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<sup>14</sup> In any case, studies such as that of Fama and French (2001) have found that there has been a downward trend in the equity premium. In this context, pension reform may have an incremental impact, either by accelerating the premium reduction or by having an additional independent effect. This is a potentially complex issue and we do not intend to dilucidate it in this paper.

<sup>15</sup> Short-term performance evaluation may indeed shorten the investment horizons of pension fund managers, but these are still expected to be longer than individual investors’. Applying the same argument to defined benefit systems it may be true that the reduction in the required premia would be larger in such a case.

Thus, the above implies that the cost of capital should fall. Moreover, if such cost of capital is evaluated at the “optimal” mix of financing sources we may be able to conclude even more strongly that the “risk-adjusted cost of capital” would decrease.<sup>16</sup> Here it is important to notice that the ability to obtain the “appropriate kind” of longer-term funding may imply reductions in the residual losses of issuing securities, because of more efficient risk-sharing mechanisms. For example, a higher degree of asset-liability duration-matching by industrial firms, lowers expected bankruptcy costs thus reducing financing costs.

This may also have implications for the costs associated with information asymmetries. Even if such asymmetries were to remain the same, these costs may be reduced. For example, Myers’ (1982) “pecking-order” theory establishes that there will be a sequence of preferred financing sources, starting with short-term debt, ending with equity, depending on the degree of information asymmetry, *ceteris paribus*. This argument takes as given a “reasonable” equilibrium among the costs of the different financing alternatives. The fact that firms could now get better-suited financing packages would reduce the residual losses due to information asymmetry, because a lower number of projects would be left out due to inappropriate financing sources.

The above implies that even though pension reform may not increase total savings, it is likely to have a positive effect on growth and welfare caused by a better allocation of investment funds. If the overall (risk-adjusted) cost of capital indeed falls, at every point in time there will be a different (not necessarily larger) set of attractive investment projects. If longer-term-higher-expected-return projects are now accepted (which perhaps also are the riskier ones, from the perspective of a short-term investor) this implies higher expected economic growth.<sup>17</sup>

### **C. Financial market integration**

Obstfeld (1994) argues that more integrated capital markets allow better risk sharing mechanisms tilting the market portfolio towards higher-return investments thus increasing economic growth. De Gregorio (1999) finds evidence that financial integration increases the depth of financial system inducing higher economic growth.

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<sup>16</sup> It is not enough to just look at the average interest rate that would be charged to firms.

<sup>17</sup> It may be argued that this need not be true if there is access to external capital markets. Nevertheless, as Chile’s 1982 experience indicates, external financing may entail significant risks for projects in the non-tradable sector of the economy. Thus, given a lack of currency matching, fewer projects would be considered attractive on a risk-adjusted basis.

An institutional environment that favors the development of the pension fund industry is likely to give additional incentives to the international integration of financial markets. Financial integration can be understood as an “alignment” of the risk-return trade-off with the rest of the world’s. Increased liquidity, transparency and especially a better protection of minority shareholder rights allow us to expect more foreign portfolio investment.

From a different perspective, since pension funds can become quite large with respect to the size of the domestic capital market, the possibility of allowing local funds to invest abroad becomes more likely. However, this process may be slow. Perhaps because of incentives arising from competition among AFPs, but also because of regulatory restrictions, Chile began investing significant amounts abroad only after the Asian financial crisis.

Finally, information requirements, sound market practices and minority shareholder protection may make it easier for local firms to issue securities abroad (such as bonds and ADRs). The three forces lead the capital markets towards integration.

Here it is important to keep in mind that, independent of pension reform, financial integration per se may also lead to a reduction in the cost of capital for firms. Thus, it is necessary to control for this in order to verify empirically if indeed the implementation of a pension system reduces the cost of capital. For instance, for Chile, Walker and Lefort (1999) report a permanent and significant fall in the dividend yield levels in 1990, which in turn reflects a fall in the cost of equity capital that is probably due to higher integration. This coincides with a time-period in which pension funds were allowed to increase their participation in local equity.

#### **D. Reduction of transaction costs, increased liquidity and lower price volatility**

Several authors have written about these issues (for example, see Blommestein, 1997; Iglesias, 1998; Vittas, 1998). From a theoretical point of view, more liquid (less expensive) stock markets increase incentives to invest in long-duration projects, because investors can more easily sell their stake before the project matures (Levine and Zervos, 1998). Therefore, good investment projects with long duration can be undertaken, increasing economic growth. Moreover, because of economies of scale, there may be a virtuous circle in the relationship between transaction costs, liquidity and volatility, in that they can be presumed to reinforce each other. In addition, new institutions may be created to handle increased transaction volumes, such as new electronic security trading systems, more competition among alternative markets, centralized custody deposits, and others alike. Shleifer and Vishny (1986) present a less optimistic view. They argue that more

liquidity in the market facilitates security selling, reducing incentives of minority shareholders to monitor controlling shareholders. The empirical evidence, however, shows that both more liquidity and less price volatility are positively correlated with current and future economic growth.<sup>18</sup>

The expectations of lower security price volatility and higher volumes caused by pension funds can be justified using the same kind of arguments regarding the effects of capital market integration (for example see Bekaert and Harvey, 1998): it happens due to a wider investor base jointly with access to more information and analysis. This implies that prices fluctuate more closely with fundamental values and that small deviations from such fundamentals cause large volumes of trades.

There is yet another perspective that may allow us to conclude that security price volatility could decrease because of pension reform – the time dimension. Indeed, at least part of the correlation exhibited by security returns across different markets and regions can be attributed to variation in required risk premia. If local pension funds' risk tolerance is assumed to remain relatively constant over time, then advantage should be taken of variations in risk premia (that perhaps are caused by variations in foreign investors' risk tolerance). This is done by purchasing securities when the risk premia is high (at “low” prices) and vice versa. Thus, price variations should be less extreme when compared with a market that does not have this class of investors. Notice that this is consistent with Caballero's (2001) idea that local capital markets should help mitigate external shocks.

#### **E. Secondary effects on the financial system's structure and other markets**

The development of a pension system may imply different forms of development and organization of other competing/complementary industries. For example, Blommestein (1998) finds related development of the life and disability insurance industry in OECD countries. Thus government financing, banks, life insurance companies, and even certain industries will be affected. For example, it may impact the housing industry if the mortgage bond market is successful.

Since significant long-term resources are accumulated, a redefinition of the market “niches” for banks and other fund providers is likely to take place. Banks will probably concentrate on shorter-term financing and/or on individuals and smaller firms.

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<sup>18</sup> See Levine and Zervos (1998).

It is important to consider that, at the capital market level, funds are "melted together" and it becomes impossible to relate specific sources of funds with specific uses. It would therefore be inappropriate to judge the impact that pension funds have on aggregate investment without considering these indirect effects. For instance, it may be true that a significant fraction of the pension funds is invested in government securities, but this frees funds from other potential sources, such as banks. That is why it may be incorrect to assert that a particular kind of financial investment by pension funds is "not productive" as suggested by Uthoff (1997).

### **III. QUALITATIVE AND TIME SERIES EVIDENCE**

This section is organized as follows: We first analyze qualitative and time series evidence regarding the effect of pension fund reform on capital market development for three reformer countries, Argentina, Chile and Peru, and assess whether it supports or contradicts the hypotheses presented in the previous section. We look both at the effect of pension fund reform on capital market development and at the consequences of this development in terms of lower cost of capital and financial integration. We also consider other explanations (from the list of concurrent conditions) to test the robustness of this evidence.

We use several data sources. First, the most specific data regarding pension fund portfolio composition is obtained from the pension fund supervisory entity of each country. Specifically, for Chile, Peru and Argentina, we obtain data on portfolio composition and the number of bond and stock issuers present in the pension fund portfolios from the local supervisory agencies, and Ramos (1999) for Peru. For these three countries, we also consider several stock market indicators that are compared to the Latin American average. These numbers come from the IFC databases and comprise dividend yields, price-to-book ratios, traded volumes, stock market returns, and volatility measures. Other data sources are local stock exchanges and central banks. Finally, country data on macroeconomic and other capital market indicators is obtained from Beck, Demirguc and Levine (1999). We also measure the importance of pension fund investments in the corporate sector (stocks and bonds) relative to total market capitalization. Regarding transaction costs we use

information from Iglesias (1998) and De la Cuadra and Galetovic (1998) in the case of Chile, and from The Emerging Markets Factbook (1998) for a list of 45 different countries.

### **III.1 Institutional capital and increased specialization in asset management**

The anecdotal evidence presented in Table 1 heuristically supports the idea of an environment that favors modernization and reform, and the notion of an adaptive legal framework. It is important to highlight the formal and informal participation by pension funds in the legislative process, which probably becomes more important the larger pension funds are relative to the local economy. This ensures that resulting laws effectively resolve the problems faced by these investors. For example, allowing Chilean pension funds to hedge using currency forwards helps explain why as of December 1998 a significant 5.6 percent of the total funds managed were already invested abroad.<sup>19</sup>

Competitive pension fund management in a global environment provides incentives for specialization in the fund management business. Moreover, with the internationalization of local pension funds, technology is transferred from foreign to local fund managers. This means using “modern” information services and technology, a learning process to understand and invest in new instruments, and a permanent transfer of technology from the more advanced countries. Frequent contact with authorities and security issuers requires increased professionalism on their part as well.

The role of pension funds regarding corporate governance is also illustrated in Table 1, and the evidence seems to be supportive of an improved balance among market participants. The main channels are the participation of independent board members representing pension funds, and the changes in corporate legislation. Iglesias (2000) argues that partly because of pension reform, in Chile the number of independent boards members increased, monitoring costs fell as a result of improved information quality, companies where pension funds have invested are under close public scrutiny, shareholder meetings become more relevant, and bondholder protection also improves.

The evidence presented is also consistent with the claim that both transparency and integrity improve with reform. Risk rating procedures at the very least promote information exchange and coordination among issuers, authorities and pension funds, which is expected to improve transparency. In addition, transactions have to take place in organized secondary markets and securities have to be valued at market prices, which provides incentives to monitor security prices.

Finally, the clear identification and penalization of inadequate resolution of the conflicts of interest faced by pension fund managers helps identify similar situations in the case of other market participants. Bad market practices become more clearly recognized in terms of their negative effects on third parties, in this case on future pensioners. Thus, they may face more severe social sanction, be it formal or informal.

In any case, for the three countries analyzed, other reforms took place at the same time, including macroeconomic stabilization plans. Naturally, these complementary reforms underpin the modernization process that is reflected in the accumulation of institutional capital.<sup>20</sup>

### **III.2 Cost of capital reduction for firms**

In general, it is difficult to estimate the impact that the competitive allocation of pension funds towards private securities has had on the cost of capital. A thorough analysis is needed, because many other variables may have evolved favorably or unfavorably during the same time period. But the analysis presented below provides a reference point.

#### **A. The qualitative evidence**

An indirect way to look at the effect that pension funds may have on firms' cost of capital is to consider their importance within the existing stock of securities. If pension funds buy a “large” fraction of a growing stock of securities, it probably reflects a “convenient required rate of return” from the perspective of issuers; otherwise they would not issue such securities. Furthermore, the lack of investment alternatives frequently noted by pension fund managers might even reflect disequilibrium rates of return, which would be “too low” for periods of time in which insufficient investment alternatives are available.

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<sup>19</sup> Of course, liberal investment regulations and poor local market performance also explain why Chilean pension fund managers started to look abroad.

<sup>20</sup> The hypothesis that adequate concurrent conditions are necessary for a successful pension fund reform is being tested during the Argentinean crises of 2001-02. In response to the fiscal distress and the need to service the external debt, the Argentinean government has implemented several measures that may reduce the public confidence on the private pension system. First, by mid 2001, the minister of economy, Domingo Cavallo, announced a reduction of the actual 11% mandatory contribution to pension fund individual accounts, to a 5% during a year. Second, by the end of 2001, about 17 billion dollars of Argentinean dollar denominated Treasury Bonds in pension fund portfolios were swapped against a credit to the government at a maximum rate of 7%. This credit was lately denominated in pesos at the official 1.4 \$/US\$ rate. Finally, The government forced the AFJPs to invest all their liquidity in 4-months treasury bills. This measure seek to finance the government deficit in order to meet the IMF fiscal requirements. This change in policy is in violation of established investment limits on government securities.

Table 2 shows that in December of 2000 Chilean pension funds held about 40 percent of the total amount outstanding of corporate bonds. This number has ranged between 40 and 62 percent since 1988. Also in December of 2000 they held 7 percent of the total equity market cap (within the range 4-11 percent). These percentages further increase if insurance companies are also considered.

For Argentina, Table 2 shows that in 1997 pension funds held important percentages of the total amount outstanding of each kind of security. This illustrates the significance of pension funds, despite their short history. Also (ASAP, 1998, p. 160) the percentage of total assets held by institutional investors has increased from 2.5% to 20%. Finally, during the 1995 crisis, institutional investors' funds almost completely replaced the reduction in holdings by foreigners. This is indicative of the stabilizing role of institutional investors.

In Perú, the fraction held by pension funds of the outstanding bond issues has been in the range of 41-45 percent since 1996 (Table 2). Also, pension funds held near 7 percent of the total equity market cap by 2000. All this has happened in the context of growing markets. The corporate bonds outstanding increased from 85 million US dollars in 1994, to nearly 1.2 billion in 2000. Ramos (1999) argues that investment limits have distorted interest rates, since pension funds cannot invest abroad and must take as given the conditions offered by local issuers.

In addition, Table 2 also indicates an important growth in the sizes of the corporate bond markets toward the year 2000, which suggests an interesting "substitution effect". In times of depressed stock prices firms may find it convenient to change their source of financing to debt. This added flexibility will exist only if there are important local providers of funds denominated in local currency. The flexibility in the financing sources may imply lower financing costs, on average. Here we do not discuss the rationality of such actions (e.g., market timing) by firms.

Table 3 shows the number of issuers present in pension fund portfolios. Upward trends in these numbers for all three countries indicate that these issuers have found a "convenient" source of financing in pension funds. Table 4 shows the "importance" of pension fund investments in the corporate sector (stocks and bonds) relative to total market capitalization. This weight indicates the importance that pension funds might have on the cost of capital for traded firms. In Chile, this "weight" became near 5 percent in 1986, whereas in Argentina and Perú this happened in 1996. Nevertheless, for the latter countries the importance of pension funds has grown at a faster pace. By 2000, the "relative importance" of pension funds was larger for Argentina and Perú than the maximum ever observed in Chile.

Any effect on the cost of capital should be reflected on the historical evolution of price-to-book ratios, dividend yields and price-earnings ratios. Book values, dividends and earnings are different ways of scaling the equity price level. These indicators reflect the cost of equity capital for firms and also reflect growth expectations. Fama and French (2001) notice that the long term expected return of investing in equity is the dividend yield plus the long-term rate of growth in earnings, book values or dividends. The reason for this is that the price level, aggregate earnings, dividends and book values are co-integrated. Given that variations in expected growth rates are seldom permanent and that its volatility is small compared with that of security prices, the largest fraction of the (permanent) level changes in price-to-book ratios, dividend yields and price-earnings ratios presumably correspond to variations in required rates of return.<sup>21</sup>

Table 5 shows several stock market indicators for Argentina, Chile and Perú compared with the Latin American average. The numbers have been calculated based on IFC databases. The year in which these countries' pension systems started investing in equity is highlighted. Figure 1 presents similar evidence on a monthly basis. The vertical lines indicate the dates when pension fund investment in stocks became larger than one million US dollars in Chile, Perú and Argentina, respectively.

The evidence presented does not show clear qualitative evidence in favor of our hypothesis. In the cases of Argentina and Perú, it is not clear that the relative price-to-book ratios increased at all with the accumulation ("weight") of pension assets. Our calculations for Chile (based on information from the Santiago Stock Exchange) indicate that the weighted-average price-to-book ratio was 0.31 in 1985. In 1987, when nine large recently privatized firms had received pension fund investment, this number increased to 0.71. In 1990, after investment limits and property concentration requirements were relaxed, it further increased to 1.0. The peak was achieved at 2.5 in 1994 and later, in 1998, after the Asian crisis, fell to 1.11. Relatively similar patterns appear in the dividend yields.<sup>22</sup> However, the price-to-book ratios measured *relative* to a Latin American index are 1.3 and 2.2 for 1986 and 1987 respectively, and 1.1 and 1.6 for 1989 and 1990, respectively.

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<sup>21</sup> In any case, we need to keep in mind that the absolute values that these numbers take may reflect different accounting standards and regulations as well. For example, certain expenses could be deferred in given countries but not in others, thus affecting the price-to-book ratios. Also, Chilean firms are required by law to pay 30 percent of profits as dividends, and thus other things equal dividend yields may be higher than for other countries.

<sup>22</sup> The exception is 1986. This happens because that year massive privatization took place. The market value of those firms is included in the denominator of the dividend yield whereas the dividends that would have corresponded are not fully included in the numerator.

Therefore, we indeed find a noticeable increase in the ratio's value in 1987 and then again in 1990 but these figures exhibit too much variability, not allowing us to detect permanent changes. In the cases of Argentina and Perú, no clear patterns appear either.

The next section performs time-series regression analyses on these variables.

## B. Time-series evidence

As argued, indicators that are correlated with the cost of equity capital for firms are the historical price-to-book ratios and dividend yields. Figure 1 shows the monthly evolution of (log) price-to-book ratios and dividend yields for Argentina, Chile, Perú and a Latin American average. There is a clear positive correlation among countries for these variables through time, although the figures for Argentina show extreme variability. Except for Argentina, (which has a correlation of +0.08) the general patterns for dividend yields are consistent with those of the price-to-book ratios, with monthly correlation of  $-0.81$ ,  $-0.86$ ,  $-0.63$  for Chile, Perú and the Latin American index, respectively.

Our general hypothesis is that pension asset accumulation causes the cost of capital to decrease. This should be reflected in higher price-to-book ratios (or lower dividend yields) *ceteris paribus*. A related hypothesis is that the sensitivity to changes in the Latin American required risk premium should also decrease with pension reform. To test these, given the apparent relative stability, only results for price-to-book ratios are presented. The estimated equations using monthly data are the following:

$$d \log(PB_{it}) = a_0 + a_1 d \log(PB_t^{LA}) + a_2 d(LPFI_{it}^*) + a_3 [d \log(PB_t^{LA}) \times d(LPFI_{it}^*)] + \varepsilon_{it} \quad (1)$$

where  $PB_{it}$  is the price-to-book ratio of country  $i$ 's IFC index and the superscript  $LA$  stands for Latin America;  $LPFI_{it}^*$  represents the log of the pension fund investment in stocks in country  $i$  and period  $t$  if such investment is greater than US\$1 million, and zero otherwise.

The equation is formulated in first differences because the levels of the (log) price-to-book ratios tend to show (empirically) unit roots, despite the strong intuitive reasons for stationarity.<sup>23</sup> Thus, we end up estimating a “market model” formulated in terms of differences between the rate

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<sup>23</sup> We use the term "stationary" as indicating the absence of a unit root, not as meaning that the probability distribution does not change over time. Price-to-book ratios (as well as other ratios) are expected to be

of growth of the country's stock price index and its book value against the same variable calculated for the Latin American index. The hypotheses are  $a_2 > 0$ , since price-to-book ratios should increase with pension fund investment because of lower required rates of return, and  $a_3 < 0$ , since price variations should become less sensitive to the changes in the Latin American risk premium when pension fund investment in stocks is significant.

Results are presented in Table 6. Only for Chile do they indicate that there is a strong positive relationship between variations in price-to-book ratios and pension fund investment,  $a_2$ , as expected. For the other countries the coefficient is insignificant. This lack of significance for Argentina and Perú may also be due to the short history of their pension systems. Regarding the lower sensitivity to changes in the Latin American index ( $a_3$ ) the coefficient is indeed negative for the three countries, and significant for Chile and Argentina (at least in a one tail 5 percent test).

We also included variables related with the Asian crisis, since most of the pension fund data for Argentina and Peru coincides with it. The variable corresponds to a dummy that takes the value of 1 after August 1997. It is not significant. However, we do find that for Chile the response to the Latin American index increased during the crisis. It is not yet possible to assert whether this represents a structural change. In any case, including these variables does not change our conclusions.

Regarding the robustness of our tests, the sensitivity to the Latin American index is always strongly present in all countries. For Argentina, given the extreme initial variability, results regarding the decreased sensitivity disappear if we extend the sample backwards. On the other hand, the recursive coefficients are relatively stable in terms of their value, and pension fund investment always tends to reduce sensitivity to the Latin American index. However, significance appears only towards the end, which is partly due to the small number of observations with positive investment in stocks by the Argentinean pension system. For the variables of interest, results for Peru are never significant. For Chile, and despite possible structural changes detected by CUSUM tests, recursive coefficients always show a reduced sensitivity associated with pension fund investment and also an increase in price to book ratios, which becomes significant from 1992 on (at 5 percent, one tail). Surprisingly, pooled estimation procedures that force coefficients  $a_2$  and  $a_3$  to be the same for all three countries indicate that both are significant and have the expected signs, which reflects

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stationary since the aggregate book values and the aggregate stock price level can not diverge indefinitely from each other.

interesting gains in the statistical power of such results. Finally, when changing the proxy of the cost of capital to the dividend yield, the only country that shows the same results is Chile. For Argentina and Perú, this can be at least partly attributed to noise in the data.

Summarizing, we do find evidence that pension fund investment in stocks is associated with reduced responsiveness to external shocks in all countries and also that price-to book-ratios tend to be positively associated with it. Altogether, the evidence is consistent with our hypotheses regarding a reduction in the cost of capital for firms with pension asset accumulation. However, these results are strongly influenced by Chile.

### **C. Event-study evidence**

Maturana and Walker (2001) use an event-study methodology to estimate abnormal returns during a 32-day window period surrounding the date at which specific stocks became eligible for the first time by AFPs. The average abnormal return is 5.7 percent during the entire sample period and 8.5 percent during the 1986-1992 sample period. This is equivalent to a significant drop in the equity cost of capital for these firms. This study so far has been completed only for Chile, and will be extended to include Peru and Argentina. Preliminary estimations give similar results for Peru.

## **III.3 Reduction of transaction costs, increased liquidity and lower security-price volatility**

### **A. Qualitative evidence**

In this area, most of the available qualitative evidence is for Chile. Regarding traded volumes, one year following the creation of pension funds, the amounts traded in fixed income were multiplied 10-fold. Traded volumes had been multiplied by 10 again as of 1987. The 1987 volume was multiplied 10 times once more as of 1998. In 1986, one year after allowing pension funds to invest in stocks, the amounts traded were multiplied 5.6 times and by 1990, more than 10 times the 1985 level.

In the case of Argentina, despite the short history of the new system, there are noticeable effects. With respect to 1993 (the year before the beginning of the new pension system), total traded volumes increased more than threefold. Also, the average sizes of the trades significantly increased (AFAP, 1998).

Regarding technical innovation that may reduce transaction costs, in 1987 the Santiago stock exchange implemented electronic security trading systems (see Iglesias, 1998). It is claimed that this

modernization greatly increased traded volumes and also the efficiency of the market. In November 1989, the Electronic Stock Exchange began operating in direct competition with the Santiago Stock Exchange (Bolsa de Comercio de Santiago, BCS). It was originated mainly by agents that wanted to operate with the AFPs, but that were not allowed to because pension funds were required to operate only in formal markets (e.g. the BCS) (De la Cuadra and Galetovic, 1997). AFPs were thus decisive, not only in the formulation of the project, but also in terms of redirecting part of their transactions to this market. It is important to keep in mind that transaction costs are paid directly by the managers and are not subtracted from the pension funds. This naturally creates additional incentives to reducing transaction costs. Iglesias (1998) reports that BCS's fees charged for the transaction of shares and fixed-income dropped from 0.5 and 0.015 percent in 1985 to 0.12 and 0.0 percent in 1994. De la Cuadra and Galetovic report that broker's fees have also fallen from 1.2 percent in the early 90's to an average 0.6 percent in 1998. Here, the concurrent condition that helps explain the drop in transaction costs is increasing competition among intermediaries, especially and in addition to the Electronic Stock Exchange, new competition from foreign stock exchanges, particularly the NYSE. Finally, electronic custody of securities was implemented in 1995. Before, by law, most of the custody took place in the Central Bank of Chile, and transactions meant physical exchanges of securities. The large pension fund holdings importantly justified this new institution, which is supposed to have significant effects on transaction costs.

For Argentina, Decree 627 of 1996 created the institution of the "market makers", mostly motivated by the growth in pension fund assets (ASAFP, 1998).

Table 7 shows evidence of transaction costs for a sample of countries, including Argentina, Chile and Perú. Considering only the direct costs of trading, Chile appears ranked 10 in this universe, Argentina 26 and Perú 32. The relative position of Chile is at least partly explained by the influence that pension funds have had on the development of the relevant institutions. However, if "Market Impact" is also considered as part of the total transaction cost, Chile's rank almost equals that of Argentina, suggesting that despite the large volumes managed by local pension funds liquidity still is relatively low.<sup>24</sup>

Altogether, the evidence suggests that the impact of pension funds on traded volumes is largest at the beginning. However, their effect on institutions that help reduce transaction costs may be more permanent. Next, we analyze time-series evidence for Argentina, Chile and Perú where we

study the effect that pension fund asset accumulation has on traded volumes in stocks and on stock return volatility.

## B. Time-series evidence

The hypotheses to be tested here are that the accumulation of pension fund assets causes security price volatility and direct transaction costs to decrease, and traded volumes to increase. We do not have time-series evidence of direct transaction costs; however we can look at volatility and traded volumes. Again, the data source is the IFC Database. The empirical approach adopted here is to find a “good” empirical model, conditioning on a set of information variables, and test whether assets accumulated by pension funds have incremental explanatory power. The dependent variables are presented in Figure 2.

Regarding volatility, we already showed indirect evidence in the previous section that pension fund investment is associated with a reduced sensitivity of the local returns to a Latin American index, which means a reduction in systematic volatility. The question now is the effect on total volatility. Two methodologies have been used. The first one explicitly uses estimated volatility levels as dependent and explanatory variables. The second methodology uses ARCH equations and determines whether pension fund investment appears with a negative coefficient in the variance equation.

The first methodology uses least squares for the estimated log-volatilities. The estimated equations are:

$$\log(\hat{\sigma}_{it}) = d_0 + d_1 \log(\hat{\sigma}_t^{ALL}) + d_2 LPFInv_{it}^* + v_{it} \quad (2)$$

Here  $\hat{\sigma}_{it}$  represents the estimated 24 month annualized rolling volatility;  $\hat{\sigma}_t^{ALL}$  represents the average volatility of all included countries in the IFC database; as before,  $LPFInv_{it}^*$  represents the investment in stocks by pension funds. We use logs because volatilities must be non-negative. We expect  $d_1$  to be positive (volatility is contagious) and  $d_2$  to be negative (pension fund investment reduces volatility).

It is important to notice that, because the dependent variable is constructed as the annualized rolling volatility, the error in equation (2) will follow an ARMA process. Furthermore, even though we expect volatilities not to have unit roots, we cannot reject this hypothesis for any of the

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<sup>24</sup> One possible reason for this is the one-year minimum residence requirement for foreign capital flows,

countries. Results are shown in Panel A of Table 8. Panel A.1 shows the unit root tests for log-volatilities in Argentina, Chile, Perú and the all country average.

Panel A.3 repeats the test for the error  $v_{it}$  of equation (2). We obtain evidence that the probably spurious unit root is removed from the error, which suggests that measured log-volatilities would be co-integrated with the world's average (C(1,1)). The regression equation results are presented in Panel A.2. AR(1) and MA(1) terms have been included. The sensitivity to the world's average is positive and significant, appearing largest for Argentina and smallest for Chile. In all cases, the pension fund investment variable has a negative sign, as expected. However, even considering that the coefficient is larger for Argentina, it is significant only for the case of Chile. Having only a few observations with actual investment in stocks by pension funds (lack of power) may explain this.

The above tests have at least one potential problem: they assume that the expected returns (for the purpose of estimating the volatility) vary slowly, given the 24 month moving average calculation. A procedure that captures more promptly changes in means may be more desirable. One such procedure is ARCH estimation. In this case, the estimated equations are the following:

$$\begin{aligned} r_{it} &= b_0 + b_1 r_{it-1} + b_2 r_t^{LA} + b_3 y_{it-12} + \varepsilon_{it} \\ \varepsilon_{it}^2 &= c_0 + c_1 \varepsilon_{it-1}^2 + c_2 LPFInv_{it}^* + u_{it} \end{aligned} \tag{3}$$

Here  $r_{it}$  represents the log return for country  $i$ 's index in period  $t$ ;  $r_t^{LA}$  represents the return of the Latin American IFC index;  $y_{it-12}$  represents the dividend yield that existed twelve months before; and  $LPFInv_{it}^*$  corresponds to the pension fund investment variable previously defined. The purpose of the first equation is to capture short-term and long-term variations in expected returns, by including the lagged own return and the dividend yield, respectively, in the context of the Market Model. For the variance, we use a standard ARCH equation, and include the pension fund investment variable. The hypothesis here is that  $c_2 < 0$ .

Results are shown in Panel B of Table 8. The estimation for the mean shows some degree of success in explaining returns, especially for Chile and Perú. The lagged own return ( $b_1$ ) is always

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which stresses the importance of the concurrent conditions.

significant but curiously, it is negative for Argentina. The coefficient  $b_3$  has the expected sign for Chile and Argentina, but is significant only in the former case.

Turning to the variance equation (Panel B.2) we find that for all three countries  $e_2$  is significantly negative, as expected (at least at the 5% level, one tail, in the case of Chile, and much more significant in the other two cases). As a robustness check, if the current or lagged squared return on the Latin American index is also included in the variance equation, results do not change. In other checks, shortening the sample greatly increases the significance of the result for Argentina. For Chile, significance is “u-shaped”, meaning that in the mid-period (around 1992) pension fund investment in stocks was not significantly related with volatility. From 1993 onwards, the coefficient becomes more significant. Thus, altogether the data gives support to the hypothesis that pension-fund asset accumulation reduces security price volatility.

With regard to volume traded, the testing methodology adopted is similar. We adopt an empirical model and look for additional explanatory power by pension fund investment. The empirical model used assumes the following empirical facts: traded volumes should have positive trends in growing economies and in economies that become integrated to international capital markets; they are correlated around the world, especially among emerging markets; traded volumes tend to be high when returns are high. Thus the simple empirical model:

$$\log(V_{it}) = e_0 + e_1 t + e_2 \log(V_t^{LAT}) + e_3 r_t^{12m} + e_4 LPFInv_{it}^* + \eta_{it} \quad (4)$$

$V_{it}$  represents the monthly traded volume for country  $i$  in period  $t$ ;  $t$  is the time trend;  $V_t^{LAT}$  is the total volume traded in Latin American countries, measured in US Dollars; and  $r_t^{12m}$  is the twelve month log return until  $t$ . We hypothesize  $e_1$ ,  $e_2$  and  $e_3$  to be positive and, more importantly, that  $e_4$  is also positive. Results are presented in Table 9.

We first test for stationarity. We expect traded volumes to be subject to permanent random shocks (to have unit roots). They do show evidence of unit roots even at 10% critical levels.<sup>25</sup> We also present the unit root tests for the error of equation (4) in point 3 of the table. At least at the 5% level, we can reject the unit root hypothesis for the errors. Altogether, this suggests that traded volumes are co-integrated. In general, we do find the expected signs for the empirical formulation. Trends are positive and there is a positive relation with aggregate traded volumes. The twelve-month total return has the expected signs for Chile and Argentina. More importantly, pension fund

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<sup>25</sup> These tests assume linear trend and intercept.

investment tends to be significantly and positively related with traded volumes only in Chile. As a robustness check (not presented), if we cut the sample in two for Chile, we find significant coefficient for  $e_4$ , with values of 0.33 and 1.12, pre and post-1990, respectively. This may reflect the increasing size of the accumulated assets by the Chilean pension funds and may also indicate a structural break. Finally, if we perform pooled fixed-effects estimation forcing a common coefficient  $e_4$ , it turns out to be very significant. This again may be suggesting a lack of power for individual regressions.

Thus, we are able to find some empirical support for the assertion that pension funds increase traded volumes, but again, it importantly depends on Chile.

### III.4 Financial market integration

We can consider different phases in the process toward complete integration. First, the entry of capital flows to a country. Second the access to foreign capital in its diverse forms by local firms; and third, the investment abroad by local investors.

Considering the first phase, Walker and Lefort (1999) report for Chile a statistically significant endogenous structural break (permanent drop) in the dividend yield level during 1990-1991. It is apparent in Figure 1. A similar pattern is observed for the Latin American average. For Chile, this is interpreted as a near 6-point drop in the required rate of return on equity.<sup>26</sup> At least for Chile, this may be attributed to the debt repurchase programs and the macroeconomic reforms that stabilized the country. The fact that similar patterns appear for Argentina and the Latin American average suggests that pension reform had little to do with this, at least directly. However, according to Larraín (1990) foreign investment funds looked for transparency, good deals and low execution costs (liquidity). The existence of pension funds facilitated the first and last requirements.

Turning to the second phase, Saens (1999) reports the sequence of Chilean firms that have issued ADRs. This process started in March 1990 with CTC, and has not stopped since. In 1998, 25 ADRs were traded abroad. Most of the issues occurred in the years 1993 and 1994, taking advantage of the relatively “high” valuations (see Table 5). But at the same time, pension funds’ legal investment limits were binding, and local firms did not have access to this source of funding. A natural way out was issuing ADRs. The Central Bank of Chile imposed risk-rating requirements

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<sup>26</sup> Bekaert and Harvey (1998) choose January 1992 as the official liberalization date for Chile and November 1989 for Argentina. The proxies for the cost of capital do not seem to reveal any particular patterns at those dates. The integration dates are probably earlier.

to allow firms to issue these securities. Thus, the same institutional capital created for the pension funds was used again. Later, some of the restrictions were lifted. It is likely that the relatively high valuations achieved by the companies before issuing ADRs, which remained high even though pension funds could not invest any more, were in part due to the pension funds' continued presence as investors (they did not sell). This may have justified the additional premium paid in the ADR markets. The fact that more Chilean firms had issued ADRs (even more so than Brazil) perhaps suggested a more "mature" capital market at the time. Probably, this was caused to an important extent by pension reform.

In the case of Argentina, the introduction of ADRs happened in August of 1991. As of October 1999, ten firms had issued ADRs. Perú had three.

We cannot assess whether pension reform has been useful for the purpose of integration, especially in the cases of Argentina and Perú, given their short histories. However, integration of financial markets also happens when local investors invest abroad. Foreign investors may interpret the investment abroad by local institutions as an implicit guarantee against expropriation. As of December 2000, Chilean pension funds had invested 11 percent abroad. In the case of Perú, near 7.2 percent had been invested in Peruvian Brady bonds.<sup>27</sup> Argentinean pension funds had invested only 4.5 percent abroad as of 2000. In any case, significant cross-investments (in and out of the country) suggest that the expected rates of return on the different securities will be closer to their international "equilibrium" levels, which reflects financial integration.

### **III.5 Creation of new financial instruments**

Table 10 presents the evolution of the portfolio composition for Chile, Argentina and Perú. It is interesting to compare the evolution of the different kinds of investments for the three countries, since they may reflect the evolution of the different markets. First, in its beginnings, the Argentinean system invested relatively more in government securities.<sup>28</sup> Until their third year, investments in that assets class by Chilean and Peruvian pension funds followed a similar pattern. However, in 1996 the figure dropped to zero in Perú.<sup>29</sup> The relative importance of banks was similar for Perú and Chile, smaller for Argentina. However, the relative importance of mortgage

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<sup>27</sup> This reminds us of the Chapter XVIII and XIX mechanisms of debt repurchase implemented in Chile in the late eighties.

<sup>28</sup> A part of this investment may be explained by the fact that the state-owned pension fund has to invest at least 20 percent of the funds in bonds and "cédulas hipotecarias" issued by the regional economies.

bonds was much larger for the Chilean funds, which are relatively safer assets. This is probably related with the existence of inflation protection mechanisms and the organization of long-term fixed-income markets around it.<sup>30</sup> Another interesting pattern that appears with the comparison is that much sooner after the reform investment in corporations by Argentinean and Peruvian pension funds became important. This can be explained by two unrelated causes: first, the debt crisis that affected Chile in the early eighties that meant that nearly no firms issued securities. Second, Peruvian and Argentinean pension funds were allowed to invest in equity almost from the beginning. This authorization is related with the previous success of that asset class for Chilean pension funds.

### **A. Chile**

The evidence for Chile shows several direct and indirect effects that the reform has had on the creation (or “adoption”) of new financial instruments. We broadly interpret the creation of new financial instruments as the process that finally allows pension funds to invest in a wider variety of alternatives. In the early eighties, corporate bonds were (“in practice”) new financial instruments. They became relatively important in the pension fund portfolios in the early nineties (also see Table 2). Similarly, authorized in 1985, investment in equity became a “new” alternative that helped the development of this market. Iglesias (1998) uses this case to point out how the coordination of different reforms may have positive effects on capital market development: the initial investment in equity by pension funds was in concurrently privatized firms. Risk-rating requirements were implemented at the same time.<sup>31</sup>

In 1989, the law allowed the formation of closed-end mutual funds, whose only significant clients have been the pension funds. Three kinds of funds have been created: real estate funds, equity funds and “company development” funds (similar to venture capital, but more conservative). In 1998, about 3 percent of pension funds were invested in these instruments. These instruments face three problems: by their very nature, they are long-term investments and they do not have secondary markets. Second, their valuation is difficult, and despite recent changes, valuations lag behind other market-valued instruments. Third, after the recent restructuring of the pension fund industry there are fewer portfolio managers. Thus, existing upper limits to property concentration in

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<sup>29</sup> The existing stock expired and no more government bonds were issued. This reflects the fiscal discipline adopted by the government in the context of important structural reforms.

<sup>30</sup> See Walker (1998).

<sup>31</sup> For anecdotal evidence regarding this issue, see Camus and Sánchez (1998, p. 139).

the close-end funds curtail their growth possibilities. It is only through these indirect investment vehicles that pension funds in Chile can participate in private equity. Due to the difficulties related with lack of liquidity, valuation problems and industry concentration, this market has not been significantly developed. This supports our view regarding the incentives faced by portfolio managers.

The “Bonos de Reconocimiento” are zero-coupon indexed bonds that are originated as the recognition of the State’s liability with contributors to the old pension system that chose to move to the new system. These are highly demanded by insurance companies because of asset-liability matching requirements. In December 31 1987, Law 18681 authorized affiliates to transfer the Bono de Reconocimiento to the insurance companies. In March 10 1990, Law 18964 authorized these bonds to be endorsed and the trading of these bonds began (AFPs could not buy them yet). Finally, in March 19 1994 law 19301 authorized AFPs to purchase such bonds, in order to allow affiliates to obtain early pensions.<sup>32</sup> This illustrates the positive unexpected consequences of pension reform, which we associate with institutional capital. Given the experience with these bonds, stripped coupons originated from Central Bank paper (PRC) can now be traded separately.

The “Mutuos Hipotecarios” were created especially for life insurance companies. They are a kind of illiquid mortgage bond whose only guarantee is the specific real estate property behind the debt. They are not traded in formal markets because of their heterogeneity, so pension funds can not buy them directly. Indirectly, pension funds have bought these instruments through real estate funds. From the perspective of insurance companies, these instruments compete with the “Letras Hipotecarias”, a mortgage bond backed by a portfolio of real estate and guaranteed by commercial banks. The latter are eligible investments for pension funds.

“New” is also the possibility of investing abroad. In March 1990, pension funds were allowed to invest only in foreign fixed-income issued by G7 governments. As of 1993, total investment in these instruments was 0.6 percent. In 2000, after having gained considerable expertise and important legal reforms, and because the expectations of domestic currency appreciation were reversed, they had invested 11 percent, mainly in equity mutual funds.

Our analysis thus far may suffer from survivorship bias. Indeed, not all efforts have been successful. For instance, real estate corporations (Sociedades Inmobiliarias) were especially created for pension funds. Two of them disappeared by mid-1995, after 4 years in business. This happened

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<sup>32</sup> We thank Augusto Iglesias for this information.

because from the perspective of pension funds they had relative tax disadvantages with respect to real estate investment funds, which are tax exempt. Also, in 1991, significant efforts were put into developing risk-rating procedures for commercial paper and “projects without history”. Neither ever attracted pension funds despite passing the rating barrier. Finally, in 1994 the law created the “securitized credits funds” which have not existed so far.

## **B. Argentina**

In the case of Argentina, the “Common Investment Funds” (Fondos Comunes de Inversión) that were created especially for pension funds in 1992 are important.<sup>33</sup> They represented 8.4 percent of the pension funds in 2000. To the same list we can add “negotiable obligations”, mortgage securitization and leasing contracts.<sup>34</sup> Negotiable obligations must be held until their maturity (of about two years), since they do not have a secondary market. Panel B of Table 2 shows that the size of this market has grown 5-fold since 1992. Of the total amount invested in this type of security, banks issued about 51 percent in 1994 and only 9 percent in 1998. This reflects a significant increase in the relative importance of the corporate bond market for pension funds.

Regarding bank deposits, in December of 1998 95 percent of them had variable rates of return. For these variable-rate deposits the principal is secured, but the interest is tied to certain security-price indices such as Merval, S&P, Bovespa., etc. These instruments became popular in the context of rising markets, which is also consistent with our hypothesis regarding investment incentives.

## **C. Perú**

Regarding Perú, despite the short history after the reform, its impact seems to have been more important than in Chile. For example, the percentage invested in private corporations is rather large (above 50 percent since 1997). The relative importance of this asset class almost doubled in 1996, when newly issued central government bonds were no longer available. Interestingly, the corporate bond market was very small before the investment by pension funds. Of the total invested in corporations, only about 7 percentage points corresponds to privatized equity.<sup>35</sup>

Since July 1998, pension funds have been allowed to invest in Brady Bonds representative of Peruvian sovereign debt. These bonds really are a hybrid, less risky than local bonds, since they

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<sup>33</sup> Law 24083 of 1992. See AFAP, 1998.

<sup>34</sup> Decree 1073 (1993), Law 24411 (1995) and Decree 627 (1996), respectively.

have as collateral zero coupon bonds issued by the Treasury of the United States. Therefore, even though they are not “new” in international markets, they are so in the local markets.

It is also interesting to remember another feature of the Peruvian system: the importance of the financial sector. Within this sector, two relatively new instruments are worth noting – subordinated bonds and leasing bonds. Comparing Tables 2 and 10, we see for 1998 that of the total invested in the financial sector, 55 percent corresponded to time deposits, 25 percent to leasing bonds and the rest to subordinated bonds. Leasing bonds have maturities ranging from 3 to 5 years. They are used to finance leasing operations by banks (which have important tax advantages for firms) and are supposed to be liquid and low risk. They are issued in soles, dollars and VAC (the CPI indexed unit). The size of this market has grown 11-fold since 1992, to exceed 2 bn US dollars after 1998. Subordinated bonds, on the other hand, are indexed and longer-term (10-year maturity). These bonds are converted into stocks if the issuing bank faces financial difficulties. They are thus considered as equity for the purposes of calculating debt ratios for the issuing bank. As in Argentina, Perú had a small fraction invested in variable option-like bonds (“bonos estructurados”), but their inadequate valuation has limited their success. There have been only two issues.

The usage of the VAC as the currency for some debts is interesting. As Ramos (1999) notes, this currency unit may allow for a better matching of assets and liabilities for certain firms, such as those oriented to mass consumption and public utilities. Better matching reduces expected bankruptcy costs, creating a net social gain. It is argued that without the pension funds, these instruments would have hardly appeared. Pension funds seem to be natural buyers of these bonds, but in 1998 only 10 percent of the total private bonds they held were denominated in VAC. In any case, an average 25 percent of the total bonds issued is denominated in VAC. This may be better understood in the context of a highly “dollarized” economy.

The above analysis allows us to stress three simple ideas: First, the importance of a consistent institutional/legal environment. In this context, tax incentives, investment limits and adequate valuation mechanisms may be determinants of success. Second, not all innovations proposed by pension funds, analysts and other observers to the authority end up being successful. Third, a requirement seems to be that pension fund managers find expected returns “attractive” at a

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<sup>35</sup> Here again we can see how reforms can be linked to each other.

given stage of development of the pension system, in order to push for the development of the new instruments.<sup>36</sup>

### **III.6 Secondary effects on the financial system's structure and other markets**

#### **A. Chile**

In Chile, one of the industries that have had an enormous growth due to the reform is the life and disability insurance industry. They managed more than 10 billion US dollars in assets as of 1998, more than ten times the amounts managed in 1981. This has created a specific clientele for long-term assets.

Iglesias (1998) argues that after pension reform in Chile, bank disintermediation has existed but that it has been limited. However, it is clear that in the presence of a well-developed pension system new long-term financing alternatives do appear, particularly for larger firms. For example, Hernández and Walker (1993) find significant changes in debt levels and composition when comparing the 1978-81 averages with those of 1988-1991. Although the total debt/equity ratios fall, particularly in the tradable sector, longer-term debt becomes more important and bank-debt becomes less so. However, in the non-tradable sector, short-term bank debt retains its importance. The overall reliance on bond financing increases significantly in the latter sub period. These facts jointly suggest that bank disintermediation has occurred to a certain extent after pension reform. However, it is also likely that the reform has contributed by making financial markets grow. In fact, M7 multiplied 10-fold between 1981 and 2000 (Table 2) and pension funds provide about 15 percent of total bank funding (including mortgages and time deposits). Since the mid 1990's, banks are expected to concentrate on shorter-term financing and smaller firms. For these firms, pension fund financing may be too expensive given the formal requirements (risk rating, prospectus, regular publication of financial statements, etc. See Iglesias, 1998).

Diamond and Valdés (1994) mention the induced development of the mortgage industry in Chile. Since the very beginning, both pension funds and life insurance companies have invested in Letras Hipotecarias. This, along with the more recent appearance of the Mutuos Hipotecarios, has helped the development of the housing and office markets. As of 2000, 14.4 percent of pension funds were invested in mortgage bonds. They held approximately 56 percent of the total stock outstanding of Letras (Table 2). Using the information in Walker (1998, Table 3), when insurance

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<sup>36</sup> As noticed, incentives are different for defined-benefit pension systems.

companies are also included this number goes up to an equivalent 80 percent, but in the latter figure we also include Mutuos. This means that a very large proportion of the total real estate funding comes from insurance companies and pension funds. Here it is important to keep in mind another of the previously identified concurrent conditions: to a certain extent the successful development of a long-term mortgage market has been possible due to the existence of inflation protection mechanisms (the so-called “Unidad de Fomento”).

Other indirect effects may come as a consequence of the foreign investment by the pension funds. First, we have observed the creation of local retail mutual funds that also invest out of the national borders. Second, it is likely to deepen the foreign currency market.

## **B. Argentina**

An important fraction of the total portfolio is held in government bonds. This has helped financing the deficit produced as a consequence of such reform. An advantage is that now this happens at transparent market prices. Regarding the possibility of bank disintermediation, the proportion invested in banks is similar to what has been invested in private corporations. Thus, a crowding out effect is not clear.

## **C. Perú**

The absence of deep, liquid government bond markets has led pension funds in Perú to use bank deposits as the “safe asset”. Thus, although pension funds hold only a 3.3 percent of outstanding deposits (Table 2), the financial sector represents about one-third of their total portfolio. The ratio of the total funds provided by the pension funds to their investment in corporate bonds and stocks is 0.7 times. This means that even if pension funds had the effect of crowding out banks from large firm financing, banks have got back most of the funding, which allows them to develop related businesses. Two of those have been the leasing bonds and the subordinated bonds. Ramos (1999) argues that pension funds have provided flexible funding to banks and that, given that the former prefer positions in local currency, the latter have been able to develop a deep currency forward market. The productive sector has benefited from these hedging possibilities, so we see again a reduction in expected bankruptcy costs. Altogether, disintermediation does not seem relevant in this case.

The evidence seems to suggest the claim that pension fund reform has positive secondary effects in other related markets, allowing more efficient fund allocation. This may have important long-term implications.

## **IV. PANEL DATA EVIDENCE**

In this section, we use country panel data to provide additional formal tests to some of the hypotheses presented earlier in this paper, using data from multiple countries. This adds to the qualitative and time series evidence provided in the above sections. In particular, we want to test two hypotheses regarding the effect of pension reform on capital market development. First, does allowing pension fund managers to invest in stocks decrease the cost of capital for firms? Second, does volatility decline as pension fund managers increase their investments in stocks.

### **IV.1 Data**

We use annual data for 33 emerging economies. The list of countries was selected from the IFC Emerging Markets database and includes seven Latin American economies and at least eight economies where there is some sort of competitive allocation of pension funds toward private securities. The countries included in this list are presented in the Annex.

As a proxy of the firm's cost of capital we use dividend yields and price to book ratios from the IFC Emerging Markets Database. The volatility variable was constructed for each country as discussed previously in the paper. We take the year-end value for each country.

As for the explanatory variables we use three different sets. For the first set, we consider data on the extent of pension fund investment in local firms. Within this set, we consider four different measures. First, a dummy variable that takes the value 1 after pension funds start investing in equity and zero before. Second, we construct a measure of the investment in stocks by pension funds (the log of). Third, we consider the relative importance of the investment in stocks and private bonds on the total market cap calculated in the IFC database (as in Table 4). Finally, we use a measure of the total pension funds to GDP for each country-year in the sample.

A second set of explanatory variables controls for what we have called the “concurrent conditions”. To this end, we used the per-capita income as a general measure of the development of the country, the annual inflation rate as an indicator of macroeconomic stability, and the assets of deposit money banks to GDP as a measure of the development of capital markets.

For the set of Latin American countries in our sample, we also used a set of index variables indicating the extent of reform in the different areas of the economies. These variables were obtained from Morley, Machado and Pettinato (1999) and constitute a proxy for the concurrent conditions. We considered indicators of reform in five areas: tax reform, privatization, international financial liberalization, domestic financial reform and external trade reform. The indexes are normalized to be between zero and one, with one being the most reformed. They were constructed from different components.<sup>37</sup> *Refcap* measures the extent of international financial liberalization and is constructed taking into account foreign investment, limits on repatriation, capital controls and capital outflows. *Refcom* measures trade reform and considers the average level and dispersion of tariffs in each country. *Reffin* measures the extent of domestic financial reform and considers controls on interest rates and reserve requirements. *Refpri* is an index measuring the size of the government sector in the economy. Finally, *Reftax* measures tax reform and considers marginal rates on personal and corporate taxes, VAT rates and VAT collection efficiency.

## IV.2 Estimation procedure

The estimation of panel data regressions was performed using the OLS fixed effects estimator and the GLS pooled estimator. The main consideration when estimating panel data regressions is, of course, the adequate treatment of the unobserved individual effects. Of the possible procedures to deal with this problem, we ruled out the estimation of GLS random effects because of the small cross-section dimension of our data. We are therefore left with the fixed-effects procedure or with trying to capture the individual effects through observable time invariant variables.

The problem with the fixed-effects estimator is that it does not consider the variation between units but only within units. In other words, the cross sectional variation is disregarded and only the time series variation within units is considered in order to estimate the coefficients. Since most of the action we hope to capture with our model occurs between units, the fixed-effects estimator is not very useful for our purposes.

Alternatively, we consider pooled estimation of the panel data using observable time-invariant variables in order to capture the systematic differences between units. In particular, we use the geographic location of the country and the value of the dependent variable the year before the starting date of our estimation sample as proxies for the unobserved differences among units.

### IV.3 Estimation results

#### A. Impact of pension funds on the cost of capital

The first set of regressions is presented in Table 11. The table shows the results of GLS pooled panel data estimations of two measures of firm cost of capital on pension fund investment decisions and a set of controls. The table is organized in two panels. Panel I presents the results obtained using the log of the dividend yield at the end of the year on a specific measure of "pension fund importance" and a set of controls. Panel II has the same structure but the dependent variable corresponds to the log of the price-to-book ratio. Each panel has four columns with one for each different measure of pension fund importance.

The first indicator of pension fund importance is a dummy variable taking the value one when for a country in a specific year there are private pension funds invested in private stocks. The second column uses the ratio of total pension fund assets to GDP as an indicator of pension fund investing activity. The third column uses the ratio of total pension fund investments on shares and private bonds to market cap. The fourth column uses the log of pension fund investments in stocks. The four columns presented in the table in addition include the set of controls previously described. A full set of time-dummies was included in each regression.

The results presented in the first panel of Table 11 show that regardless of the indicator used, pension fund importance significantly decreases the average dividend yield, which would indicate a reduction in the effective cost of capital. It shows that the proxies for the unobserved individual effects are significant. Panel II of Table 11 shows that in a similar way that, the more important pension funds are, the higher is the price to book ratio of firms in a particular country. Therefore, this would indicate that the pension funds significantly decrease firms' cost of capital.

Notice also that, in all cases, inflation, as a measure of stability, has the expected sign. In addition, the initial conditions for both the dividend-yield and the price to book ratio are significant capturing the presence of exogenous differences between countries.

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<sup>37</sup> See Morley, Machado and Pettinato (1999) for a detailed explanation of the different indexes.

## **B. Impact of pension funds on volatility**

Table 12 presents the same kind of evidence in the case of market volatility. It shows a negative and statistically significant relationship between market volatility and pension fund importance. The table also indicates that market volatility is positively related with inflation rates and negatively related to per-capita income, as expected.

The validity of the previous analysis depends on that of the control variables used as indicators of what we have defined as the “concurrent conditions”. Using the reform indexes for seven Latin American countries provided by Morley, Machado and Pettinato (1999) we further test the hypothesis that pension reform reduces cost of capital and stock market volatility. Although for this purpose we have to reduce our sample, we hope that this procedure allows us to control for the effect of other reforms. These are, successively, capital account liberalization, trade reform, financial reform, privatization and tax reform. It is important to notice that none of these reform variables include directly the effect of pension fund reform, and that using them we should control for the critical competitor of pension reform: international opening of capital account (*Refcap*).

Tables 13 and 14 show the results for dividend yield, price to book ratios and volatility after controlling for the degree of reform in different areas of the economy. We use pooled estimation and fixed-effects estimation for each of the four measures of pension fund importance: dummy variable; the ratio of total pension fund assets to GDP; the ratio between total pension fund investments on shares and private bonds, and market cap; and the log of pension fund investments on stocks. The tables present GLS pooled estimation and OLS fixed effects estimation. We do not provide random effects estimation due to the small number of cross-sectional units.

The results are mixed. First, in general we do not find any significant effects of pension fund reform on dividend-yields. Moreover, using fixed effects estimation and the ratio and log of pension fund investments on stocks as explanatory variables we find, contrary to what we expected, a positive and significant effect. That is, pension funds investments would tend to increase cost of capital when measured as the dividend yield, which does not make much sense. On the other hand,

the only reform index that significantly affects dividend yields is the capital account liberalization index that would reduce the cost of capital.<sup>38</sup>

Second, GLS pooled estimation indicates that, after controlling for the effect of other reforms, pension reform significantly increases price-to-book ratios, and thus, would decrease the cost of capital, as expected. Of the five reform variables, the degree of capital account openness and the tax reform index seem to be the most important in explaining price-to-book ratios. Finally, we do not find any significant effect of the pension fund variables on stock market volatility.

Therefore, these results partly contradict those found in the previous sections. However, this could be simply due to the fact that there are very serious problems in measuring the depth of the different reforms in different countries, and that these indices usually are constructed with a degree of arbitrariness and subjective judgement. Thus, these last results could be due to measurement problems.

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<sup>38</sup> Although several coefficients in this set of regressions are insignificant, the estimations present relatively high R<sup>2</sup>. This partly happens because we use GLS cross-sectional weights in the estimation. Another reason for this phenomenon could be a multicollinearity problem among the reform indicators. Table 15 shows cross-correlation among the five reform indices. The table shows that although there is ample variation, the correlation tends to be high.

## V. CONCLUSIONS

We have considered evidence of very different nature (anecdotal, casuistic, qualitative, simple data and econometric) to analyze several hypotheses regarding the impact of pension reform on capital markets. Overall, the evidence seems to be consistent with the claims by advocates of reform.

The *accumulation of institutional capital* is an important side effect of reform in every country analyzed in more detail. We do find evidence of an adaptive legal framework, of increased specialization in the investment decision-making process, of "transparency and integrity" (particularly via the mandatory risk-rating process), and also of a new corporate governance balance, particularly for Chile, which has the oldest reform.

Regarding the effect on *the cost of capital*, the econometric analyses, with both time-series and pooled estimation techniques, indicate that dividend yields are lower (stock prices and price-to-books larger) with reform. We present certain evidence that at least for the case of Chile, transaction costs have decreased as a side effect of pension reform and asset accumulation. We also find econometric, time-series evidence of increased liquidity. The evidence also favors the hypothesis of lower security-price volatility after reform. Volatility would be lower both in absolute value and also in terms of the sensitivity to external shocks (systematic risk).

The linkage between *financial market integration* and pension reform is somewhat weaker. However, during the different phases of the process of integration (the entrance of capital flows to a country, the access to foreign capital in its diverse forms by local firms and the investment abroad by local investors) pension funds have an important and distinct role.

The qualitative evidence regarding the creation of *new financial instruments* is very clear for all countries analyzed and the institutional environment always plays a central role. As per secondary effects on the financial system's structure and other markets, effects on industries directly related with the reform are almost tautologically present. One interesting result however is that there does not seem to be bank "disintermediation" although after reform the role of banks is likely

to change. Altogether, perhaps one of the most important effects is an *improvement in fund allocation* for investment purposes, which should translate into a better resource allocation. This could have permanent positive effects on growth and welfare, even if total savings are not affected.

Regarding panel data evidence, the results presented in this paper show that regardless of the indicator used, pension fund importance significantly decreases the average dividend yield and increases price to book ratios. We also find a negative and statistically significant relationship between market volatility and pension fund importance.

Finally, when we restrict the sample to only 7 Latin American economies and control for other reforms using reform indices results are mixed. In this case, we do not find significant effects of pension funds on dividend-yields but they do seem to significantly increase price-to-book ratios. Finally, we do not find any significant effect of pension fund reform on stock market volatility. However, these particular results are probably subject to important measurement error problems.

In the context of the existing literature, our results imply somewhat different types of support for the effect of pension reform on long-term growth and welfare. Consistent with Levine and Zervos (1998), Rousseau and Wachtel (1998) and Arestis, Demetriades and Luintel (2001) they highlight the importance of the "capital markets channel". However, here we argue that it is higher risk tolerance and longer investment horizons on the part institutional investors (with respect to individual investors or banks) which imply lower cost of capital. The analysis of Prowse (1998) and Catalán, Impávido and Musalem (2000) relate it to a reduced liquidity premium (or willingness to invest in illiquid alternatives). This may be less likely in the context of a competitive individual-account-based-defined-contribution system, however.

Using Granger causality tests Catalán *et al* argue that contractual savings lead the development of capital markets. Our results are generally consistent with theirs. However, as in their case, it is difficult to control for other reforms. Granger causality tests are not free from biases associated with the simultaneous effects of concurrent reforms. Alternatively, we provide qualitative evidence supporting the idea that "institutional capital accumulation" has been quite important for the development of capital markets in the three cases studied here. We expect this to be especially true for countries with a civil law tradition. Therefore, we do find a few "hard" links, but the "soft" links may be just as important.

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FIGURE 1

PRICE TO BOOK RATIOS AND DIVIDEND YIELDS

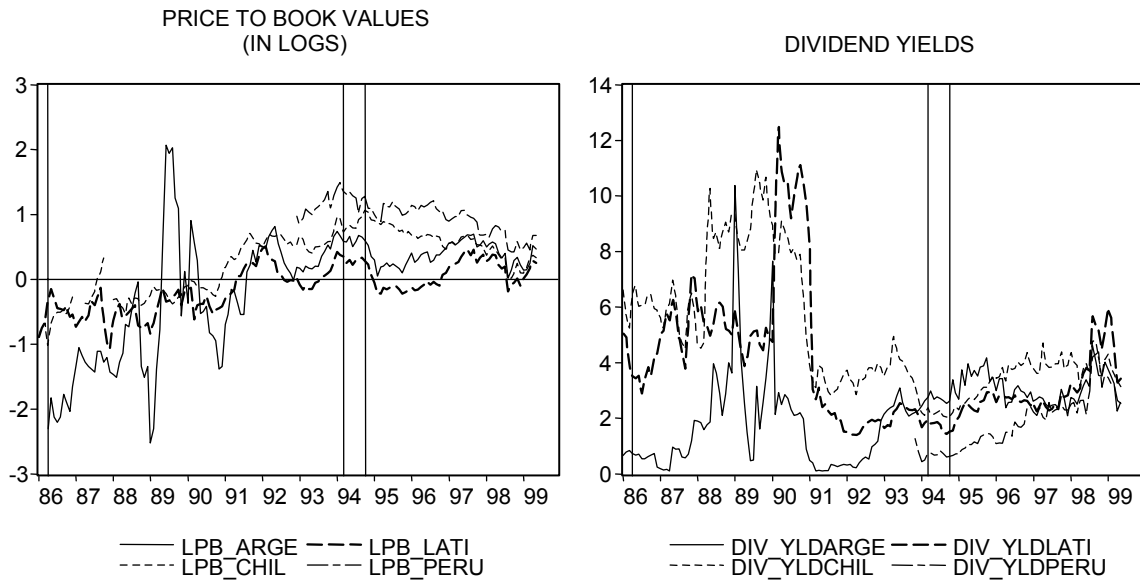
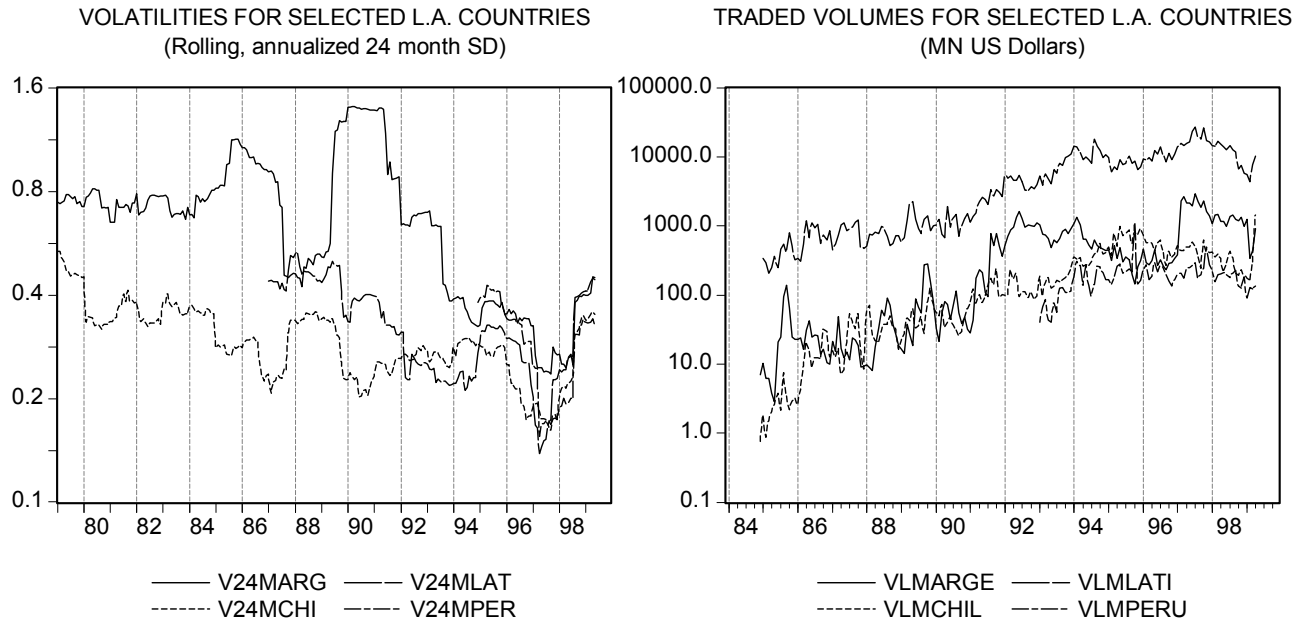


FIGURE 2

VOLATILITIES AND TRADED VOLUMES



## TABLES

### TABLE 1

#### INSTITUTIONAL CAPITAL: EVIDENCE

CHILE	ARGENTINA	PERU	OTHERS
<b>ADAPTIVE LEGAL ENVIRONMENT</b>			
<ul style="list-style-type: none"> <li>- Valdés and Cifuentes (1990, Tables 1 and 2) present a list of 15 legal modifications related with pension reform. Arrau (1994) adds three additional ones. Iglesias (1999) mentions that in all, some 25 such reforms have been related with the investment and transparency requirements of pension funds.</li> <li>- The process of reforms has been continuous and mostly caused or at least accelerated by pension funds.</li> <li>- Pension funds directly participate in the formulation of (or observations to) new laws. For example, there was joint work of independent professionals with the regulatory authorities to formulate the Capital Market Reform of 1994. Pension funds actively participated in the final stage of the process.</li> <li>- Added flexibility to the norms regarding the investment of pension funds abroad, including the use currency forward contracts as hedging instruments (this was not initially considered in the 1994 law).</li> </ul>	<ul style="list-style-type: none"> <li>- The mere discussion of the pension reform in Argentina took more than two years to be prepared implemented, which occurred in 1993. (Murolo, 1995)</li> <li>- At least 19 reforms to capital market laws and 28 resolutions are associated with the accumulation of pension funds (ASAP, 1998, p.157-158, p. 165-169).</li> </ul>	<ul style="list-style-type: none"> <li>- The Peruvian pension reform of December 1992 was the most important reform of the recent years. It is expected to have a significant impact on the economy. (Barúa, 1995)</li> <li>- The financial systems faces two impulses: liberalization of the economy and new rules that seek the modernization and development of the capital market, in the context of institutional investors that require increasing investment opportunities (Ramos, 1999)</li> </ul>	<p style="text-align: center;"><u>México</u></p> <ul style="list-style-type: none"> <li>- The complementary pension reform (Sistema de Ahorro para el Retiro, SAR) required significant modifications to the social security and housing laws. (Farell, 1995)</li> </ul> <p style="text-align: center;"><u>Colombia</u></p> <ul style="list-style-type: none"> <li>- Pension reform was approved in December 1993 after a long legislative debate. The new system started to operate in April 1994. (Ayala, 1995)</li> </ul>

## INCREASED SPECIALIZATION IN THE INVESTMENT DECISION-MAKING PROCESS

<ul style="list-style-type: none"> <li>- The latest information services and technologies are used for managing pension funds, given the competitive advantage that they provide</li> <li>- Security issuers have rounds of “conversations” with pension funds and life insurance companies (AFPs are not allowed to “negotiate” and determine prices in advance to the actual trading). For example, fees and investment policies of local investment funds are negotiated with AFPs. The required credibility increases the counterparts’ professionalism.</li> <li>- Investing in “new” instruments (such as forward contracts) requires a continuous learning process</li> <li>- With the internationalization of local pension fund investments, technology is transferred from foreign fund managers.</li> </ul>	<ul style="list-style-type: none"> <li>- Initially, technology was transferred from Chilean counterparts at all levels (official and private).</li> <li>- Use of latest information services and technology</li> <li>- Contact with security issuers</li> </ul>	<ul style="list-style-type: none"> <li>- Initially technology was transferred from Chilean counterparts at all levels (official and private).</li> <li>- Use of latest information services and technology</li> <li>- Authorization of the investment in Brady bonds requires a specific learning process in order to operate in that market</li> <li>- Contact with security issuers</li> </ul>	
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## CORPORATE GOVERNANCE BALANCE

<ul style="list-style-type: none"> <li>- Investors pretending to obtain or increase control of firms usually explain their plans to pension funds, and consider their opinion as (sometimes small but) influential shareholders.</li> <li>- AFPs are required to vote for independent candidates to be members of the board of directors where funds are invested</li> <li>- During the board member election period,</li> </ul>	<ul style="list-style-type: none"> <li>- A new bankruptcy law is implemented (Law 24.552 of 1995).</li> </ul>	<ul style="list-style-type: none"> <li>- AFPs actively promoted that large firms be eligible (paying themselves the related expenses).</li> <li>- Being “AFPable” became a new status, reflecting information transparency (Ramos, 1999)</li> </ul>	
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<p>negotiations among pension funds take place, in order to determine the names of candidates that pass the independence requirements established by law.</p> <ul style="list-style-type: none"> <li>- The Association of Pension Funds (ASAFP) informs authorities and the public opinion in general about corporate governance situations that are negative for pension funds.</li> <li>- AFPs are typically required by the Superintendence to file reports regarding events or transactions by security issuers that may have negative effects on pension fund investments.</li> </ul>			
<b>TRANSPARENCY AND INTEGRITY</b>			
<ul style="list-style-type: none"> <li>- Risk rating requirements are mandatory and custodians are authorized by the Central Bank of Chile.</li> <li>- In 1985 pension funds themselves had to evaluate securities' risks, according to parameters established by the authorities. This meant a continuous exchange of information between security issuers, authorities and pension funds.<sup>39</sup></li> <li>- The 1994 law also led to the consolidation of independent risk-rating agencies. In this context, the Risk Rating Commission (Comisión Clasificadora de Riesgo, CCR) changes its role, by considering these independent ratings to formulate its own opinion regarding the eligibility by pension funds of certain instruments. CCR is partly</li> </ul>	<ul style="list-style-type: none"> <li>- Significant coordination between the Central Bank the superintendence of pensions and the Comisión Nacional de Valores (CNV) has been required. An intense supervision process is an ongoing concern. (Murolo, 1995)</li> <li>- Risk rating requirements are mandatory and custodians are authorized by the CNV.</li> <li>- With few exceptions, transactions must take place in transparent secondary markets</li> <li>- Valuation of funds is mostly at market prices</li> <li>- CNV requires additional transparency in transactions by firms that issue securities (Resolution 262, 1995)</li> </ul>	<ul style="list-style-type: none"> <li>- Superintendence has significant powers and keeps good communication levels with pension funds and their association. (Barúa, 1995)</li> <li>- Risk rating requirements are mandatory and custodians are authorized by the CONASEV.</li> <li>- Risk rating of an ad hoc commission was initially required (Barúa, 1995)</li> <li>- In 1998 the market considered risk rating as a normal procedure; the ad hoc commission was ended. Four private rating agencies with foreign expert partners existed. (Ramos, 1999)</li> <li>- With few exceptions, transactions must take place in transparent secondary markets</li> <li>- Conflicts of interest are strongly regulated</li> </ul>	<p style="text-align: center;"><u>México</u></p> <ul style="list-style-type: none"> <li>- Implementation of this system has required information exchange and coordination among financial institutions, employers and regulatory authorities. (Farell, 1995)</li> </ul> <p style="text-align: center;"><u>Colombia</u></p> <ul style="list-style-type: none"> <li>- At least 50 percent must be invested via capital market, government bonds were expected to offer competitive rates.</li> <li>- The new privately managed pension system is expected to expand the availability of financial instruments, partly through "securitization", and to provide incentives for firms to become open to external capital. (Ayala, 1995)</li> </ul>

<sup>39</sup> See Camus and Sánchez (1998) regarding anecdotal evidence with respect to the evolution of risk-rating in Chile.

<p>composed of independent professionals designated by the pension funds.</p> <ul style="list-style-type: none"> <li>- With few exceptions, transactions must take place in transparent secondary markets</li> <li>- Conflicts of interest are strongly regulated</li> <li>- Valuation of funds at market prices</li> </ul>		<ul style="list-style-type: none"> <li>- Valuation of funds is mostly at market prices</li> </ul>	
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**TABLE 2**

**Share of Pension Funds in Financial Markets and Size of Each Market  
(December of each year)**

**A. Chile**

Year	Government Debt		Time Deposits and Bank Bonds		Mortgage Bonds		Corporate Bonds		Equity	
	PF Inv. (%)	Market Size (US\$ MM)	PF Inv. (%)	Market Size M7 (US\$ MM)	PF Inv. (%)	Market Size (US\$ MM)	PF Inv. (%)	Market Size (US\$ MM)	PF Inv. (%)	Market Size (US\$ MM)
	(1)	(2)	(1)	(3)	(1)	(2)	(1)	(2)	(1)	(2)
1981	0.7	301.3	3.0	6,320.2	2.2	1,296.5	1.9	96.1	0.0	7,049.8
1982	30.8	431.4	4.5	3,586.9	24.9	1,144.9	1.3	287.4	0.0	4,388.6
1983	31.5	1,100.4	1.0	6,610.7	44.8	1,289.4	9.3	268.0	0.0	2,598.5
1984	24.7	1,309.2	6.0	5,837.3	44.0	1,236.4	10.2	229.0	0.0	2,105.8
1985	46.5	755.2	11.9	6,235.8	48.2	1,125.1	7.7	222.0	0.0	2,012.0
1986	71.6	612.2	17.6	7,594.6	44.2	1,223.5	11.1	142.0	3.2	4,061.7
1987	88.2	367.3	20.5	9,195.7	46.9	1,266.5	27.1	264.0	5.3	5,341.4
1988	31.9	606.7	22.5	11,465.2	53.0	1,393.0	48.1	486.0	4.2	6,912.0
1989	40.7	384.4	19.1	13,828.9	52.1	1,518.6	47.8	862.0	4.8	9,405.6
1990	39.5	269.7	20.1	17,166.2	57.7	1,852.0	59.2	1,256.0	5.5	13,618.6
1991	38.0	238.4	18.8	21,192.4	58.6	2,304.8	62.4	1,791.0	8.6	27,898.3
1992	39.9	528.1	14.9	26,880.2	60.8	2,884.7	60.3	1,972.0	10.0	29,128.3
1993	46.3	172.2	11.3	30,240.3	57.3	3,644.7	54.9	2,056.0	9.9	51,368.7
1994	52.1	16,978.2	3.7	38,362.8	57.4	5,294.2	57.2	2,451.7	11.1	67,681.6
1995	52.3	19,158.0	3.6	46,472.6	55.7	7,212.6	55.3	2,410.1	11.0	71,177.5
1996	55.2	20,971.6	3.0	53,803.0	55.4	8,875.4	55.5	2,315.1	11.1	65,844.0
1997	50.8	23,997.4	6.0	63,186.7	49.3	10,600.8	53.2	1,901.5	10.4	71,831.6
1998	63.8	19,936.5	24.4	63,067.8	50.2	10,265.4	51.9	2,255.6	8.9	51,809.2
1999	62.6	19,149.1	10.1	62,425.4	51.8	10,095.0	51.0	2,573.7	6.3	68,499.0
2000	65.0	19,738.3	11.8	63,059.1	56.4	9,146.0	39.8	3,642.8	6.9	60,513.6

Source: 1981-1994, Walker and Lefort (1999).

(1) Since 1994, source: Superintendencia de Administradoras de Fondos de Pensiones.

(2) Since 1994, source: Superintendencia de Valores y Seguros.

(3) Since 1994, source: Banco Central de Chile.

**B. Argentina**

Year	Government Debt		Time Deposits		Mortgage Bonds		Negotiable Obligations		Equity	
	PF Inv. (%)	Market Size (US\$ MM)	PF Inv. (%)	Market Size M7 (US\$ MM)	PF Inv. (%)	Market Size (US\$ MM)	PF Inv. (%)	Market Size (US\$ MM)	PF Inv. (%)	Market Size (US\$ MM)
	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)
1992		7,025.0		26,277.3				496.0		18,326.0
1993		28,481.0		40,158.7				932.0		42,932.0
1994	0.9	27,623.0	0.3	46,915.8	0.0	954.8	4.3	720.3	0.0	36,529.0
1995	4.1	32,421.0	1.4	43,195.5	0.0	860.1	10.8	2,006.9	0.4	37,062.0
1996	7.1	39,461.0	1.4	53,575.9	5.0	559.5	14.1	2,937.5	2.3	44,358.0
1997	11.8	42,684.0							3.2	58,983.0
1998	14.7	39,221.0							4.7	45,292.0
1999	17.9	49,171.0							4.2	82,982.0

Source: (1) CNV

(2) SAFJP

**C. Peru**

Year	Time Deposits		Leasing Bonds		Corporate Bonds		Equity	
	PF Inv. (%)	Market Size M7 (US\$ MM)	PF Inv. (%)	Market Size (US\$ MM)	PF Inv. (%)	Market Size (US\$ MM)	PF Inv. (%)	Market Size (US\$ MM)
	(4)	(1)	(4)	(1)	(4)	(2)	(4)	(3)
1993	0.3	5,340.0	0.9	211.0	0.0	n/a	0.0	5,084.0
1994	1.2	7,618.0	7.9	344.0	10.1	85.0	0.5	8,162.0
1995	1.7	9,480.0	8.7	599.0	26.4	209.1	0.9	11,701.0
1996	2.0	11,708.0	4.1	1,129.0	44.5	471.3	2.2	13,842.0
1997	2.8	13,511.0	5.7	1,728.0	45.0	699.0	3.0	17,383.0
1998	3.3	12,976.6	7.2	2,481.8	38.6	797.1	5.2	11,034.0
1999	4.4	12,591.5	11.4	2,305.6	38.3	851.5	6.7	13,407.0
2000	3.3	12,624.0	16.1	2,166.2	40.7	1,188.1	7.4	10,511.0

Source: 1993-1996, Ramos (1999)

(1) Since 1997, S.B.S. Of Peru

(2) Since 1997, Banco Central de Reserva del Perú

(3) Since 1997, Conasev

**Table 3**  
**Number of different issuers in Pension Fund Portfolios**

**A. Chile**

Year	Stock	Corp. Bonds	Mortgage Bonds <sup>1</sup>	Bonds by financial institutions <sup>2</sup>	Investment Funds	Foreign Investment <sup>3</sup>	Derivatives <sup>4</sup>
1985	2	4	26				
1986	5	4	23				
1987	8	9	22				
1988	8	15	22				
1989	24	15					
1990	32	24					
1991	44	32					
1992	53	33	21	13			
1993	77	34	26	15	7	13	
1994	79	39	26	16	10	18	
1995	102	40	28	14	19	11	
1996	117	40	30	14	19	52	
1997	119	38	28	14	23	83	
1998	116	39	29	14	23	84	
1999	123	46	29	8	23	217	13
2000	107	40	30	6	23	244	23

<sup>1</sup> Includes leasing bonds

<sup>2</sup> Includes subordinated bonds

<sup>3</sup> In 1997 includes 4 government institutions, 59 investment funds, 13 private firms and 7 financial institutions

In 1998 includes 2 governments institutions, 70 investment funds, 2 private firms and 10 financial institutions

In 1999 includes 19 governments institutions, 155 investment funds, 2 private firms and 41 financial institutions

In 2000 includes 17 governments institutions, 208 investment funds, 2 private firms and 17 financial institutions

<sup>4</sup> Includes Futures, Forward and Options from national and foreign issuers. Published since July 1999

Source: SAFP

**B. Peru<sup>5</sup>**

Year	Common Stock	Corporate Bonds	Leasing Bonds	Subordinated Bonds	Mortgage Bonds
1994	3	2	13	2	4
1995	8	12	17	8	7
1996	12	15	20	14	7
1997	18	24	22	16	8
1998	18	22	20	15	8
1999	26	22	16	10	7
2000	23	22	14	7	7

<sup>5</sup> Authorized Issuers

Source: Ramos, 1999.

Since 2000, SAFP

**C. Argentina**

Year	Stock	Corp. Bonds	Bank's Bond	Investment Funds <sup>6</sup>	Foreing Public Sector Bonds	Foreing Private Sector Issues <sup>7</sup>	Derivatives
1994	15	9	8	8	0	5	0
1995	19	19	10	23	8	31	0
1996	28	30	9	44	4	14	0
1997	34	40	10	73	3	8	0
1998	36	42	13	100	1	3	1
1999	37	33	11	131	1	14	2
2000	35	31	4	130	0	68	1

<sup>6</sup> Includes real estate investment funds

<sup>7</sup> Includes stocks and bonds

Source: SAFJP

**TABLE 4**  
**Market Capitalization versus Corporate Bonds and Stocks in Pension Funds Portfolios**  
**(End of period, Million US dollars)**

Year	Chile					Peru					Argentina				
	Market Cap (1)	Corp. Bonds (2)	Stocks (3)	Total (4)=(2)+(3)	Weight (4)/(1) (%)	Market Cap (1)	Corp. Bonds (2)	Stocks (3)	Total (4)=(2)+(3)	Weight (4)/(1) (%)	Market Cap (1)	Corp. Bonds (2)	Stocks (3)	Total (4)=(2)+(3)	Weight (4)/(1) (%)
1981	2,670	2	0	2	0.1										
1982	1,191	4	0	4	0.3										
1983	791	25	0	25	3.2										
1984	744	22	0	22	3.0										
1985	932	17	0	17	1.8										
1986	2,066	17	82	98	4.8										
1987	2,833	69	167	236	8.3										
1988	4,474	229	290	520	11.6										
1989	6,102	407	451	858	14.1										
1990	9,942	739	749	1,488	15.0										
1991	19,098	1,121	2,399	3,520	18.4										
1992	21,933	1,190	2,913	4,103	18.7										
1993	28,595	1,164	5,085	6,249	21.9	2,351	0	0	0	0.0					
1994	45,058	1,403	7,483	8,886	19.7	5,271	9	38	47	0.9	18,751	15	8	23	0.1
1995	48,070	1,333	7,642	8,975	18.7	7,353	60	105	166	2.3	22,148	171	146	317	1.4
1996	35,780	1,284	7,155	8,439	23.6	7,605	227	301	528	6.9	26,564	375	998	1,374	5.2
1997	44,498	1,012	7,212	8,224	18.5	9,657	343	526	869	9.0	35,142	226	1,894	2,120	6.0
1998	31,837	1,170	4,629	5,799	18.2	6,151	341	570	911	14.8	24,894	264	2,116	2,380	9.6
1999	42,639	1,312	4,299	5,611	13.2	7,583	414	900	1,314	17.3	23,319	331	3,449	3,780	16.2
2000	35,350	1,451	4,176	5,626	15.9	4,380	623	782	1,405	32.1	12,331	564	2,499	3,063	24.8

Sources: IFC for the Market Caps and Pension Fund Superintendencies.

**TABLE 5**  
**STOCK MARKET INDICATORS**

Year	IFCG LATIN AMERICA				Argentina				Chile				Perú			
	ANNUAL RETURN	P/E	P/BV	DIV. YIELD (%)	ANNUAL RETURN	P/E	P/BV	YIELD (%)	ANNUAL RETURN	P/E*	P/BV*	DIV. YIELD (%)	ANNUAL RETURN	P/E	P/BV	YIELD (%)
1981					-0.53				-0.42							
1982					-0.61				-0.55							
1983					0.48				-0.32							
1984				4.03	-0.18			0.14	-0.24			5.00				
1985	0.66			4.74	0.75			0.7	0.49			7.48				
1986	-0.02	3.53	0.58	4.34	-0.26	6.72	0.19	0.24	1.55	4.93	0.76	5.88				
1987	-0.30	5.56	0.34	7.05	0.10	4.31	0.24	1.92	0.30	5.88	0.73	5.87				
1988	0.70	4.00	0.51	5.02	0.39	3.23	0.26	3.62	0.37	3.67	0.73	9.38				
1989	0.52	6.68	0.82	4.90	1.76	9.15	1.13	4.69	0.51	5.61	0.89	9.50				
1990	-0.04	10.12	0.66	9.78	-0.37	NM	0.26	0.89	0.40	7.87	1.04	5.00				
1991	1.24	17.54	1.41	1.53	3.97	NM	1.68	0.33	0.98	15.87	1.73	3.55				
1992	0.06	19.45	1.04	1.89	-0.26	37.99	1.20	1.93	0.16	12.99	1.71	3.82		25.91	2.66	0.00
1993	0.57	18.42	1.31	2.10	0.73	41.90	1.94	2.28	0.35	20.04	2.11	2.74	0.37	44.01	3.62	0.79
1994	0.00	15.96	1.08	1.87	-0.23	17.71	1.42	2.91	0.45	21.38	2.51	2.41	0.53	43.95	3.00	0.72
1995	-0.16	23.25	0.84	2.96	0.13	15.00	1.35	3.48	0.01	17.15	2.10	3.53	0.11	14.46	2.84	1.33
1996	0.19	16.17	1.11	2.46	0.22	38.21	1.62	2.95	-0.14	14.62	1.59	3.95	0.03	14.21	2.52	2.43
1997	0.29	15.08	1.47	2.84	0.20	16.34	1.81	2.09	0.07	14.67	1.64	3.92	0.17	13.97	1.98	2.30
1998	-0.36	11.58	0.91	5.08	-0.26	13.41	1.25	4.02	-0.27	15.14	1.11	4.11	-0.38	21.09	1.57	3.55
1999	0.62	19.79	1.66	2.37	0.38	39.36	1.52	3.21	0.40	34.97	1.68	3.00	0.24	25.69	1.48	2.15
2000	-0.13	14.04	1.40	2.89	-0.23	NM	0.93	3.45	-0.12	24.90	1.44	2.53	-0.25	11.60	1.09	5.50
Average	0.24	13.41	1.01	3.87	0.31	20.28	1.12	2.29	0.20	14.65	1.45	4.80	0.10	23.88	2.31	2.09

Source: IFC.

\*1987 corresponds to January, 1988

**TABLE 6**  
**IMPACT OF PENSION FUNDS ON PRICE-TO-BOOK RATIOS**

**A. Least squares estimation**

		Argentina		Chile		Perú		
Dependent Variable:		1990:12	1998:12	1986:03	1999:03	1993:02	1999:03	
DLOG(PB)		Included observations: 97		Included observations: 148		Included observations: 74		
Constant	$a_0$	0.0159	0.0170	0.0075	0.0074	0.0094	-0.0034	0.0022
<i>t-test*</i>		<i>0.9541</i>	<i>0.8825</i>	<i>1.0822</i>	<i>0.8751</i>	<i>1.0616</i>	<i>-0.3026</i>	<i>0.1928</i>
DLOG(PB_LATI)	$a_1$	0.9048	0.9011	0.1469	0.1469	0.1004	0.5447	0.5314
		<i>4.8678</i>	<i>4.8203</i>	<i>1.7809</i>	<i>1.7760</i>	<i>1.1664</i>	<i>5.3549</i>	<i>5.1606</i>
<b>D(LPFInv*)</b>	$a_2$	<b>-0.0005</b>	<b>-0.0008</b>	<b>0.3550</b>	<b>0.3556</b>	<b>0.3090</b>	<b>-0.0369</b>	<b>-0.0477</b>
		<i>-0.0101</i>	<i>-0.0161</i>	<i>2.1249</i>	<i>2.0038</i>	<i>1.7250</i>	<i>-0.3257</i>	<i>-0.4299</i>
<b>D(LPB_LATI)*D(LPFInv)</b>	$a_3$	<b>-0.6670</b>	<b>-0.6564</b>	<b>-1.7240</b>	<b>-1.7255</b>	<b>-1.5494</b>	<b>-0.5134</b>	<b>-0.4363</b>
		<i>-1.6917</i>	<i>-1.6783</i>	<i>-3.6618</i>	<i>-3.4402</i>	<i>-2.9011</i>	<i>-0.4251</i>	<i>-0.3582</i>
ASIAN CRISIS			-0.0065		0.0006	-0.0001		-0.0176
			<i>-0.3220</i>		<i>0.0306</i>	<i>-0.0038</i>		<i>-0.8756</i>
ASIAN CRISIS*DLOG(PB_LATI)						0.3180		
						<i>1.6945</i>		
AR(1)		0.1182	0.1176	0.0837	0.0834	0.1097	-0.2256	-0.2320
		<i>1.4513</i>	<i>1.4346</i>	<i>0.8367</i>	<i>0.8240</i>	<i>1.0528</i>	<i>-1.8246</i>	<i>-1.9097</i>
R-squared		0.3185	0.3187	0.3720	0.3720	0.3899	0.2485	0.2562
Adjusted R-squared		0.2889	0.2813	0.3545	0.3499	0.3639	0.2049	0.2015
S.E. of regression		0.1265	0.1272	0.0756	0.0758	0.0750	0.0916	0.0918
Sum squared resid		1.4719	1.4715	0.8169	0.8169	0.7936	0.5789	0.5729
Log likelihood		65.49	65.50	174.76	174.76	176.90	74.48	74.86
Durbin-Watson stat		1.9260	1.9273	1.9440	1.9441	1.9533	1.9919	2.0123
F-statistic		10.7494	8.5141	21.1782	16.8244	15.0182	5.7032	4.6850
Prob(F-statistic)		0.0000	0.0000	0.0000	0.0000	0.0000	0.0005	0.0010

**B. Pooled estimation with fixed effects and common changes in level and sensitivity**

<b>D(LPFInv*)</b>	$a_2$	<b>0.1004</b>
<i>t-test*</i>		<b>2.5915</b>
<b>D(LPB_LATI)*D(LPFInv)</b>	$a_3$	<b>-0.9609</b>
<i>t-test*</i>		<b>-6.3803</b>

\*White Heteroskedasticity-Consistent Standard Errors and Covariances

**TABLE 7**  
**TRANSACTION COSTS IN SELECTED COUNTRIES**

Country Avgs.	Price	Commission (BP)	Fees (BP)	SubTotal (BP)	Rank (1=low)	Mkt Impact (BP)	Total (BP)	Rank (1=low)
U.S.-OTC	\$34.30	3.15	0.13	3.28	1	26.61	29.89	5
U.S.-NYSE	\$41.06	13.92	0.15	14.07	2	9.48	23.55	2
India	\$13.70	16.04	0	16.04	3	48.73	64.77	32
U.K.-Selis	\$8.81	15.98	0.12	16.1	4	18.12	34.22	10
Japan-Buys	\$14.73	17.12	0.03	17.15	5	1.09	18.24	1
Canada	\$26.73	19.57	0.01	19.58	6	24.36	43.94	17
France	\$95.22	21.68	1.29	22.97	7	3.59	26.56	3
Netherlands	\$49.32	21.47	1.73	23.2	8	6.7	29.9	6
Belgium	\$241.08	21.24	2.19	23.43	9	10.5	33.93	9
Chile	\$24.39	23.69	0	23.69	10	23.34	47.03	21
Germany	\$87.48	22.45	1.65	24.1	11	3.48	27.58	4
Italy	\$5.18	22.38	1.81	24.19	12	6.19	30.38	7
Denmark	\$95.13	23.25	1.32	24.57	13	18.82	43.39	16
Sweden	\$24.32	23.62	1.06	24.68	14	6.22	30.9	8
Spain	\$33.58	25.12	2.01	27.13	15	15.91	43.04	15
Finland	\$37.65	25.99	1.86	27.85	16	16.12	43.97	18
Norway	\$20.78	26.97	1.26	28.23	17	8.14	36.37	12
Switzerland	\$838.01	23.7	5.13	28.83	18	17.21	46.04	19
Japan-Sells	\$11.01	16.89	13.57	30.46	19	5.83	36.29	11
Luxembourg	\$53.22	25.82	5	30.82	20	39.22	70.04	33
New Zealand	\$2.23	30.85	0.27	31.12	21	7.81	38.93	13
Austria	\$80.77	29.54	3.39	32.93	22	21.19	54.12	25
Portugal	\$38.33	27.91	5.42	33.33	23	7.81	41.14	14
Mexico	\$2.90	32.18	1.89	34.07	24	26.91	60.98	30
Brazil	\$0.22	30.39	3.69	34.08	25	12.54	46.62	20
Argentina	\$4.61	34.73	5.19	39.92	26	8.75	48.67	23
Turkey	\$0.07	35.71	4.53	40.24	27	16.86	57.1	27
<b>Total-45</b>	<b>\$47.10</b>	<b>32.93</b>	<b>8.13</b>	<b>41.06</b>	<b>28</b>	<b>18.55</b>	<b>59.62</b>	<b>29</b>
Hong Kong	\$2.36	30.71	14.2	44.91	29	5.19	50.1	24
Australia	\$3.95	30.78	14.13	44.91	30	2.13	47.04	22
South Africa	\$9.22	29.26	16.07	45.33	31	13.17	58.5	28
Peru	\$3.28	38.99	6.71	45.7	32	30.27	75.97	36
Colombia	\$4.83	48.09	0	48.09	33	47.01	95.1	39
Taiwan	\$4.10	22.92	29.35	52.27	34	4.55	56.82	26
Greece	\$44.60	39.25	14.03	53.28	35	10.33	63.61	31
Korea	\$15.28	43.86	11.64	55.5	36	42.33	97.83	41
Singapore	\$2.80	56.52	4.43	60.95	37	23.91	84.86	37
Thailand	\$2.31	60.55	2.84	63.39	38	12.13	75.52	35
Czech Republic	\$81.83	62.02	1.73	63.75	39	97.22	160.97	46
U.K.-Buys	\$8.08	18.13	47.58	65.71	40	5.29	71	34
Hungary	\$33.58	63.21	4.43	67.64	41	34.68	102.32	43
Malaysia	\$1.32	62.67	9.45	72.12	42	18.71	90.83	38
Indonesia	\$0.39	64.34	12.69	77.03	43	18.48	95.51	40
Ireland	\$9.77	26	56.05	82.05	44	17.37	99.42	42
Philippines	\$1.39	68.48	28.03	96.51	45	8.5	105.01	44
Venezuela	\$5.68	84.92	27.77	112.69	46	32.04	144.73	45

\* Note: The United States, United Kingdom, and Japan have two universes to acknowledge special tariffs and marketplaces in those countries.

Source: Elkins/McSherry Global Universe, Fourth Quarter, 1998. Taken from the Emerging Markets Factbook (1998)

**TABLE 8**  
**IMPACT OF PENSION FUND STOCK INVESTMENT ON VOLATILITY**

**A. LEAST SQUARES ESTIMATION**

**A1. Unit root tests for 24 month log volatilities**

	ARGENTINA	CHILE	PERU	ALL COUNTRIES
<b>ADF Test Statistic</b>	-1.9900	-2.9763	-1.9261	-2.3094
1% Critical Value	-3.4591	-3.4591	-3.5682	-3.4591
5% Critical Value	-2.8737	-2.8737	-2.9215	-2.8737
10% Critical Value	-2.5732	-2.5732	-2.5983	-2.5732

**A2. Dendent Variable: 24 month moving volatility (annualized SD)**

		ARGENTINA	CHILE	PERU
Sample(adjusted):		1979:02 1998:12	1979:02 1999:03	1995:01 1999:03
Included observations:		239	242	51
Constant	$d_0$	0.0241	0.0859	-0.4063
<i>t-test*</i>		0.0909	1.4187	-0.2762
Avg. 24 mo. volatility (All IFC countries)	$d_1$	1.6449	0.6458	1.0916
<i>t-test</i>		3.8580	4.3651	3.7168
<b>LPFInv*</b>	$d_2$	<b>-0.0137</b>	<b>-0.0071</b>	<b>-0.0020</b>
<i>t-test</i>		<b>-1.0990</b>	<b>-2.0994</b>	<b>-0.4306</b>
AR(1)		0.9810	0.9355	0.9922
<i>t-test</i>		66.7916	42.0961	31.9781
MA(1)		0.1643	-0.0660	-0.4231
<i>t-test</i>		1.1202	-1.2217	-2.7085
R-squared		0.9726	0.9590	0.9608
Adjusted R-squared		0.9721	0.9583	0.9574
S.E. of regression		0.0518	0.0143	0.0180
Sum squared resid		0.6285	0.0487	0.0149
Log likelihood		370.81	686.49	135.21
Durbin-Watson stat		1.9262	2.0154	2.0243
F-statistic		2074.82	1384.24	281.86
Prob(F-statistic)		0.0000	0.0000	0.0000

\*White Heteroskedasticity-Consistent Standard Errors and Covariance

**A3. Unit Root Tests for Residuals**

<b>ADF Test Statistic</b>	-2.6509	-3.7345	-2.9815
1% Critical Value	-3.4597	-3.4593	-3.5653
5% Critical Value	-2.8739	-2.8738	-2.9202
10% Critical Value	-2.5733	-2.5732	-2.5977

**A4. Pooled Estimation**

<b>LPFInv*</b>	<b>-0.0057</b>
<i>t-test</i>	<b>-1.8783</b>

**TABLE 8 (Cont.)**  
**B. ARCH ESTIMATION**

	<b>ARGENTINA</b>	<b>CHILE</b>	<b>PERU</b>
Sample:	1985:02 1998:12	1985:02 1998:12	1993:02 1998:12
Included observations:	167	167	71

**B1. Expected Return Equation**

Constant	$b_0$	-0.0209	-0.0128	0.0146
<i>t-test</i>		-1.4652	-1.0588	1.2250
Own Return (-1)	$b_1$	-0.1143	0.1202	0.1743
<i>t-test</i>		-5.6299	1.7269	1.9006
Return Latam IFC Index	$b_2$	0.8714	0.4468	0.7240
<i>t-test</i>		20.0893	9.6843	6.4677
Dividend Yield (-12)	$b_3$	0.0070	0.0049	-0.0092
<i>t-test</i>		1.3149	2.0401	-1.7630

**B2. Variance Equation**

Constant	$c_0$	0.0222	0.0089	0.0037
<i>t-test</i>		9.5717	2.7904	2.1077
ARCH(1)	$c_1$	0.8523	-0.0108	0.3752
<i>t-test</i>		6.3126	-0.0973	1.2190
<b>LPFInv*</b>	$c_2$	<b>-0.0029</b>	<b>-0.0006</b>	<b>-0.0006</b>
<i>t-test</i>		<b>-9.6571</b>	<b>-1.6437</b>	<b>-1.7616</b>
R-squared		0.0670	0.2883	0.4607
Adjusted R-squared		0.0320	0.2616	0.4007
S.E. of regression		0.2083	0.0698	0.0750
Sum squared resid		6.9391	0.7803	0.3542
Log likelihood		89.92	215.10	96.53
Durbin-Watson stat		2.0313	1.8822	2.5168
F-statistic		1.9147	10.8025	7.6871
Prob(F-statistic)		0.0815	0.0000	0.0000

**TABLE 9**  
**IMPACT OF PENSION FUNDS STOCK INVESTMENT ON TRADED VOLUMES**

**LEAST SQUARES ESTIMATION: TRADED VOLUMES**

**1. Unit root tests for log monthly traded volumes in stocks**

	ARGENTINA	CHILE	PERU	L.A. COUNTRIES
<b>ADF Test Statistic</b>	-2.8724	-3.0681	-2.7555	-2.0269
1% Critical Value	-4.0152	-4.0152	-4.0909	-4.0155
5% Critical Value	-3.4373	-3.4373	-3.4730	-3.4374
10% Critical Value	-3.1426	-3.1426	-3.1635	-3.1427

**2. Dendent Variable: log of monthly traded volumes**

		ARGENTINA	CHILE	PERU**
Sample:		1985:02 1998:12	1985:02 1998:12	1994:01 1998:12
Included observations:		167	167	60
Constant		-1.8540	-1.1846	2.2483
<i>t-test*</i>	$e_0$	-1.6525	-2.1061	1.7387
Trend		0.0327	0.0089	0.0044
<i>t-test</i>	$e_1$	4.8897	2.2725	0.5297
LOG(VLMLATI)		0.2374	0.2504	0.2131
<i>t-test</i>	$e_2$	1.9284	2.2748	1.6154
LOG(12m total rreturn)		0.7843	0.4283	0.4467
<i>t-test</i>	$e_3$	4.9697	1.9701	1.6274
<b>LPFInv*</b>		<b>-0.1241</b>	<b>0.3260</b>	<b>0.0155</b>
<i>t-test</i>	$e_4$	<b>-1.5358</b>	<b>4.4992</b>	<b>0.2353</b>
AR(1)		0.8346	0.6621	-0.0334
<i>t-test</i>		15.0204	5.2753	-0.0731
MA(1)		-0.0803	-0.1763	0.3626
<i>t-test</i>		-0.8305	-0.9879	0.7935
R-squared		0.9431	0.9469	0.5742
Adjusted R-squared		0.9410	0.9449	0.5169
S.E. of regression		0.4285	0.3765	0.2449
Sum squared resid		29.3801	22.6831	3.1193
Log likelihood		-91.87	-70.27	3.57
Durbin-Watson stat		2.0023	1.9349	2.0332
F-statistic		442.21	475.35	10.02
Prob(F-statistic)		0.0000	0.0000	0.0000

\*White Heteroskedasticity-Consistent Standard Errors and Covariance

\*\*Includes a dummy variable for October 1995, since it is an outlier.

**3. Unit Root Tests of Residuals**

<b>ADF Test Statistic</b>	-2.9640	-3.6450	-4.5946
1% Critical Value	-3.4715	-4.0168	-3.5457
5% Critical Value	-2.8792	-3.4381	-2.9118
10% Critical Value	-2.5761	-3.143	-2.5932

**4. Pooled Estimation**

<b>LPFInv*</b>		<b>0.1491</b>
<i>t-test</i>	$e_4$	<b>3.3278</b>

**TABLE 10**  
**Pension Fund Portfolio Composition**  
**(Percentages and Million US dollars)**

**A. Chile**

Year	Central Bank (1)	Treasury (2)	Central Government (3)=(1)+(2)	Time Deposits (4)	Mortgage Bonds (5)	Total banks (6)=(4)+(5)	Corporate Bonds (7)	Equity (8)	Total Private Corporations (9)=(7)+(8)	Local Investment Funds (10)	Investment Abroad (11)	Derivatives (12)	Total Pension Fund (end of period) (US\$ million)
1981	27.4	0.7	28.1	61.9	9.4	71.3	0.6	0.0	0.6	0.0	0.0	0.00	300
1982	4.3	21.7	26.0	26.6	46.8	73.4	0.6	0.0	0.6	0.0	0.0	0.00	606
1983	14.1	30.4	44.5	2.7	50.6	53.3	2.2	0.0	2.2	0.0	0.0	0.00	1,136
1984	16.6	25.6	42.2	12.9	43.1	56.0	1.8	0.0	1.8	0.0	0.0	0.00	1,244
1985	20.4	22.2	42.6	20.9	35.4	56.3	1.1	0.0	1.1	0.0	0.0	0.00	1,533
1986	26.1	20.2	46.3	23.4	25.6	49.0	0.8	3.9	4.7	0.0	0.0	0.00	2,107
1987	29.8	11.7	41.5	28.5	21.3	49.8	2.6	6.2	8.7	0.0	0.0	0.00	2,708
1988	30.0	5.4	35.4	29.5	20.6	50.1	6.4	8.1	14.5	0.0	0.0	0.00	3,603
1989	38.1	3.5	41.6	21.5	17.7	39.2	9.1	10.1	19.2	0.0	0.0	0.00	4,501
1990	42.5	1.6	44.1	17.4	16.1	33.5	11.1	11.3	22.4	0.0	0.0	0.00	6,683
1991	37.4	0.9	38.3	13.4	13.4	26.8	11.1	23.8	34.9	0.0	0.0	0.00	10,078
1992	40.1	0.8	40.9	11.1	14.2	25.4	9.6	24.2	33.8	0.2	0.0	0.00	12,409
1993	38.8	0.5	39.3	7.6	13.1	20.7	7.3	31.9	39.1	0.3	0.6	0.00	15,877
1994	38.5	1.2	39.7	6.4	13.7	20.0	6.3	32.2	38.5	0.9	0.9	0.00	22,267
1995	37.5	1.9	39.4	6.7	15.8	22.5	5.3	30.1	35.3	2.6	0.2	0.00	25,419
1996	38.8	3.3	42.1	5.8	17.9	23.7	4.7	26.0	30.7	3.0	0.5	0.00	27,517
1997	36.4	3.2	39.6	12.5	17.0	29.4	3.3	23.4	26.7	3.1	1.3	0.00	30,819
1998	37.5	3.4	41.0	15.2	16.6	31.8	3.8	14.9	18.7	2.9	5.7	0.00	31,056
1999	31.0	3.6	34.6	18.2	15.1	33.3	3.8	12.4	16.2	2.6	13.4	0.00	34,656
2000	31.9	3.8	35.7	18.7	14.4	33.1	4.0	11.6	15.7	2.4	10.9	0.00	35,937

Source: Superintendencia of AFP's..

<sup>a</sup> Includes "Bono de Reconocimiento"

<sup>b</sup> Includes bonds issued by financial institutions.

**B. Argentina**

Year	Central Bank (1)	Treasury (2)	Central Government (3)=(1)+(2)	Time Deposits (4)	Mortgage Bonds (5)	Total banks (6)=(4)+(5)	Corporate Bonds (7)	Equity (8)	Total Private Corporations (9)=(7)+(8)	Local Investment Funds (10)	Investment Abroad (11)	Derivatives (12)	Total Pension Fund <sup>3</sup> (end of period) (millions of US\$)
1994	0.0	53.7	53.7	5.5	0.0	5.5	2.9	1.5	4.4	5.0	0.1	0.0	519
1995	0.0	57.5	57.5	28.8	0.0	28.8	6.9	6.0	12.9	1.8	0.7	0.0	2,497
1996	0.0	54.3	54.3	16.8	0.3	17.0	7.1	18.7	25.8	2.6	0.2	0.0	5,326
1997	0.0	44.8	44.8	25.7	0.5	26.2	2.6	21.5	24.0	4.6	0.4	0.0	8,827
1998	0.0	51.4	51.4	20.6	0.4	20.9	2.5	18.3	20.8	6.8	0.3	0.0	11,526
1999	0.0	53.7	53.7	16.6	0.1	16.7	2.0	20.5	22.5	6.5	0.4	0.2	16,787
2000	0.0	56.0	56.0	15.9	0.1	16.0	2.8	12.3	15.1	8.4	4.5	0.1	20,381

Source: Superintendencia of AFJP's.

1 Includes local governments and public institutions. Items a, b and o of the Monthly Statistiscal Bulletin

2 Does not include mortgage bonds.

3 Include "Disponibilidades"

**C. Perú**

Year	Central Bank (1)	Treasury (2)	Central Government (3)=(1)+(2)	Time Deposits (4)	Mortgage Bonds (5)	Total financial institutions (6)=(4)+(5)	Corporate Bonds (7)	Equity (8)	Total Private Corporations (9)=(7)+(8)	Local Investment Funds (10)	Investment Abroad (11)	Derivatives (12)	Total Pension Fund (end of period) (US\$ million)
1993	18.9	13.0	31.9	68.1	0.0	68.1	0.0	0.0	0.0	0.0	0.0	0.0	29
1994	20.0	6.0	26.0	54.8	1.3	56.1	3.4	14.5	17.9	0.0	0.0	0.0	260
1995	20.5	2.0	22.5	48.4	0.6	49.0	10.4	18.1	28.5	0.0	0.0	0.0	581
1996	0.0	0.4	0.4	43.5	0.5	44.0	23.9	31.7	55.6	0.0	0.0	0.0	949
1997	0.3	0.0	0.3	41.7	0.5	42.2	22.7	34.8	57.5	0.0	0.0	0.0	1,512
1998	0.0	4.9	4.9	41.6	0.3	42.0	19.6	32.7	52.3	0.8	0.0	0.0	1,743
1999	1.0	6.0	7.0	37.9	0.2	38.1	17.1	37.1	54.2	0.6	0.0	0.0	2,409
2000	2.7	6.3	9.0	32.1	0.1	32.2	22.6	28.4	51.0	0.6	7.2	0.0	2,744

Source: Superintendencia of AFP's.

1 Includes brady bonds.

2 Includes leasing bonds, subordinated bonds and repos.

3 Banks, financial institutions and leasing companies.

4 Includes commercial papers and securitization operations.

**TABLE 11**  
**IMPACT OF PENSION FUNDS ON FIRM'S COST OF CAPITAL**

*(GLS, Cross Section Weights)*

**Panel I. Dependent variable: Log of Dividend Yield**

Pension Funds:	<i>A. Dummy</i>	<i>B. Assets</i>	<i>C. Share_Priv</i>	<i>D. Log(Inv_stocks)</i>
	-0.2621	-0.0086	-0.0130	-0.0365
	<i>-2.8835</i>	<i>-2.6465</i>	<i>-2.0756</i>	<i>-2.4654</i>
Inflation	3.3600 <i>0.1529</i>	6.3400 <i>0.2869</i>	5.6900 <i>0.2563</i>	6.0100 <i>0.2718</i>
Income	-2.8600 <i>-0.1274</i>	9.8200 <i>0.4012</i>	3.7700 <i>0.1525</i>	1.1400 <i>0.4531</i>
Bank_Assets	0.3490 <i>2.0052</i>	0.2924 <i>1.6874</i>	0.2647 <i>1.4998</i>	0.2833 <i>1.6211</i>
Initial_dvy	0.6273 <i>11.5090</i>	0.6878 <i>9.1954</i>	0.6619 <i>8.5982</i>	0.6879 <i>8.8307</i>
Region	-0.3829 <i>-1.8468</i>	-0.3836 <i>-1.8402</i>	-0.4349 <i>-2.0598</i>	-0.3727 <i>-1.7426</i>
No. Observations	146	146	146	146
R-squared	0.8431	0.8849	0.8438	0.8636
Adjusted R-squared	0.8277	0.8735	0.8284	0.8501
S.E. Of regression	0.5859	0.5917	0.5948	0.5921
F-statistic	54.5963	78.0418	54.8780	64.2890
Prob(F-statistic)	0.0000	0.0000	0.0000	0.0000

Note: t-statistics in italic.

**TABLE 11 (Cont.)**  
**IMPACT OF PENSION FUNDS ON FIRM'S COST OF CAPITAL**

*(GLS, Cross Section Weights)*

**Panel II. Dependent variable: Log of Price to Book Ratio**

Pension Funds:	<i>A. Dummy</i>	<i>B. Assets</i>	<i>C. Share_Priv</i>	<i>D. Log(Inv_stocks</i>
	0.1762 <i>2.4765</i>	0.0092 <i>3.8145</i>	0.0163 <i>3.3760</i>	0.0402 <i>3.7484</i>
Inflation	-0.0006 <i>-6.3493</i>	-0.0005 <i>-6.0814</i>	-0.0006 <i>-6.3044</i>	-0.0005 <i>-6.3434</i>
Income	-4.9100 <i>-3.6113</i>	-4.5600 <i>-3.3406</i>	-4.6700 <i>-3.4879</i>	-5.6100 <i>-4.2143</i>
Bank_Assets	-0.2727 <i>-2.4034</i>	-0.3609 <i>-3.1341</i>	-0.3529 <i>-3.0675</i>	-0.3255 <i>-2.8655</i>
Initial_dvy	0.4436 <i>7.4026</i>	0.5172 <i>8.3808</i>	0.5129 <i>8.2637</i>	0.5128 <i>8.3183</i>
Region	-0.3259 <i>-2.0339</i>	-0.2502 <i>-1.5981</i>	-0.2598 <i>-1.6709</i>	-0.3260 <i>-2.1098</i>
No. Observations	147	147	147	147
R-squared	0.6914	0.7204	0.7175	0.7249
Adjusted R-squared	0.6612	0.6930	0.6899	0.6980
S.E. Of regression	0.4198	0.4162	0.4169	0.4162
F-statistic	22.9215	26.3566	25.9910	26.9666
Prob(F-statistic)	0.0000	0.0000	0.0000	0.0000

Note: t-statistics in italic.

**TABLE 12**  
**IMPACT OF PENSION FUNDS ON MARKET VOLATILITY**

*(GLS, Cross Section Weights)*

***Dependent variable: 24 month moving volatility***

<b>Pension Funds:</b>	<b>A. Dummy</b>	<b>B. Assets</b>	<b>C. Share_Priv</b>	<b>D. Log(Inv_stock)</b>
	-0.0658 <i>-4.1034</i>	-0.0016 <i>-2.6997</i>	-0.0031 <i>-3.0232</i>	-0.0088 <i>-2.7795</i>
Inflation	0.0002 <i>3.4499</i>	0.0002 <i>3.3432</i>	0.0002 <i>3.3562</i>	0.0002 <i>3.5446</i>
Income	-1.1600 <i>-2.7186</i>	-7.8700 <i>-1.6042</i>	-7.5300 <i>-1.5655</i>	-6.8000 <i>-1.4799</i>
Bank_Assets	-0.0290 <i>-0.8603</i>	-0.0366 <i>-1.0684</i>	-0.0358 <i>-1.0492</i>	-0.0411 <i>-1.2170</i>
Initial_dvy	0.3076 <i>5.9056</i>	0.3169 <i>5.6979</i>	0.3169 <i>5.7657</i>	0.3128 <i>6.0089</i>
Region	-0.0024 <i>-0.0592</i>	0.0003 <i>0.0071</i>	0.0048 <i>0.1114</i>	0.0120 <i>0.2882</i>
No. Observations	147	147	147	147
R-squared	0.6826	0.5723	0.5824	0.5505
Adjusted R-squared	0.6515	0.5304	0.5416	0.5066
S.E. Of regression	0.1475	0.1478	0.1472	0.1448
F-statistic	21.9981	13.6893	14.2713	12.5332
Prob(F-statistic)	0.0000	0.0000	0.0000	0.0000

Note: t-statistics in italic.

**TABLE 13**  
**IMPACT OF PENSION FUNDS ON FIRM'S COST OF CAPITAL**

(GLS, Cross Section Weights)

**Panel I. Dependent variable: Log of Dividend Yield**

	<i>pooled</i>	<i>fixed</i>	<i>pooled</i>	<i>fixed</i>	<i>pooled</i>	<i>fixed</i>	<i>pooled</i>	<i>fixed</i>
<b>Pension Funds:</b>	<b>A. Dummy</b>		<b>B. Assets</b>		<b>C. Share_Priv</b>		<b>D. Log(lnv_stocks)</b>	
	0.1477	0.4268	0.0079	-0.0223	0.0176	0.0953	0.0485	0.1926
	<i>0.7880</i>	<i>1.3091</i>	<i>1.1824</i>	<i>-0.9974</i>	<i>1.4319</i>	<i>2.6878</i>	<i>1.7889</i>	<i>3.6853</i>
Refcap	-1.6176	-1.0166	-1.6395	1.2278	-1.6455	0.8789	-1.6711	2.3426
	<i>-2.3603</i>	<i>-0.3053</i>	<i>-2.4105</i>	<i>0.3603</i>	<i>-2.4409</i>	<i>0.2710</i>	<i>-2.5596</i>	<i>0.3071</i>
Refcom	4.7821	1.6200	4.5450	0.5626	4.1965	0.8306	3.5455	-1.5413
	<i>1.7611</i>	<i>0.4101</i>	<i>1.6937</i>	<i>0.1404</i>	<i>1.5517</i>	<i>0.2081</i>	<i>1.3122</i>	<i>-0.3645</i>
Reffin	-0.8513	0.1214	-1.1205	0.2372	-1.1018	0.0629	-1.0325	-0.1778
	<i>-1.0583</i>	<i>0.1118</i>	<i>-1.4167</i>	<i>0.2585</i>	<i>-1.3761</i>	<i>0.0691</i>	<i>-1.3168</i>	<i>-0.1749</i>
Refpri	0.5417	6.3261	0.8803	7.3636	0.8901	4.4577	0.7669	5.1966
	<i>0.8212</i>	<i>2.0209</i>	<i>1.3113</i>	<i>2.3018</i>	<i>1.3248</i>	<i>1.5078</i>	<i>1.1864</i>	<i>1.7579</i>
Reftax	1.0636	0.8460	0.5469	-0.0503	0.3845	1.4598	0.3836	1.9101
	<i>1.0893</i>	<i>0.4864</i>	<i>0.5225</i>	<i>-0.0259</i>	<i>0.3553</i>	<i>0.8324</i>	<i>0.3705</i>	<i>1.1747</i>
No. Observations	53	54	54	54	54	54	54	54
R-squared	0.72888	0.7599	0.6975	0.8401	0.767	0.9157	0.7458	0.7569
Adjusted R-squared	0.6385	0.6217	0.5967	0.7481	0.6919	0.8683	0.661	0.6170
S.E. Of regression	0.5657	0.5277	0.5696	0.5309	0.4042	0.3170	0.5602	0.4995
F-statistic	8.0655	8.7074	6.9190	14.4580	10.158	30.7881	8.8027	8.5645
Prob(F-statistic)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note: t-statistics in italic.

**TABLE 13 (Cont.)**  
**IMPACT OF PENSION FUNDS ON FIRM'S COST OF CAPITAL**

(GLS, Cross Section Weights)

**Panel II. Dependent variable: Log of Price to Book Ratio**

	<i>pooled</i>	<i>fixed</i>	<i>pooled</i>	<i>fixed</i>	<i>pooled</i>	<i>fixed</i>	<i>pooled</i>	<i>fixed</i>
<b>Pension Funds:</b>	<b>A. Dummy</b>		<b>B. Assets</b>		<b>C. Share_Priv</b>		<b>D. Log(Inv_stocks)</b>	
	0.3962	-0.2187	0.0187	0.0025	0.0360	-0.0209	0.0709	0.0067
	<i>2.6571</i>	<i>-1.2208</i>	<i>4.2229</i>	<i>0.1945</i>	<i>4.3071</i>	<i>-1.1646</i>	<i>3.6697</i>	<i>0.2066</i>
Refcap	1.2623	-0.0076	1.4013	0.4874	1.2989	0.1191	1.2149	0.8146
	<i>2.1196</i>	<i>-0.0044</i>	<i>2.5801</i>	<i>0.2688</i>	<i>2.4663</i>	<i>0.0685</i>	<i>2.2163</i>	<i>0.4441</i>
Refcom	3.5093	-1.1873	1.5328	-1.4656	1.3549	-0.9783	2.2600	-1.6740
	<i>1.9829</i>	<i>-0.5565</i>	<i>0.9742</i>	<i>-0.6999</i>	<i>0.8463</i>	<i>-0.4592</i>	<i>1.2936</i>	<i>-0.7617</i>
Reffin	0.0665	-0.6052	-0.5717	-0.6356	-0.4876	-0.6500	-0.4553	-0.6232
	<i>0.0793</i>	<i>-0.8426</i>	<i>-0.9156</i>	<i>-0.7554</i>	<i>-0.7948</i>	<i>-0.7699</i>	<i>-0.6864</i>	<i>-0.7325</i>
Refpri	-0.0014	-1.6179	0.7590	-1.2126	0.7114	-1.1672	0.4421	-1.1907
	<i>-0.0023</i>	<i>-0.8982</i>	<i>1.5073</i>	<i>-0.6893</i>	<i>1.4386</i>	<i>-0.7072</i>	<i>0.8630</i>	<i>-0.6894</i>
Reftax	-2.0070	-0.8571	-2.7689	-0.9546	-2.9583	-1.0831	-2.4361	-0.9526
	<i>-2.3753</i>	<i>-0.8187</i>	<i>-3.6624</i>	<i>-0.8920</i>	<i>-3.8216</i>	<i>-1.0848</i>	<i>-3.0431</i>	<i>-0.9296</i>
No. Observations	54	54	54	54	54	54	54	54
R-squared	0.6821	0.8829	0.7750	0.8982	0.767	0.9157	0.7479	0.8945
Adjusted R-squared	0.5788	0.8175	0.7019	0.8413	0.6919	0.8683	0.6659	0.8356
S.E. Of regression	0.4307	0.3139	0.4147	0.3211	0.4042	0.3170	0.4172	0.3210
F-statistic	6.6043	21.3748	10.6010	25.0127	10.158	30.7881	9.1285	24.0290
Prob(F-statistic)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note: t-statistics in italic.

**TABLE 14**  
**IMPACT OF PENSION FUNDS ON MARKET VOLATILITY**

*(GLS, Cross Section Weights)*

**Dependent variable: 24 month moving volatility**

	<i>pooled</i>	<i>fixed</i>	<i>pooled</i>	<i>fixed</i>	<i>pooled</i>	<i>fixed</i>	<i>pooled</i>	<i>fixed</i>
<b>Pension Funds:</b>	<b>A. Dummy</b>		<b>B. Assets</b>		<b>C. Share_Priv</b>		<b>D. Log(Inv_stocks)</b>	
	-0.0593	-0.1193	0.0015	0.0047	0.0009	-0.0038	0.0016	-0.0090
	<i>-1.4882</i>	<i>-1.0530</i>	<i>1.1861</i>	<i>1.0002</i>	<i>0.3569</i>	<i>-0.6696</i>	<i>-0.2699</i>	<i>-0.8299</i>
Refcap	0.3706	0.4111	0.4957	0.3194	0.4684	0.4937	0.4442	0.2381
	<i>2.1461</i>	<i>0.5181</i>	<i>2.9643</i>	<i>0.3746</i>	<i>2.7912</i>	<i>0.5954</i>	<i>2.6174</i>	<i>0.2838</i>
Refcom	-3.6578	-3.7925	-4.5774	-3.7938	-4.3374	-4.0124	-4.0938	-3.7056
	<i>-7.9759</i>	<i>-4.7637</i>	<i>-10.0534</i>	<i>-4.4244</i>	<i>-8.8785</i>	<i>-5.0043</i>	<i>-8.3559</i>	<i>-4.5356</i>
Reffin	-0.1414	0.1875	-0.0998	0.1045	-0.1014	0.1251	-0.1016	0.1102
	<i>-0.5472</i>	<i>0.4429</i>	<i>-0.4355</i>	<i>0.2386</i>	<i>-0.4373</i>	<i>0.3242</i>	<i>-0.4294</i>	<i>0.2726</i>
Refpri	-0.3089	0.8311	-0.3624	0.6466	-0.3750	0.7037	-0.3792	0.7333
	<i>-1.6549</i>	<i>1.4132</i>	<i>-2.2456</i>	<i>1.2036</i>	<i>-2.3202</i>	<i>1.2568</i>	<i>-2.3127</i>	<i>1.2142</i>
Reftax	0.8117	0.2271	0.8093	0.4484	0.8471	0.3391	0.8703	0.2635
	<i>4.4930</i>	<i>0.7391</i>	<i>4.5676</i>	<i>1.4041</i>	<i>4.6772</i>	<i>1.0954</i>	<i>4.8236</i>	<i>0.8335</i>
No. Observations	52	52	52	52	52	52	52	52
R-squared	0.9136	0.9424	0.9281	0.9440	0.92977	0.971102	0.9241	0.9098
Adjusted R-squared	0.884	0.9083	0.9035	0.9120	0.9057	0.9539	0.8981	0.8562
S.E. Of regression	0.1496	0.1393	0.1456	0.1536	0.1498	0.1397	0.1500	0.1367
F-statistic	30.9124	43.6820	37.7690	45.6340	38.701	89.6113	35.6096	26.9010
Prob(F-statistic)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note: t-statistics in italic.

**TABLE 15**  
**CORRELATION MATRICES OF REFORM VARIABLES**

<i><b>ARGENTINA</b></i>					
	Refcap	Refcom	Reffin	Refpri	Reftax
Refcap	1.00				
Refcom	0.89	1.00			
Reffin	0.68	0.72	1.00		
Refpri	0.81	0.87	0.63	1.00	
Reftax	0.76	0.83	0.70	0.79	1.00

<i><b>BRAZIL</b></i>					
	Refcap	Refcom	Reffin	Refpri	Reftax
Refcap	1.00				
Refcom	0.84	1.00			
Reffin	0.72	0.93	1.00		
Refpri	0.03	-0.40	-0.33	1.00	
Reftax	0.79	0.97	0.95	-0.39	1.00

<i><b>CHILE</b></i>					
	Refcap	Refcom	Reffin	Refpri	Reftax
Refcap	1.00				
Refcom	0.74	1.00			
Reffin	0.70	0.82	1.00		
Refpri	0.69	0.76	0.75	1.00	
Reftax	-0.10	0.16	0.24	0.40	1.00

<i><b>COLOMBIA</b></i>					
	Refcap	Refcom	Reffin	Refpri	Reftax
Refcap	1.00				
Refcom	0.88	1.00			
Reffin	0.06	0.04	1.00		
Refpri	0.71	0.79	-0.01	1.00	
Reftax	0.80	0.75	-0.21	0.66	1.00

<i><b>MEXICO</b></i>					
	Refcap	Refcom	Reffin	Refpri	Reftax
Refcap	1.00				
Refcom	0.71	1.00			
Reffin	0.72	0.79	1.00		
Refpri	0.95	0.70	0.71	1.00	
Reftax	0.81	0.84	0.94	0.78	1.00

<i><b>PERU</b></i>					
	Refcap	Refcom	Reffin	Refpri	Reftax
Refcap	1.00				
Refcom	0.84	1.00			
Reffin	0.97	0.90	1.00		
Refpri	0.61	0.49	0.61	1.00	
Reftax	0.88	0.87	0.87	0.77	1.00

<i><b>VENEZUELA</b></i>					
	Refcap	Refcom	Reffin	Refpri	Reftax
Refcap	1.00				
Refcom	0.89	1.00			
Reffin	0.75	0.89	1.00		
Refpri	0.19	-0.01	-0.24	1.00	
Reftax	0.92	0.79	0.66	0.35	1.00

ANNEX

LIST OF COUNTRIES SELECTED FROM  
THE IFC EMERGING MARKETS  
DATABASE

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1	<b>Argentina</b>
2	<b>Brazil</b>
3	<b>Colombia</b>
4	Czech Republic
5	<b>Chile</b>
6	China
7	Egypt
8	Greece
9	Hungary
10	India
11	Indonesia
12	Israel
13	Jordan
14	Korea
15	Malaysia
16	<b>Mexico</b>
17	Morocco
18	Nigeria
19	Pakistan
20	<b>Peru</b>
21	Philippines
22	Poland
23	Portugal
24	Russia
25	Saudi Arabia
26	Slovakia
27	South Africa
28	Sri Lanka
29	Taiwan, China
30	Thailand
31	Turkey
32	<b>Venezuela</b>
33	Zimbabwe

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