# Is Growth in the Stock Market Responsible for the Decline in the Savings Rate? The Evidence for Canada

**By**

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# Abstract

The paper initially posited that an increase in the stock market may result in the decline of the personal savings rate. Using Multiple Linear Regression analysis, the paper examines the empirical relation between stock markets and gross household savings rates in Canada over the 1986-2006 period. The empirical test uncovered a positive relationship between stock market development and the personal savings rate, albeit an asynchronous one. The relationship is most significant when stock market development measures are lagged 4 quarters. Although it was expected that the development of the stock market influenced personal savings rates, in fact the opposite holds true. The application of the Granger test revealed that the personal savings rate positively Granger causes stock market development in intermediary financial systems such as Canada.

# 1.Introduction

The last few years have witnessed a growing interest in the relationship between stock market development and economic growth. There exists, however, an underlying subsidiary relationship that has received less focus in recent empirical literature —the relationship between stock market development and the personal savings rate.

Both sides of this relationship, stock market development and personal savings, have experienced dramatic fluctuations during the last two decades, especially in developed countries with sophisticated financial systems such as the US and Canada. Household savings rates have reached record lows not seen since the Great Depression, with negative rates registered in the United States (2005), Australia (2002), and Denmark (2005). In Canada, the personal savings rate declined sharply during the latter half of the 1990s, reaching an all-time low of 1.3 percent in 2005.

According to the neo-classical endogenous growth model, the steady-state growth rate can be written as: $g=A\Phi s-\delta$, where "A" represents multifactor productivity (often generalized as technology), "$\Phi$" denotes the proportion of savings that flow into investment, "s" represents the gross savings rate, and "$\delta$" is the rate of depreciation. Since "s" is a necessary prerequisite to the financing of investment, a declining savings rate is a sign of declining capital accumulation and therefore reflects a slowdown in the pace of economic growth. This view is widely accepted by most mainstream economists (Gale and Sabelhaus 1999, Jappelli and Pagano 1994).

On the other hand, the healthy growth experience of the American economy during the 1990s was accompanied by a significant decrease in private savings rates, which appears to contradict the aforementioned theory. Partly because of this contradiction,

Keynesian economists hold to a different basic theory, namely that effective demand drives economic growth. In other words, a fall in the savings rate would not only directly sustain economic growth through increased consumption and effective demand, but also indirectly support it through increased investment via a so-called accelerator effect: when consumption spending flows to a corporation, then the corporation will increase its investment. In recent years, a group of economists called "Monetary Keynesians" raised another concern: that a long-term decrease in the personal savings rate would result in an increasing debt-to-income ratio, which would make the rising household spending unsustainable (Minsky, Godley, Seccareccia). Although the merits and flaws of the trend of declining savings rates are still in dispute, the significance of explaining this trend is recognized by most academics.

While the polemic over the effects of the declining savings rates continues, a large number of countries, both developed and developing, have implemented significant capital market reforms, including stock market liberalization. The wave of stock market development and reform accelerated these countries' market capitalization. Mullins (1993) noted that it probably took 85 years (1810-95) for the US market capitalization ratio[1] to rise from 7 % to 71%, while the Taiwanese ratio rose from 11% to 74% in just 10 years (1981-91). With a market capitalization of $2.3 trillion, the Chinese stock market was roughly 90% of its nominal GDP in 2006, compared to 1% in 1990 (2007 China Statistical Year Book). Along with stock market development, many of these countries have experienced concomitant declines in the personal savings rates. Studying

[1] Market capitalization ratio=(value of listed shares / GDP)*100%

the relationship between these two phenomena is highly relevant since savings, along with consumption and net exports, form the three key forces driving economic growth.

Although stock market development can enhance the efficiency with which saved resources are channeled into productive use, the effect on the quantity and quality of savings is theoretically ambiguous. The stock market influences a number of mechanisms, at least in theory.

Firstly, the stock market is expected to increase personal savings by presenting an additional savings option for households. The most basic function of the stock market is to act as a financial intermediary that provides the necessary tools for household investment, which in turn encourages households to save more. During the Industrial Revolution, the emergence of the banking system initiated a "capital revolution" by collecting money from households to provide the necessary funds for corporations. The consequence of the emergence of banks is that people were able to place their money in banks, instead of storing gold, silver and other valuable items in their home. As they earned interest income from banks, they would realize that the opportunity cost to consume rather than save is higher than before, which would urge them to save more. Similarly, the development of the stock market allows for enterprises to raise funds to advance their technologies, projects and business development without borrowing from the banks.

What makes the stock market fundamentally different from banks, and more attractive to investors, is the rate of return. The stock market normally has a higher rate of return, which results in a higher savings rate as households realize the higher opportunity cost of consumption. Theoretically, countries with fast growth rates and newly

established or reformed stock markets such as India and China would witness a higher savings rate. But this might not hold true in very poor countries where households are struggling to survive, and where most of the income is rapidly consumed.

Secondly, with further development of the stock market, stock markets not only encourage more savings and more investment, but also improve the quality of investment through the allocation of resources. An economy with a relatively developed stock market is able to attract more investment to its growing companies and industries, and less investment to its shrinking companies and industries. To quote Wurgler (1999), "the elasticity of industry investment to value added is several times higher in Germany, Japan, the United Kingdom and the United States, than in financially undeveloped countries such as Bangladesh, India, Panama, and Turkey, although some financially undeveloped countries have high savings and high investment." A more developed financial system takes better advantage of investment opportunities, through a process of reallocation of resources, consequently leading to a higher rate of return on investment and savings. The higher rate of return on investment, however, doesn't have a certain impact on savings because an increase in the rate of return makes current consumption more expensive relative to future consumption, thereby increasing savings. However, some economists (Beck and Levine 2001) hold that an increase in the rate of return will increase wealth, which in turn increases consumption and decreases savings.

Thirdly, the liquidity function of the stock market allows the return to be realized, either from the quantity or the quality of saving. The development of the stock market brings about greater liquidity, a mixture of more in-depth information, fewer transaction constraints, lower transaction costs and less uncertainty. The decrease of

uncertainty may in turn decrease the demand for socially unnecessary liquid funds such as precautionary savings. Levine (1991) and Smith and Starr (1996) note that stock markets make trading in financial assets less risky because they allow savers to buy and sell quickly and cheaply when they want to change their portfolios. Conversely, others argue that with the development of stock markets, a global capital market comes into being (Devereux and Smith 1994, Levine and Zervos 1996). This trend further decreases market risk, and may decrease savings as well.

Fourthly, changes in the stock market, particularly stock market appreciation and depreciation, may be partly responsible for the variation in savings. An appreciation of the stock market would enact a re-valuation of household existing assets, which in turn would induce them to spend more, due to the expectation of a higher future income and the desire to realize existing capital gains. On the other hand, a substantial fall in equity prices would leave households in poor financial health, prompting them to rebuild savings to survive a situation when strong consumption would be needed, such as during a deep recession. According to the traditional permanent income hypothesis (Friedman 1957) and life cycle hypothesis (Modigliani 1957), temporary income or "windfall" gains from stock markets have no effects on consumption and savings. The key to determining if stock markets have a measurable effect on savings rests in answering the question, "Is stock market wealth regarded as permanent wealth or temporary wealth?"

In general, there are more stable and reliable stock markets in market-based financial systems and more volatile and risky stock markets in bank-based financial systems[2]. Thus

[2] In bank-based systems, (such as in Germany and Japan) banks play a leading role in mobilizing savings, allocating capital, overseeing the investment decisions of corporate managers, and providing risk management vehicles. In market-based systems (such as in the United States) securities markets share center stage with banks in distributing the public's savings to firms, exerting corporate control, and easing

the stock market wealth effect is, in general, larger in countries with market-based financial systems such as the U.S., Canada[3] and the UK, than in countries with bank-based financial systems such as the countries of Continental Europe (Edison and Slok, 2001). But even if market-derived capital gains are considered as permanent income, and would encourage households to lift their consumption level, their influence on the personal savings rate is ambiguous. In theory, wealthy households are likely to increase their personal savings rate, while poorer households would experience a decrease in their personal savings rate for consumption.

Finally, it is of interest to consider whether the inverse of the proposed relationship holds true. In other words, do personal savings affect stock markets? And if so, how? A possible hypothesis could include:

1. More savings mean more capital flows into stock market, more sales and purchases and more liquidity. This results in fewer costs and a more advanced stock market.

2. Similarly, greater savings, by initiating more investment and further economic growth, stimulate the financial demand for companies. Thus more companies are listed on the stock market, and more developed stock markets emerge as a consequence.

The empirical relation between stock market development and savings has rarely been discussed. The primary hindering obstacle for analyzing this relationship might be the lack of a good proxy for stock market development. Some academics (Levine and Zervos 1996, Capasso 2006) have used a number of variables to measure the development of stock market, including: market capitalization (Market Cap)/GDP, Value

[3] Canada was classified as an intermediary-based rather than market-based system (Demirguc-Kun and Levine 1999)

Traded/Market Cap, Value traded/GDP, turnover ratio. There are also various savings indicators such as national savings rates, private savings rates, gross saving or net saving. Should a gross or net national savings rate be used? Is a national savings rate the more appropriate measure of savings? The existing literature analyzing stock market development and savings is not very helpful in answering these questions. However, Bonser-Neal and Dewenter (1999) studied data from 16 emerging market countries over the 1982-1993 period and found a significant positive link between personal savings rates and stock market size and liquidity.

In distinguishing itself from the work of Bonser-Neal and Dewenter (1999), this paper combines OLS regression and the Granger test to examine both the relationship and the causality between stock market development and savings rates in Canada. Three measures of stock market development and personal savings rates as well as several standard explanatory variables of savings are included for testing the underlying relationship between stock market development and savings.

There are several reasons for examining Canada separately. First, Canada's personal savings rate has experienced a significant decline from 15% in the 1$^{st}$ quarter of 1986 to 2% in the 4$^{th}$ quarter of 2006. During the same period, Canada's stock market (Toronto Stock Exchange) experienced a more than six-fold growth. Second, Canada's stock market is more than 150 years old, and is regarded as well developed. The effect of the stock market on savings, if any, should be easily evident considering this long history. Finally, comprehensive stock market data is available in the Statistics Canada CANSIM database, and a large sample allows us to arrive at a more accurate result. The sample for

empirical tests includes quarterly data for the period 1986 to 2006, a total of 84 observations.

The rest of the paper is organized as follows: section 2 presents a review of the existing literature on stock market development and savings. In section 3, a description of the data and methodology is introduced. The research results are analyzed in section 4, and the conclusion and policy implications are addressed in section 5.

# 2 Literature Review

## 2.1 Stock market and savings

The direct relationship between stock markets and savings has not been frequently discussed in the literature. Perhaps it is because the stock market is not as important as banks or other financial intermediaries, or because the stock market is only considered important in some countries; whatever the reason, this relationship is often ignored.

Although there is a lack of literature on this topic, plenty of studies (mostly focusing on stock market and economic growth or stock market and household consumption) directly or indirectly mention the existence of this relationship. Going as far back as two centuries ago, Alexander Hamilton (1781), the founding father of the first national bank of the United States, wrote that, "...banks would furnish the needed capital to win the war and be a source of national strength and wealth." He believed that banking and funding systems worked together to enable economic growth. Adam Smith (1776), on the other hand, claimed that banks were the sources of corruption that disturbed economic growth and damaged national wealth. Both Alexander Hamilton and Adam Smith lived in societies where banks were relatively rudimentary financial institutions; their main function was to endorse paper money instead of coins minted out of precious metals or tangible assets like goats and cows. Another function of banks in those times was to finance municipalities. Hence at this early stage, banks worked mostly as a tool to attract household savings and as agents to provide funding for the Industrial Revolution and governmental needs (Adam Smith 1819).

The growth of financial markets has complicated the debate on the merits and hazards of financial markets and their components. Bagehot (1873) and Schumpeter

(1911) hold a positive opinion of the impact of banks on economic growth, while Bohm-Bawerk (1891) noted that the most productive capital investments often require a commitment of large amounts of funds for substantial periods, with investors facing relatively a long time until payout - a manner in which the financial market positively affects the economy. Keynes (1936), on the other hand, argued in his famous *General Theory* that exuberant stock market participants cause over-investment, and investment without real economic benefit causes investment bubbles and harms economic growth. Robinson (1952) suggested that, "Where enterprise leads, finance follows," implying that financial markets react passively to economic growth.

In recent decades, with the emergence and development of the stock market in the developing world, there has been an increase in the literature focusing on the role of stock markets in economic growth. The foundation was laid by the early historical contributions of Goldsmith (1969), Cameron (1976) and Gerschenkron, (1962) and the theoretical work of McKinnon (1973) and Shaw (1973).Following them, Pagano (1993a), who drew his inspiration from the endogenous growth models of Roemer (1989) and Lucas (1988), argued that financial intermediation as well as the stock market helps economic growth by increasing the rate of investment, improving the productivity of investment and improving the private savings rate. Hicks (1969) and Harber (1991) claimed that a sufficiently liquid capital market allows for technological innovation and spurs economic growth. Levin (1991) notes that stock markets improve the efficiency of capital allocation, accelerate the labor capital growth rate and the per capita productivity rate, and hence improve the steady-state economic growth rate. Kyle (1984) and Holmstrom and Tirole (1993) highlighted the role of the stock market in resource

allocation from another angle, namely that a liquid stock market can increase incentives to acquire information about firms and improve corporate governance. Differing opinions are to be found in Shleifer and Summers (1988), as well as Morck, Shleifer and Vishy (1990), who claimed that stock market development can hurt economic growth by easing counterproductive corporate takeovers. Singh (1997) pointed out that the negative effect of stock market on economic growth is particularly true in developing countries. The same argument was advanced by Arestis and Demetriades (1997), based on an empirical study of South Korea's stock market, and by Tan Ruyong (1999), based on an empirical study of the Chinese stock market.

In an extensive study of stock markets, banks and economic growth using data on 49 countries from 1976 to 1993, Levine and Zervos (1996) investigated whether measures of stock market liquidity, size, volatility, and integration in world capital markets are robustly correlated with current and future rates of economic growth, capital accumulation, productivity improvements, and savings rates. Using the private savings rate as one of the growth indicators, their study failed to find a statistically significant link between private savings rates and either stock market liquidity or banking development. What the study found was a strong, positive link between financial development and economic growth that suggests financial factors are an integral part of the growth process. As exemplified by Levine (1991), in a closed economy model savings rates can be held fixed; yet an increase in stock market liquidity induces agents to reallocate savings toward capital producing investments with longer-run and higher returns. Thus, savings rates are uncorrelated with liquidity, while stock market liquidity boosts the rate of capital accumulation. Levine and Zervos also suggested that funds

attracted to liquid stock markets in developing countries come mainly as a switch from other assets.

In terms of improving resource allocation, the Gurley-Shaw theory (Gurley and Shaw, 1960) indicates that by improving the composition of a given amount of wealth, through the substitution of financial assets for relatively unproductive tangible assets, financial intermediaries, including through the stock market, would improve the efficiency of the allocation of resources. The theory rests on two important assumptions: first, individual savers are not the most efficient investors in terms of optimal allocation of investment; and second, that savers are not willing to make the full amount of their savings directly available to the most efficient investor. Consequently, it is reasonable to expect that the development of the stock market will increase the rate of return on savings.

Similarly, Greenwood and Smith (1997) argued that by pooling resources into large projects that would otherwise have difficulty accessing finance, stock markets can mobilize savings and spur the rate of investment. They established two models with endogenous market information. One examines the role that the financial market- banks and the stock market- plays in allocating funds forward the highest returns in economic systems. The other focuses on the role that markets play in supporting specialization in economic activities. Their research claims that the development of the financial market reduced the perceived cost of investing in long-run projects, great ideas and innovation technologies, which are inaccessible without financial support. The emergence and development of the stock market enables investments on those high-return values, thereby increasing the return on savings, and encouraging savings.

As economies developed, economic activity has tended to become increasingly specialized. The operation of more advanced production technologies requires the input of specialized intermediate goods. The production of these goods requires the formation of a supporting market. By improving the rate of return, and therein lies a general rule that saving is monotonic in rate of return, the increase in the quantity and quality of the stock market would encourage savings.

A significant amount of literature, however, relates the decline in private savings rates in the late 1990s to the substantial rise in stock market wealth. Frederic Minskin (2001) described this wealth effect by means of the following relation: M ↑→Ps →W↑→C↑→Y↑, where M is expansionary monetary policy, Ps is stock prices, W is household wealth, C is consumption and Y is economic growth. By increasing consumption, stock market development is theoretically able to decrease personal savings rates. As early as 1965, John J. Arena examined 1947-1964 time series data to estimate the impact of the stock market changes on spending, but found no co-relation between stock market gains and household consumption. Tamim Bayoumi (1993) reported the results from estimating a model of household saving using regional data for the United Kingdom, with particular emphasis on the interaction between household saving and financial deregulation, and concluded that much of the decline in the personal savings rate in the 1980s was caused by the rise in wealth. Lusardi (2001) asserted that the increase of the stock market value between 1988 and 2000 could be responsible for 3.5 percentage points of the decline in the US personal savings rate. Davis and Palumbo (2001), Gale and Sabelhaus (1999), and Kiley, (2000) found that a US$1 increase in stock market wealth leads to additional spending of 4–7 cents. Maki and Palumbo (2001) noted that the

households that benefited the most from stock market gains were also the ones responsible for most of the fall in the aggregate savings rate. Mario Seccareccia (2005) also indicated that the higher the appreciation of assets in the stock market, the lower the personal savings rate. He based his conclusion on his study of the Toronto Stock Exchange index of 300 traded stocks (the TSE300 index). Finally, Godley (2002) found that household debt ratio moved in tandem with a declining savings rate during the 1990s. He argued that capital gains can be realized only if there is an alternative purchaser, and that the increased debt ratio is evidence that households believe that their gains from the stock market are permanent. Hence households borrow to sustain higher consumption based on their expected growth of real wealth.

In an article entitled "Does Financial Market Development Stimulate Savings? Evidence from Emerging Stock Markets", Bonser-Neal and Dewenter (1999) examined the empirical relationship between financial market development (measured by the stock market) and savings (denoted by gross private savings rates) in 16 emerging countries over the 1982-1993 time period. Their investigation uncovered a significant positive relation between savings and stock market size and liquidity. In their empirical study, private savings were most sensitive to the current account balance, the real interest rate, and the budget surplus, as well as stock market measures. Two of the three stock market measures revealed weak links to savings, with only the Market Cap/GDP coefficient being significant. However, when dummy variables were excluded, all three stock market variable coefficient estimates were significant. Nonetheless, the relationship disappears when two countries with particularly large stock market values (Malaysia and Korea) were removed from the sample.

In contrast to Levine and Zervos (1996), who estimated a long-run average cross-sectional link between private savings and stock market development with one observation per country, Bonser-Neal and Dewenter (1999) used cross-section time series regression to test for differences across the industrial and developing countries samples. Both of these studies seem to agree that the estimated relationship between stock market development and savings is critically dependent on the sample selection. Therefore, studying an individual country with a sufficient data pool may be able to reveal the real relationship between savings and stock market development in that country, and offer important information on similar countries.

## 2.2 Measuring stock market development and savings

Measuring stock market development and savings is important because both measures have more than one form. Defining and measuring the level of development of the stock market, however, is difficult because the level of stock market development (like the level of economic development) is a complex and multi-faceted concept (Demirguc-Kunt and Levine1993). For the measurement of savings, personal savings rates are often used in much of the literature because of the unavailability of net values. This section presents a representative catalogue of the indicators used in earlier literature, with the strength and weakness of each indicator further explained.

**Stock Market Development Indicators**:

1. Number of listed companies. This specifies the number of all companies listed in the country's stock exchange at any point in time. This indicator is also a measure of stock market size. Although it does reflect the absolute size of the stock market,

some regions may have a low absolute size as well as highly-developed stock markets (i.e. Hong Kong).

2. The Market capitalization divided by GDP (used in Atje and Jovanovich 1993; Levine and Zeros 1996; Bonser-Neal and Dewnter 1999). This gives a measure of the size of the stock market that equals the value of listed domestic shares relative to the size of economy as measured by GDP. It improves measure 1 above by including GDP, thus providing a relative development of the stock market to GDP. However, it may not accurately indicate the level of stock market development. Companies may list their stock on the exchange merely to benefit from tax advantages provided to listed firms (Demirguc-Kunt and Levine 1993).
3. Value traded ratio (TVT) (Used in Levine 1991; Bencivenga et al. 1995; Bonser-Neal and Dewnter 1999). This equals the total value of domestic shares traded on the stock market exchange divided by GDP. The value traded ratio measures how easily securities can be bought and sold, and therefore positively reflects liquidity on an economy-wide basis. However, the ratio may not be able to properly represent the liquidity of the stock market because the liquidity indicator could rise without an increase in the number of transactions or a fall in transaction costs. For example, if the market anticipates an increase in corporation profits, stock prices will rise. The price effect, in turn, will raise the value traded ratio at the same trading volume.
4. Turnover Ratio (TOR) One way to eliminate measure 3 errors is to examine market capitalization and value traded indicators together. As both of them are affected by the stock price, if we divide the value traded indicator by market capitalization,

then the price effect will diminish because the price affects both the numerator and denominator. This measure, called turnover ratio,) is a better measure than TVT. If more developed stock markets have greater activity, a higher turnover ratio indicates a higher degree of stock market development (Demirguc-Kunt and Levine (1993). Generally, we can expect a lower transaction cost with higher turnover ratios, which in turn improves the liquidity of the stock market.

5. Stock Market Concentration is a function of the number of firms and their respective shares of the total production (alternatively, total capacity or total reserves) in a market. A measure of concentration in the stock market is the average size of firms listed on the stock market. Normally, a more developed stock market has greater market concentration (Salvatore Capasso 2006).
6. Institutional indicators. In addition to the above measures, other measures exist that are not of a quantitative nature, called institutional indicators (Ash and Vojislav 1996). These include underlying legal and accounting rules and regulations. One problem with these indicators is that they tend to be qualitative and subjective in nature, which makes it difficult to perform statistical analysis. However, it is possible to construct dummy variables of institutional indicators. Institutional indicators are often a good supplement for quantitative indicators and provide a more complete description of the extent of stock market development.

**Saving Indicators:**

1. The personal savings rate (from NIPA account) or household savings rate, or private savings rate is defined as the fraction of personal income that is not

consumed. That is, the personal savings rate equals the personal savings/personal disposable income. Disposable personal income is personal income less personal tax and non-tax payments. Personal savings equals disposable personal income minus spending for consumption and interest payments. However, in this definition of the personal savings rate, realized capital gains are excluded. A realized gain, although it reflects an increase in the purchasing power of the asset holder, is not considered to raise current production in the NIPA framework. Bonser-Neal and K.L. Dewenter (1999) used the gross private savings rate in testing the private sector response of savings to stock market development.

2. Differing from the traditional definition of the personal savings rate, which does reflect changes in asset value like real estate, stocks and bonds, changes in the net worth of the personal sector, as estimated in the National Balance Sheet Accounts (NBSA), provide an alternative measure of personal savings that is closer to the theoretical concept (Gilles and Denise 2006). The personal savings rate, estimated in the NBSA, is equal to the change in the net worth of the personal sector divided by personal disposable income, normally higher than the NIPA personal savings ratio.
3. The third possibility for measuring the personal savings rate can be called the Hicksian welfare measure, which is equal to: the change in net worth (Hicksian' measure of savings) divided by the sum of the disposable income and capital gains.

# 3 Data and Methodology

This study uses quarterly data for the 1986Q1-2006Q4 period and contains a total of 84 quarterly observations. For the measure of stock market development, the Toronto Stock Exchange Composite index (denoted by Toronto Stock Exchange 300) is a fairly representative measure, as it is the largest stock exchange in Canada as well as the 7th largest in the world. Although the history of Canada's stock market can be traced back to 1852, quarterly data has only been available since the 1950s. This study uses the 1986 to 2006 time range because the personal savings rate started to decline in the middle of 1980s while the stock market was steadily expanding. In line with Bonser-Neal and Dewenter's study, this paper applies three variables as proxies for stock market development, and the personal savings rate as a proxy for savings. After explaining these indicators, several standard explanatory variables of savings rates like real interest rates, the dependency ratio and consumer credit are added in order to control other factors that may affect savings.

This paper uses three indicators for measuring stock market development, as outlined below. This is because (a) these three measures together are able to trace the comprehensive growth in terms of size and liquidity of the Canadian Stock Market; (b) institutional measures such as the underlying legal and accounting rules and regulations cannot be specified and calculated.

The first measure, the ratio of stock market capitalization to Gross Domestic Product (GDP), provides a scale of overall market size. Market size is an important indication of market development. The United States and Japan constitute the world's two largest economies when measured by GDP. They also have the world's two largest

stock markets. A higher market capitalization usually implies higher opportunities for raising funds through the stock market, greater liquidity within the stock market, and an improved ability to diversify risk. The TSE300 market capitalization is the total shares of stock multiplied by the price of each share at the Toronto Stock Exchange, and this value increased approximately six-fold from 1986 to 2006. When divided by GDP, however, the ratio has only increased by 2.5 times. The market capitalization to GDP ratio also implies a relationship between stock market wealth growth to GDP growth, and an increase of this ratio implies that the proportion of stock market wealth in total savings is growing.

The second measure of stock market development is the ratio of total value traded to GDP. Total value traded divided by GDP avoids the argument that value traded growth is only an accompanying result of GDP growth. This measure provides an indicator of the liquidity of the market relative to the size of the economy - a more direct indicator of liquidity in the stock market. In a large but illiquid stock market we may arrive at a misleading result if we only focus on the market capitalization to GDP ratio. In the Toronto Stock Exchange, the Value traded/GDP ratio increased by nearly 10 times from 3.4% in 1986 (Quarter 1) to 33.2% in 2006 (Quarter 4).

The third measure of stock market development is the ratio of total value traded to market capitalization (Value traded/Market Capitalization), which is also called the turnover ratio. It measures domestic equities traded in the stock market relative to the total value of the domestic stock market. This measure eliminates the price effect as both the numerator and denominator change in the same direction if the price of the stock changes. It offers an absolute value to test horizontal changes of a specific stock market's

liquidity. At the Toronto Stock Exchange, the Value Traded/Market Cap value increased from 4% to 17% during 1986-2006. This was less than the increase in the value traded to GDP ratio (which increased from 3.4% to 33.2% during the same period), since it excludes the price effect. The Value Traded/Market Cap value exclusively focuses on the improvement of stock market liquidity and moves in the opposite direction to transaction cost and market risk.

This paper uses National Income and Expenditure Accounts (NIEA) measures of the personal savings rate. Although personal savings rates are known under various names in other countries (such as household savings rate or private savings rate), the term has the same definition of "savings of household sector divided by household disposable income". The personal rather than the national savings rate is used in order to focus on household sector response of savings to stock market development and due to the fact that a personal savings rate is closer to the concept of savings behavior included in many economic models. The National Balance Sheet Accounts (NBSA) of personal savings, introduced in section 2, is excluded because data that tracks changes in asset value and customer durables is not available, and hard to estimate. In Canada, the personal savings rate has continued to decline in the past twenty years from 15% in 1986 to 2% in 2006. As mentioned in the introduction, some economists argue that the fall in the personal savings rate could have important implications on the ability of the country to finance investment in plant and equipment, as well as endanger future growth in productivity and real incomes.

In analyzing whether measures of stock market development are correlated with savings, this paper uses multivariate regression analysis and includes other explanatory

variables of savings. These variables are consistent with Bonser-Neal and Dewenter (1999), with specific Canadian variables having been added.

1. Personal disposable income. The Life-cycle hypothesis (Modigliani 1970) suggests that an increase in personal disposable income would increase the expectation of a household's lifetime income. The relationship between savings and personal disposable income appears bell-shaped, which implies that at very low and very high levels of development of an economy, it shows a relatively low level of personal savings rates.
2. Dependency Ratio. Dependency ratio is the population either below 15 years of age or above 65 in proportion to the rest of the population. The Life-cycle hypothesis addresses the importance of age structure on savings. If a high proportion of the population is of working age, then the economy should have a high rate of aggregate savings, as workers save for their retirement. Conversely, when they reach their retirement age and start to consume their wealth, then the personal savings rate should decline. In countries such as Canada, the government provides transfers to youth and the elderly, thereby decreasing government sector savings, while corporations offer pension plans, thereby decreasing corporation savings. As the numbers of seniors rises, the dependency ratio increases. This paper uses the elderly age dependency ratio (the population of individuals over 65 divided by the population of all other ages) as one independent variable. Youths are not independent deciders, and thus are presumed not have their own saving behavior.
3. Current Account Balance/GDP. Current account balance is the sum of the balance of trade (exports minus imports of goods and services), net factor incomes (such

as interest and dividends) and net transfer payments (such as foreign aid). All other things being equal, a current account surplus causes savings to increase while a current account deficit causes savings to decrease.

4. Government Budget Surplus/GDP. A Government Budget surplus occurs when government revenues exceed expenditures in any fiscal year. The opposite of a surplus is a deficit. While deficits have to be covered by government borrowing, surpluses reduce the net public debt. The government of Canada has been running surpluses in its budgets from 1997–98 until the present fiscal year. Budget surpluses allow governments to save more and reduce taxes, thus increasing the gross savings rate. The data used in this paper is the budget surplus or deficit of all levels of governments (federal, provincial, territorial and local governments).
5. Real interest rate. The real interest rate is the nominal interest rate minus the inflation rate. It is the real rate of return on money saved in banks. This study uses chartered bank-administered interest rates minus the inflation rate as an independent variable affecting savings. The quarterly data is derived from monthly data by using a simple averaging method.
6. Public pension benefit replacement rate. This rate is defined as the ratio of public pension payments per person aged 65 over to the personal disposable income per person aged 15 to 64. In Canada, a compulsory public pension scheme financed on a pay-as-you-go basis (PAYGO) was introduced in 1966 (the Canada Pension Plan). By providing insurance for retirement consumption, public pension plans can reduce the amount of precautionary saving (Evans 1983).

7. Real GDP growth rate. This rate is the nominal quarterly GDP growth rate less the quarterly inflation rate.

Given these economic determinants of savings, the empirical model used to test the impact of stock market development on savings can therefore be specified as

$$S_t = c + \alpha Z_t + \beta MMD_t + \nu_t \quad (1)$$

Where S is the personal savings rate; Z represents the economic variables that may affect savings, with 7 independent variables used in the regression; MMD is the Measure of Market development, with three measures used in the regression; and $\nu_t$ is the error term. This study applies the Multiple Linear Regression method to examine the relationship between savings rates and stock market development. As three stock market development measures are selected, three regression equations are listed below:

$$S_t = c + \alpha Z_t + \beta \ (\text{Market Capitalization/GDP})_t + \nu_t \quad (2)$$

$$S_t = c + \alpha Z_t + \beta \ (\text{Value Traded/GDP})_t + \nu_t \quad (3)$$

$$S_t = c + \alpha Z_t + \beta \ (\text{Value Traded/Market Capitalization})_t + \nu_t \quad (4)$$

The null hypothesis proposes that stock market development does not affect savings rates, or $\beta=0$ in the above equations. Rejecting the hypothesis means that there is a relationship between stock market development and personal savings rates, while failing to reject the hypothesis means that no relationship exists between them. The description of the notation of each variable is available in Table 1 of the appendix.

Ordinary least square (OLS), which is used to estimate the slope coefficients of the autoregressive model, may not be valid in this case, because the use of OLS relies on the stochastic process being stationary. When the stochastic process is non-stationary, the use of OLS can produce invalid estimates. Granger and Newbold (1974) called such

estimates 'spurious regression' results: high R2 values and high t-ratios yielding results with no economic meaning. In case the variables are non-stationary and in order to avoid invalid results, this paper uses Engle-Granger Augmented Dickey-Fuller (EG-ADF) method (Engle and Granger 1987) to test cointegration. The test consists of two steps:

1. Estimate the stationarity of each of the variables. For any variable $y_t$. If $y_t \sim$ I(1), then $z_t = y_t - y_{t-1}$ is stationary. If $y_t \sim$ I(2), then $z_t = y_t - y_{t-1} - (y_t - y_{t-2})$ is stationary. It is the condition for cointegration that is being tested.
2. Estimate the cointegrating coefficient by using OLS estimation of the regression of equation (1).
3. Use Dickey-Fuller t-test to test for a unit root in the residual v from this regression.

Another problem that may arise when estimating such an equation is that the stock market may not simultaneously affect the savings rate. To solve this problem, this paper uses lagged values[4] of stock market development measures. For instance, mc_gdp(-1) means lagged one quarter, and mc_gdp(-2) means lagged two quarters. Supposing mc_gdp(-1) does affect savings rates, we can say that the stock market affects savings rates with a one quarter delay.

Moreover, although we can learn about the relationship between the personal savings rate and stock market development from the regression, the causality of stock market development and savings rates may run in both directions. In particular, stock market development may affect the savings rates, while the savings rates are also likely to affect stock market development. To solve this problem and to determine the statistical causality

[4] Each measure of stock market development was lagged by several quarters.

between stock market development and savings rates, this paper employs the "Granger causality" test proposed by C.J. Granger in 1969. The basic logic of the Granger test is that while the past can cause the future, the future cannot cause the past. This study tests the following models:

$$MSR = \sum_{i=1}^{n} \beta MMD_{t-i} + \sum_{i=1}^{n} \alpha MSR_{t-i} + \varepsilon \quad (5)$$

Where,

MSR= Measure of savings rate. We use the personal savings rate in this paper.

MMD= Measure of Stock market development, which can be market capitalization to GDP ratio, value traded to GDP ratio, or Value traded to market capitalization ratio.

ε = Error term

In this regression, if the coefficient of β is statistically different from zero, we would conclude that stock market development leads to a savings rate change. We run the following regression to test the causality in the other direction:

$$MMD = \sum_{i=1}^{n} \eta MMD_{t-i} + \sum_{i=1}^{n} \nu MSR_{t-i} + \mu \quad (6)$$

In the second model, if ν is statistically different from zero using a joint F-test, we would conclude that the variation of savings rates leads to stock market development. If both β and ν are statistically different from zero, we would conclude that there exists a bi-directional causality between stock market development and savings rates. Similarly, if neither β nor ν is statistically different from zero, the conclusion would be that none of them Granger causes the other.

Given three stock market development measures and the personal savings rate, this paper estimates three equations to examine the Granger causality among them.

Although this study is restricted to Canada by means of a simple OLS regression method, by exploring the relationship between stock market development and savings rates, the study can shed light on the importance of the relationship in other market-based countries. In opposition to Bonser-Neal and Dewenter's study, this paper is equipped with sufficient observations (84 obs). Moreover, this paper employs the EG-ADF two-step cointegration test, thereby excluding the possibility of using OLS without considering the stationarity of variables. Finally, this paper extends the study to the causality of stock market development and savings rates, offering greater policy implications.

# 4. Analysis of Results

As noted in the previous section, before running the OLS regression we must examine the stationarity of all of the variables. The personal savings rate and all the indicators of stock market development and other explanatory variables of savings appear to be non-stationary. Consequently, the unit-root and cointegration tests are used to examine the long-run relationship between the personal savings rate and stock market development measures and other potential long-run determinants. Table 2 reports the results of unit-root tests. ADF tests performed on the first difference of all these variables indicate that the first difference of each series is mean stationary (at the 0.01 level). The indicators of stock market development are lagged several quarters for testing the lagged relationships among variables.

The results suggest that the personal savings rate, stock market development indicators and other variables are integrated of order one, which implies that it is appropriate to examine the possibility that they are cointegrated. The results of the cointegration test, EG-ADF test, as well as the OLS regression results are presented in Table 3. The results of the causality relationship between the personal savings rate and stock market development are summarized in Table 4. This section consists of two parts. Part one (s. 4.1) discusses the results of an EG-ADF two step cointegration test, and the relationship between stock market and the personal savings rate (Table 2, Table 3); part two (s. 4.2) discusses the causality relationships based on Table 4.

## 4.1 The relationship between the personal savings rate and stock market development

Table 2 indicates that both the first difference I(1) and the second difference I(2) of each series are mean-stationary at the 1% level. These results allow us to further estimate the cointegration coefficient of the OLS regression and test for a unit root in the residual from this regression.

Before examining the results summarized in Table 3, it was necessary to establish a benchmark result for comparison by running a model without stock market development measures (a model that only included those standard explanatory variables as independent variables). This regression, which we shall call the "base regression", was estimated as follows:

| Variable | C | RIR | DR | BB_GDP | CAB_GDP | PDI_GDP | RGDPGR | PPBRR |
|---|---|---|---|---|---|---|---|---|
| Coefficient | 0.533** | 0.111 | -5.671** | -0.786** | | | | |
| t | * | * | * | * | -0.040 | 0.474*** | 0.058 | -0.018 |
| t-Statistic | 11.75 | 1.72 | -11.38 | -2.89 | -0.15 | 7.93 | 0.28 | -0.40 |

Adjusted R-squared: 0.967

Note: a. *, ** `and *** denote significance at the 10%, 5% and 1% levels, respectively.
b. The ADF unit root testing the residual of the base regression has a t-statistics of -10.49, thereby rejecting the null of non-cointegration at the 1% level.

As shown above, the coefficient estimate on the real interest (RIR) is positive but only significant at the 10% level. The elderly age dependency ratio (DR) coefficient is negative and significant at the 1% level. The negative, significant coefficient of the government budget balance (BB) is consistent with the modern Ricardian paradigm[5], and it is also consistent with the Keynesian claim of a reverse causality that higher savings rates slow down the economy and lead to reduced government revenue and hence budget

[5] According to the modern Ricardian paradigm, rational and far-sighted individuals realize that government spending must be paid for either now or later. Government expenditures will therefore be compensated by increased personal savings in anticipation of future tax liabilities.

deficits. The current account balance coefficient is positive but not significant; the real GDP growth rate and the public pension coefficients are not significant. The personal disposable income coefficient, as expected, is positive and significant at the 1% level. The base regression's adjusted R-squared is equal to 0.967, which implies that the base regression can well explain the fluctuations in the personal savings rate.

Table 3 presents the effects of adding Market Capitalization and the GDP ratio to the base regression. The ADF unit root test (right side of table 3) is the residual of the regression with stock market development measures added, and rejects the null hypothesis of non-cointegration at the 1% level. It implies a cointegration relationship between variables, and allows us to perform a further least square regression. Table 3 suggests that the current, first, second, and third quarter market cap/GDP indicator estimates are negative but not significant. With the Market Cap/GDP indicator extended to 4 and 5 quarters, the coefficient estimates are significant at the 10% and 5% levels, but no significance for the coefficient estimates can be found when this indicator was lagged more than 5 quarters. Compared to the base regression, the explanatory power of the equation, the adjusted $R^2$, increases from 0.967 to 0.968 by adding the Market Cap/GDP indicator, but only when this indicator lagged 4 or 5 quarters. This implies that the stock market development measure-Market Cap/GDP increases the explanatory power of the model, but not by much. The coefficient estimates are most significant with 4 or 5 quarters lags, and they imply that Market Cap/GDP has an impact on the personal savings rate with a lagged effect. , Moreover, a change of stock market capitalization one year or 5 quarters earlier tends to stimulate the personal savings rate. The positive coefficients imply that the development of the stock market improves the personal savings rate.

The second part of Table 3 presents the effects of adding the Value Traded to GDP ratio indicator to the base regression. Value Traded/GDP indicator was lagged 0-5 quarters to test its influence on the personal savings rate. All lagged coefficient estimates of this measure, except 2 quarters lags (significant at 5% level), are positive and significant at the 1% level. When extended beyond 5 quarters, this measure becomes insignificant, and thus has no economic meaning. The measure is most significant at the 1% level (with the largest t-statistic value equal to 4.18) with 4 quarters lags, thereby rejecting the hypothesis that Value Traded/GDP results from previous years have no relationship with the personal savings rate. Lagging also improves the explanatory power of the equation by increasing the adjusted $R^2$ from 0.967 to 0.973. The fact that the explainable power of adding the 4 quarters lagged measure is larger than that with any other quarters lagged implies that the development of the stock market one year earlier has the most significant effect on current personal savings rates. The positive value of the coefficient of Value Traded/GDP implies that the improvement of stock market liquidity increases the personal savings rate.

The third part of Table 3 presents the effects of adding the Value Traded/Market Cap to the base regression. The Value Traded/Market Cap indicator was lagged 0-5 quarters to test its influence on the personal savings rate. The coefficient estimates are positive. With this measure extend from current to 5 quarters; the coefficient estimates are significant at the 1%, 1%, 5%, 1%, 1% and 5% levels. This measure excludes the price effect, whereas the previous two measures may have included the price effect. Furthermore, the measure is also a stock market liquidity indicator. It implies that more liquidity in the stock market is associated with a higher personal savings rate while less

liquidity in the stock market is associated with a lower personal savings rate. Although the coefficient estimates of all Value Traded/Market Cap measures are significant, the coefficient estimate of this measure when lagged 4 quarters is significant at the 1% level, with the largest t value equal to 4.18. This suggests a greater likelihood of a positive relationship between the Value Traded/Market Cap over the last year and the present personal savings rate. Compared to the base regression, the explanatory power of the equation, the adjusted $R^2$, increases from 0.967 to 0.973 (4 quarters lags) by adding the Value Trade/Market Cap indicator. The improvement of the prediction power of the regression implies that the Value Traded/Market Cap indicator, a form of stock market measurement, is useful at explaining the variation in the personal savings rate.

A similar conclusion may be reached when running the base regression. We find that after adding all three stock market development measures, elderly age dependency ratio, and government budget balances are negatively related to the personal savings rate, and all of their coefficient estimates are significant at the 1% level. Personal disposable income is positively related to the personal savings rate and its estimated coefficient is significant at the 1% level. Other explanatory variables such as the real interest rate, the current account balance, the real gross domestic product growth rate and public pension plans are not significant, and thus we reject the relationship between them and the personal savings rate.

According to the above results, all of the three measures of stock market development are positively, rather than negatively, related to personal savings rate. Although we observed a negative co-movement between personal savings rate and stock market development in Canada during the past twenty years, the empirical results do not

support our initial hypothesis that stock market development is responsible for the declining personal savings rate. Indicators that may account for the declining personal savings rate are the elderly age dependency ratio (DR) and the government budget balance (BB).

## 4.2 The causality between the personal savings rates and stock market development

From the results of the last section, we know that stock market development as represented by three key measures does have positive relationship with the personal savings rate. Table 4 presents the results of testing the causality between stock market development and the personal savings rate.

**Table 4**
**Causality between stock market development and the savings rates**

| Pairwise Granger Causality Tests /Personal Savings rate / Lags: 4[6] | | | |
|---|---|---|---|
| Null Hypothesis: | Obs | F-Statistic | Probability |
| MC_GDP does not Granger cause PSR | 81 | 0.67032 | 0.61469 |
| PSR does not Granger cause MC_GDP | | 3.19873 | 0.01782 |
| VT_GDP does not Granger cause PSR | 81 | 0.70173 | 0.59331 |
| PSR does not Granger cause VT_GDP | | 2.60984 | 0.04247 |
| VT_MC does not Granger cause PSR | 81 | 0.59522 | 0.66723 |
| PSR does not Granger cause VT_MC | | 2.17213 | 0.08070 |

Using the personal savings rate as the measure of savings rates, the results show that causality runs from the personal savings rate to stock market development for all

[6] This Granger causality test chose lags equal to 4 because according to Table 3, all three stock market development measures estimates are at their most significant level when lagged 4 quarters.

three stock market development measures, at the 1%, 5%, and 10% levels respectively. The three stock market measures, Market Cap/GDP, Value Traded/GDP and Value Traded/Market Cap, however, do not Granger cause personal savings rates. Considering the positive relationship established by the results from Table 3, this implies that increasing the personal savings rate facilitates the development of the stock market, while decreasing the personal savings rate hampers development of the stock market, but not the reverse.

In summary, the only evident causality relationship shows that the personal savings rate leads to stock market development. Theoretically, the stock market is supposed to have several channels through which it operates on savings rates; however this causality relationship, along with the positive relationship, is consistent with the theoretical hypothesis advanced in the introduction, namely that personal savings rate positively cause stock market development.

The disadvantage of the Granger test is that it can be applied only to pairs of variables. Hence, it may produce misleading results when the true relationship involves three or more variables. For example, in the case where both of the variables being tested are "caused" by a third variable such as personal disposable income, they may have no true relationship with each other.

In general, this paper illustrates a map of the relationship and causality direction between stock market development and savings rates in Canada, while keeping the econometric technique as simple and as relevant as possible.

# 5. Conclusion

This paper examines the empirical relationship between the personal savings rate and three measures of stock market development in Canada, using data from the 1986Q1-2006Q4 period, to reveal a positive, yet somewhat weak, link between the personal savings rate and stock market size and liquidity. The estimates indicate that the relative impact of stock market development on the personal savings rate is less than that of other economic indicators such as the dependency ratio, the government's budget balance and personal disposable income. Results also show that the effect of the stock market on the personal savings rate is not immediate. Stock market development measured by size has the most impact on savings when lagged 4 or 5 quarters. Stock market development measured by liquidity is most significant at the 1 % level when lagged 4 quarters. The turnover ratio of the stock market also suggests a significant impact on the personal savings rate when the stock market measure was lagged 4 quarters. In summary, stock market development does have a positive relationship with the personal savings rate in Canada, but the immediate development of the stock market has less of an impact than development 4 quarters earlier. This paper, however, finds no evidence for the initial hypothesis that the development of the stock market causes changes in the personal savings rate. On the contrary, it concludes that the personal savings rate causes stock market development, implying that households provide the necessary funds for the development of the stock market at the micro level, and economic growth leads stock market development at the macro level.

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## *Table 1 Description of the data*

| Variables | Define | Source(CANSIM) |
|---|---|---|
| psr | National accounts personal saving as percentage of personal disposable income. Seasonally adjusted at annual rates | Table 380-0004 |
| nsr | National saving as percentage of national income. Seasonally adjusted at annual rates | Table 380-0060 |
| mc_gdp | Toronto Stock Exchange ,Stock market capitalization / Gross Domestic Product | Table 377-0003 ; 379-0018 |
| vt_gdp | Toronto Stock Exchange, value of shares traded/ Gross Domestic Product | Table 176-0046; 379-0018 |
| vt_mc | Value of shares traded / stock market capitalization | Table 176-0046; 377-0003 |
| dr | Dependency ratio=Population of age over 65 divided by population of other ages | Table 051-0001 |
| rir | Real interest rate=Chartered bank administered interest rates – inflation rate | Table 176-0043 |
| bb_gdp | All-government fiscal balances to nominal GDP | Table 183-0009—183-0013; 379-0018 V3723404; V3723416 |
| cc_gdp | Monthly Seasonally adjusted Customer credit to GDP ratio. Quarterly data is summarized from monthly data. | Table 176-0027; 379-0018 |
| cab_gdp | Balance of international payments, Current Account Balance to GDP ratio. | Table 376-0003; 379-0018 |
| pdi_gdp | Personal Disposable Income to GDP ratio | Table 384-0013; 379-0018 |
| rgdpgr | Real GDP growth rate=GDP growth rate-inflation rate | D14816 or D14840 |
| ppbrr | public pension benefit replacement rate defined as: ((old_age_security + can_pension + que_pension)/population65-99)/((pdi-(old_age_security + can_pension + que_pension))/population15-64). old_age_security = old age security fund payments | Table 051-0001; 380-0007 |

# Table 2 [a]
# Stationarity tests

## Sample: 1986Q1-2006Q4 (84 observations)

| *Test in the absence of drift* [b] | | | |
|---|---|---|---|
| **Variables** | **ADF:** t-Statistic [c] | **Variables** | **ADF:** t-Statistic |
| **Δpsr** | -9.01*** | **Δ² psr** | -10.54*** |
| **Δrir** | -11.04*** | **Δ² rir** | -9.42 *** |
| **Δdr** | -3.82** | **Δ² dr** | -81.29*** |
| **Δbb_gdp** | -11.83*** | **Δ² bb_gdp** | -7.69*** |
| **Δcc_gdp** | -3.86*** | **Δ² cc_gdp** | -9.54*** |
| **Δcab_gdp** | -4.20*** | **Δ² cab_gdp** | -18.28*** |
| **Δpdi_gdp** | -7.66*** | **Δ² pdi_gdp** | -11.92*** |
| **Δrgdpgr** | -11.56*** | **Δ² rgdpgr** | -7.98*** |
| **Δppbrr** | -8.76*** | **Δ² ppbrr** | -11.04*** |
| **Δmc_gdp** | -8.40*** | **Δ² mc_gdp** | -10.28*** |
| **Δ mc_gdp(-1)** | -8.49*** | **Δ² mc_gdp(-1)** | -10.19*** |
| **Δ mc_gdp(-2)** | -8.37*** | **Δ² mc_gdp(-2)** | -10.08*** |
| **Δ mc_gdp(-3)** | -8.20*** | **Δ² mc_gdp(-3)** | -10.24*** |
| **Δ mc_gdp(-4)** | -8.22*** | **Δ² mc_gdp(-4)** | -8.22*** |
| **Δ vt_gdp** | -13.46*** | **Δ² vt_gdp** | -8.20*** |
| **Δ vt_gdp(-1)** | -13.37*** | **Δ² vt_gdp(-1)** | -8.14*** |
| **Δ vt_gdp(-2)** | -13.29*** | **Δ² vt_gdp(-2)** | -8.08*** |
| **Δ vt_gdp(-3)** | -13.19*** | **Δ² vt_gdp(-3)** | -9.51*** |
| **Δ vt_gdp(-4)** | -13.14*** | **Δ² vt_gdp(-4)** | -9.45*** |
| **Δ vt_gdp(-5)** | -13.06*** | **Δ² vt_gdp(-5)** | -9.38*** |
| **Δvt_mc** | -14.44*** | **Δ² vt_mc** | -8.69*** |
| **Δvt_mc(-1)** | -14.35*** | **Δ² vt_mc(-1)** | -8.64*** |
| **Δ vt_mc(-2)** | -14.26*** | **Δ² vt_mc(-2)** | -8.56*** |
| **Δ vt_mc(-3)** | -14.17*** | **Δ² vt_mc(-3)** | -8.50*** |
| **Δvt_mc(-4)** | -14.09*** | **Δ² vt_mc(-4)** | -8.43*** |
| **Δvt_mc(-5)** | -14.00*** | **Δ² vt_mc(-5)** | -8.37*** |

a. *,**,and *** denote significance at the 10%, 5% and 1% levels, respectively. 0, (-1), (-2), (-3), (-4), (-5) means no lagged, 1 quarter, 2 quarter, 3 quarter, 4 quarter, 5 quarter lagged of stock market measures respectively from Table 2 to Table 4.

b. In the presence of drift they include a constant term as well as a linear time trend.

c. The ADF t-statistics test the null hypothesis of nonstationarity (i.e., H0: y is I(p)) against the alternative hypothesis of stationarity (i.e., H1: y is I(0)). Critical values are obtained from Davidson and MacKinnon (1993, Table 20.1)

**Table 3**

**OLS Regression for Personal Saving Rates against Stock Market Development Measures and Standard Explanatory Variables**

| Independent Variables | | | C | RIR | DR | BB_GDP | CC_GDP | CAB_GDP | PDI_GDP | RGDPGR | PPBRR | Stock Market Measures | Adj.$R^2$ | ADF t-statistics [b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stock Market Measures | Market Cap/GDP | 0 | 0.414*** | 0.017 | -3.219*** | -0.770*** | -0.218*** | 0.240* | 0.569*** | 0.001 | -0.380*** | 0.009** | .0984 | -15.99*** |
| | | | (12.475)[a] | (0.383) | (-7.474) | (-4.171) | (-9.714) | (1.303) | (13.636) | -0.004 | (-7.877) | (2.044) | | |
| | | (-1) | 0.416*** | 0.016 | -3.381*** | -0.702*** | -0.214*** | 0.202 | 0.591*** | 0.092 | -0.372*** | 0.008** | 0.984 | -16.02*** |
| | | | (12.777) | (0.361) | (-7.883) | (-3.723) | (-9.974) | (1.116) | (13.948) | (0.635) | (-7.885) | (1.870) | | |
| | | (-2) | 0.412*** | 0.013 | -3.488*** | -0.727*** | -0.217*** | 0.182 | 0.612*** | 0.160 | -0.369*** | 0.012*** | 0.985 | -9.60*** |
| | | | (12.930) | (0.302) | (-8.381) | (-3.936) | (-10.578) | (1.042) | (14.619) | (1.144) | (-8.119) | (2.691) | | |
| | | (-3) | 0.423*** | 0.020 | -3.641*** | -0.649*** | -0.209*** | 0.212 | 0.617*** | 0.201* | -0.358*** | 0.010** | 0.985 | -10.15*** |
| | | | (12.304) | (0.440) | (-8.224) | (-3.550) | (-10.043) | (1.194) | (13.945) | (1.393) | (-7.703) | (2.246) | | |
| | | (-4) | 0.435*** | 0.020 | -3.901*** | -0.661*** | -0.203*** | 0.270* | 0.633*** | 0.266** | -0.343*** | 0.012*** | 0.985 | -15.49*** |
| | | | (11.508) | (0.431) | (-8.220) | (-3.637) | (-9.680) | (1.530) | (13.841) | (1.743) | (-7.353) | (2.685) | | |
| | Value Traded/GDP | 0 | 0.424*** | 0.032 | -3.385*** | -0.741*** | -0.195*** | 0.196 | 0.559*** | 0.055 | -0.348*** | 0.013** | 0.986 | -9.92*** |
| | | | (12.407) | (0.712) | (-7.493) | (-4.038) | (-8.930) | (1.050) | (13.583) | (0.382) | (-6.995) | (1.915) | | |
| | | (-1) | 0.424*** | 0.026 | -3.527*** | -0.694*** | -0.194*** | 0.147 | 0.580*** | 0.126 | -0.341*** | 0.015** | 0.984 | -15.63*** |
| | | | (12.960) | (0.608) | (-8.072) | (-3.756) | (-9.058) | (0.802) | (13.969) | (0.903) | (-7.050) | (2.197) | | |
| | | (-2) | 0.408*** | 0.042 | -3.398*** | -0.601*** | -0.202*** | 0.171 | 0.596*** | 0.203* | -0.356*** | 0.006 | 0.984 | -9.93*** |
| | | | (12.105) | (0.955) | (-7.657) | (-3.238) | (-9.302) | (0.870) | (13.790) | (1.402) | (-7.281) | (0.881) | | |
| | | (-3) | 0.419*** | 0.040 | -3.567*** | -0.604*** | -0.196*** | 0.148 | 0.598*** | 0.223* | -0.343*** | 0.012** | 0.984 | -9.84*** |
| | | | (12.086) | (0.896) | (-8.006) | (-3.298) | (-9.057) | (0.794) | (13.794) | (1.515) | (-7.082) | (-1.801) | | |
| | | (-4) | 0.434*** | 0.050 | -3.931*** | -0.580*** | -0.184*** | 0.155 | 0.618*** | 0.311** | -0.315*** | 0.021*** | 0.985 | -7.61*** |
| | | | (11.686) | (1.084) | (-8.446) | (-3.266) | (-8.458) | (0.878) | (14.269) | (2.020) | (-6.512) | (2.996) | | |
| | | (-5) | 0.409*** | 0.061 | -3.550*** | -0.627*** | -0.197*** | 0.227 | 0.604*** | 0.246* | -0.336*** | 0.011* | 0.983 | -10.12*** |
| | | | (10.567) | (1.235) | (-7.733) | (-3.248) | (-8.812) | (1.239) | (13.338) | (1.529) | (-6.674) | (1.627) | | |
| | Value Traded/Market Cap | 0 | 0.426*** | 0.038 | -3.442*** | -0.731*** | -0.192*** | 0.197 | 0.562*** | 0.079 | -0.348*** | 0.022* | 0.984 | -9.96*** |
| | | | (12.106) | (0.864) | (-7.220) | (-3.962) | (-8.403) | (1.0461) | (13.461) | (0.557) | (-6.857) | (1.625) | | |
| | | (-1) | 0.427*** | 0.033 | -3.582*** | -0.685*** | -0.191*** | 0.158 | 0.584*** | 0.146 | -0.342*** | 0.026** | 0.984 | -15.56*** |
| | | | (12.760) | (0.762) | (-7.899) | (-3.680) | (-8.647) | (0.852) | (13.945) | (1.046) | (-6.983) | (1.935) | | |
| | | (-2) | 0.404*** | 0.047 | -3.334*** | -0.592*** | -0.205*** | 0.217 | 0.596*** | 0.210* | -0.363*** | 0.004 | 0.984 | -14.88*** |
| | | | (11.814) | (1.056) | (-7.315) | (-3.175) | (-9.223) | (1.080) | (13.696) | (1.445) | (-7.388) | (0.266) | | |
| | | (-3) | 0.418*** | 0.043 | -3.537*** | -0.596*** | -0.197*** | 0.165 | 0.599*** | 0.219* | -0.350*** | 0.017* | 0.984 | -9.89*** |
| | | | (11.864) | (0.953) | (-7.732) | (-3.224) | (-8.941) | (0.871) | (13.6) | (1.468) | (-7.156) | (1.331) | | |
| | | (-4) | 0.437*** | 0.052 | -3.952*** | -0.557*** | -0.184*** | 0.151 | 0.621*** | 0.298** | -0.320*** | 0.034*** | 0.985 | -7.61*** |
| | | | (11.442) | (1.114) | (-8.085) | (-3.084) | (-8.207) | (0.838) | (13.919) | (1.901) | (-6.474) | (2.579) | | |
| | | (-5) | 0.409*** | 0.059 | -3.514*** | -0.614*** | -0.198*** | 0.225 | 0.603*** | 0.227* | -0.343*** | 0.016 | 0.983 | -10.04*** |
| | | | (10.474) | (1.159) | (-7.531) | (-3.141) | (-8.775) | (1.220) | (13.154) | (1.401) | (-6.738) | (1.190) | | |

**a.** t-statistics reported in parentheses.

**b.** The ADF statistics test the null hypothesis of non-cointegration (i.e., H0: y is II(2) against the alternative hypothesis of stationarity (i.e., H1: y is I(0)). Critical values for ADF t-statistics are obtained from MacKinnon (1991, Table 1)