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Finance, Financial Services, and Economics Growth

How Does the Size of the Financial Sector and Different Types of Financial Services
Impact Economic Growth?

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While writing this thesis, I have not witnessed any wrongdoing, nor have I personally violated any conditions of the Skidmore College Honor Code.

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Introduction:

This paper studies the relationship between finance, financial services, and economic growth. More particularly, this study attempts to answer the following two questions: What is the relationship between the size of the financial sector and economic growth? And how do different types of financial services impact economic growth? Understanding the dynamics between the financial sector and economic growth is extremely important from an intellectual as well as practical perspective. Intellectually speaking, it is safe to say that finance as a sector and financial services in general do not have a very good reputation in popular culture, especially in the post 2008 world. Hence, understanding the how finance impact economic growth will put the public opinion of finance to test. Practically speaking, understanding the relationship between finance and growth is extremely important from a public policy and regulatory perspective since finance has proven itself to be impactful and relevant after it sent the global economy into a the deepest recession in a century. If policy makers have insights on the relationship between finance and social wellbeing, they will be able to assess whether (1) this relationship is linearly positive or whether it diminishes at some point. If finance impacts society positively up to a point, policy makers will be able to create regulation that disincentives the size of the financial sector to grow beyond healthy levels. At the same time, if policy makers had insight on (B) which financial activities/services are more harmful to social welling than others, then they will be able to create an incentive system or a legal framework that encourages certain type of activities while limiting others.

While little research has been done on how different types of financial services impact economic growth, a substantial body of academic research has empirically investigated the relationship between the size of the financial sector and economic growth. Most financial economists that investigated the relationship between the size of the financial sector and economic growth concluded that there is a perfectly linear positive relationship between the size of the financial sector and economic growth [Goldsmith (1970), Levin (1994), Zervos (2000)]. However, the existing literature on the relationship between the finance and growth suffers from two major issues. First, most studies use (and therefore assume) a perfectly linear population regression function. Second, all of these studies address “finance” as a homogeneous entity both in type and in impact.

The purpose of this paper is to: (1) examine the relationship between the size of the financial sector and economic growth. And (2) to investigate how different types of the financial services impact economic growth.

This paper builds on the existing literature in two ways: first, it examines the relationship between the size of the financial sector and economic growth using a polynomial population regression function rather than the commonly-used perfectly-linear model. Second, instead of looking at “finance” as a homogeneous entity both in type and in impact, this paper examines how different types financial services impact GDP growth by particularly looking at four different types of financial services: equity market, bond market, banking sector, and financial insurance (derivatives).

Based on panel data from 70 developed and developing countries between 1970 and 2006, this paper concludes two major findings: First, the relationship between the size of the financial sector and economic growth is not perfectly linear but rather it has

diminishing marginal returns on economic growth. Second, this paper concludes that the well-being of the banking and equity sectors are most contributive to economic growth, while the bond market and the financial insurance market (derivatives) contributes the least to economic growth.

The Analytical Framework:

The question of economic growth has puzzled economists since Adam Smith. Given its significant political and social consequences, economists and policy makers have always been keen to know the drivers of economic growth. One of the most predominant macroeconomic growth models is the Solow- Swan Growth model, developed independently by Robert Solow and Trevor Swan in 1956. The Solow growth model is a neoclassical exogenous growth model that explains long-run economic growth as a function of capital accumulation, labor, and technological innovations. This neoclassical model is built on a microeconomics foundation. The key microeconomics assumption of the Solow macroeconomics growth model is that there is diminishing marginal returns to physical capital, that is given a fixed stock of labor and no technological innovation, the impact of accumulating one more unit of physical capital will always be less than the impact of the one before. Hence, in an economy with no labor force growth or technological innovations, the rate of growth will slow in the short run because of the diminishing marginal return of physical capital, and in the long the economy will cease to grow. If the stock of labor was not fixed, output will grow in the short run and then starts to diminish until the economy converges to a “steady-state” where the rate of growth is constant and the rate of economic growth per capita is zero. In other words, for an economy to grow, technological innovation needs to grow at the same rate or faster than the rate of growth in

the stock of labor; that is for an economy to grow, the rate of productivity growth per capita must increase. Hence, the standard Solow model predicts that the only way for an economy to grow in the long run is through technological progress. Mathematically, the Solow-Swan Growth Model takes the following form:

$$Y(t) = K(t)^\alpha [A(t)L(t)]^{1-\alpha}$$

where total output, $Y(t)$, is a function of: capital (K) and labor (L)¹. In the equation above, A represents the productivity of effective labor.

Graph (1) illustrates the Solow Growth, where the red line y reflects total output that is increasing at a decreasing rate because of the diminishing rate of return on capital. The perfectly linear yellow line k represents the capital necessary to break-even during production. The line is perfectly linear because of capital depreciation rate that requires producers to replace their capital. The green line i_t represents the investments available in an economy per effective worker, which is the amount of money saved or left over after consumption. The available investments per-effective-worker and the investments necessary to break-even intersects at k^* , the steady state level of capital stock at which investments and depreciations offset each other.

One of the key features or implications of the standard Solow growth model is convergence theory. Since the determinant of economic growth is technological progress,

¹ By labor, the Solow-Swan growth model does not refer to population in general, but rather to “effective labor”, that is labor that is actually willing and able to participate in the production process. Hence the coefficient A in the mathematical model refers to labor-augmenting technology or “knowledge”; and accordingly, AL represents effective labor.

not the initial level of capital, all countries will grow until they reach the steady state where economic growth becomes a function of technological innovation rather than the stock of capital or labor. According to the Solow growth model, capital and investments will flow into countries with higher productivity; that is, countries that have higher marginal product of capital where capital per worker K/L is maximized. This influx of capital to countries with higher productivity, leads to what economists refer to as “the convergence effect”, where developing countries with lower per capita income grow at a faster rate than developed countries because developed economies will eventually experience diminishing returns on capital, leading capital and investments to flow into countries that have higher returns on investments as a function of higher marginal product of capital before reaching the steady state.

Although Solow’s theory of growth and convergence makes theoretical sense, it might face some practical obstacles. For capital and investments to flow smoothly and efficiently into an economy that has higher marginal return on physical capital, a functioning financial system is crucial for an efficient allocation of resources. The purpose of this paper is to empirically examine the impact of finance on growth in the context of Solow’s growth theory. More particularly, the purpose of this paper is (1) to investigate whether finance in general, just like capital, experiences diminishing marginal returns at its later stages of development, and (2) to investigate which financial service contributes the most to economic growth.

Literature Review:

This paper studies the relationship between finance, financial services, and economic growth. More particularly, this study has two main objectives. First, to examine the nature of the relationship between the size of the financial sector and economic growth: whether it is perfectly linear with a constant slope, or whether the nature of the relationship experiences different modes at different levels of financial developments. Mathematically speaking, the first objective of this paper is to examine whether the relationship between the size of the financial sector and economic growth has a constant slope, or whether the slope and sign of the relationship change based on the level of the dependent variable, which is the size of the financial sector. The second objective of this paper is to investigate how different types of financial services impact economic growth.

While little research has been done on how different types of financial services impact economic growth, a substantial body of academic research has empirically investigated the relationship between the size of the financial sector and economic growth using a variety of econometric approaches ranging from cross-country studies, to panel data, and pure time-series investigations. Nobel laureate in economics science Merton Miller remarked once that the question whether “financial markets contribute to economic growth is a proposition too obvious for serious discussion” [Miller (1998)]. With the exception of some heterodox economists such as Robert Lucas and Joan Robinson and other “Post-2008” critics, the vast majority of economic literature agrees with Merton Miller. What follows is a comprehensive analysis of mainstream economic literature that, generally speaking, concluded a perfectly linear positive relationship between the size of the financial sector and economic growth, in addition to an assessment of economic studies

that tend to be critical of the impact that finance can potentially have on financial stability and therefore economic growth.

Theoretically speaking, mainstream economists believe that finance positively impacts economic growth because of the efficiencies that a large financial sector brings to an economy, not because of the amount of financial capital that a country's financial systems accumulates [Jorgenson (1995, 2005)]. In other words, the services that the financial industry provides lead to a more efficient allocation of resources that will ultimately pave the path to a faster rate of economic growth. The primary role of finance is the allocation of resources, particularly capital, across time and space, and the redistribution of risk among investors. This allocation of financial capital across time and space and the redistribution of risk among investors takes place through the provision of the following services: pooling savings and allocating it into various forms of (hopefully) productive enterprises [Merton and Bodie (1995,)], reducing the cost of acquiring information about potential investment opportunities [Boyd and Prescott (1986)], improving the efficiency and transparency of overall production activities by constraining firms' access to capital to the quality of corporate governance that is being monitored before and after providing financing [Bencivenga and Smith (1993)], and expanding the amount of capital available for investments since investors feel more comfortable investing in liquid secondary markets where financial intermediaries facilitate trading, diversification and management of risk by providing market-making operations [Grossman and Stiglitz (1980)].

Although this theoretical role that the financial sector plays in an economy dates all the way back to Joseph Schumpeter (1912), the first empirical examination of the impact of

the financial sector on economic growth was conducted as late as 1969 by Goldsmith. He compiled data on 35 countries from 1860 to 1963 to study the relationship between the size of the financial sector and economic growth. To measure the size of the financial sector, Goldsmith used the value of financial intermediaries' assets as a share of economic output. Goldsmith documented a perfectly linear positive correlation between the size of the financial sector, measured by value of financial intermediaries' assets as a share of GDP, and economic growth, measured by GDP [Goldsmith (1970)].

Goldsmith's findings results cannot be taken as conclusive evidence about the relationship between the size of the financial sector and economic growth for a variety of reasons. First, a correlation is by no mean a causal relationship. The fact that larger economies tended to have on average larger financial sector is by no means an indicator that larger financial sector leads to more economic growth. Second, although his sample size was sufficient, 35 countries, his results could have changed if he used a larger sample size. Third, the variable Goldsmith uses to measure financial development, the value of financial intermediary assets as a share of economic output, is not necessary an accurate measure of the financial system as a whole with all of its services, rather it simply reflects the size of financial intermediaries which is only one aspect of the financial sector. Most importantly, Goldsmith research was done in 1970, before the rise of what is often referred to as "financial capitalism." Since the 1970, finance has become a far more prominent element of the economy both in size and in the role that it plays. Since the 1970, the global economy has been going through a phase of financial development that has never been seen before: starting with the "merger mania" in the 1980 that was financed by "junk bonds", then the rise of the derivatives market in the 1990s that added another layer of

technical and financial sophistication to the system, and eventually the surge in consumer and household debt in the early 2000s in the form mortgages. It is fair and accurate to say that the financial system that exist in the world economy today is completely different from the one that Goldsmith studied in 1970. Hence, regardless of the theoretical limitations of Goldsmith's study that are discussed above, Goldsmith findings are simply not suited to answer the question of how the size of the financial sector impact economic growth today.

Even though Goldsmith's research does not fully answer the question of the impact of the size of the financial sector on economic growth, it did, however, open the door for more research to follow. Economists King and Levin followed through on Goldsmith research. Based on a sample size of 77 countries in total, King and Levin examined the relationship between the size of the financial sector and economic growth by using a different and more comprehensive measure of the size of the financial sector and by assessing the direction of the causality, that is to examine whether finance leads to economic growth or the other way around.

Instead of using the value of financial intermediaries' assets as a share of economic output as a measure of financial development, Levin and King used the amount of liquid liabilities in the financial system. Liquid liabilities is currency plus demand and interest-bearing liabilities of banks and nonbank financial intermediaries divided by GDP. King and Levin also looked at another measure of financial development: Privet domestic money Bank credit to GDP, the amount of credit in an economy that is provided by domestic privet sector banks. There are two rationales behind choosing privet domestic money bank credit to GDP as a measure of financial development. First, if financial services in an economy were provided by the government rather than the privet sector, then the true and actual

driver of growth is not the financial sector per se, but rather the government's policy. The second rationale is more theoretical. Most economists, including King and Levin, seem to assume that the private sector is always more efficient than the government because the pursuit of self-interest by two parties will yield an optimal outcome that will satisfy both; otherwise there will be no outcome or "equilibrium."

After using a more comprehensive measure of the size of the financial sector, controlling for the direction of the relationship, and based on a sample size of 77 countries between the time period 1960- 1989, Levin and King found a strong perfectly linear positive relationship between the size of the financial sector, measured by liquid liabilities and private credit to GDP, and economic growth [Levin and King (1992)]. King and Levin also concluded that the initial level of financial development in 1960 is a reliable indicator of future economic growth. Therefore, concluding that not only finance leads to growth, but also that a well-functioning financial sector is prerequisite to growth [Levin and King (1992)]. In other words, Levin and King's findings provide a more robust evidence to Goldsmith's findings of the perfectly linear positive relationship between the size of the financial sector and economic growth.

Although Levin and King's study is perhaps one of the most comprehensive and widely accepted studies on the relationship between the size of the financial sector and economic growth, the study can potentially be the subject of a major error. The results are based on a perfectly linear population regression function. Choosing a model that does not describe the empirical data accurately can lead to functional form specification error-making the model an inaccurate approximation of the data at hand. Researchers usually choose the form of their population regression form based on what they expect the

relationship to be. In Levin and King's case, given that they used perfectly linear population regression function, their findings are based on the assumption that the relationship between the size of the financial sector and economic growth is theoretically perfectly linear. Hence, the results may change if a different assumption about the relationship between the size of the financial sector and economic growth was made.

Instead of studying the relationship between the size of the financial sector and economic growth, other economists have looked at the relationship between one single financial service and economic growth. Levin and Zervos collaborated to study the impact of stock market development on economic growth between 1976 and 1993. From a theoretical perspective, a well-developed stock market can indicate a well-functioning financial sector because firms are able to raise capital by selling equities and investors are willing to invest more capital since they will be able to exist/sell their investment positions fairly easily in a well-functioning market.

Levin and Zervos use two variables to measure stock market development: stock market capitalization and stock market turnover ratio. Stock market capitalization is simply a measure of the size of the stock market, calculated by adding up the market capitalization of all listed firms on all stock-exchanges within an economy. While the turnover ratio, the total value of shares traded on a country's stock exchanges divided by stock market capitalization, is a measure of the liquidity of the stock market. Liquidity is a measure of how quickly can investors sell or buy a financial asset in a market at a relatively stable price. To study the relationship between stock market development and economic growth, Levin and Zervos ran a two-variables (stock market capitalization and stock market liquidity) regression based on a perfectly linear population regression function.

Levin and Zervos found no statistically significant relationship between stock market capitalization and economic growth [Levin and Zervos (1998)]. The lack of a statistically significant correlation between stock market capitalization and economic growth could be explained by a disconnect that sometimes occur between asset prices and the asset's intrinsic value. Simply listing a company on an exchange does not necessary mean that the company is involved in productive projects. Moreover, stock market capitalization, which is a US dollar value that is calculated by adding up the market capitalization of all publically traded companies, is subject to incorrect asset prices bias. The market capitalization of a firm is calculated by multiplying the number of outstanding shares by the share price. Stock prices can be a function of supply and demand, future expectation, fashionable investment, herd behavior, animal spirit, over-optimism...etc. In other words, stock prices are not always an accurate reflection of a company's productive capacity because there are many physiological and economic factors that are not directly related to the firm's productive capacity that effect stock pricing. This disconnect between the stock price and a company's intrinsic value is also true on the aggregate level, where stock market capitalization does not always accurately reflect the productive capacity of an economy because assets can be mispriced for a variety of reasons. Therefore, the statistically insignificant relationship between stock market capitalization and economic growth that Levin and Zervos documented in their paper is unsurprising.

However, Levin and Zervos did find a positive relationship between stock market liquidity and economic growth [Levin and Zervos (1998)]. Stock market liquidity might have contributed statistically significant results to economic growth because it is far more to the functionality and efficiency of finance in general than stock market capitalization.

Stock market liquidity is more important than stock market capitalization because liquidity will (1) serve as an incentive for banks to issue more securities since they will be able to syndicate these securities to outside investors easily in a liquid market, (2) incentivize investors to invest more capital in the market because they will know they will be able to exit their investment position quickly at a relatively stable price in a liquid market, and (3) leads to a more transparent exchange of information, which will eventually bring on more efficiencies to the economy as a whole. These three positive externalities and efficiencies that stock market liquidity brings to other aspects of the financial sector explains why stock market liquidity has a statistically significant contribution to growth.

However, Levin and Zervos study ignores the interconnectedness of global financial markets which is changing the nature of the assumed perfectly linear relationship between the development of the stock market and economic growth. Since global markets have - and continue to- become increasingly integrated across geographies, the physical location of the stock market may not necessarily matter for the provision of financing or liquidity. A corporation can be listed on the New York Stock Exchange, but the majority of its operations and production might be taking place in Nigeria, China, or Ireland, in which case the country hosting the operations of that corporations is benefiting from the liquidity of the New York Stock Exchange. While on the other hand, the United States economy may not economically benefit from the economic activities that are being financed using the United States' increasingly liquid stock market. In cases as such, and in times like today when the global economy is experiencing a new and advanced level of financial integration, it's becoming increasingly difficult to study how the well-being of a stock market in certain

country is impacting the GDP growth of that same country. Corporations will want to list their shares on a liquid exchange so they incentivize investors to buy their shares, which makes the already liquid stock market even more liquid. In this case, an increase in stock market liquidity may not be contributive to economic growth. Hence, the current state of global financial integration that attracts international corporations to list their shares in a liquid stock exchange that could be in a different economy challenges Levin and Zervos's conclusion of a perfectly linear positive relationship between stock market liquidity and economic growth.

Moreover – and more importantly- Levin and Zervos do not fully incorporate all the determinants of allocating an investment a certain economy or financial asset. The fact that Levin and Zervos have found statistically significant results that suggest a perfectly linear positive relationship between stock market liquidity and economic growth does not necessary mean that more liquidity will always lead to more economic growth. Surely, initial levels of stock market liquidity are necessary for signaling to investors their ability to enter and exit an investment quickly at a relatively stable price, but that does not necessary mean that investors will always respond to more liquidity with an influx of capital. While investment decisions are slightly driven by holding period risk (which is a risk that is eliminated in initial levels liquidity), investment decisions are mainly driven by potential higher returns. An investor will not buy a stock simply because they can sell it quickly at a stable price, investors buy stocks and other financial instruments in pursuit of future profits. Hence, stock market liquidity might contribute to economic growth until the holding period risk is eliminated by providing initially sufficient levels of liquidity. Levin

and Zervos's perfectly linear model does not seem to account for the fact that investment decisions are driven by more than holding period risk.

Finally, Levin and Zervos's model confuses high levels of stock market liquidity as gesture of a healthy equity market. Using turnover as measure of liquidity can be problematic, because higher volumes of trading might be driven by volatility or speculation, not the expectations of future growth. Volatile markets artificially raise the turnover ratio because large volumes of stock trading are occurring within a short period of time where investors are risking and de-risking based on large magnitude events (think about the two days following the 2016 Presidential Elections in the United States when the S&P 500 went down and up by 400bp in each direction with the span of 72 hours. Large magnitude events occur far more frequently in developing economies than in developed ones, which gives these under-developed equity market a false sense of liquidity). Speculative activities can also artificially raise the turnover ratio; giving the market a false sense of healthy liquidity. According to Levin and Zervos, liquidity occurs when investors are buying and selling financial assets based on forecasted dividend payout and preferable risk tolerance. However, Levin and Zervos do not address the impact that speculation can have on artificially increasing stock market liquidity. As the stock market develops and more capital enters the market, "speculators" start buying and selling stocks in anticipation of future demand for stocks; based on their perception of how other investors' perceptions of certain stocks will change stock prices in the future (The vast majority of stocks trading before the Dodd-Frank Act called for the implementation of the Volcker rule, which restricted US banks from proprietary trading, was trading done by banks in anticipation of future demand rather than trading to take on a principle investment). This form of

speculative trading that is based on anticipation of future demand for stocks increases the trading volume substantially and it separates asset prices from the performance of the underlying business and attaches it to merely a perception of future asset prices. Given that Levin and Zervos used a perfectly linear form for their model, they seem to disregard the impact that speculation and volatility can potentially have on artificially increasing trading volumes and therefore liquidity. When liquidity is no longer a function of investors' vibrant interest in holding principle investments in productive enterprises, it is rather illogical to assume a perfectly linear relationship between stock market liquidity and economic growth as Levin and Zervos did.

Given that Levin and Zervas's findings on the relationship between stock market liquidity and economic growth (1) ignores the interconnectedness of global financial markets that is making it difficult to link the impact of the level of stock market liquidity to only one economy, (2) does not seem to account for the fact that investment decisions are driven by more than holding period risk, and (3) does not take into consideration the fact that high levels of liquidity are sometimes a function of volatility and speculation rather than capital invested in productive enterprises, it becomes difficult to accept their conclusion that the relationship between the stock market liquidity and economic growth is perfectly linear.

The majority of the existing literature on the relationship between finance, financial services, and economic growth suffer from three major issues. Firstly, most studies that look at the relationship between the size of the financial sector and economic growth use (and therefore assume) a perfectly linear population regression function. This assumption of perfect linearity can lead to misspecification error that is extremely difficult to detect

even in the presence of high R-square. More importantly, using a perfectly linear population regression function can underrepresent and suppress some of the data at hand, which have serious implication on the accuracy of forecasted relationships. Secondly, the majority of the existing literature that study the impact financial services have on economic growth address “finance” as a homogeneous entity both in type and in impact, but the financial sector includes a wide variety of financial services that have different functions; and therefore potential different impact on economic growth. Thirdly, there is stunningly very little literature on the relationship between financial services, other than the stock market, such as high-yield bond market, derivatives, insurance, banking sector...etc. and economic growth. The research that has differentiated between the impact that finance, as a sector, has on economic growth, and the impact different types of financial services have on economic growth look at the particular impact of one single financial service, such as the stock market, on economic growth. There has never been research done that looked at how different types of financial services impact economic growth differently using the same non-perfectly linear population regression function. Neither have there been any research done that used the same dataset to investigate any non-linear relationship between the size of the financial sector and economic growth in addition to investigating how different types of financial services impact economic growth differently while allowing for non-linear relationships to be represented in the model; this, shall be the task of this paper.

Methodology:

To investigate (1) the relationship between the size of the financial sector and economic growth, and (2) how different types of financial services impact economic growth, three quadratic polynomial population regression functions were constructed

based on panel data. The first population regression function examines the relationship between the size of the financial sector and economic growth. The second population regression function investigates how different types of financial services impact economic growth. The third population regression function investigates the relationship between one financial service and economic growth. The financial service that is examined in the third population regression function was excluded from the second population regression function because of data availability limitations that would have led to biased results. This limitation will be further discussed later in the section and in the limitations section. All three of these population regression functions use a quadratic polynomial form that allows for the representation of a variety of different possible relationships at different levels of the development of the dependent variables.

The objective of the first population regression function is to explore whether the relationship between the size of the financial sector and economic growth would change in sign and slope from the relationship documented by Goldsmith and Levin & King if a different form of population regression function was used than the perfectly linear one that is used by mainstream financial economists. In other words, the purpose of this population regression function is to explore whether there the size of the financial sector has: (a) a linear positive relationship with economic growth like Goldsmith, King, and Levin suggest, (b) that the size of the financial sector has diminishing marginal returns on economic growth just like capital does in the Solow-Swan growth model; meaning, whether the relationship between the size of the financial sector and economic growth keep its sign (positive in this case) as the size of the financial sector changes but the slope of the relationship starts to diminishes at some point, (c) or whether the impact the size of the

financial sector has on economic growth changes both in sign and slop as the level of the size of the financial sector changes.

Since the objective of this population regression function is to examine how the rate of change in the size of the financial sector impacts the rate of change in economic growth (meaning: whether both rates of growth increase at a constant rate, a changing rate only in terms of the slop, or a changing rate both in terms of the slop and the sign of the relationship), the dependent variable is the Log of GDP, since this research project is not interested in changes in absolute value of GDP, which can be impacted by many other macroeconomic factors, rather this research project is interested in changes in the rate of economic growth in relation to changes in the rate of change of the size of the financial market.

Since the objective of this model is to explore whether Goldsmith, Levin, and King's findings about the relationship between the size of the financial sector and economic growth would change if a non-perfectly linear population regression function was used, this paper uses the same variable that Levin and King used in their research to measure the size of the financial sector: liquid liabilities, in order to avoid any variable selection bias. Also known as broad money, or M3, liquid liabilities are the sum of currency and deposits in the central bank (M0), plus transferable deposits and electronic currency= (M1), plus time and savings deposits, foreign currency transferable deposits, certificates of deposit, and securities repurchase agreements (M2), plus travelers' checks, foreign currency time deposits, commercial paper, and shares of mutual funds or market funds held by residents. Therefore, the first population regression function takes the following form:

$$\text{LogGDP} = \beta + \beta_1 LL + \beta_2 LL^2 + \varepsilon_i$$

Where LogGDP is the rate of GDP growth, LL equals liquid liabilities.

The majority of economic literature that examined the relationship between the size of the financial sector and economic growth is in line with Goldsmith's theory that finance, in addition to being a prerequisite to economic growth, always feeds economic growth; meaning there is a positive relationship between the size of the financial sector and economic growth (Goldsmith 1970). This perfectly linear positive relationship was documented in work by Levin and King (1993). However, Levin and King's work was done almost three decades ago in 1993, and it looked at the time period 1960-1989. Although this time period does not look very far gone, the financial system that exist today is radically different from the one before 1990, before the rise of the derivatives market and other sophisticated financial instruments, and before the wave of the financial government deregulation that took place in the 1990s that reshaped the role and perhaps the impact of finance on the economy. In addition, the time frame that Levin and King looked was before the household debt and mortgage-issuance-rate started to boom. Hence, from a strictly data perspective, the relationship between the size of the financial sector and economic growth today might be different from the one studied by Levin and King. However, not only that this paper reexamines Levin and King's findings by looking at a different timeframe, but it also uses a polynomial population regression function, hypothesizing that finance, measured by the size of liquid liabilities, experiences diminishing marginal rate of return to economic growth that might not have been appeared in Levin and King's results. Furthermore, this model assumes that there comes a point where not only that the size of the financial sector begins to experience diminishing marginal returns to economic growth,

but it also reaches a peak-point where the rate of return to economic growth thereafter become negative; harmful.

This polynomial relationship might not have appeared in Levin and King's results because of specification error as a consequence of using perfectly linear model. (an in-depth discussion of theoretical explanations behind the relationship between the size of the financial sector and economic growth is presented in the discussion section).

The objective of the second population regression model is to go beyond the rather simplistic view of mainstream financial economists who look at finance as a homogenous unit both in type and in impact. This limited view of finance underestimates the potential variation in impact on economic growth done by different types of financial services, and it overestimates how informative a static about the impact of the size of the financial sector as a whole on economic growth can be. This paper acknowledges that, within the financial sector, there are different financial services that serve completely different functions and different client class. These financial services can be broken down to four major categories: financing through equities, financing through credits (debt securities where investors carry the risk), financing through banking (where the bank is the main carrier for the risk, at least at the time of the issuance), and financial insurance, also known as derivatives, which enables investors to hedge their risk by entering a variety of bilateral contracts on the likelihood of an event occurring. These four general and comprehensive categories of finance reflect the financial development and sophistication of an economy. To measure these four categories, this paper uses the following five variables:

- Banking Sector: Private credit by deposit money banks to GDP (%): The financial resources provided to the private sector by domestic money.
 - Bond Market: Outstanding domestic private debt securities to GDP (%): Total amount of domestic private debt securities (amount outstanding) issued in domestic markets as a share of GDP. It covers data on long-term bonds and notes, commercial paper and other short-term notes. This is a measure of total amount of outstanding credit
 - Bond Market: Corporate bond issuance volume to GDP (%): Ratio of new corporate bond issuance volume by private entities in industries other than finance, holding companies and insurance to GDP. This is a measure of both the efficiency and access to credit capital markets.
 - Equity Market: Stock market turnover ratio (%): Total value of shares traded during the period divided by the average market capitalization for the period. This is a measure of stock market liquidity, which can indicate the efficiency and development of the equities market. Levin and Zervos used the same variable in their paper which also concluded a perfectly linear positive relationship between stock market liquidity and economic growth.
 - Financial Insurance (Derivatives): Over-the-counter (OTC) derivatives turnover ratio: Total value of contracts traded during the period divided by the average market capitalization for the period. This is a measure of the size and efficiency of the financial insurance services, also known as derivatives. ²
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The following quadratic polynomial population regression function was constructed to study how these four types of financial services (excluding derivatives) impacted economic growth based on a panel data from 1970 to 2006 and a sample size of 70 developed and developing countries country³ :

$$\log GDP = \beta + \beta_3 PCB + \beta_4 PCB^2 + \beta_5 ODD + \beta_5 ODD^2 + \beta_6 CBI + \beta_7 CBI^2 + \beta_8 SMT + \beta_9 SMT^2 + \varepsilon_i$$

Where PCB represents private credit by domestic deposit money bank, measuring the wellbeing of the banking sector. ODD represents outstanding domestic debt, reflecting the development of capital markets. CBI denotes corporate bonds issuance volume to GDP, which indicates the efficiency of the bond market. SMT represents stock market turnover, which demonstrates stock market liquidity.

Given the different functions that these services have in the financial sector, the first logical assumption that this model makes is that these financial services will impact economic growth differently. Surprisingly, there is very little economic literature that attempted to assess the impact of the development of the banking sector or bond market on economic growth. Furthermore, the limited literature that investigated the relationship between the efficiency of the banking sector or capital markets and economic growth is fairly out-of-date, goes back to 1985 (Ranciere 1985). This paper attempts to address this niche yet important topic by examining the relationship between the development of the banking sector and bond market and economic growth. This paper hypothesizes that there is diminishing marginal return on economic growth by the development of both the

banking sector and the bond market, because debt is not always used for productive activities⁴, which increases the probability of a GDP growth loss as a consequence of a financial crisis.

However, Levin and Zervas examined the relationship between equities market and economic growth. They found a statistically significant perfectly linear positive relationship between stock market liquidity and economic growth (Levin and Zervos 1998). This paper predicts different results from the one that Levin and Zervos proposed. More precisely, this paper hypothesizes that: (a) at early stages of development, stock market liquidity leads to more economic growth because the liquidity will minimize the holding period risk, minimizing investors risk. Moreover, (b) this paper anticipates that stock market liquidity has a diminishing marginal rate of returns on economic growth, because after the market becomes liquid enough to minimize holding-period risk, investment decisions are driven by potential rate of returns on investments, not by how quickly an investor can exit a position at a relatively stable price. Eventually, (c) this paper is built on the hypothesis that disproportionately high levels of stock market liquidity reflect high volumes of trading in secondary market for speculative not investment purposes, which might lead to GDP loss as a consequence of a financial crisis.

The results from the first two population regression functions will be produced using the same dataset, which is composed of observations collected about a bundle of 77 developed and developing countries⁵ from 1970 to 2006. The rationale behind looking at

⁴ Consider for example the high-yield bond boom in the 1980s, when bond issuance rate in the United States was at all-time high. Corporations used the majority of that debt to buy out their competitors and gain larger market share than actually investing in productive technologies.

⁵ This sample size is the same sample size that was used by two leading Bank of International Settlement, Stephen G Cecchetti and Enisse Kharroub, for a paper titled: "Reassessing the impact of finance on growth." A list of these

this time period is in part due to data availability; but in large, this time period was selected because the 1970 marked the beginning of what is often referred to as “financial capitalism”, where intermediation of saving to investment became an increasingly dominant function in the economy. Hence, in a way, this paper examines how the rise of financial capitalism impacted economic growth. The time-series ends at 2006 to exclude the rather acute impact of the 2008 financial crisis. Inevitably, a large-scale crisis at the level of the one of 2008 will skew the results, especially that the post-2008 recovery has been the slowest in history.

Understandably, there is limited literature that investigated the impact of the derivatives market on economic growth. Academics find assessing the impact of the derivative market on economic growth particularly challenging because the derivatives market is a relatively new industry. Modern day derivatives were firstly introduced to the world of financial markets in the mid 1990s and did not become widely popular until the early 2000s. Additionally, given of the nature of derivative products, the derivatives market is extremely nontransparent. A derivative is a contract between two betters on the likelihood of an event occurring. All it takes for a derivative to be initiated is for two parties to enter an agreement where one of them would pay the other if the the underlying event actually occurs in the future. Hence, all derivatives are traded “over-the-counter”, not through a public exchange. This non-transparent nature of the market makes the characteristics of the derivatives market, such as its size and turnover ratio, simply

countries is available in the appendix. Data was collected from World Bank Financial Development and Structure Dataset.

undocumented, and therefore unknown for academics, policy makers, and even participants in the market.

However, after derivative products amplified the magnitude of the housing bubble in 2008 and turned it into a financial crisis, the market is increasingly becoming more transparent as a consequence of regulatory pressure. Bank of International Settlement has estimates for the derivatives market turnover ratio of all the 30 countries that have a derivatives market. Since my second population regression function that investigates how different type of financial services impact economic growth is based on a dataset that encompasses observations about 77 countries from 1970 to 2006, including the derivatives market variable in the second population regression function would create a bias in in the results since a lot of the observations from other variables would be omitted by the software Stata. Hence, a third quadratic polynomial population regression was constructed to examine relationship between derivatives market turnover and economic growth based on a cross-country time-series panel data from 1996 to 2006 of 30 different countries.

$$\log GDP = \beta + \beta_1 DMT + \beta_2 DMT^2 + \varepsilon_i$$

Where DMT represents derivatives market turnover ratio and LogGDP denotes change in the rate of economic growth. Given the amplifying effect that derivatives have on financial crisis, and the fact that they are detached from investments in enterprise (derivatives are bets between two party on the future movement of a financial instrument, say a stock or bond), this paper hypothesizes that there is negative relationship between the size of the derivative's market and economic growth.

Discussion of results

In line with the hypothesis of this paper, and contrary to the findings of Goldsmith, Levin and King, liquid liabilities has a statistically significant diminishing marginal rate of return to economic growth. While the results from the first population regression function show that liquid liabilities positively correlates with economic growth, the relationship is not constant in slope and sign. The coefficient of the liquid liabilities squared variable is negative; indicating that at some point, the rate of returns on economic growth from liquid liabilities starts increasing at a decreasing rate. This results are stated in Table (1) and clearly represented in Figure (1); indicating a diminishing marginal rate of return to economic growth. Since this population regression function is based on a panel data, the Hausman test that was applied indicated that fixed effects would provide a more accurate coefficient. The fixed effects coefficient of the liquid liabilities variables are statically significant at the 95% level indicating that the relationship between the size of the financial sector, measured by liquid liabilities, and economic growth, measured by GDP, is not perfectly linear like Goldsmith, Levin, and King concluded in their studies. Hence, using a different functional form than the perfectly linear one that is used by all of Goldsmith, Levin and King did in fact lead to a different conclusion.

There are many reasons as to why the size of the financial sector might experience diminishing marginal rate of return to economic growth. One of these explanations is the market dynamics of supply and demand. The first bank to open in a nation will be far more contributive to growth than the thousandth bank. At early stages of financial development, when the size of the financial sector is small in relation to the overall size of the economy, the demand for capital and financial services drastically exceeds the supply of these

services. Hence, the first bank to open in a nation will make large sums of profit providing these services, attracting more firms to enter the banking sector. As more banks enter the market, increasing the size of the financial sector, more demanders of financial services will be satisfied. The second bank to open in a nation will consequently have less customers to serve than the first bank; which decreases the potential contribution that the second bank can have on economic growth.

Another explanation as to why the size of the financial sector might have diminishing marginal rate of return is the impact that the size of the financial sector might have on financial stability. Some economists hypothetically and theoretically warned that a large financial sector leads to macroeconomic volatility, financial crisis, and therefore negative impact on growth in the long run. As the financial sector becomes larger and the amount of outstanding credit in an economy expand, the financial system becomes interdependent in a way that is theoretically incomprehensible and practically intangible [Minsky (1974)]. This unquantifiable interdependency makes the financial sector systematically fragile to outside shocks, where a relatively small market correction in one overpriced class of financial assets will lead to a system wide crisis [Kindleberger (1978)]. Esterly, Islam, and Stiglitz documented that as the size of the financial sector increases, “risk-enhancing” behavior and investments increase too [Esterly, Islam, and Stiglitz (200)]. Risk enhancing investments lead to higher market volatility and increase the chance of a financial crisis occurring [Rajan (1998)]. Hence, financial crisis caused by the unquantifiable interdependency and risk enhancing behavior could be one explanation as to why the size of the financial sector has a diminishing marginal rate of return to economic growth.

As the financial sector increase in size, the composition of the financial services that the financial sector provides changes, which changes the relationship between the finance and growth. At early stages of financial development, when the size of the financial sector is small, channeling capital from savers to entrepreneurs is the most dominant financial service in the sector. But as the financial sector grows in size and the country gets richer, the demand for wealth management increases, which moves the emphasis of the financial sector from the generation of capital to the management of capital. Generating capital, providing businesses with capital they need to carry on their investments, is arguably more contributive to economic growth than the management of capital, investing it in various financial assets. Although management of capital is technically investing in enterprise because investors are buying financial assets that financed real businesses, capital management is not the same as the generation of capital. Capital management mainly takes place in the secondary market, where investors buy, sell, and trade already existing financial instruments. On the other hand, capital generation takes place in the primary market, where a new financial asset or instrument is being initialed and syndicated for the first time. An increase in the amount of capital being managed will lead to higher turnover ratio in the secondary market (more liquidity); meaning the already existing assets are being traded more often without any increase in actual financing. An increase in the amount of capital being generated, on the other hand, means that the actual financing of enterprise in that economy has increased. The shift of emphasis and the change of composition of the financial sector as it gets larger from the generation of capital to the management of capital can also explain the diminishing marginal rate of return to economic growth.

Mainstream financial economists argue that an increase in the capital being managed, that is increase in turnover, will always lead to increase in amount of capital being generated; meaning, there is a perfectly linear relationship between liquidity and the economic growth [Levin, Zervos (1998)]. This proposition was examined in the second population regression function that investigated how different types of financial services impact economic growth.

While Levin and Zervos concluded a perfectly linear positive relationship between stock market liquidity and economic growth, the results from the second population regression function indicates otherwise. While there is a statistically significant positive relationship between stock market liquidity and economic growth, there is also a statically significant negative relationship between stock market liquidity square and economic growth, indicating that stock market liquidity has diminishing marginal rate of return to economic growth. Hence, Levin and Zervos were correct to assume that some amount of secondary market liquidity is necessary and contributive to economic growth, but they were wrong to conclude that more liquidity is always good for economic growth.

The stock market liquidity diminishing marginal rate of return to economic growth can be explained by the fact that investment decisions are not always driving by holding period risk, inability to exit an investment position at a stable price. Investments are always driven by the risk to reward ratio. While a liquid stock market minimizes the overall risk of investing in a stock because it eliminates the holding period risk, liquidity does not necessary signal to investors that a certain investment will be profitable just because it is liquid.

It is important to note that capital management, liquidity, and capital generation, banking, impact economic growth similarly at early stages of development, while they differ in impact at later stages. As documented in Table (1), Privet Credit to GDP by Domestic Banks, which is a measure of the development of the banking sector, impacts economic growth by a coefficient that is almost equivalent to the one of the stock market turnover ratio variable, which is a measure of liquidity. While Privet Credit by domestic banks has a coefficient of 0.013, stock market liquidity has a coefficient of 0.014. Yet the difference between the coefficient of these two variables squares is much higher -0.00387 for stock market liquidity squared and -0.000395 for privet credit by domestic bank squared. This large difference between the coefficient of these two variables indicates that at later stages of development, the rate of return of stock market liquidity diminishes at a much higher rate than the one of the privet credit by domestic banks. Therefore, both of these financial services contribute to economic growth almost equally at early stages of developments; but at later stages of financial development, the impact that capital management, liquidity, has on economic diminishes at a much fast than the one of the capital origination, banking.

If the last four pieces of findings were to be pieced together, the following narrative would emerge: At first, there is a positive relationship between the size of the financial sector and economic growth. Then as a country gets richer, financial services shift from the generation of capital to the management of capital. Capital management makes financial markets more liquid. Higher levels of market liquidity are associated with volatility. Since the financial system is unquantifiably interdependent, swings in volatility can lead to systematic crisis that impacts economic growth negatively. Hence, eventually, the size of

the financial sector has a diminishing (and potentially negative) marginal rate of return on economic growth.

It is important to note that the results from the second population regression function passed the multicollinearity test and they are the outcome of the fixed effects. Tables (2) and (3) show the results of the multicollinearity and houseman test.

Between all variables, OTC derivatives turnover ratio had the smallest statistically significant positive linear correlation to growth and the highest statistically significant negative diminishing rate of return; .0000278 and -4.4511 respectively. This in line with the original hypothesis of this paper which predicted very little impact on economic growth from derivatives activities- given that derivatives structuring and trading, though is based on fluctuations in assets prices that track real business, is fairly attached from the process of funding enterprises. When it comes to derivatives, there seem to be very little upside with huge potential downside, especially when considering the amplifying effect that they have on financial crisis. The derivatives liquidity diminishing rate of return on economic growth is documented in Figure (3)

It was noted in the literature review that the relationship between the bond market and economic growth was not addressed before by financial economists before. This paper attempted to examine the relationship between the bond market and economic growth. However, the results presented in Table (1) about the relationship between the bond market and economic growth are not statistically significant. Hence, based on the results from the second population regression function, this paper cannot make conclusive statement to the relationship between bond market development and economic growth.

However, it is noted that, just like the equity and banking market, the bond market has a diminishing marginal rate of return to economic growth.

The purpose of this paper was to (1) examine the relationship between the size of the financial sector and economic growth, and (2) to investigate how different aspects of the financial sector impact economic growth. The dominant thought on the relationship between the size of the financial sector and economic growth among the academic community was one of Goldsmith, Levin, and King, assuming a perfectly linear relationship between the size of the financial sector and economic growth. The findings of this paper, based on a panel data of 77 developed and developing countries from 1970 to 2006, provides an alternative view on the relationship between the size of the financial sector and economic growth. Using a polynomial population regression function, this paper concluded a non-linear relationship between the size of the financial sector and economic growth. More precisely, the size of the financial sector has a diminishing marginal rate of return to economic growth. This paper also departed from the mainstream economic research that treats finance as a homogenous unit both in type and in impact by acknowledging that different financial services might have different impact on economic growth by virtue of their different functions. While this paper could not provide any statistically significant results on the relationship between bond market development and economic growth, this paper concluded that both stock market liquidity and banking sector development have a diminishing marginal rate of return to economic growth, which is in contrast to Levin and Zervos's findings of a perfectly linear relationship between stock market liquidity and economic growth. Finally, this paper suggest that OTC derivatives market liquidity has almost negligible positive contribution to growth at very early stages

of development, while it diminishes at an extremely high rate during middle and later stages of development. When it comes to understanding the dynamics between finance, financial services and economic growth, this paper suggests that the relationship is not as black and white as popular culture and mainstream economists would like to think of it to be.

VII. List of Tables

Table (1): Summary of results from the three population regression functions.

| | Finance and Growth | Financial Services and Growth | Derivatives and Growth |
|---|-----------------------------|-------------------------------|------------------------|
| Liquid liabilities | .0337352*** (0.006) | - | - |
| Liquid liabilities SQ | -.00008801*** (.000) | - | - |
| Privet Credit to GDP | - | -.0136918*** (.003) | - |
| Privet Credit to GDP SQ | - | .00038*** (.000) | - |
| Outstanding domestic privet sector debt | - | .0005284 (.006) | - |
| Outstanding domestic privet sector debt SQ | - | -.0362419 (.003) | - |
| Corporate Bond issuance rate | - | .02574656 (.174) | - |
| Corporate Bond issuance rate SQ | - | -.0362419 (.038) | - |
| Stock Market Turnover ratio | - | .0143503*** (.005) | - |
| Stock Market Turnover ratio SQ | - | -.0000395** (.000) | - |
| OTC derivatives turnover ratio | - | - | .0000278*** (4.32) |
| OTC derivatives turnover ratio SQ | - | - | -4.4511*** (9.27) |
| Constant | 23.53983 *** (0.0695633) | 25.55452*** (0.214851) | 26.30951*** (.110) |
| R overall | 12% | 4% | 2.5% |
| N | 1,552 | 231 | 138 |

All standard errors are in parentheses

* indicates significance at 10% level of significance

** indicates significance at 5% level of significance

*** indicates significance at 1% level of significance

Table (1): Hausman Test for the first population regression function

| | Fix | Ran | Difference | sqrt |
|----------------------|---------------|------------|------------|-----------|
| Liquid Liabilities P | 0.0393152 | 0.0388961 | 0.0004191 | 0.0001306 |
| Liquid liabilities Q | -0.0000699 | -0.0000701 | 2.407 | . |
| Prob>chi2 | 0.0124 | | | |

Table (2): Multicollinearity Test Results

| Variable | VIF | 1/VIF |
|-------------------------------|-------------|----------|
| Outstanding Debt | 1.30 | 0.769120 |
| Corporate Bond Issuance Rate | 1.27 | 0.785831 |
| Privet Debt by Domestic Banks | 1.27 | 0.786790 |
| Stock Market Turnover Ratio | 1.18 | 0.849907 |
| Mean VIF | 1.26 | |

Table (3): Hausman Test for the second population regression function

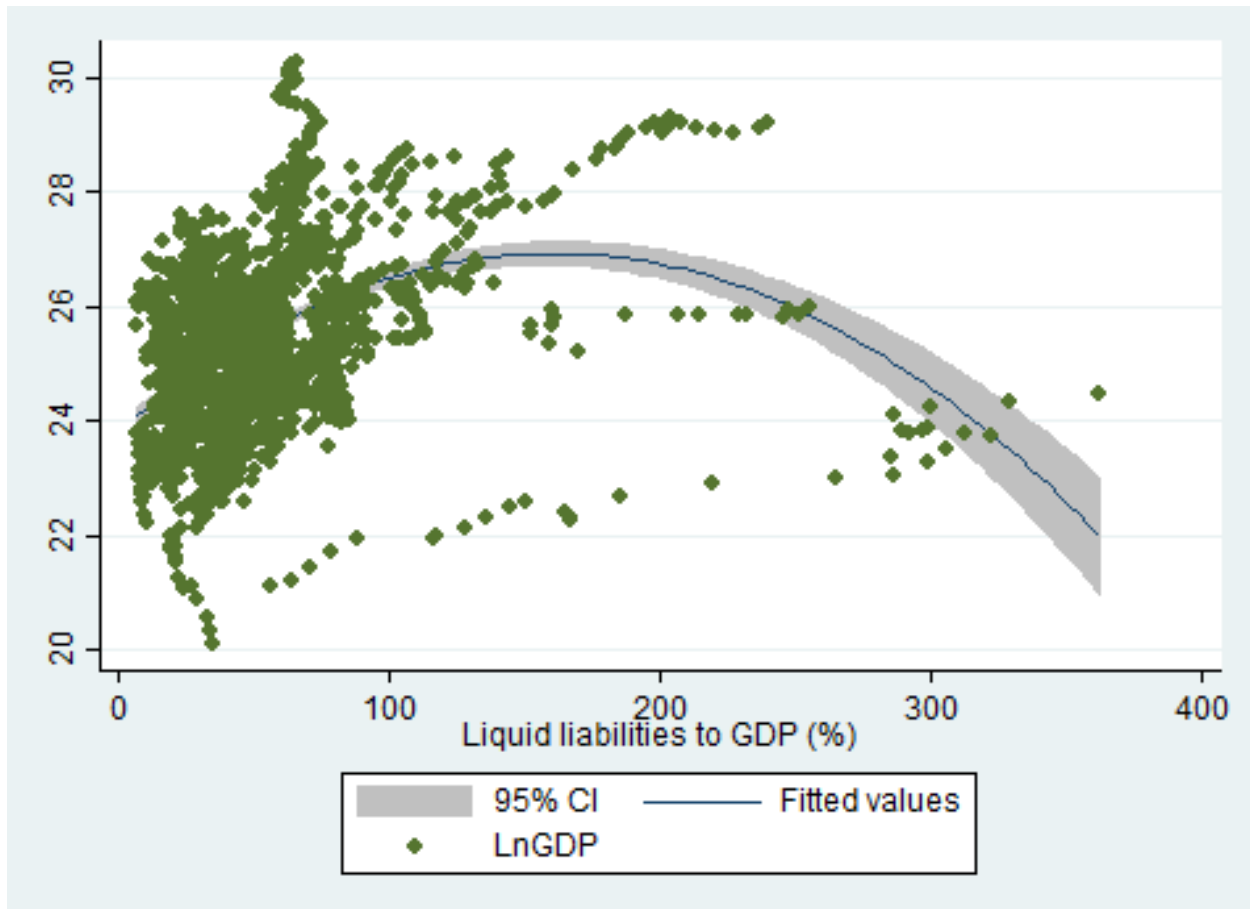
| | Fix | Ran | Difference | Sqrt |
|-------------------------|--------------|------------|------------|-----------|
| CBIR | 0.0775559 | 0.0859458 | -0.0077898 | . |
| CBIR SQ | -0.0284308 | -0.0293338 | 0.000903 | . |
| OD | 0.01221634 | 0.0120717 | 0.0000917 | . |
| OD SQ | -0.0000469 | -0.0000451 | -1.77e-06 | 6.72e-07 |
| P | 0.0136918 | 0.01222 | 0.0014718 | 0.0009535 |
| PSQ | -0.0000331 | -0.0000292 | -3.86e-06 | 2.51e-06 |
| SM | 0.0021499 | 0.0026364 | -0.0004865 | . |
| SMSQ | -8.17e-06 | -9.33e-06 | 1.16e-06 | . |
| Prob>Chi2 (6) | -9.34 | | | |

Table (4): houseman test for the third population regression function:

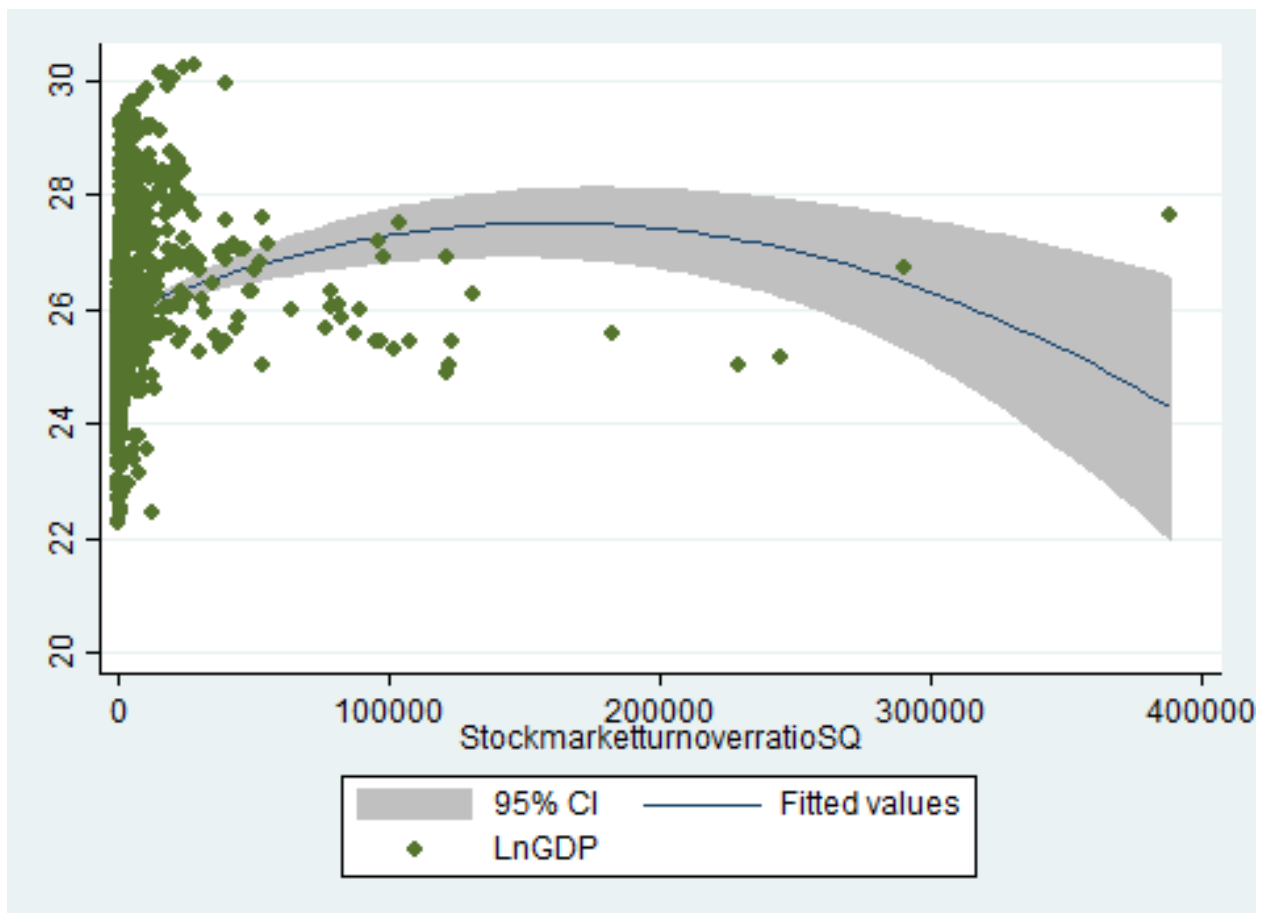
| | Fix | Ran | Difference | Sqrt |
|--------------------|--------------|-----------|------------|------|
| OTC Derivatives | 2.86e-06 | 4.28e-06 | -1.42e-06 | . |
| OTC Derivatives SQ | -2.52e-12 | -4.56e-12 | 2.04e-12 | . |
| Chi2 (1) | -4.63 | | | |

VIII. List of Graphs

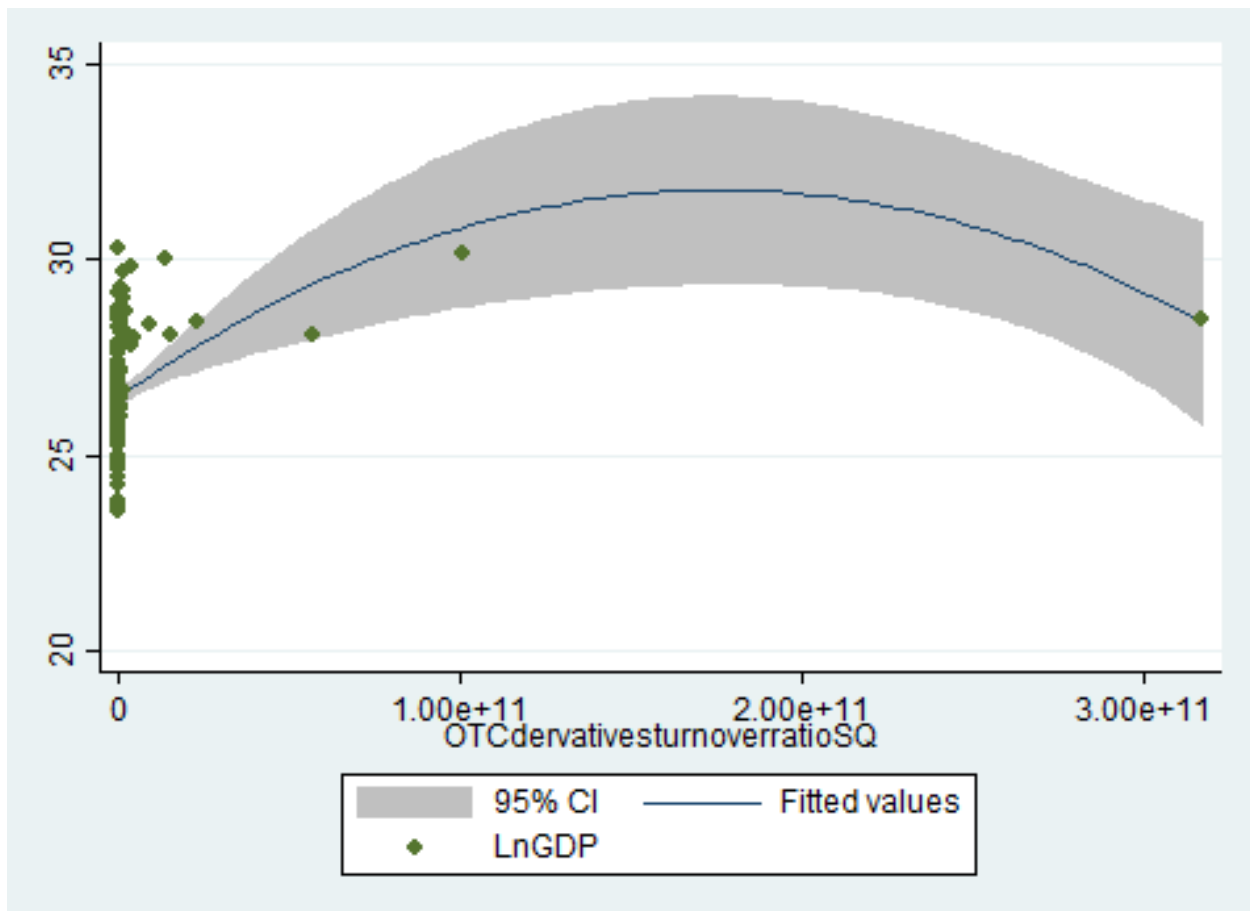
Graph (1): Liquid Liabilities diminishing rate of return on economic growth



Graph (2): Stock Market Liquidity's diminishing rate of return on economic growth



Graph (3): OTC Derivatives Liquidity's diminishing rate of return on economic growth



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X. Appendix:

Countries used in the second population regression function that investigates how different type of financial services impact economic growth are:

Argentina, Australia, Austria, Bangladesh, Belgium, Brazil, Canada, Chile, China, Colombia, the Czech Republic, Denmark, Egypt, Estonia, Finland, France, Germany, Greece, Hungary, Hong Kong, Iceland, India, Indonesia, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, Morocco, the Netherlands, New Zealand, Nigeria, Norway, Pakistan, the Philippines, Poland, Portugal, Russia, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, the United Kingdom, the United States, Venezuela and Vietnam.

Countries used in the third population regression function that examines the relationship between the derivatives market and economic growth are:

Australia Austria Belgium Brazil Canada Chile Czech Republic Denmark Finland France Germany Hungary India Ireland Italy Japan Korea, Rep. Luxembourg Mexico Norway Poland Portugal South Africa Spain Sweden Switzerland Thailand Hong Kong SAR, Chi