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FINANCIAL DEVELOPMENT, MACROECONOMIC VOLATILITY, AND ECONOMIC GROWTH

Metodij Hadzi-Vaskov

Abstract

The main objective of this study is to empirically evaluate the impact of financial development upon macroeconomic volatility, economic growth and upon the relationship between macroeconomic volatility and economic growth.The panel dataset used in this study contains observations for 78 countries worldwide during the period 1960-1995. Most of the data sources used are standard and widely used in comparable empirical studies. There are four different relations that are estimated with the panel dataset: -the importance of a better-quality financial system for overall (average) economic growth (1); -the effect of (aggregate) growth volatility upon mean growth rate (2); - the extent to which a more developed financial sector manages to dampen aggregate shocks, and thereby reduce growth volatility (3), and; -the power of financial intermediaries and stock markets to affect (change) the relationship between mean growth and volatility (4).
The paper is organized as follows: the first section is an introduction to the research topic, while the second section gives an overview of some theoretical and empirical findings in four different, though interrelated, strands of the literature. Section three presents the dataset used and the empirical strategy pursued. The main findings are presented in section four. Finally, section five concludes.

Key words: *Economic growth, financial sector, financial development, macroeconomic volatility*

Introduction

There are several reasons why countries with better-developed financial systems perform well in economic terms and ultimately, experience higher growth of income per capita. The most general explanation, which has received considerable attention in recent years, is that the development of a good financial infrastructure is a direct consequence of a generally stable institutional setting. The importance of institutions for economic performance in the long-run has been most vividly presented by North and Weingast (1989). They argue that the "credible commitment", which England achieved during the Glorious Revolution (1688), was a keystone in the construction of its path-breaking institutional system and finally, a crucial condition for its

(economic) successes in the following two centuries. Moreover, recent research in Law and Finance Theory points out that the origin of the legal system can explain the cross-country differences in financial development, and economic growth (La Porta, Lopez-de-Silanes, Shleifer and Vishny, 1997, 1999).

Besides these lines of research that focus on the broad (institutional) picture why financial development and economic growth co-exist in some countries and not in others, there are numerous studies that analyze the channels through which more finance can lead to higher growth. Two channels occupy a central position in this research: i) more rapid capital accumulation (capital deepening) in the sense that a better functioning financial system makes possible a faster re-use of savings or re-investment of profits; ii) technology changes (efficiency) that point out the role of finance in channeling resources from people that put them aside to those that have the most profitable ideas/projects, thereby increasing efficiency in allocation. Additionally, a third channel through which finance can lead to higher growth is through its role in reducing macroeconomic volatility. Better-developed financial systems are expected to dampen aggregate shocks and smooth out output deviations. In turn, one may argue that less volatility means more predictable outcomes, and ceteris paribus, this can lead to more investment and higher growth. The volatility channel received relatively less attention in the literature on finance and growth. Therefore, the integration of the volatility channel in the financial development-economic growth link occupies a central place in my investigation.

The main objective of this study is to empirically evaluate the impact of the financial development upon macroeconomic volatility, economic growth and upon the relationship between macroeconomic volatility and economic growth.

The rest of the paper is organized as follows: the next section gives an overview of some theoretical and empirical findings in four different, though interrelated, strands of research. Section three presents the dataset used and the empirical strategy pursued. The main findings are presented in section four. Finally, section five concludes.

II. LITERATURE REVIEW

II. 1. Finance-Growth Nexus

The complementarities and interdependencies between the rise of industrial production and the development of capital markets have been observed at least as far back as the beginnings of the nineteenth century. Later, in the first half of the past century, this interdependence captured the attention of many prominent scholars who mainly focused their debates on the direction of causality between finance and growth. While Schumpeter (1912) stressed the leading role of financial development for overall economic growth, Robinson (1952) argued that finance simply follows the successes in the "real sector": "where enterprise leads, finance follows". Though the two camps have put many arguments forward in the following decades, no definitive and unanimous conclusion has been reached yet.[1] In general, finance can influence the aggregate rate of economic growth through five instruments:[2] i) production of ex-ante information about possible investment opportunities through a decrease in the information costs, ii) monitoring of investments and implementation of corporate governance, iii) trading, diversification, and management of risk, (iv) mobilization and pooling of savings, and (v) facilitation in the exchange of goods and services.[3] An extensive survey of the most up-to-date theoretical as well as empirical literature on this finance-growth nexus can be found in Levine (2004).

Moreover, there is a subcategory of research within this field that emphasizes the importance of financial structure, rather than finance per se, as a crucial determinant of the growth process. Some authors stress the superiority of financial intermediaries relative to capital markets in the allocation of financial resources.

1) For later debates on the same issue see McKinnon (1973), Lucas (1988) or Miller (1988) for example.

2) The functioning of the three channels described above depends crucially on the success of these five instruments.

3) This classification of the instruments through which finance can accelerate growth is due to Levine (2004).

Most notably, Stiglitz (1985) points out to the possibility for free-riding behavior in the large, anonymous stock markets. Since the information about firms and their monitoring has a (quasi) public-good character, only limited number of market participants has a genuine interest in providing it. Furthermore, Schleifer and Vichy (1997) emphasize the ineffectiveness of capital markets to discipline managers through takeover(s) (threats) in presence of asymmetric information. According to this literature, it is the development of the banking sector and its long-term relationships with the industry that lead to higher growth since capital markets might produce serious misallocation of financial resources. On the other hand, Allen and Gale (1999) show that banks cannot act in the most efficient way in an environment of fast innovation and change. Similarly, Rajan and Zingales (2002) emphasize the superiority of capital markets in eliminating or cleansing the least profitable firms in times of aggregate negative shocks.

The preceding overview of the major issues in the financial development (structure) – economic growth literature leads to the first major issue this analysis attempts to empirically evaluate: how important is the level and structure of financial development for the subsequent rates of economic growth?

II. 2. Volatility and Growth

Business cycles are widely regarded as normal, natural phenomena in the capitalist systems. The volatility in the rate of economic growth that they produce is not only their most familiar characteristic, but can be seen also as their blueprint on the long-run course of economic growth. The latter phenomenon was already observed in the 1940-1950s by Schumpeter, Hicks and Kaldor, among others. Though many scholars recognize the likely impact of macroeconomic volatility on the subsequent growth rates, there is a major disagreement about the sign of this relationship.[4] Many theoretical arguments imply a positive relationship between volatility and economic growth. For example, Aghion and Saint-Paul (1991, 1998) and Hall (1991) show that the opportunity costs of innovation and R&D activities is low in times of economic distress. Therefore, a more volatile economy will allocate a higher proportion of its workforce to these productivity-enhancing activities, thereby inducing a higher growth rate. Moreover, precautionary savings (due to the higher level of uncertainly in more volatile periods) argument by Deaton (1991) or the "cleansing effect" proposed in Caballero and Hammour (1994) can lead to survival of the (relatively) more efficient producers only. Through all these links, a more volatile economy will lead to faster economic growth. Conversely, business cycles might lead to skill loss if the workers that become unemployed during recessions lose (part of) their professional abilities (van Ewijk, 1994).[5] Moreover, volatile growth and/or frequent recessions might reflect broader institutional failures in the countries affected. Finally, Stiglitz (1993) argues that research output falls during recessions because of imperfect capital markets that do not accept human capital as collateral.

The inconclusiveness of the theoretical models signals that the sign of this relationship has to be established empirically. However, the empirical conclusions are not more optimistic. The pioneer studies in this field done by Kormendi and Maguire (1985) and Grier and Tullock (1989) find a strongly positive correlation between volatility and average growth. In an influential study, Ramey and Ramey (1995) find a negative relation between the level of volatility of GDP per capita and the overall long-run growth of the economy in a cross-section analysis with 92 countries. This result is robust after the inclusion of various control variables like the share of investment in GDP, population growth, human capital etc. Nonetheless, this relation turns out insignificant when only the OECD-countries are included in the analysis. A more recent study by Martin and Rogers (2000) reaches a similar conclusion using three different datasets.[6]

4) About a comprehensive survey of the main theoretical as well as empirical findings about the relationship between the business cycles and economic growth see Canton (1997).

5) Here a distinction can be made between mild and wild business cycles, the former associated with higher, while the latter with lower economic growth.

6) They use data for 90 European Union regions in the period 1979-1992, developed countries during the period 1960-1988, and developing countries in the period 1960-1988.

The relationship between volatility and growth is the second issue I will test with my dataset. Besides the estimations for the whole dataset (78 countries), I will investigate this issue in four additional sub samples for groups of countries that are clearly identified in the literature.

II. 3. Finance and Volatility

The wave of financial crises in the emerging markets during the 1990s put light on the role that financial institutions and capital markets play in dampening or magnifying the shocks from the real sector. One of the basic functions of a well-developed financial system is the provision of (partial) risk-sharing among economic agents at all levels of aggregation. Nonetheless, higher leverage in an economy means a higher interdependence with the other market participants, and therefore, can lead to substantial spillover effects and stronger declines in output. Many authors focus especially on the relationship finance-volatility at different stages of (economic) development and in different country groups around the world. Acemoglu and Zilibotti (1997) argue that in the early stages of development there are many indivisible investment projects that cannot be financed in incomplete capital markets. Since most of these high-yields, productivity-enhancing projects cannot get appropriate financial resources, they will never be undertaken, thereby contributing to more variable and lower growth rates on average. In a microeconomic model with imperfections in the credit markets, Kiyotaki and Moore (1997) show that effects from the other sectors can be amplified and made more persistent. Furthermore, Aghion, Banerjee and Piketty (1999) emphasize that a less developed financial system (together with unequal investment opportunities) can be a generator for macroeconomic volatility. In a more recent theoretical paper, Aghion, Bachetta and Banerjee (2004) show that countries (small open economies) with better financial systems can achieve more stable growth-paths. However, countries that are at an intermediate level of financial development will be most volatile according to their model.

Empirical evidence suggests that the development of the financial sector can indeed lead to lower growth volatility. Easterly, Islam and Stiglitz (2001) argue that the role of financial markets is essential in explaining growth volatility in a set of 74 countries for the period 1960-1997.[7] They derive several important conclusions: first, credit constraints appear much more important than wage-rigidities and frictions in the labour market; second, the effect of financial sector development on volatility is non-linear, so that after a certain threshold, more finance means more volatility. Moreover, Raddatz (2002) claims that sectors, which depend relatively more on external financing, experience less volatility in more financially developed countries. Finally, Denizer, Iyigun and Owen (2002) test for the effect of several financial indicators on growth, consumption and investment volatility. Using fixed-effects estimations for a group of 70 countries in the period 1956-1998, they conclude that not only the financial system *per se*, but also the manner in which it develops, reduce macroeconomic volatility.[8] Beck, Lundberg and Majnoni (2001) present a theoretical model that focuses on the impact of two types of shocks (real-sector and monetary) upon growth volatility. Their model predicts that more developed financial sector dampens the real, while it magnifies the impact of monetary shocks on aggregate output.[9] Subsequently, they find evidence in favor of this hypothesis using a panel dataset for 63 countries in the period 1960-1997. Overall, they reach a conclusion that the impact of the financial sector on output volatility is not unambiguous, but rather depends on the relative importance of real versus monetary shocks.

II. 4. Financial Development and the Growth-Volatility Relationship

The level of investment is a principal channel through which volatility exerts its impact on the rate of economic growth according to the theoretic literature surveyed above. Therefore, many studies predict that a more

7) They aggregate the data in two subperiods of 18 years each (1960-1978 and 1979-1997) so that they are left with a panel with only two observations per country.

8) The dataset consists of variables averaged over a five-year window in order to capture not only the immediate but also the medium-term effect of the financial sector on volatility.

9) Terms of trade volatility is used as a proxy for real, while the volatility of the inflation rate is used as a proxy for monetary shocks.

volatile economy will be considered more risky as well, which in turn will lead to lower level of investment and slower economic growth.[10] If this argument is correct, then controlling for the investment level in a growth regression should leave the direct effect of volatility on growth insignificant. However, Aghion et al. (2004) find that although the effect of volatility is slightly reduced after investment is included in their analysis, it still remains strongly significant. Therefore, they focus on another possible channel - the composition of investment - through which volatility exerts its (negative) impact on growth. They develop a theoretical model, which predicts that more financially developed countries will experience a less negative relationship between volatility and growth. Thus, besides the direct influence that finance exerts on growth, and the effect it has on growth volatility, their model implies that the level of financial development *qualitatively changes the relationship* between volatility and growth. Their preliminary results from cross-section regressions for 70 countries suggest support this hypothesis. Nonetheless, they do not differentiate between different sources of finance, different groups of countries (they only report separate results for the OECD-subset of countries) nor do they consider the time-variation in the dataset. These are the issues I would like to address in the fourth and final part of this empirical study.

III. EMPIRICAL STRATEGY

III. 1. Data Description

The panel dataset used in this study contains observations for 78 countries worldwide during the period 1960-1995. Most of the data sources used are standard and widely used in comparable empirical studies. The major part of the macroeconomic variables is constructed from the Penn World Tables 6.1. The growth rate of real GDP per capita is computed as the log difference of two consecutive per capita real GDP levels available in PWT 6.1. Subsequently, this variable is averaged over seven five-year periods (1961-1965, 1966-1970, 1971-1975, 1976-1980, 1981-1985, 1986-1990 and 1991-1995). This is comparable with the measure(s) for growth volatility computed as the standard deviation of the real GDP per capita growth rate over the corresponding five-year time-windows. In a similar way, I compute the standard deviation of the ratio between the growth rate of real consumption and real GDP per capita. This is used as an additional variable for macroeconomic volatility and the level of consumption smoothing following Bekaert, Harvey and Lundblad (2004). My main interest lies in explaining the behavior of these variables by a number of factors.

A central place among the explanatory factors is given to the indicators of financial development. These are constructed as five year averages for each country in the dataset compiled by Beck, Levine and Loyaza (2000). I use three indicators for bank development and three indicators for stock market development. Each of these six measures captures a different aspect of the financial sector.

The level of development of the financial intermediaries is measured by three variables: i) Deposit Money Banks Assets to GDP ratio; ii) Liquid Liabilities to GDP ratio; and iii) Private Credit by Deposit Money Banks to GDP ratio. The first two indicators stress the importance of the financial services performed compared to the overall level of the economy. While the first variable roughly refers to the size of the commercial banks (by their assets), the second one includes currency, all interest-bearing liabilities on the balance sheets of commercial banks and other, non-bank financial institutions. Therefore, this is a better aggregate indicator for the size of the overall financial sector (measured by the liability side of the balance sheet). Finally, the third variable measures the size of the financial intermediaries by the activity that they perform. The Ratio of the private credit by money banks to GDP captures exclusively the portion of bank credit that is issued to the private enterprises. Thereby, it refers precisely to the main bank activity – channeling resources from savers to investors (Levine and Zervos, 1998).

10) The opposing literature's principal argument is that higher volatility implies more risk, which in turn, leads to more savings due to precautionary reasons, and faster capital accumulation.

Three indicators are used to measure the development of stock markets on a cross-country basis: i) Stock Market Capitalization to GDP ratio, ii) ratio of the Total Value Traded to GDP; and iii) Stock Market Turnover ratio. Similar to the measures for bank development, each of these indicators refers to a specific aspect of stock market development. The capitalization ratio shows the total value of all the shares listed on the stock exchanges in certain country (a stock variable) relative to its overall economic activity on a yearly basis (a flow variable). Furthermore, a reasonable picture about the activity of stock markets during certain period of time can be found by comparing the value of shares that were actually being traded (in a year) to GDP. This is the main reason for including the second variable in the analysis. Finally, an important indicator for the overall functioning of the stock market is its liquidity, i.e. the frequency by which the shares listed "change hands". The last measure refers to this aspect by comparing the value of shares traded relative to the value of all shares listed on the market.

Different control variables are used in the analysis. It is a standard in growth regressions to include the initial real GDP per capita level as control for possible convergence among countries. In this analysis, I include the logarithm of real GDP per capita in the period preceding the period for which the average growth rate is calculated (i.e. ln(gpc1960) as a control in the regression with the growth rate for 1961-1965 as dependent variable). As control for the level of human capital, I include the average years of schooling in the population. Moreover, I control for other institutional or political factors. In order to measure the degree of openness or economic integration of a particular country, I include two variables: the ratio of total trade (exports plus imports) to GDP and the black market exchange premium. The latter serves also as an indicator for frictions in domestic markets. Finally, I include the average inflation rate over each five-year period as a control for monetary policy stance and the share of government expenditures in the economy to control for the importance of the public sector. Additional control variables have been used for the institutional quality and similar characteristics. However, these results are not included as they do not significantly change the main conclusions. Moreover, many of them have low variability through time, which make their usefulness in panel estimations rather dubious.[11] Finally, especially important control variable in the growth-volatility regressions is the investment ratio, since the neoclassical economics identifies it as the main channel through which macroeconomic volatility exercises a negative impact on the GDP growth rate. To test for the validity of this argument I report each growth regression twice: once without and once with the investment control.

III. 2. Model Specification(s)

There are four different relations that I estimate with the panel dataset described in the previous section:

- the importance of a better-quality financial system for overall (average) economic growth (1);
- the effect of (aggregate) growth volatility upon mean growth rate (2);
- the extent to which a more developed financial sector manages to dampen aggregate shocks, and thereby reduce growth volatility (3), and:
- the power of financial intermediaries and stock markets to affect (change) the relationship between mean growth and volatility (4).

In order to empirically evaluate the first two relations (1) and (2), I run static panel model estimations for model(s) of the following form:

$$growth_{it} = \beta_0 + \beta_1 \ln(initial)_{it-1} + \beta_2 V_{it} + \gamma X_{it} + \mu_i + \varepsilon_{it} \qquad (3.1)$$

11) A number of variables can be considered for this purpose as the (intellectual) property rights protection, legal origin etc.

- dependent variable is the mean growth rate for economy *i* at time *t*;[12]
- *ln*(initial) is the level of real GDP per capita preceding the first period included in the calculation of the dependent variable;
- *V* is the explanatory variable of our primary interest, i.e., the average indicator for financial sector development for the first relation (1), the volatility of economic growth for economy *i* during time period *t* in the second relation (2);
- *X* contains all the other variables used as controls in the regression, and:
- the error term is decomposed into two parts: country-specific and i.i.d. component.

The third relation is estimated according to the following specification:

$$volatility_{it} = \beta_0 + \beta_1 growth_{it} + \beta_2 V_{it} + \gamma X_{it} + \mu_i + \varepsilon_{it} \quad (3.2)$$

In this relation I test for the impact of the financial sector on aggregate volatility. The mean growth rate is included as a control variable since periods of higher mean growth are expected to produce higher volatility as well (Denizer et al., 2002). The main variable of interest is *V*, the effect of the financial indicators. Finally, the error term is decomposed as before and variables *X* are used as controls.

Finally, I evaluate the impact of financial development on the relation between volatility and growth (4) using the following panel model specification:

$$growth_{it} = \beta_0 + \beta_1 \ln(initial)_{it-1} + \beta_2 volatility_{it} + \beta_3 finance_{it} + \beta_4 volatility_{it} * finance_{it} + \gamma X_{it} + \mu_i + \varepsilon_{it} \quad (3.3)$$

This is a modified version of equation (3.1) where I include measure for volatility, for financial development and their linear interaction term.

For each model specification I run fixed-effects and/or random-effects panel estimations. The choice between these two procedures is based on the results from the Hausman test (Hausman, 1978). Most of the regressions having the mean growth rate as dependent variable turn out to be appropriate only when estimated by fixed-effects method. On the contrary, most volatility regressions show no systematic difference among the coefficients estimated using the two methods, thereby signaling that the random-effects method should be preferred.

The model(s) will be estimated for five different (sub)samples as the relations among the variables of interest might differ significantly from one sample of countries to the other. The first includes all 78 countries for which data is available. The regression results for this group will be found under the header “Whole sample”. “Industrial” refers to the sub sample that includes 21 developed, industrial countries. Three sub samples of developing countries are investigated. First, I run estimations for the (heterogeneous) group of all developing countries – “Developing”. Then this heterogeneous group is split in two parts: MFIs (more financially-integrated economies, 19 in total) and LFIs (less financially-integrated economies, 38 in total) according to the classification done by Kose, Prasad and Terrones (2004).[13]

12) Time periods refer to the five-year windows I use to calculate growth volatiltiy and the other average variables.

13) The descriptive statistics reported in the appendix compare the evolution of the variables of highest interest in this study across the different groups of countries.

IV. RESULTS

IV. 1. Financial Development and Growth

Table 1 in the appendix shows the results from the growth regression (3.1), which relates the rate of economic growth with the level of bank development. The first column in the table presents the results for the whole sample of 78 countries, followed by the sub samples of industrial, developing, MFIs and LFIs. For each of these (sub)samples, two different specifications of the basic regression are reported: one without, the other with a control for the investment ratio.

In accordance with the convergence hypothesis, the countries that had relatively higher initial level of real GDP per capita grew less rapidly in the following five-years. Moreover, human capital measured by the average years of schooling enters with a positive sign, though it is rarely significant. Countries with higher share of government (public) expenditures and larger black-market premium tend to grow less, while more open economies in general experience higher rates of growth.[14] The variable of main interest – level of bank development – enters with positive sign (but insignificant) in the specification for the whole sample. More interestingly, all measures of bank development indicate higher growth for the developing countries and two of them enter with very significant coefficients. Similar conclusion applies for the sub categories MFIs and LFIs, though they are significant in the first group only. Finally, including the investment ratio in the regression(s) does not change these results. Bank finance contributes significantly to economic growth in the developing world after taking into account the investment ratio differences among them. Conversely, more bank finance means lower mean growth rates for the industrial countries. Two of these measures are significant at 10 percent and enter with negative signs. Table 2 reports the results for the same regression(s) where bank development is lagged one period. In general, the control variables retain their signs (and significance), but the finance variable changes sign in the specification for the whole sample. Moreover, it is even more significantly negative for the industrial countries sub sample.[15]

Similar estimations are performed for the effect of stock market development on economic growth. The controls are generally significant and with the correct (expected) sign.[16] The indicator for stock market development enters with positive sign in all specifications. Moreover, its effect rarely changes when a control for investment is included in the regression. Contrary to the results for bank finance, better stock markets benefit all countries, irrespective of their level of development. Table 4 presents the same set-up, but now the stock market variable is lagged for one period. Its coefficient changes sign and becomes even significantly negative in the specification for the whole sample, thereby indicating that it is not only the (contemporaneous) level of financial development, but also its increase as compared to the previous five-year period that leads to higher subsequent growth.[17]

Finally, I include measures for bank finance and stock market development in table 5. For bank finance I include the measures for overall liquid liabilities to GDP (the results do not change if we include the other two measures instead), while for stock market I include the ratio of total value traded to GDP since it contains the highest number of observations.[18] The results in the first panel of table 5 indicate that both types of finance lead to higher growth.[19] Furthermore, stock market development is more important than financial

14) This result does not apply to the LFIs, where trade openness means less growth.

15) The additional regressions that I do not report in this paper indicate that the change in the level of financial development is an important factor in explaining growth around the world.

16) The only exception being the school variable that is not significant and even changes sign for the MFIs, suggesting that the countries at middle stages of development do not benefit much from the human capital they possess.

17) This result deserves much more attention. Nonetheless, this will be investigated more extensively in some later study.

18) These two indicators (liquid liabilities and value traded on the stock markets) are used in the rest of the regressions where both types of financial development are included in the specification.

19) An exception to this is the group of LFIs where bank finance enters with a negative sign. Though these results have to be taken with reservation since the overall number of observations in this group is rather low (32 in total, so 2 observations per country).

intermediates and enters with a significant sign at the 5 percent level in the specification for industrial countries. Results are not robust when I use a lagged value for these indicators and even turn out negative.

IV. 2. Volatility and Growth

Table 6 presents the results for the second issue that I investigate in this study. The dependent variable is the same as before – average growth rate of real GDP per capita over the five-year periods. The set of instruments (the same as before) indicates similar results as before. All of the variables enter with the expected signs and are significant in the whole as well as in the sub samples for developing countries.[20] Major conclusion from this table is that higher volatility is associated with lower economic growth. This result is clearly robust to the inclusion of a control variable for investment. While this significant negative relationship applies to the whole sample and to each of the three different sub samples of developing countries, industrial countries seem to be "immune" to higher volatility. Volatility enters with negative but insignificant sign for this set of developed countries.

IV. 3. Financial Development and Volatility

In tables 7-11 I focus on the third relation: the impact of finance on growth volatility. For each of the five samples I use two different specifications. The first has the volatility of the real GDP growth rate as a dependent variable. In the second specification I use volatility (standard deviation) of the ratio between the growth rate of real consumption and the growth rate of real GDP (as a measure for aggregate risk-sharing) as a dependent variable. The set of control variables enters with the expected sign. Larger government share, higher inflation rate, more investment and greater (trade) openness all lead to more volatility. Though this picture does not change substantially from one group of countries to the other, most significant results are obtained for the whole sample and for the sub sample of developing countries. The mean growth rate enters with a significant negative sign in all but the specification for industrial countries. Most importantly, all the indicators for financial intermediaries enter the relation with negative sign. Bank finance seems to lead towards lower output volatility in all and higher risk-sharing in all but the subset of industrial countries. Though some of these indicators lose their significance somewhat when they are lagged for one period in table 8, the major conclusions remain still valid.

The relationship between stock market development and output volatility can be observed in table 9. In general, deeper financial markets lead to less volatile growth, though this effect does not apply to the developed countries (negative, but insignificant coefficients).[21] Similarly as in the case of bank finance, the stock market indicators retain the "correct" sign, though lose of their significance when lagged for one period (table 10).

Finally, table 11 presents the relative importance of bank and stock market finance in reducing growth volatility. The latter seems more important for the whole sample and the group of developing countries, while none of them has a significant sign in the specification for the industrial countries. When these indicators are measured by their lagged values only the coefficient for stock market in the specification for developing countries stays significant and with the expected, negative sign.

IV. 4. Financial Development and the Volatility-Growth Relationship

The final set of regressions investigates whether the relationship between volatility and growth depends on the level of financial development. Table 12 indicates that higher volatility leads to lower growth, though its effect is reduced when I control for bank finance. Moreover, in none of the sub samples is the interaction

20) The variable school is never significant in these specifications either.

21) The effect on risk-sharing for the LFIs is rather counterintuitive, but one can speculate that the low number of observations is the main reason for this (about 30 observations in total, so two per country included).

term finance-volatility significantly positive. This indicates that better developed financial systems do not mitigate the effect of volatility on growth. If anything, more developed financial intermediaries magnify the effect of volatility on growth for the set of industrial countries. When I use the lagged values for the bank finance indicator, the results change only for the MFIs. The countries at intermediate level of development are the only ones that benefit from more developed financial system. Though volatility retains its negative impact on growth, the financial intermediaries substantially mitigate this effect.

The last table 13 presents the results of the same specification(s) for stock market development. Again, my empirical findings contradict the prediction of the model in Aghion et al. (2004). Deeper stock markets do not reduce the negative impact of volatility on growth. The only exception is the group of MFIs again, though the positive coefficient of the interaction term is not significant at conventional significance levels.

V. CONCLUDING REMARKS

The aim of this study was to find empirical evidence about four different, though interlinked relations between the level of financial development, macroeconomic volatility and economic growth. The first set of estimations focused on the impact of finance on growth. Better financial intermediaries lead to higher growth for the set of developing countries, while deeper stock markets do not have significant effect. By contrast, stock markets lead to higher while banks lead to lower economic growth for the group of industrial countries. These conclusions hold irrespective of the measures used as financial indicators. Second, the more volatile economies tend to grow less on average than the more stable ones. This is relevant for every group of developing countries (but not for the industrial ones) and robust to the inclusion of different controls. Third, the level of investment is relevant for growth in both types of estimation, but it does not capture the effect of financial development or volatility on growth. Fourth, larger financial sectors dampen the effect of aggregate shocks and thereby reduce growth volatility. Stock markets outperform again bank finance for the developing countries. Finally, the development of the financial sector (irrespective of its structure) does not attenuate the negative effect of volatility on growth. Clearly, most of the relations studied apply in different ways for industrial and for developing countries. Generally, more finance is associated with faster growth. Moreover, better financial systems reduce macroeconomic volatility, though they do not mitigate its negative effect on economic growth.

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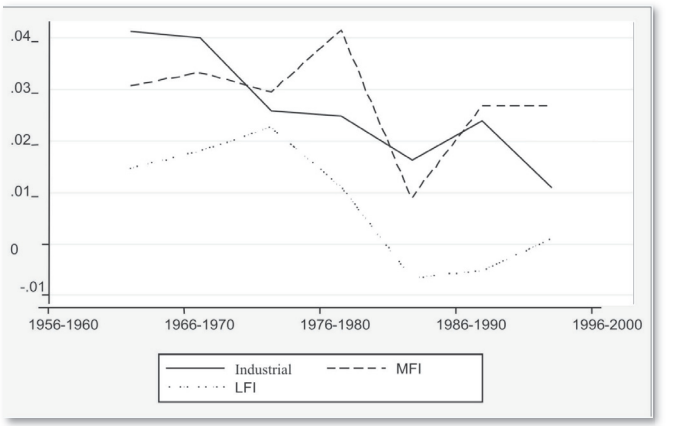
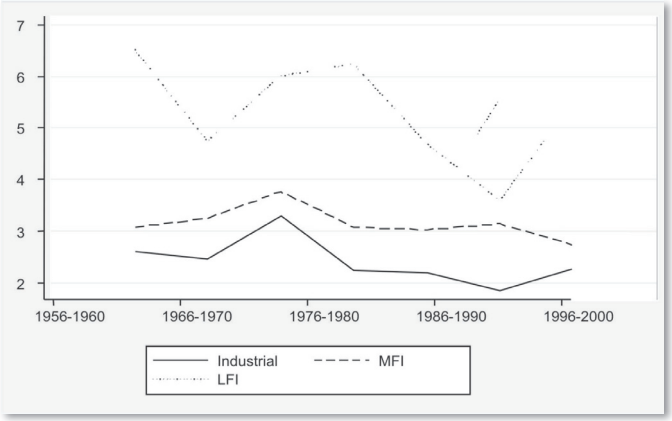
Classification of Countries

Industrial Countries	MFI	LFI
Australia	Argentina	Algeria
Austria	Brazil	Bolivia
Belgium	Chile	Cameroon
Canada	Colombia	Central African Republic
Denmark	Cyprus	Congo
Finland	Egypt, Arab Rep.	Costa Rica
France	India	Dominican Republic
Germany	Indonesia	Ecuador
Greece	Israel	El Salvador
Ireland	Korea, Republic of	Gambia, The
Italy	Malaysia	Ghana
Japan	Malta	Guatemala
Netherlands	Mexico	Guyana
New Zealand	Pakistan	Haiti
Norway	Peru	Honduras
Portugal	Philippines	Iran, Islamic Republic of
Spain	South Africa	Jamaica
Sweden	Thailand	Kenya
Switzerland	Venezuela	Lesotho
United Kingdom		Malawi
United States		Mauritius
		Nepal
		Nicaragua
		Niger
		Panama
		Papua New Guinea
		Paraguay
		Rwanda
		Senegal
		Sierra Leone
		Sri Lanka
		Sudan
		Syria
		Togo
		Trinidad and Tobago
		Uruguay
		Zaire
		Zimbabwe

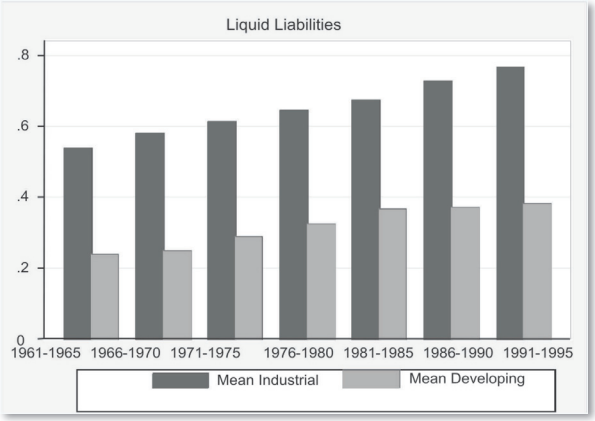
Growth Rates

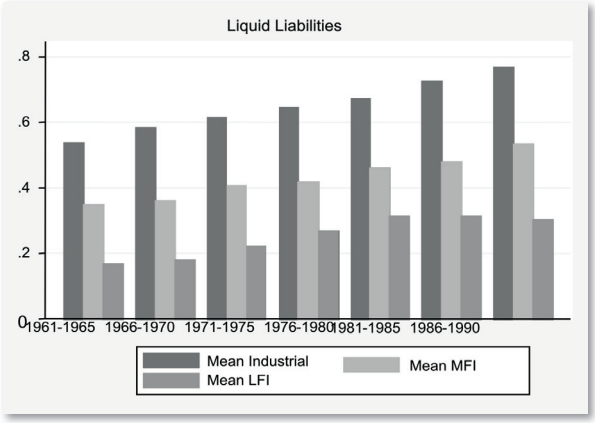


Growth volatility

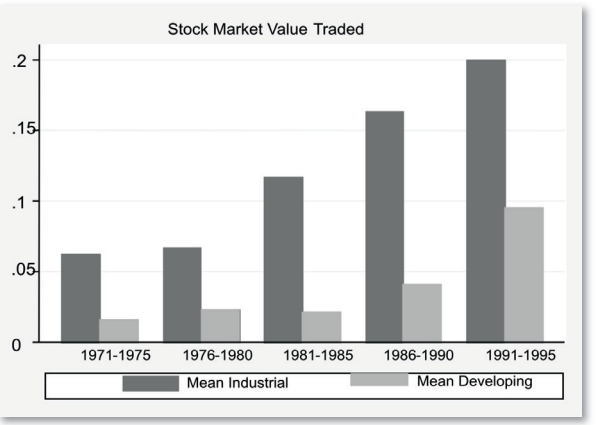


Indicators for bank development





Indicators for
Stock Market Development



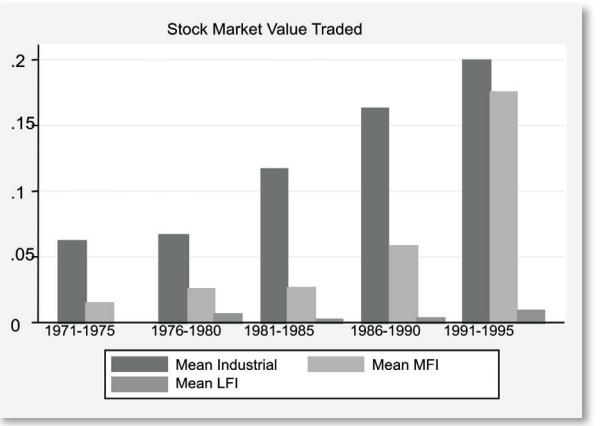


Table 1. Economic Growth and Bank Development

	Whole sample		Industrial		Developing		MFI		LFI	
	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv
					LIQUID LIABILITIES					
linitial	-0.045	-0.050	-0.025	-0.023	-0.053	-0.068	-0.041	-0.053	-0.070	-0.084
	(6.48)**	(7.55)**	(3.09)**	(2.76)**	(5.63)**	(7.54)**	(3.00)**	(4.11)**	(5.67)**	(7.15)**
school	0.000	0.004	-0.001	-0.001	-0.001	0.004	-0.002	0.003	-0.003	0.001
	(0.14)	(1.84)	(0.71)	(0.72)	(0.30)	(1.56)	(0.58)	(0.78)	(0.84)	(0.34)
lbmp	-0.009	-0.008	0.534	0.569	-0.009	-0.009	-0.029	-0.028	-0.006	-0.006
	(2.34)*	(2.26)*	(2.47)*	(2.57)*	(2.26)*	(2.35)*	(2.76)**	(2.89)**	(1.19)	(1.26)
gov	-0.163	-0.126	-0.201	-0.193	-0.168	-0.120	-0.065	0.004	-0.178	-0.144
	(3.45)**	(2.77)**	(3.01)**	(2.86)**	(2.94)**	(2.25)*	(0.67)	(0.04)	(2.59)*	(2.24)*
trade	0.023	0.015	0.017	0.017	0.016	0.000	0.055	0.036	-0.002	-0.015
	(2.58)*	(1.75)	(1.11)	(1.12)	(1.38)	(0.01)	(2.98)**	(2.05)*	(0.13)	(1.12)
ll	**0.007**	**0.000**	**-0.016**	**-0.017**	**0.046**	**0.043**	**0.039**	**0.026**	**0.016**	**0.027**
	(0.55)	**(0.01)**	**(1.78)**	**(1.82)**	**(2.14)***	**(2.15)***	**(1.59)**	**(1.13)**	**(0.47)**	**(0.87)**
inv		0.135		0.026		0.173		0.173		0.164
		(6.17)**		(0.84)		(6.43)**		(3.95)**		(4.99)**
Obs	418	417	116	115	302	302	110	110	192	192
Number	73	73	17	17	56	56	19	19	37	37
R^2	0.23	0.31	0.59	0.59	0.22	0.33	0.29	0.40	0.29	0.39
					BANK ASSETS					
linitial	-0.045	-0.053	-0.046	-0.046	-0.051	-0.071	-0.033	-0.054	-0.065	-0.085
	(7.17)**	(8.70)**	(7.78)**	(7.67)**	(5.44)**	(7.71)**	(2.50)*	(4.10)**	(5.31)**	(7.11)**
school	-0.000	0.003	0.001	0.001	-0.001	0.004	-0.002	0.003	-0.003	0.002
	(0.01)	(1.58)	(0.32)	(0.38)	(0.24)	(1.61)	(0.67)	(0.77)	(0.79)	(0.52)
lbmp	-0.009	-0.008	0.058	0.063	-0.008	-0.007	-0.028	-0.027	-0.006	-0.005
	(2.43)*	(2.26)*	(0.79)	(0.84)	(2.00)*	(1.94)	(2.61)*	(2.78)**	(1.25)	(1.09)
gov	-0.146	-0.138	-0.118	-0.112	-0.160	-0.158	-0.077	0.000	-0.144	-0.163
	(3.39)**	(3.36)**	(2.01)*	(1.86)	(2.92)**	(3.14)**	(0.77)	(0.00)	(2.19)*	(2.68)**
trade	0.017	0.010	0.039	0.039	0.013	-0.003	0.060	0.035	-0.005	-0.017
	(2.03)*	(1.18)	(3.17)**	(3.17)**	(1.19)	(0.26)	(3.25)**	(1.95)	(0.39)	(1.38)
ba	**0.010**	**0.015**	**-0.009**	**-0.009**	**0.039**	**0.047**	**0.013**	**0.022**	**0.017**	**0.029**
	(1.07)	**(1.63)**	**(1.41)**	**(1.41)**	**(2.09)***	**(2.74)****	**(0.62)**	**(1.15)**	**(0.54)**	**(0.99)**
inv		0.125		0.015		0.163		0.186		0.155
		(6.50)**		(0.51)		(6.56)**		(4.26)**		(5.23)**
Obs	452	451	147	146	305	305	110	110	195	195
Number	77	77	21	21	56	56	19	19	37	37
R^2	0.26	0.33	0.60	0.60	0.21	0.33	0.28	0.40	0.27	0.38
					PRIVATE CREDIT					
linitial	-0.046	-0.052	-0.043	-0.042	-0.057	-0.071	-0.048	-0.055	-0.066	-0.083
	(7.32)**	(8.46)**	(7.12)**	(7.01)**	(6.02)**	(7.73)**	(3.58)**	(4.24)**	(5.34)**	(7.02)**
school	-0.000	0.003	0.001	0.001	-0.001	0.004	-0.002	0.002	-0.003	0.002
	(0.20)	(1.38)	(0.31)	(0.35)	(0.29)	(1.53)	(0.64)	(0.52)	(0.76)	(0.59)
lbmp	-0.008	-0.007	0.089	0.093	-0.007	-0.007	-0.028	-0.027	-0.005	-0.004
	(2.28)*	(2.14)*	(1.21)	(1.25)	(1.71)	(1.70)	(2.73)**	(2.80)**	(1.14)	(1.00)
gov	-0.149	-0.139	-0.158	-0.153	-0.151	-0.145	-0.100	-0.021	-0.138	-0.152
	(3.43)**	(3.35)**	(2.53)*	(2.39)*	(2.81)**	(2.88)**	(1.05)	(0.22)	(2.13)*	(2.54)*
trade	0.018	0.012	0.034	0.035	0.011	-0.002	0.050	0.035	-0.005	-0.017
	(2.08)*	(1.41)	(2.96)**	(2.96)**	(0.98)	(0.19)	(2.69)**	(1.87)	(0.39)	(1.32)
pc	**0.014**	**0.013**	**-0.014**	**-0.014**	**0.063**	**0.057**	**0.055**	**0.040**	**0.021**	**0.021**
	(1.28)	**(1.22)**	**(1.90)**	**(1.89)**	**(2.80)****	**(2.68)****	**(2.00)***	**(1.52)**	**(0.61)**	**(0.65)**

inv		0.115		0.012		0.147		0.148		0.153
		(5.82)**		(0.41)		(5.83)**		(2.95)**		(5.16)**
Obs	445	444	142	141	303	303	108	108	195	195
Number	77	77	21	21	56	56	19	19	37	37
R^2	0.27	0.33	0.60	0.59	0.24	0.33	0.34	0.40	0.27	0.38

Dependent Variable: Growth Rate of Real GDP Per Capita, Period Average

Table 2. Economic Growth and Bank Development Lagged One Period

	Whole sample		Industrial		Developing		MFI		LFI	
	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv
LIQUID LIABILITIES										
linitial	-0.036	-0.046	-0.028	-0.023	-0.035	-0.056	-0.023	-0.036	-0.063	-0.089
	(5.54)**	(7.17)**	(3.35)**	(2.74)**	(4.02)**	(6.29)**	(2.22)*	(3.45)**	(4.87)**	(6.95)**
school	-0.001	0.003	-0.001	-0.001	-0.001	0.005	-0.003	0.001	-0.004	0.003
	(0.26)	(1.56)	(0.71)	(0.71)	(0.38)	(1.63)	(0.94)	(0.26)	(0.97)	(0.70)
lbmp	-0.011	-0.010	0.586	0.600	-0.011	-0.011	-0.026	-0.025	-0.007	-0.007
	(2.83)**	(2.86)**	(2.79)**	(2.83)**	(2.42)*	(2.59)*	(2.39)*	(2.51)*	(1.38)	(1.51)
gov	-0.183	-0.181	-0.195	-0.196	-0.187	-0.186	-0.134	-0.057	-0.150	-0.167
	(4.14)**	(4.28)**	(2.88)**	(2.88)**	(3.47)**	(3.70)**	(1.45)	(0.63)	(2.32)*	(2.80)**
trade	0.025	0.016	0.018	0.018	0.023	0.006	0.065	0.047	0.006	-0.012
	(2.64)**	(1.69)	(1.16)	(1.20)	(1.97)*	(0.52)	(3.71)**	(2.65)**	(0.36)	(0.85)
ll_1	**-0.013**	**-0.012**	**-0.009**	**-0.015**	**-0.012**	**-0.008**	**-0.002**	**-0.005**	**-0.028**	**-0.018**
	(1.74)	**(1.56)**	**(1.39)**	**(2.04)***	**(1.11)**	**(0.75)**	**(0.17)**	**(0.41)**	**(1.73)**	**(1.22)**
inv		0.120		0.027		0.155		0.155		0.166
		(5.81)**		(0.89)		(5.83)**		(3.31)**		(5.29)**
Obs	414	413	119	118	295	295	109	109	186	186
Number	75	75	20	20	55	55	19	19	36	36
R^2	0.24	0.31	0.59	0.60	0.21	0.31	0.28	0.36	0.30	0.41
BANK ASSETS										
linitial	-0.037	-0.045	-0.047	-0.047	-0.034	-0.054	-0.023	-0.036	-0.059	-0.083
	(6.18)**	(7.74)**	(8.13)**	(8.01)**	(3.98)**	(6.21)**	(2.22)*	(3.44)**	(4.76)**	(6.79)**
school	-0.000	0.003	0.001	0.001	-0.001	0.004	-0.003	0.001	-0.004	0.002
	(0.16)	(1.62)	(0.58)	(0.61)	(0.35)	(1.58)	(0.91)	(0.27)	(1.05)	(0.55)
lbmp	-0.011	-0.011	0.041	0.044	-0.011	-0.011	-0.026	-0.026	-0.008	-0.008
	(3.16)**	(3.16)**	(0.57)	(0.61)	(2.61)**	(2.72)**	(2.42)*	(2.53)*	(1.72)	(1.73)
gov	-0.183	-0.177	-0.124	-0.119	-0.192	-0.190	-0.139	-0.059	-0.146	-0.162
	(4.42)**	(4.47)**	(2.13)*	(1.99)*	(3.65)**	(3.87)**	(1.49)	(0.65)	(2.33)*	(2.80)**
trade	0.020	0.012	0.033	0.034	0.019	0.002	0.066	0.047	-0.001	-0.017
	(2.36)*	(1.43)	(2.96)**	(2.96)**	(1.69)	(0.19)	(3.74)**	(2.65)**	(0.09)	(1.30)
ba_1	**-0.008**	**-0.006**	**-0.009**	**-0.009**	**-0.007**	**-0.005**	**-0.004**	**-0.003**	**-0.020**	**-0.015**
	(1.49)	**(1.24)**	**(2.14)***	**(2.11)***	**(0.86)**	**(0.61)**	**(0.37)**	**(0.34)**	**(1.64)**	**(1.39)**
inv		0.118		0.012		0.152		0.154		0.160
		(6.08)**		(0.41)		(5.86)**		(3.28)**		(5.30)**
Obs	448	447	147	146	301	301	109	109	192	192
Number	76	76	21	21	55	55	19	19	36	36
R^2	0.26	0.33	0.61	0.61	0.21	0.31	0.28	0.36	0.29	0.41
PRIVATE CREDIT										
linitial	-0.037	-0.045	-0.043	-0.043	-0.035	-0.054	-0.026	-0.037	-0.057	-0.081
	(6.09)**	(7.53)**	(7.38)**	(7.26)**	(4.08)**	(6.19)**	(2.51)*	(3.44)**	(4.70)**	(6.69)**
school	-0.001	0.003	0.001	0.001	-0.001	0.004	-0.003	0.001	-0.004	0.002

	(0.30)	(1.46)	(0.36)	(0.37)	(0.41)	(1.53)	(0.93)	(0.24)	(1.17)	(0.44)
lbmp	-0.011	-0.011	0.064	0.066	-0.011	-0.011	-0.026	-0.026	-0.008	-0.008
	(3.10)**	(3.10)**	(0.88)	(0.90)	(2.57)*	(2.69)**	(2.47)*	(2.51)*	(1.69)	(1.75)
gov	-0.187	-0.181	-0.151	-0.149	-0.193	-0.191	-0.143	-0.064	-0.146	-0.162
	(4.48)**	(4.53)**	(2.49)*	(2.39)*	(3.67)**	(3.87)**	(1.54)	(0.68)	(2.33)*	(2.79)**
trade	0.021	0.012	0.028	0.029	0.020	0.003	0.071	0.048	0.001	-0.016
	(2.48)*	(1.47)	(2.53)*	(2.53)*	(1.82)	(0.26)	(3.91)**	(2.51)*	(0.04)	(1.24)
pc_1	**-0.011**	**-0.009**	**-0.012**	**-0.012**	**-0.010**	**-0.007**	**-0.002**	**-0.005**	**-0.027**	**-0.016**
	(1.66)	**(1.41)**	**(2.31)***	**(2.29)***	**(1.00)**	**(0.70)**	**(0.19)**	**(0.42)**	**(1.77)**	**(1.16)**
inv		0.116		0.007		0.151		0.151		0.158
		(5.87)**		(0.24)		(5.74)**		(2.91)**		(5.19)**
Obs	441	440	142	141	299	299	107	107	192	192
Number	76	76	21	21	55	55	19	19	36	36
R^2	0.27	0.33	0.62	0.62	0.21	0.31	0.29	0.36	0.30	0.40

Dependent Variable: Growth Rate of Real GDP Per Capita, Period Average

Table 3. Economic Growth and Stock Market Development

	Whole sample		Industrial		Developing		MFI		LFI	
	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv
linitial	-0.054	-0.063	-0.099	-0.102	-0.041	-0.070	-0.025	-0.052	-0.207	-0.236
	(4.21)**	(4.85)**	(5.09)**	(4.65)**	(2.13)*	(3.05)**	(1.22)	(2.06)*	(2.70)*	(3.14)*
school	0.002	0.005	0.004	0.004	0.001	0.009	-0.004	0.004	0.040	0.040
	(0.63)	(1.33)	(1.41)	(1.42)	(0.23)	(1.28)	(0.56)	(0.58)	(1.99)	(2.06)
lbmp	-0.028	-0.023	0.022	0.021	-0.025	-0.019	-0.027	-0.023	-0.013	0.033
	(2.17)*	(1.78)	(0.20)	(0.18)	(1.52)	(1.15)	(1.47)	(1.29)	(0.35)	(0.68)
gov	-0.227	-0.139	-0.007	-0.010	-0.216	-0.067	-0.265	-0.126	-0.175	0.079
	(2.40)*	(1.41)	(0.06)	(0.08)	(1.47)	(0.42)	(1.56)	(0.68)	(0.61)	(0.24)
trade	0.017	0.023	0.023	0.024	0.034	0.039	0.020	0.006	-0.032	0.043
	(0.93)	(1.30)	(1.03)	(1.05)	(1.10)	(1.32)	(0.49)	(0.13)	(0.57)	(0.57)
smcap	**0.014**	**0.010**	**0.030**	**0.031**	**0.006**	**0.001**	**0.011**	**0.012**	**0.059**	**0.097**
	(1.40)	**(1.08)**	**(2.73)****	**(2.69)****	**(0.41)**	**(0.09)**	**(0.65)**	**(0.69)**	**(0.58)**	**(0.98)**
inv		0.104		-0.011		0.174		0.167		0.350
		(2.56)*		(0.26)		(2.17)*		(1.76)		(1.41)
Obs	180	180	82	82	98	98	69	69	29	29
Number	54	54	21	21	33	33	18	18	15	15
R^2	0.23	0.27	0.44	0.44	0.22	0.28	0.18	0.23	0.66	0.73
					VALUE TRADED					
linitial	-0.064	-0.066	-0.052	-0.048	-0.065	-0.080	-0.051	-0.071	-0.173	-0.170
	(6.34)**	(6.66)**	(3.52)**	(3.04)**	(3.83)**	(4.58)**	(2.79)**	(3.66)**	(3.71)**	(3.59)**
school	0.002	0.004	-0.000	-0.001	0.003	0.008	-0.001	0.005	0.023	0.021
	(0.71)	(1.27)	(0.14)	(0.20)	(0.65)	(1.63)	(0.23)	(0.98)	(0.99)	(0.91)
lbmp	-0.034	-0.030	-0.020	-0.013	-0.033	-0.025	-0.032	-0.028	-0.015	0.009
	(3.12)**	(2.69)**	(0.19)	(0.13)	(2.16)*	(1.64)	(1.84)	(1.72)	(0.49)	(0.23)
gov	-0.160	-0.087	-0.015	0.003	-0.183	-0.065	-0.278	-0.121	-0.018	0.104
	(2.07)*	(1.06)	(0.15)	(0.03)	(1.47)	(0.50)	(1.78)	(0.74)	(0.08)	(0.39)
trade	0.034	0.035	0.006	0.004	0.044	0.050	0.018	0.014	0.013	0.052
	(2.23)*	(2.38)*	(0.33)	(0.21)	(1.41)	(1.64)	(0.48)	(0.38)	(0.18)	(0.60)
smvt	**0.029**	**0.024**	**0.029**	**0.029**	**0.028**	**0.008**	**0.043**	**0.029**	**0.722**	**0.872**
	(2.21)*	**(1.90)**	**(2.71)****	**(2.71)****	**(0.87)**	**(0.25)**	**(1.20)**	**(0.85)**	**(1.32)**	**(1.51)**

inv		0.083		0.026		0.170		0.186		0.178
		(2.31)*		(0.71)		(2.40)*		(2.36)*		(0.87)
Obs	199	199	96	96	103	103	71	71	32	32
Number	55	55	21	21	34	34	18	18	16	16
R^2	0.34	0.36	0.41	0.41	0.34	0.39	0.30	0.38	0.73	0.75
					TURNOVER RATIO					
linitial	-0.062	-0.077	-0.088	-0.080	-0.053	-0.094	-0.035	-0.079	-0.214	-0.230
	(4.55)**	(5.52)**	(4.08)**	(3.54)**	(2.65)*	(3.71)**	(1.61)	(2.86)**	(2.61)*	(2.71)
school	0.002	0.005	0.003	0.002	0.001	0.011	-0.004	0.008	0.039	0.038
	(0.61)	(1.42)	(0.86)	(0.68)	(0.14)	(1.46)	(0.58)	(0.93)	(1.52)	(1.45)
lbmp	-0.023	-0.016	0.065	0.068	-0.022	-0.014	-0.025	-0.018	0.003	0.039
	(1.80)	(1.30)	(0.56)	(0.58)	(1.31)	(0.84)	(1.36)	(1.05)	(0.08)	(0.71)
gov	-0.220	-0.115	-0.049	-0.027	-0.167	-0.036	-0.202	-0.054	-0.005	0.202
	(2.13)*	(1.10)	(0.38)	(0.21)	(1.05)	(0.22)	(1.04)	(0.28)	(0.02)	(0.52)
trade	0.035	0.036	0.033	0.027	0.048	0.040	0.038	0.023	0.006	0.058
	(2.03)*	(2.17)*	(1.30)	(1.05)	(1.80)	(1.55)	(1.34)	(0.84)	(0.07)	(0.59)
smtr	**0.012**	**0.016**	**0.010**	**0.012**	**0.033**	**0.030**	**0.034**	**0.030**	**0.267**	**0.383**
	(1.74)	**(2.38)***	**(2.21)***	**(2.45)***	**(1.63)**	**(1.52)**	**(1.70)**	**(1.58)**	**(1.15)**	**(1.43)**
inv		0.140		0.049		0.225		0.236		0.322
		(3.17)**		(1.12)		(2.46)*		(2.39)*		(0.92)
Obs	167	167	77	77	90	90	64	64	26	26
Number	54	54	21	21	33	33	18	18	15	15
R^2	0.26	0.33	0.43	0.44	0.28	0.36	0.26	0.35	0.78	0.82

Dependent Variable: Growth Rate of Real GDP Per Capita, Period Average

Table 4. Economic Growth and Stock Market Development Lagged One Period

	Whole sample		Industrial		Developing		MFI		LFI	
	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv
					CAPITALIZATION RATIO					
linitial	-0.041	-0.042	-0.042	-0.041	-0.028	-0.035	-0.023	-0.027	-0.120	-0.180
	(5.14)**	(5.25)**	(5.13)**	(4.77)**	(1.88)	(2.26)*	(1.52)	(1.73)	(2.10)	(2.29)
school	0.005	0.006	0.002	0.001	0.005	0.007	0.000	0.002	0.041	0.049
	(1.81)	(1.92)	(0.52)	(0.47)	(0.99)	(1.27)	(0.04)	(0.30)	(2.17)	(2.45)
lbmp	-0.033	-0.027	0.026	0.035	-0.027	-0.023	-0.033	-0.030	-0.009	0.005
	(2.69)**	(2.21)*	(0.27)	(0.34)	(1.78)	(1.57)	(2.00)	(1.83)	(0.22)	(0.12)
gov	-0.178	-0.068	-0.106	-0.093	-0.140	-0.059	-0.240	-0.149	-0.356	-0.251
	(2.57)*	(0.87)	(1.21)	(0.96)	(1.30)	(0.50)	(1.77)	(0.96)	(1.32)	(0.89)
trade	0.028	0.027	0.018	0.019	0.043	0.037	0.052	0.042	-0.013	-0.016
	(2.27)*	(2.21)*	(1.21)	(1.21)	(2.21)*	(1.88)	(2.14)*	(1.64)	(0.27)	(0.34)
smcp_1	**-0.026**	**-0.027**	**-0.020**	**-0.021**	**-0.030**	**-0.029**	**-0.018**	**-0.019**	**-0.037**	**-0.073**
	(3.14)**	**(3.31)****	**(2.51)***	**(2.50)***	**(2.07)***	**(2.03)***	**(1.14)**	**(1.22)**	**(0.49)**	**(0.89)**
inv		0.120		0.025		0.103		0.090		0.291
		(2.69)**		(0.40)		(1.48)		(1.17)		(1.09)
Obs	167	166	77	76	90	90	60	60	30	30
Number	57	57	21	21	36	36	17	17	19	19
R^2	0.36	0.40	0.64	0.63	0.32	0.35	0.38	0.40	0.65	0.73
					VALUE TRADED					
linitial	-0.042	-0.042	-0.042	-0.041	-0.028	-0.034	-0.027	-0.031	-0.120	-0.064
	(5.48)**	(5.59)**	(5.68)**	(5.44)**	(1.90)	(2.17)*	(1.87)	(2.03)*	(2.14)	(1.03)
school	0.004	0.005	0.002	0.002	0.003	0.005	-0.000	0.001	0.030	-0.004

	(1.73)	(2.01)*	(0.77)	(0.79)	(0.71)	(1.06)	(0.07)	(0.28)	(1.30)	(0.13)
lbmp	-0.026	-0.019	0.006	0.018	-0.017	-0.014	-0.027	-0.024	0.033	0.075
	(2.35)*	(1.69)	(0.06)	(0.19)	(1.20)	(0.98)	(1.72)	(1.53)	(0.66)	(1.40)
gov	-0.205	-0.112	-0.051	-0.035	-0.212	-0.138	-0.318	-0.254	-0.367	-0.802
	(2.99)**	(1.47)	(0.63)	(0.42)	(1.93)	(1.07)	(2.51)*	(1.72)	(1.34)	(2.14)
trade	0.031	0.029	0.015	0.016	0.049	0.041	0.057	0.048	0.030	0.139
	(2.64)**	(2.47)*	(1.02)	(1.05)	(2.55)*	(2.02)*	(2.41)*	(1.85)	(0.45)	(1.51)
smvt_1	**-0.027**	**-0.027**	**-0.012**	**-0.014**	**-0.049**	**-0.040**	**-0.026**	**-0.023**	**-0.156**	**-0.480**
	(2.45)*	**(2.49)***	**(1.43)**	**(1.56)**	**(1.80)**	**(1.43)**	**(0.88)**	**(0.80)**	**(0.83)**	**(1.78)**
inv		0.097		0.035		0.081		0.064		-0.550
		(2.64)**		(0.92)		(1.10)		(0.84)		(1.56)
Obs	185	184	91	90	94	94	62	62	32	32
Number	57	57	21	21	36	36	17	17	19	19
R^2	0.32	0.35	0.58	0.58	0.28	0.30	0.39	0.40	0.56	0.69
					TURNOVER RATIO					
linitial	-0.042	-0.041	-0.042	-0.042	-0.019	-0.023	-0.027	-0.027	-0.001	-0.076
	(5.02)**	(4.99)**	(4.58)**	(4.33)**	(1.30)	(1.52)	(1.71)	(1.71)	(0.02)	(1.52)
school	0.006	0.006	0.002	0.002	0.004	0.004	0.002	0.002	-0.004	0.020
	(1.95)	(2.03)*	(0.48)	(0.50)	(0.70)	(0.85)	(0.39)	(0.42)	(0.14)	(1.18)
lbmp	-0.036	-0.029	0.020	0.024	-0.027	-0.025	-0.037	-0.037	-0.013	-0.041
	(2.98)**	(2.43)*	(0.19)	(0.22)	(1.92)	(1.75)	(2.33)*	(2.24)*	(0.25)	(1.39)
gov	-0.178	-0.039	-0.083	-0.071	-0.150	-0.064	-0.349	-0.325	0.136	0.931
	(2.36)*	(0.44)	(0.88)	(0.67)	(1.31)	(0.45)	(2.36)*	(1.83)	(0.35)	(2.75)
trade	0.027	0.023	0.019	0.018	0.048	0.041	0.051	0.049	0.044	-0.022
	(2.20)*	(1.90)	(1.15)	(1.11)	(2.57)*	(2.12)*	(2.13)*	(1.88)	(0.93)	(0.66)
smtr_1	**-0.011**	**-0.011**	**-0.004**	**-0.005**	**-0.026**	**-0.022**	**-0.020**	**-0.020**	**-0.037**	**0.054**
	(1.97)	**(2.16)***	**(0.92)**	**(0.94)**	**(2.13)***	**(1.77)**	**(1.25)**	**(1.21)**	**(0.77)**	**(1.35)**
inv		0.133		0.019		0.080		0.021		0.791
		(2.75)**		(0.27)		(1.04)		(0.26)		(2.97)
Obs	154	153	72	71	82	82	55	55	27	27
Number	56	56	21	21	35	35	17	17	18	18
R^2	0.34	0.39	0.61	0.60	0.35	0.37	0.44	0.44	0.62	0.93

Table 5. Economic Growth with Joint Bank and Stock Market Development

	Whole sample		Industrial		Developing		MFI		LFI	
	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv
					JOINT EFFECT: LIQUID LIABILITIES AND VALUE TRADED					
linitial	-0.061	-0.063	-0.032	-0.032	-0.067	-0.078	-0.055	-0.068	-0.157	-0.154
	(5.20)**	(5.41)**	(1.93)	(1.72)	(3.37)**	(3.94)**	(2.53)*	(3.18)**	(3.43)**	(3.33)*
school	0.002	0.004	-0.001	-0.001	0.003	0.009	-0.001	0.006	0.024	0.023
	(0.68)	(1.16)	(0.29)	(0.28)	(0.63)	(1.64)	(0.24)	(1.00)	(1.10)	(1.03)
lbmp	-0.034	-0.029	0.040	0.035	-0.034	-0.024	-0.033	-0.027	0.011	0.035
	(2.88)**	(2.47)*	(0.03)	(0.03)	(2.14)*	(1.49)	(1.85)	(1.62)	(0.32)	(0.81)
gov	-0.166	-0.092	-0.040	-0.039	-0.178	-0.068	-0.264	-0.127	-0.000	0.123
	(1.87)	(0.97)	(0.31)	(0.29)	(1.39)	(0.51)	(1.63)	(0.76)	(0.00)	(0.48)
trade	0.039	0.041	-0.033	-0.033	0.044	0.050	0.017	0.014	0.023	0.062
	(2.12)*	(2.27)*	(1.04)	(1.03)	(1.39)	(1.64)	(0.45)	(0.39)	(0.33)	(0.76)
ll	**0.000**	**-0.003**	**0.000**	**0.000**	**0.010**	**-0.010**	**0.014**	**-0.012**	**-0.115**	**-0.116**
	(0.01)	**(0.16)**	**(0.01)**	**(0.01)**	**(0.25)**	**(0.26)**	**(0.33)**	**(0.28)**	**(1.40)**	**(1.39)**
smvt	**0.024**	**0.020**	**0.027**	**0.027**	**0.029**	**0.007**	**0.044**	**0.028**	**0.698**	**0.849**

	(1.65)	**(1.42)**	**(2.53)***	**(2.47)***	**(0.89)**	**(0.20)**	**(1.22)**	**(0.78)**	**(1.34)**	**(1.54)**
inv		0.079		0.001		0.174		0.193		0.179
		(1.99)*		(0.02)		(2.38)*		(2.33)*		(0.92)
Obs	177	177	74	74	103	103	71	71	32	32
Number	51	51	17	17	34	34	18	18	16	16
R^2	0.33	0.35	0.40	0.40	0.34	0.39	0.30	0.38	0.78	0.80
	JOINT EFFECT: LIQUID LIABILITIES AND VALUE TRADED (LAGGED)									
linitial	-0.038	-0.038	-0.026	-0.023	-0.027	-0.033	-0.026	-0.030	-0.088	-0.034
	(4.65)**	(4.60)**	(2.51)*	(2.08)*	(1.74)	(2.01)*	(1.75)	(1.90)	(1.20)	(0.44)
school	0.004	0.004	0.001	0.001	0.003	0.005	-0.000	0.002	0.038	0.004
	(1.33)	(1.45)	(0.47)	(0.30)	(0.70)	(1.04)	(0.03)	(0.29)	(1.44)	(0.13)
lbmp	-0.024	-0.018	0.325	0.359	-0.017	-0.014	-0.027	-0.025	0.023	0.065
	(2.16)*	(1.61)	(1.19)	(1.23)	(1.12)	(0.92)	(1.74)	(1.54)	(0.43)	(1.14)
gov	-0.217	-0.132	-0.102	-0.101	-0.204	-0.133	-0.317	-0.256	-0.240	-0.675
	(2.89)**	(1.57)	(1.13)	(1.04)	(1.80)	(1.02)	(2.48)*	(1.71)	(0.71)	(1.59)
trade	0.039	0.038	-0.018	-0.015	0.048	0.041	0.056	0.047	-0.031	0.079
	(2.91)**	(2.79)**	(0.75)	(0.64)	(2.43)*	(1.96)	(2.34)*	(1.81)	(0.29)	(0.64)
ll_1	**-0.009**	**-0.009**	**-0.004**	**-0.006**	**0.006**	**0.005**	**0.012**	**0.010**	**0.041**	**0.040**
	(0.94)	**(0.93)**	**(0.38)**	**(0.41)**	**(0.35)**	**(0.26)**	**(0.46)**	**(0.38)**	**(0.72)**	**(0.76)**
smvt_1	**-0.022**	**-0.021**	**-0.007**	**-0.007**	**-0.058**	**-0.047**	**-0.044**	**-0.039**	**-0.052**	**-0.377**
	(1.60)	**(1.50)**	**(0.81)**	**(0.66)**	**(1.55)**	**(1.22)**	**(0.89)**	**(0.77)**	**(0.22)**	**(1.21)**
inv		0.083		0.026		0.080		0.061		-0.545
		(2.12)*		(0.68)		(1.06)		(0.79)		(1.49)
Obs	163	162	72	71	91	91	62	62	29	29
Number	51	51	18	18	33	33	17	17	16	16
R^2	0.31	0.34	0.64	0.63	0.29	0.30	0.39	0.40	0.59	0.72

Table 6. Economic Growth and Volatility

	Whole sample		Industrial		Developing		MFI		LFI	
	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv
linitial	-0.038	-0.047	-0.048	-0.047	-0.034	-0.054	-0.029	-0.043	-0.051	-0.077
	(6.60)**	(8.70)**	(8.03)**	(7.89)**	(4.33)**	(7.09)**	(2.98)**	(4.68)**	(4.69)**	(7.28)**
school	-0.003	0.002	-0.000	0.000	-0.003	0.003	-0.001	0.003	-0.009	-0.001
	(1.38)	(0.98)	(0.01)	(0.04)	(1.29)	(1.09)	(0.29)	(1.09)	(2.32)*	(0.38)
lbmp	-0.011	-0.011	0.047	0.053	-0.011	-0.011	-0.021	-0.019	-0.009	-0.009
	(3.27)**	(3.36)**	(0.64)	(0.71)	(2.72)**	(2.96)**	(1.98)	(1.93)	(1.98)*	(2.19)*
gov	-0.106	-0.127	-0.111	-0.105	-0.102	-0.139	-0.062	0.015	-0.067	-0.120
	(2.81)**	(3.63)**	(1.83)	(1.70)	(2.21)*	(3.29)**	(0.69)	(0.18)	(1.24)	(2.44)*
trade	0.033	0.018	0.032	0.033	0.035	0.009	0.059	0.030	0.015	-0.011
	(3.95)**	(2.24)*	(2.82)**	(2.84)**	(3.29)**	(0.89)	(3.29)**	(1.77)	(1.10)	(0.86)
volatility	**-0.002**	**-0.002**	**-0.001**	**-0.001**	**-0.002**	**-0.002**	**-0.004**	**-0.003**	**-0.001**	**-0.001**
	(3.83)**	**(4.15)****	**(0.82)**	**(0.90)**	**(3.38)****	**(3.32)****	**(2.93)****	**(3.13)****	**(2.20)***	**(2.09)***
inv		0.136		0.018		0.163		0.198		0.166
		(8.11)**		(0.60)		(7.50)**		(4.96)**		(6.56)**
Constant	0.317	0.348	0.463	0.455	0.256	0.354	0.232	0.266	0.375	0.509
	(8.68)**	(10.20)**	(10.72)**	(9.99)**	(5.44)**	(7.90)**	(3.81)**	(4.87)**	(5.60)**	(8.02)**
Observations	471	470	145	144	326	326	114	114	212	212
Number of groups	76	76	21	21	55	55	18	18	37	37
R-squared	0.27	0.38	0.60	0.60	0.22	0.36	0.33	0.47	0.28	0.43

Absolute value of t statistics in parentheses

* significant at 5%; ** significant at 1%

Table 7. Volatility and Bank Development

	Whole sample		Industrial		Developing		MFI		LFI	
	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv
					LIQUID LIABILITIES					
gov	6.743	11.312	-8.169	4.920	14.000	16.275	7.670	2.540	18.074	19.468
	(2.00)*	(4.16)**	(1.62)	(0.90)	(3.25)**	(4.93)**	(1.74)	(0.95)	(3.00)**	(4.16)**
pi	0.557	1.599	0.937	-0.899	0.249	1.434	1.602	0.268	-0.694	2.960
	(1.07)	(4.15)**	(0.25)	(0.19)	(0.42)	(3.49)**	(3.31)**	(0.84)	(0.72)	(4.50)**
inv	1.455	5.159	0.056	-1.346	-0.278	5.785	2.442	-1.606	-2.813	6.017
	(0.68)	(3.19)**	(0.02)	(0.41)	(0.11)	(3.18)**	(0.66)	(0.65)	(0.89)	(2.59)**
trade	2.000	2.423	-0.426	1.265	1.886	2.421	-0.200	1.346	1.198	2.588
	(3.17)**	(4.94)**	(0.62)	(1.71)	(2.45)*	(4.06)**	(0.18)	(1.98)*	(1.30)	(3.32)**
growth	-27.530	-18.204	-9.856	3.218	-27.442	-17.959	-16.593	-6.730	-26.151	-16.988
	(4.90)**	(4.45)**	(1.04)	(0.28)	(4.11)**	(3.93)**	(2.11)*	(1.29)	(2.77)**	(2.79)**
ll	**-2.670**	**-2.916**	**-1.446**	**0.018**	**-3.000**	**-4.234**	**-0.546**	**-2.351**	**-0.897**	**-3.765**
	(3.56)**	**(4.94)****	**(1.98)***	**(0.02)**	**(2.24)***	**(4.48)****	**(0.41)**	**(2.73)****	**(0.39)**	**(2.14)***
Obs	415	417	113	113	302	304	108	109	194	195
Number	71	72	17	17	54	55	18	19	36	36
					BANK ASSETS					
gov	7.119	10.911	-4.851	2.745	15.812	16.598	11.596	4.147	18.481	17.993
	(2.18)*	(3.93)**	(1.30)	(0.74)	(3.65)**	(4.83)**	(2.60)**	(1.42)	(2.95)**	(3.65)**
pi	0.661	1.753	0.766	4.742	0.408	1.623	1.660	0.396	-0.612	3.068
	(1.31)	(4.54)**	(0.25)	(1.34)	(0.71)	(3.87)**	(3.59)**	(1.25)	(0.63)	(4.48)**
inv	1.557	4.238	2.501	1.592	-0.605	4.865	3.383	-2.156	-2.156	5.180
	(0.78)	(2.66)**	(0.93)	(0.55)	(0.25)	(2.63)**	(0.97)	(0.89)	(0.70)	(2.18)*
trade	1.918	2.418	-0.315	0.833	2.091	2.516	0.996	1.051	1.593	2.827
	(3.36)**	(5.05)**	(0.58)	(1.58)	(2.83)**	(4.22)**	(0.96)	(1.72)	(1.72)	(3.54)**
growth	-25.457	-14.899	-6.919	8.623	-25.434	-15.402	-19.305	-5.826	-24.454	-13.548
	(4.74)**	(3.72)**	(0.80)	(0.87)	(3.83)**	(3.31)**	(2.56)*	(1.12)	(2.60)**	(2.18)*
ba	**-2.768**	**-2.234**	**-0.768**	**0.260**	**-4.188**	**-4.339**	**-3.251**	**-2.358**	**-2.194**	**-2.390**
	(4.65)**	**(4.49)****	**(1.60)**	**(0.51)**	**(3.14)****	**(4.40)****	**(2.88)****	**(2.98)****	**(0.83)**	**(1.17)**
Obs	448	450	144	144	304	306	108	109	196	197
Number	75	76	21	21	54	55	18	19	36	36
					PRIVATE CREDIT					
gov	5.825	10.114	-5.669	1.543	13.284	14.756	8.900	2.974	18.316	17.255
	(1.81)	(3.68)**	(1.36)	(0.39)	(3.19)**	(4.38)**	(1.97)*	(1.05)	(3.12)**	(3.65)**
pi	0.581	1.665	1.514	4.901	0.295	1.486	1.607	0.376	-0.738	2.964
	(1.13)	(4.25)**	(0.48)	(1.35)	(0.50)	(3.51)**	(3.33)**	(1.17)	(0.76)	(4.30)**
inv	1.586	4.700	2.041	1.541	-0.488	5.512	4.197	-0.204	-2.109	5.386
	(0.78)	(2.91)**	(0.73)	(0.52)	(0.20)	(2.94)**	(1.04)	(0.08)	(0.70)	(2.27)*
trade	1.739	2.334	-0.476	0.817	2.021	2.596	0.320	1.040	1.455	2.828
	(3.04)**	(4.90)**	(0.83)	(1.50)	(2.73)**	(4.31)**	(0.28)	(1.54)	(1.61)	(3.58)**
growth	-25.806	-15.446	-5.669	5.190	-26.079	-15.599	-17.645	-6.370	-25.239	-14.043
	(4.72)**	(3.81)**	(0.64)	(0.51)	(3.89)**	(3.35)**	(2.25)*	(1.21)	(2.68)**	(2.26)*
pc	**-2.841**	**-2.682**	**-0.754**	**0.067**	**-4.213**	**-5.490**	**-2.189**	**-2.740**	**-3.298**	**-3.614**
	(4.09)**	**(4.57)****	**(1.33)**	**(0.12)**	**(2.61)****	**(4.54)****	**(1.36)**	**(2.54)***	**(1.18)**	**(1.60)**
Obs	441	443	139	139	302	304	106	107	196	197
Number	75	76	21	21	54	55	18	19	36	36

Table 8. Volatility and Bank Development Lagged

	Whole sample		Industrial		Developing		MFI		LFI	
	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv
					LIQUID LIABILITIES					
gov	8.403	10.645	-5.078	4.805	15.116	15.717	7.809	0.790	19.840	21.435
	(2.06)*	(3.51)**	(1.08)	(0.99)	(2.85)**	(4.20)**	(1.91)	(0.28)	(2.52)*	(4.10)**
pi	0.890	1.703	2.159	-1.582	0.638	1.519	1.517	0.383	-0.067	3.033
	(1.61)	(4.22)**	(0.60)	(0.34)	(1.00)	(3.51)**	(3.21)**	(1.14)	(0.06)	(4.41)**
inv	3.037	3.227	0.545	-0.791	1.339	3.772	3.856	-2.494	0.012	3.884
	(1.35)	(1.96)*	(0.19)	(0.25)	(0.49)	(1.99)*	(1.04)	(0.94)	(0.00)	(1.63)
trade	2.893	1.821	-0.410	1.379	3.230	1.391	0.222	0.210	3.606	1.809
	(4.37)**	(3.80)**	(0.58)	(1.96)*	(3.86)**	(2.40)*	(0.23)	(0.34)	(3.25)**	(2.42)*
growth	-24.620	-15.028	-7.001	10.444	-25.311	-14.930	-18.206	-4.998	-21.393	-12.573
	(4.24)**	(3.58)**	(0.78)	(0.97)	(3.59)**	(3.16)**	(2.34)*	(0.90)	(2.18)*	(2.03)*
ll_1	**-2.638**	**-1.065**	**-0.946**	**0.305**	**-2.772**	**-0.907**	**-1.693**	**-0.168**	**-2.028**	**-0.736**
	(3.56)**	**(1.99)***	**(1.47)**	**(0.42)**	**(2.47)***	**(1.23)**	**(1.76)**	**(0.25)**	**(1.13)**	**(0.63)**
Obs	404	406	117	117	287	289	106	107	181	182
Number	75	76	20	20	55	56	18	19	37	37
					BANK ASSETS					
gov	5.807	8.913	-3.524	3.395	12.638	13.550	8.533	0.901	16.030	18.338
	(1.47)	(3.02)**	(0.96)	(0.95)	(2.40)*	(3.67)**	(2.12)*	(0.30)	(2.07)*	(3.57)**
pi	1.001	1.784	2.049	5.642	0.734	1.588	1.549	0.351	0.034	3.111
	(1.83)	(4.47)**	(0.68)	(1.64)	(1.15)	(3.62)**	(3.40)**	(1.04)	(0.03)	(4.46)**
inv	3.276	3.166	2.287	1.192	0.879	3.372	3.411	-2.654	-0.034	3.574
	(1.51)	(1.99)*	(0.84)	(0.41)	(0.32)	(1.79)	(0.96)	(1.01)	(0.01)	(1.51)
trade	2.506	1.731	-0.444	0.827	3.141	1.572	0.306	0.202	3.471	2.011
	(4.06)**	(3.87)**	(0.82)	(1.59)	(3.84)**	(2.82)**	(0.34)	(0.34)	(3.21)**	(2.79)**
growth	-21.277	-12.675	-2.044	10.838	-22.636	-13.426	-18.039	-4.941	-18.186	-10.060
	(3.77)**	(3.10)**	(0.25)	(1.17)	(3.21)**	(2.80)**	(2.41)*	(0.89)	(1.86)	(1.60)
ba_1	**-2.014**	**-0.633**	**-0.254**	**0.664**	**-2.436**	**-0.727**	**-2.202**	**-0.346**	**-1.375**	**-0.238**
	(3.43)**	**(1.47)**	**(0.57)**	**(1.37)**	**(2.51)***	**(1.11)**	**(3.03)****	**(0.64)**	**(0.84)**	**(0.23)**
Obs	437	439	144	144	293	295	106	107	187	188
Number	76	77	21	21	55	56	18	19	37	37
					PRIVATE CREDIT					
gov	5.639	9.062	-3.841	2.155	12.246	13.784	7.422	2.320	16.015	18.384
	(1.41)	(3.07)**	(0.96)	(0.57)	(2.32)*	(3.73)**	(1.79)	(0.93)	(2.08)*	(3.58)**
pi	0.967	1.751	2.422	5.729	0.694	1.561	1.553	0.407	-0.002	3.104
	(1.75)	(4.37)**	(0.78)	(1.62)	(1.08)	(3.57)**	(3.31)**	(1.32)	(0.00)	(4.45)**
inv	3.196	3.589	2.155	0.997	0.785	3.875	3.799	0.564	-0.166	3.488
	(1.45)	(2.24)*	(0.77)	(0.34)	(0.28)	(2.04)*	(0.97)	(0.22)	(0.05)	(1.47)
trade	2.453	1.658	-0.469	0.827	3.109	1.472	0.075	-0.151	3.406	2.031
	(3.94)**	(3.71)**	(0.83)	(1.54)	(3.78)**	(2.63)**	(0.08)	(0.29)	(3.17)**	(2.82)**
growth	-21.560	-13.634	-2.825	8.881	-22.523	-14.111	-17.163	-9.363	-18.425	-10.139
	(3.77)**	(3.31)**	(0.33)	(0.92)	(3.17)**	(2.95)**	(2.18)*	(1.79)	(1.88)	(1.61)
pc_1	**-2.178**	**-0.796**	**-0.230**	**0.485**	**-2.575**	**-0.642**	**-1.913**	**0.370**	**-1.533**	**-0.694**
	(3.04)**	**(1.53)**	**(0.43)**	**(0.85)**	**(2.13)***	**(0.79)**	**(2.16)***	**(0.62)**	**(0.72)**	**(0.50)**
Obs	430	432	139	139	291	293	104	105	187	188
Number	76	77	21	21	55	56	18	19	37	37

Table 9. Volatility and Stock Market Development

	Whole sample		Industrial		Developing		MFI		LFI	
	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv
					CAPITALIZATION RATIO					
gov	-3.628	1.380	3.337	4.313	-6.027	4.848	-7.498	-0.478	7.685	10.987
	(1.17)	(0.49)	(0.94)	(0.80)	(1.20)	(1.17)	(1.38)	(0.14)	(0.57)	(1.01)
pi	1.477	0.649	-1.672	-0.159	1.445	0.407	1.399	0.648	3.112	-1.914
	(3.60)**	(1.53)	(0.51)	(0.03)	(2.78)**	(0.93)	(2.97)**	(1.95)	(0.80)	(0.60)
inv	-0.418	-0.790	0.562	1.961	-2.088	-4.207	-2.699	-4.908	-5.840	-7.323
	(0.18)	(0.32)	(0.23)	(0.43)	(0.59)	(1.40)	(0.67)	(1.56)	(0.71)	(1.09)
trade	0.889	1.028	-0.325	0.365	1.959	1.243	2.940	1.300	2.315	0.513
	(1.62)	(1.99)*	(0.59)	(0.43)	(2.12)*	(1.61)	(2.28)*	(1.49)	(1.14)	(0.31)
growth	-22.282	-6.417	-5.440	5.750	-27.102	-4.098	-28.409	-1.314	-36.081	-12.191
	(4.08)**	(1.02)	(0.64)	(0.32)	(3.69)**	(0.66)	(3.64)**	(0.22)	(1.80)	(0.75)
smcap	**-0.964**	**-0.574**	**-0.398**	**-0.436**	**-1.364**	**-0.511**	**-1.853**	**-0.465**	**-1.687**	**10.043**
	(2.15)*	**(1.24)**	**(0.64)**	**(0.39)**	**(1.98)***	**(0.88)**	**(2.58)****	**(0.92)**	**(0.29)**	**(2.12)***
Obs	181	181	82	82	99	99	69	69	30	30
Number	55	55	21	21	34	34	18	18	16	16
					VALUE TRADED					
gov	-3.506	0.856	0.549	5.963	-8.027	1.773	-8.806	-1.458	-2.474	13.742
	(1.20)	(0.37)	(0.16)	(1.20)	(1.65)	(0.51)	(1.62)	(0.43)	(0.21)	(1.76)
pi	1.669	0.740	0.348	0.968	1.805	0.499	1.848	0.694	1.895	-1.233
	(4.09)**	(1.94)	(0.11)	(0.19)	(3.52)**	(1.24)	(3.85)**	(1.91)	(0.45)	(0.50)
inv	1.746	0.536	3.617	3.159	-1.914	-3.827	-0.272	-2.649	-5.581	-4.718
	(0.79)	(0.25)	(1.39)	(0.78)	(0.54)	(1.35)	(0.07)	(0.76)	(0.73)	(0.95)
trade	0.512	0.939	-0.594	0.497	2.428	1.630	3.043	1.151	2.561	1.455
	(1.00)	(2.19)*	(1.13)	(0.66)	(2.66)**	(2.40)*	(2.39)*	(1.32)	(1.33)	(1.18)
growth	-17.926	-5.749	-0.814	0.500	-22.684	-2.974	-23.833	-3.259	-26.821	-0.392
	(3.42)**	(1.07)	(0.09)	(0.03)	(3.37)**	(0.54)	(3.22)**	(0.57)	(1.64)	(0.03)
smvt	**-1.381**	**-1.144**	**-0.297**	**-0.121**	**-3.348**	**-1.846**	**-4.348**	**-1.319**	**17.759**	**52.233**
	(1.97)*	**(1.72)**	**(0.43)**	**(0.11)**	**(2.17)***	**(1.44)**	**(2.63)****	**(0.92)**	**(0.42)**	**(1.77)**
Obs	200	200	96	96	104	104	71	71	33	33
Number	56	56	21	21	35	35	18	18	17	17
					TURNOVER RATIO					
gov	-5.103	0.629	4.211	7.395	-9.731	0.704	-9.336	-4.541	-10.357	16.947
	(1.60)	(0.23)	(1.21)	(1.31)	(1.76)	(0.18)	(1.42)	(1.22)	(0.68)	(1.67)
pi	1.597	0.707	0.139	4.285	1.481	0.439	1.326	0.706	1.853	0.515
	(3.85)**	(1.75)	(0.05)	(0.78)	(2.71)**	(1.08)	(2.56)*	(2.13)*	(0.37)	(0.16)
inv	-1.257	-1.331	1.150	3.197	-4.007	-7.431	-2.290	-5.085	-10.550	-10.805
	(0.52)	(0.54)	(0.44)	(0.67)	(1.02)	(2.53)*	(0.49)	(1.41)	(1.04)	(1.67)
trade	0.669	0.751	-0.163	0.624	1.479	1.315	0.833	1.080	3.480	2.222
	(1.27)	(1.57)	(0.31)	(0.73)	(1.68)	(2.03)*	(0.77)	(1.58)	(1.51)	(1.51)
growth	-18.764	-3.940	-3.168	8.137	-23.555	-2.481	-25.425	-0.577	-22.301	1.432
	(3.25)**	(0.63)	(0.36)	(0.44)	(2.91)**	(0.41)	(2.89)**	(0.09)	(1.15)	(0.10)
smtr	**-0.204**	**0.019**	**0.109**	**0.675**	**-0.181**	**0.074**	**-0.503**	**-0.008**	**3.419**	**4.310**
	(0.55)	**(0.05)**	**(0.34)**	**(1.14)**	**(0.19)**	**(0.10)**	**(0.53)**	**(0.01)**	**(0.51)**	**(1.02)**
Obs	168	168	77	77	91	91	64	64	27	27
Number	55	55	21	21	34	34	18	18	16	16

Table 10. Volatility and Stock Market Development Lagged

	Whole sample		Industrial		Developing		MFI		LFI	
	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv
					CAPITALIZATION RATIO					
gov	-11.043	1.580	5.574	10.313	-16.620	2.993	-7.375	-1.451	-6.877	10.908
	(2.12)*	(0.59)	(1.32)	(1.71)	(2.23)*	(0.80)	(1.60)	(0.42)	(0.39)	(1.36)
pi	1.473	0.453	-0.206	-1.032	1.212	0.150	1.756	0.459	-0.470	0.906
	(2.59)**	(1.10)	(0.05)	(0.17)	(1.87)	(0.38)	(4.26)**	(1.41)	(0.08)	(0.31)
inv	-10.459	-1.515	2.022	5.860	-17.111	-3.271	-2.491	0.296	-21.853	-5.632
	(2.87)**	(0.62)	(0.51)	(1.00)	(3.65)**	(1.30)	(0.53)	(0.08)	(1.98)*	(1.25)
trade	1.600	1.044	-0.774	0.701	3.801	1.154	1.888	-0.080	5.367	1.598
	(2.24)*	(2.31)*	(1.25)	(0.80)	(3.70)**	(2.02)*	(1.95)	(0.11)	(2.53)*	(1.59)
growth	-8.561	-9.975	2.217	0.311	-23.779	-11.543	-23.303	-5.646	-11.776	-15.016
	(1.16)	(1.54)	(0.22)	(0.02)	(2.38)*	(1.72)	(2.60)**	(0.78)	(0.43)	(1.04)
smcap_1	**-0.569**	**-0.648**	**-0.252**	**-0.770**	**-1.057**	**-0.380**	**-1.288**	**0.407**	**2.032**	**0.206**
	(0.80)	**(1.12)**	**(0.33)**	**(0.64)**	**(1.02)**	**(0.55)**	**(1.50)**	**(0.60)**	**(0.53)**	**(0.10)**
Obs	160	161	75	75	85	86	59	59	26	27
Number	52	53	21	21	31	32	17	17	14	15
					VALUE TRADED					
gov	-5.252	0.587	3.967	5.963	-9.431	1.840	-8.369	-0.961	-0.780	13.204
	(1.02)	(0.23)	(1.15)	(1.20)	(1.25)	(0.52)	(1.71)	(0.29)	(0.05)	(1.68)
pi	1.575	0.502	0.681	0.968	1.125	0.286	1.854	0.414	-2.070	0.485
	(2.91)**	(1.22)	(0.21)	(0.19)	(1.88)	(0.74)	(4.12)**	(1.31)	(0.44)	(0.17)
inv	-2.831	-0.180	1.370	3.159	-11.245	-2.031	-1.018	0.900	-14.361	-5.730
	(1.03)	(0.09)	(0.50)	(0.78)	(2.91)**	(0.96)	(0.22)	(0.27)	(1.99)*	(1.64)
trade	1.879	1.235	-0.662	0.497	3.762	1.597	1.223	-0.031	4.976	2.337
	(3.07)**	(3.18)**	(1.28)	(0.66)	(4.46)**	(3.49)**	(1.25)	(0.04)	(3.59)**	(3.09)**
growth	-15.783	-10.802	0.934	0.500	-31.454	-13.393	-18.714	-7.496	-22.859	-20.146
	(2.31)*	(1.76)	(0.10)	(0.03)	(3.54)**	(2.17)*	(2.08)*	(1.17)	(1.12)	(1.51)
smvt_1	**-1.345**	**-0.788**	**0.150**	**-0.121**	**-4.138**	**-0.210**	**-3.118**	**1.004**	**-2.142**	**-0.984**
	(1.48)	**(1.00)**	**(0.21)**	**(0.11)**	**(2.35)***	**(0.15)**	**(1.42)**	**(0.62)**	**(0.60)**	**(0.41)**
Obs	179	180	89	96	90	91	61	61	29	30
Number	53	54	21	21	32	33	17	17	15	16
					TURNOVER RATIO					
gov	-6.061	1.861	5.875	13.389	-11.001	4.079	-6.331	-0.681	-10.694	14.140
	(1.06)	(0.60)	(1.31)	(2.03)*	(1.35)	(0.93)	(1.13)	(0.16)	(0.59)	(2.02)*
pi	1.704	0.533	1.509	0.938	1.357	0.207	1.985	0.475	-1.095	0.448
	(2.89)**	(1.19)	(0.37)	(0.15)	(2.24)*	(0.49)	(4.47)**	(1.37)	(0.23)	(0.19)
inv	-9.106	-1.173	0.519	9.176	-15.331	-3.190	-1.049	0.304	-17.510	-5.906
	(2.36)*	(0.44)	(0.12)	(1.40)	(3.26)**	(1.18)	(0.21)	(0.07)	(1.32)	(1.29)
trade	1.680	1.047	-0.703	0.996	3.784	1.165	1.182	0.048	4.693	1.541
	(2.31)*	(2.11)*	(1.14)	(1.12)	(3.90)**	(1.89)	(1.24)	(0.07)	(2.69)**	(1.84)
growth	-10.538	-9.804	3.591	2.265	-32.709	-13.039	-18.738	-5.106	-12.350	-48.028
	(1.33)	(1.38)	(0.35)	(0.14)	(3.21)**	(1.72)	(1.99)*	(0.67)	(0.43)	(3.37)**
smtr_1	**-0.146**	**-0.444**	**0.409**	**-0.341**	**-2.189**	**-0.542**	**-1.104**	**-0.537**	**-1.364**	**-1.046**
	(0.32)	**(1.13)**	**(1.11)**	**(0.60)**	**(2.54)***	**(0.84)**	**(1.30)**	**(0.80)**	**(0.74)**	**(1.11)**
Obs	147	148	70	70	77	78	54	54	23	24
Number	51	52	21	21	30	31	17	17	13	14

Table 11. Volatility with Joint Bank and Stock Market Development

	Whole sample		Industrial		Developing		MFI		LFI	
	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv
JOINT EFFECT: LIQUID LIABILITIES AND VALUE TRADED										
gov	-4.851	0.532	-1.629	7.502	-9.104	3.961	-8.847	1.379	-1.106	10.949
	(1.60)	(0.22)	(0.41)	(0.99)	(1.85)	(1.05)	(1.56)	(0.39)	(0.09)	(1.34)
pi	1.761	0.557	0.531	-10.226	1.986	0.305	1.855	0.509	3.704	-0.839
	(4.13)**	(1.37)	(0.12)	(1.23)	(3.80)**	(0.73)	(3.75)**	(1.39)	(0.96)	(0.34)
inv	-0.762	-1.200	0.792	-0.490	-2.437	-3.262	-0.298	-0.988	-5.220	-4.680
	(0.33)	(0.51)	(0.32)	(0.10)	(0.69)	(1.14)	(0.07)	(0.28)	(0.73)	(0.95)
trade	1.042	1.401	-0.621	0.244	1.888	2.069	3.022	2.166	1.228	0.906
	(1.80)	(2.83)**	(1.02)	(0.21)	(2.00)*	(2.83)**	(2.03)*	(2.20)*	(0.64)	(0.68)
growth	-18.828	-6.165	-5.088	9.314	-21.001	-3.873	-23.718	-5.628	-23.897	0.551
	(3.47)**	(1.12)	(0.48)	(0.46)	(3.09)**	(0.71)	(3.07)**	(0.98)	(1.45)	(0.05)
ll	**0.611**	**-0.654**	**-0.745**	**-0.064**	**1.675**	**-1.779**	**0.039**	**-2.156**	**6.808**	**3.411**
	(0.92)	**(1.15)**	**(1.11)**	**(0.05)**	**(1.26)**	**(1.69)**	**(0.03)**	**(2.06)***	**(1.52)**	**(1.09)**
smvt	**-1.917**	**-0.734**	**0.249**	**-0.465**	**-3.433**	**-1.517**	**-4.340**	**-1.632**	**15.226**	**51.299**
	(2.37)*	**(0.90)**	**(0.37)**	**(0.36)**	**(2.20)***	**(1.18)**	**(2.57)***	**(1.16)**	**(0.37)**	**(1.75)**
Obs	178	178	74	74	104	104	71	71	33	33
Number	52	52	17	17	35	35	18	18	17	17
JOINT EFFECT: LIQUID LIABILITIES AND VALUE TRADED (LAGGED)										
gov	-9.672	-0.207	4.924	12.739	-11.566	1.473	-8.054	-2.410	-7.186	13.551
	(1.71)	(0.07)	(1.00)	(1.61)	(1.45)	(0.39)	(1.56)	(0.71)	(0.39)	(1.45)
pi	1.383	0.536	-3.078	-8.743	1.065	0.258	1.813	0.565	-2.646	0.538
	(2.45)*	(1.22)	(0.64)	(1.09)	(1.72)	(0.64)	(3.80)**	(1.72)	(0.51)	(0.18)
inv	-4.783	-2.238	1.490	-0.864	-12.492	-2.672	-1.075	0.732	-17.284	-7.198
	(1.61)	(1.04)	(0.48)	(0.17)	(3.08)**	(1.20)	(0.23)	(0.22)	(2.10)*	(1.82)
trade	2.508	1.677	-0.861	1.551	3.869	1.678	1.280	-0.371	4.966	2.603
	(3.68)**	(3.80)**	(1.06)	(1.20)	(4.44)**	(3.56)**	(1.23)	(0.52)	(3.17)**	(3.10)**
growth	-18.514	-9.348	6.915	19.160	-31.755	-13.150	-19.237	-5.974	-24.340	-19.958
	(2.48)*	(1.44)	(0.59)	(0.99)	(3.48)**	(2.09)*	(2.10)*	(0.93)	(1.06)	(1.42)
ll_1	**-1.318**	**0.321**	**-0.691**	**2.034**	**-0.017**	**-0.119**	**-0.287**	**1.508**	**-0.066**	**-0.283**
	(1.61)	**(0.50)**	**(0.85)**	**(1.56)**	**(0.01)**	**(0.15)**	**(0.20)**	**(1.54)**	**(0.03)**	**(0.22)**
smvt_1	**-0.469**	**-1.228**	**0.699**	**-2.087**	**-4.230**	**-0.157**	**-2.783**	**-1.109**	**-2.936**	**-0.908**
	(0.40)	**(1.19)**	**(0.81)**	**(1.48)**	**(1.75)**	**(0.09)**	**(0.92)**	**(0.53)**	**(0.68)**	**(0.33)**
Obs	158	159	71	71	87	88	61	61	26	27
Number	47	48	18	18	29	30	17	17	12	13

Table 12. Growth-Volatility Relationship and Bank Development

	Whole sample		Industrial		Developing		MFI		LFI	
	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv
					LIQUID LIABILITIES					
linitial	-0.044	-0.049	-0.024	-0.022	-0.051	-0.066	-0.044	-0.053	-0.067	-0.083
	(6.26)**	(7.41)**	(3.05)**	(2.69)**	(5.27)**	(7.25)**	(3.15)**	(4.09)**	(5.25)**	(6.80)**
school	-0.001	0.002	-0.002	-0.002	-0.003	0.002	-0.000	0.005	-0.005	-0.001
	(0.61)	(1.12)	(1.03)	(1.00)	(1.00)	(0.87)	(0.08)	(1.40)	(1.30)	(0.27)
lbmp	-0.009	-0.008	0.505	0.540	-0.010	-0.010	-0.018	-0.015	-0.006	-0.006
	(2.47)*	(2.41)*	(2.35)*	(2.46)*	(2.39)*	(2.49)*	(1.59)	(1.49)	(1.21)	(1.32)
gov	-0.120	-0.076	-0.200	-0.193	-0.123	-0.071	-0.001	0.058	-0.150	-0.116
	(2.43)*	(1.61)	(2.92)**	(2.78)**	(2.02)*	(1.27)	(0.01)	(0.66)	(1.98)	(1.66)
trade	0.033	0.025	0.019	0.019	0.025	0.009	0.047	0.027	0.008	-0.005
	(3.46)**	(2.74)**	(1.27)	(1.27)	(2.06)*	(0.81)	(2.56)*	(1.54)	(0.49)	(0.36)
vol	**-0.002**	**-0.002**	**0.003**	**0.003**	**-0.001**	**-0.001**	**-0.005**	**-0.005**	**-0.001**	**-0.001**
	(2.40)*	**(2.72)****	**(1.36)**	**(1.30)**	**(1.19)**	**(1.38)**	**(2.17)***	**(2.75)****	**(0.83)**	**(0.68)**
ll	**0.003**	**-0.004**	**-0.008**	**-0.009**	**0.051**	**0.047**	**0.032**	**0.002**	**0.017**	**0.040**
	(0.21)	**(0.32)**	**(0.74)**	**(0.88)**	**(1.86)**	**(1.89)**	**(0.92)**	**(0.07)**	**(0.41)**	**(1.03)**
ll_vol	**0.001**	**0.001**	**-0.007**	**-0.007**	**-0.002**	**-0.002**	**0.002**	**0.004**	**0.000**	**-0.002**
	(0.26)	**(0.25)**	**(2.00)***	**(1.97)**	**(0.52)**	**(0.55)**	**(0.35)**	**(0.93)**	**(0.04)**	**(0.34)**
inv		0.143		0.032		0.178		0.182		0.171
		(6.62)**		(1.05)		(6.70)**		(4.33)**		(5.11)**
Obs	405	404	114	113	291	291	107	107	184	184
Number	71	71	17	17	54	54	18	18	36	36
R^2	0.26	0.35	0.62	0.62	0.24	0.37	0.36	0.48	0.30	0.41
					LIQUID LIABILITIES (LAGGED)					
linitial	-0.035	-0.046	-0.027	-0.023	-0.033	-0.054	-0.022	-0.036	-0.060	-0.087
	(5.39)**	(7.09)**	(3.31)**	(2.70)**	(3.81)**	(6.10)**	(2.19)*	(3.69)**	(4.57)**	(6.64)**
school	-0.002	0.002	-0.002	-0.002	-0.003	0.003	-0.002	0.003	-0.006	0.001
	(0.96)	(0.95)	(0.88)	(0.88)	(1.00)	(1.08)	(0.56)	(0.92)	(1.52)	(0.17)
lbmp	-0.010	-0.010	0.595	0.620	-0.010	-0.010	-0.013	-0.011	-0.007	-0.007
	(2.75)**	(2.72)**	(2.81)**	(2.91)**	(2.32)*	(2.43)*	(1.18)	(1.15)	(1.32)	(1.37)
gov	-0.146	-0.143	-0.210	-0.217	-0.140	-0.145	-0.101	-0.012	-0.116	-0.140
	(3.18)**	(3.30)**	(3.01)**	(3.09)**	(2.49)*	(2.76)**	(1.12)	(0.14)	(1.68)	(2.21)*
trade	0.035	0.026	0.019	0.019	0.035	0.017	0.059	0.035	0.018	0.000
	(3.55)**	(2.71)**	(1.19)	(1.22)	(2.84)**	(1.46)	(3.41)**	(2.05)*	(1.09)	(0.02)
vol	**-0.002**	**-0.002**	**-0.002**	**-0.001**	**-0.002**	**-0.002**	**-0.007**	**-0.007**	**-0.001**	**-0.001**
	(2.13)*	**(2.58)***	**(0.68)**	**(0.22)**	**(1.62)**	**(1.99)***	**(3.14)****	**(3.66)****	**(0.79)**	**(0.83)**
ll_1	**-0.014**	**-0.015**	**-0.011**	**-0.014**	**-0.012**	**-0.012**	**-0.036**	**-0.043**	**-0.022**	**-0.014**
	(1.40)	**(1.55)**	**(1.06)**	**(1.33)**	**(0.78)**	**(0.82)**	**(2.03)***	**(2.59)***	**(0.85)**	**(0.59)**
ll_1_vol	**-0.001**	**0.000**	**0.001**	**-0.001**	**-0.001**	**-0.000**	**0.010**	**0.011**	**-0.002**	**-0.001**
	(0.25)	**(0.00)**	**(0.24)**	**(0.32)**	**(0.44)**	**(0.08)**	**(1.87)**	**(2.18)***	**(0.48)**	**(0.43)**
inv		0.124		0.030		0.155		0.179		0.164
		(6.08)**		(0.99)		(5.86)**		(4.08)**		(5.14)**
Obs	402	401	118	117	284	284	106	106	178	178
Number	73	73	20	20	53	53	18	18	35	35
R^2	0.27	0.35	0.60	0.61	0.24	0.34	0.35	0.46	0.32	0.43

Table 13. Growth-Volatility Relationship and Stock Market Development

	Whole sample		Industrial		Developing		MFI		LFI	
	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv	No inv	Inv
					VALUE TRADED					
linitial	-0.069	-0.071	-0.052	-0.047	-0.066	-0.076	-0.049	-0.066	-0.180	-0.181
	(7.18)**	(7.52)**	(3.45)**	(2.99)**	(4.39)**	(4.74)**	(3.01)**	(3.85)**	(5.03)**	(4.84)**
school	0.002	0.003	-0.001	-0.002	0.002	0.006	-0.003	0.002	-0.008	-0.011
	(0.61)	(1.19)	(0.47)	(0.57)	(0.48)	(1.11)	(0.67)	(0.43)	(0.43)	(0.54)
lbmp	-0.019	-0.014	-0.038	-0.033	-0.006	-0.003	-0.003	-0.001	0.056	0.049
	(1.69)	(1.28)	(0.35)	(0.31)	(0.39)	(0.22)	(0.15)	(0.06)	(1.77)	(1.39)
gov	-0.223	-0.154	0.003	0.032	-0.298	-0.212	-0.298	-0.163	-0.519	-0.638
	(3.00)**	(1.94)	(0.03)	(0.30)	(2.59)*	(1.69)	(2.13)*	(1.12)	(2.00)	(1.88)
trade	0.042	0.044	0.007	0.004	0.072	0.073	0.018	0.013	0.193	0.188
	(2.93)**	(3.11)**	(0.33)	(0.20)	(2.44)*	(2.49)*	(0.49)	(0.36)	(2.44)*	(2.27)
vol	**-0.004**	**-0.004**	**-0.001**	**-0.001**	**-0.006**	**-0.006**	**-0.007**	**-0.007**	**-0.005**	**-0.006**
	(4.25)**	**(4.32)****	**(0.72)**	**(0.98)**	**(4.14)****	**(3.71)****	**(3.93)****	**(3.90)****	**(1.63)**	**(1.64)**
smvt	**0.008**	**0.001**	**0.037**	**0.035**	**-0.029**	**-0.038**	**-0.020**	**-0.031**	**1.824**	**1.772**
	(0.45)	**(0.06)**	**(2.29)***	**(2.15)***	**(0.72)**	**(0.94)**	**(0.50)**	**(0.79)**	**(2.35)***	**(2.18)**
smvt_vol	**0.008**	**0.010**	**-0.004**	**-0.003**	**0.019**	**0.018**	**0.045**	**0.045**	**-0.557**	**-0.578**
	(0.95)	**(1.23)**	**(0.62)**	**(0.42)**	**(0.59)**	**(0.59)**	**(1.34)**	**(1.43)**	**(1.64)**	**(1.62)**
inv		0.080		0.037		0.109		0.163		-0.112
		(2.35)*		(0.95)		(1.64)		(2.33)*		(0.58)
Obs	199	199	96	96	103	103	71	71	32	32
Number	55	55	21	21	34	34	18	18	16	16
R^2	0.42	0.44	0.43	0.43	0.49	0.51	0.48	0.54	0.88	0.89
					VALUE TRADED (LAGGED)					
linitial	-0.045	-0.046	-0.045	-0.045	-0.034	-0.036	-0.027	-0.029	-0.158	-0.095
	(5.97)**	(6.04)**	(5.80)**	(5.51)**	(2.55)*	(2.50)*	(1.97)	(2.00)	(2.17)	(0.99)
school	0.006	0.006	0.003	0.003	0.006	0.006	0.002	0.003	0.032	0.007
	(2.34)*	(2.59)*	(1.05)	(1.06)	(1.27)	(1.31)	(0.46)	(0.60)	(1.08)	(0.17)
lbmp	-0.016	-0.009	0.005	0.019	-0.004	-0.003	-0.005	-0.004	0.008	0.047
	(1.41)	(0.83)	(0.05)	(0.19)	(0.28)	(0.23)	(0.30)	(0.25)	(0.13)	(0.65)
gov	-0.205	-0.116	-0.044	-0.025	-0.231	-0.207	-0.306	-0.272	-0.368	-0.705
	(3.05)**	(1.55)	(0.51)	(0.28)	(2.30)*	(1.72)	(2.62)*	(1.98)	(1.25)	(1.56)
trade	0.028	0.025	0.014	0.015	0.048	0.046	0.042	0.038	0.056	0.121
	(2.41)*	(2.26)*	(0.99)	(1.01)	(2.58)*	(2.28)*	(1.89)	(1.55)	(0.49)	(0.92)
vol	**-0.004**	**-0.004**	**-0.001**	**-0.001**	**-0.005**	**-0.005**	**-0.005**	**-0.005**	**-0.005**	**-0.004**
	(3.46)**	**(3.42)****	**(0.33)**	**(0.47)**	**(2.98)****	**(2.86)****	**(2.67)***	**(2.56)***	**(1.03)**	**(0.71)**
smvt_1	**-0.048**	**-0.047**	**-0.006**	**-0.010**	**-0.047**	**-0.045**	**-0.063**	**-0.062**	**-0.086**	**-0.374**
	(2.03)*	**(2.06)***	**(0.27)**	**(0.44)**	**(0.72)**	**(0.69)**	**(0.81)**	**(0.78)**	**(0.42)**	**(1.05)**
smvt_1_vol	**0.010**	**0.010**	**-0.004**	**-0.002**	**-0.010**	**-0.010**	**0.008**	**0.008**	**-0.048**	**-0.013**
	(0.84)	**(0.85)**	**(0.33)**	**(0.19)**	**(0.29)**	**(0.26)**	**(0.17)**	**(0.17)**	**(0.38)**	**(0.09)**
inv		0.092		0.038		0.026		0.034		-0.440
		(2.59)*		(0.97)		(0.37)		(0.47)		(0.99)
Obs	183	182	90	89	93	93	62	62	31	31
Number	56	56	21	21	35	35	17	17	18	18
R^2	0.39	0.42	0.60	0.60	0.44	0.44	0.51	0.51	0.66	0.72

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ACCOMMODATION CAPACITIES IN MACEDONIA AS A FACTOR FOR COMPETITIVE TOURISM SUPPLY

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Abstract

Creating an adequate tourism supply which will meet the demand is a challenge for every country that seeks a planned tourism development. Tourism infrastructure is an essential part of the tourism supply and must be projected on a thorough analysis of the tourism demand. This paper argues the necessity of initiating measures and activities for enhancing tourism competitiveness in Macedonia. The recommendations stemmed from detailed calculations as a base for analyzing accommodation capacities, measured by the number of hotel beds and hotel rooms in Macedonia for the period 1990-2010. In that respect, their optimal number is estimated by employing the standard formulas. The results pointed to a significant over dimension of current hotel accommodation supply in Macedonia.

Key words: *Tourism; Accommodation capacities; Competitiveness; Macedonia.*

Introduction

One may argue that tourism in Macedonia is far behind the competition due to the lack of overall concept for development, as well as adequate general economic policy, especially development policy for supplementary sectors necessary for tourism follow-up development. The presence of uncoordinated activities, the lack of organisational forms functioning on horizontal and vertical line, unclear set of goals, aims and field of interest within the public, as well as the private tourism sector, resulted in poorly developed tourism in Macedonia. In order to cope with all serious challenges, obstacles and difficulties, Macedonia has just recently started to work on creating the foundations for increasing its competitiveness in tourism (USAID, 2006).

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Consequently, all the efforts and attempts undertaken are directed toward promoting Macedonia as an attractive tourism destination. On one hand, tourist destination means temporary location whereas new travelling experiences may be gained, representing attractiveness of a certain destination (Leiper, 1979). On the other hand, attractiveness may be evaluated in many different ways, such as: from the point of view of emotions, experiences, adventures and satisfaction of tourists (Hu and Ritchie, 1993), with respect to the meaning of tourism attractions and business environment (Enright and Newton, 2004) or, by evaluation of different supporting factors which create tourism supply (Uysal, 1998; Dwyer and Kim, 2003). For instance, initially, the concept of tourism competitiveness was related to prices (Dwyer et al., 2000), and later on, econometric models were used for the purpose of ranking (Song and Witt, 2000). Additionally, it is highly believed that competitiveness determines the success of a sustainable tourist destination (Ritchie and Crouch, 2003). Undoubtedly, the most comprehensive approach is the one which, beside the competitive advantages, takes into consideration the comparative advantages as significant factors which determine tourism competitiveness of a certain destination (Ritchie et al., 2001). There is a variety of definitions and approaches, none being correct or false, but rather helpful in formulating hypothesis for proving different aspects of tourism destination competitiveness (Mazanec et al., 2007).

In the changing environment, it is especially important to define properly the role of government in giving the tourism an appropriate treatment, as a possible tool for achieving positive economic results. The role of the government is particularly crucial in the implementation of the tourism development plan in order to achieve sustainable growth of tourism industry. It can be accomplished by different measures and activities for supporting the international tourism or, by redirecting domestic tourists towards domestic tourism destinations. In both cases, it is fundamental to look at two particular issues: (1) tourism promotion and (2) appropriate tourism supply.

THE COMPETITIVENESS OF MACEDONIAN TOURISM: AN OVERVIEW

In Macedonia, the budget expenditures allocated for the implementation of the Programme for tourism promotion are very modest, though their constant increases every year. For instance, approximately 100 000 EUR were scheduled for tourism promotion in 2005 (Government of Republic of Macedonia, 2009), and another 120 000 EUR were spent in 2011 (Government of the Republic of Macedonia, 2010). The need for more efforts in the field of tourism promotion in Macedonia is illustrated by the fact that Macedonia has been ranked low on the list of the most attractive destinations for travel and tourism, issued by the World Economic Forum. So, in 2007 Macedonia was ranked as 83rd out of 124 countries. In 2008, it was placed at the same position, but this time out of 130 countries. In 2009, a small progress was made, i.e. Macedonia was ranked 80th out of 133 countries (Blanke and Chiesa, 2009, p. 31). Finally, a slight improvement was made in 2011, when Macedonia was ranked at the 76th place out of 139 countries. However, it should be mentioned that the majority of the countries in the region are significantly better ranked than Macedonia: Slovenia – 33rd place, Croatia – 34th place, Montenegro – 36th place, Bulgaria – 48th place and Albania – 71st place (Blanke and Chiesa, 2011, p. xv). Concerning the neighboring countries, only Serbia, and Bosnia and Herzegovina are ranked lower than Macedonia.

If we make a detail analysis of all indicators concerning certain sub-indexes, many interesting concluding remarks emerge, in particular with respect to: travel and tourism regulatory framework, tourism business environment and infrastructure, tourism human, cultural and natural resources etc. For the purpose of this paper, we refer only to the tourism infrastructure index, which is categorized within the business environment and the necessary infrastructure for tourism and travel development. Thus, tourism infrastructure of Macedonia, which is essential part of the tourism supply and represents its appropriateness, has a score of 3.8, being ranked at the 69th place out of 139 countries (Blanke and Chiesa, 2011, p. 256). In this framework, it should be emphasized that hotel rooms are ranked at the 72nd place (Blanke and Chiesa, 2011, p. 257). It is also noticeable that this segment is not included in the list of competitive advantages of Macedonia, which is supported by the calculations presented in the next sections.

METHODOLOGY

Calculating accommodation capacities in Macedonia is undertaken in order to present (in)appropriate tourism accommodation supply. The main conclusions of the presented calculations should initiate, among all key actors responsible for the tourism policy, the urgent need for carrying out measures and activities for enhancing tourism competitiveness in Macedonia.

The calculations are based on the average values regarding the number of tourists and the average length of stay in all hotels in Macedonia. So, the data set does not cover the small accommodation facilities (motels, tourist camps, private accommodation etc.). The sample is spread over the period from 1990-2010, thus covering 21 years (State Statistical Office, 2011).

The working hypothesis applied in the calculations is the economic presumption that the accommodation capacities must be projected upon a detailed analysis of the tourism demand in order to accomplish optimal business results. In other words, it means obtaining optimal degree of capacity utilization with minimum costs, thus achieving maximum income.

The calculation of accommodation capacities consists of two mutually correlated calculations. The first calculation deals with the demand for beds, and the outcome serves as a data base for the next calculation, which refers to the required number of hotel rooms. Such mutual interrelation is obvious due to the fact that these two calculations are complementary and represent the two sides of a coin.

The calculations are based on application of standard formulas for forecasting tourism accommodation capacities, which may be applied in each tourism market separately, as well as for certain types of accommodation (European Commission – Eurostat, 2007). The aim is to determine the real need for total accommodation in a tourist destination.

Hence, the required number of beds is estimated by means of formula (1):

$$Number\ of\ beds = \frac{number\ of\ tourists\ in\ certain\ time\ period \times\ average\ length\ of\ stay\ in\ overnights}{number\ of\ nights\ spent\ in\ certain\ time\ period \times\ percent\ of\ capacity\ usage} \quad (1)$$

The second calculation, which is complementary to the previous one, refers to the need for hotel rooms and it is based on the formula (2) for estimating the demand for rooms:

$$Number\ of\ rooms = \frac{number\ of\ demand\ for\ beds}{average\ usage\ of\ room\ (person\ per\ room)} \quad (2)$$

In order to obtain more accurate results, two variants are applied regarding the average room occupancy:

a) We presume 75% of average room occupancy, which can be treated as optimal rate of utilization; and

b) We presume 60% of average room occupancy, taken as a minimum rate which assures cost-effectiveness of hotels.

As a result to the fact that tourism demand may not be met completely during the main tourist season, the calculations should be made with some acceptable occupancy rate. In that respect, the rate of 62% is set as internationally accepted average room occupancy, which is the most economically efficient rate for hotels (Horwath Consulting Zagreb, 1999).

Thecalculated values refer only to the hotel accommodation capacities in Macedonia, mainly due to the following reasons:

(1) The hotels are the main and dominant factor of tourism accommodation supply in Macedonia, representing a ground for commercial tourism development in future; and

(2) Limited statistical data do not allow accurate projections of accommodation needs for other types of capacities (households, tourist camps, motels etc.).

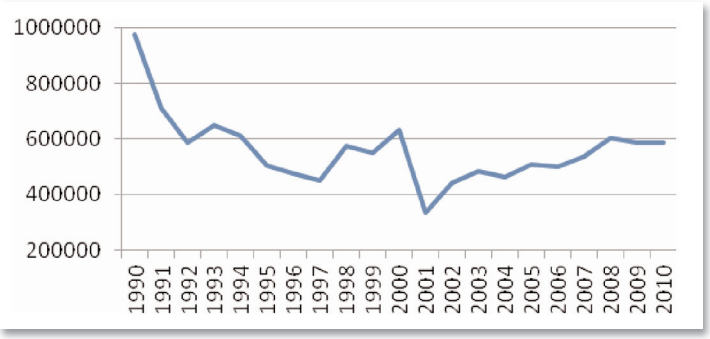
ANALYSIS, RESULTS AND DISCUSSION

The calculation of accommodation needs in Macedonia is based on statistical data for the average number of tourists and the average number of stay in all hotels during 1990-2010.

Chart 1 reveals that the number of tourist arrivals in the sample period shows sharp downward trend due to the variety of obstacles that the newly created independent country was faced with. The total number of tourist arrivals in Macedonia during 1990-2010 was 11 768 450 tourists, meaning an average of 560 402 tourists.

Chart 1:

Tourist arrivals, 1990-2010

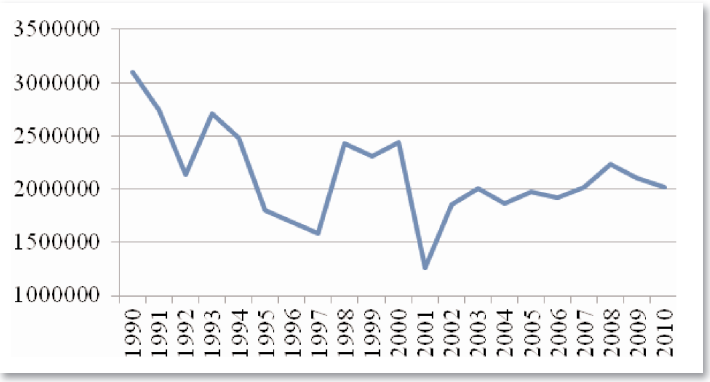


Source: State Statistical Office. (2011). Statistical Review: Transport, Tourism and Other Services, Tourism in the Republic of Macedonia 2006-2010. Skopje, p.11.

The data representing the tourist nights spent within the sample period are presented visually in the Chart 2. The same trend line being noticeable in the Chart 1 is present in the Chart 2. Moreover, the total number of tourist nights spent in Macedonia during 1990-2010 is 44 667 380 nights spent, resulting in an average of 2 127 018 nights spent.

Chart 2:

Tourist nights spent, 1990-2010



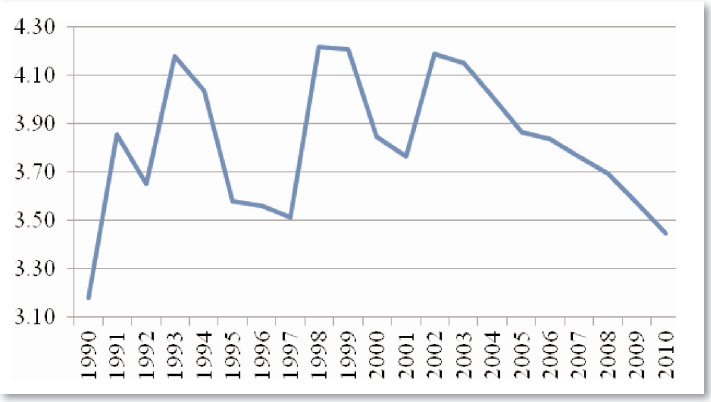
Source: State Statistical Office. (2011). Statistical Review: Transport, Tourism and Other Services, Tourism in the Republic of Macedonia 2006-2010. Skopje, p.11.

Although the economic impacts which affect the tourism development cannot be evaluated according to the length of stay in certain tourist destination, yet it is considered that longer stay implies larger tourism con-

sumption. Consequently, each country tries to identify and introduce measures and activities for extending the tourists' stay in the destination.

Chart 3:

Average length of stay in days, 1990-2010



Source: Own calculations.

The data presented in Chart 3 clearly indicate visible variations during the sample period when referring the average length of stay in terms of days, when addressing the total number of tourists in Macedonia. In that respect, the average length of stay in 1990 was 3,2 days, in 2000 - 3,8 days, while in 2010 was 3,4 days. Additional indicator that supports the conclusion for extremely limited average duration of tourists' stay in the sample period, is the fact that all tourists in Macedonia (foreign and domestic ones) stayed only 3,8 days during 1990-2010.

Table 1: Average length of stay of foreign tourists in selected countries in 2006

Country	Days
Malta	10,2
Bulgaria	8,6
Cyprus	7,4
Croatia	5,6
Spain	5,0
Turkey	4,5
Macedonia*	2,3

Source: Voithofer, P. (2006). Tourism - Key to Growth and Employment. Vienna, p. 14.

**Note: Own calculations.*

Some previous in-depth analysis resulted with more shocking alerts stating the average length of stay of foreign tourists in Macedonia. Moreover, the comparative analysis from the data presented in Table 1, pointed out that Macedonia is far behind many countries that are tourism-oriented. Specifically, it can be concluded that foreign tourists in Macedonia are not coming due to tourism aims, but they visited Macedonia for business, diplomatic or other similar motives.

Calculating the required number of beds in hotel accommodation capacities

The first calculation refers to the required number of beds. In that respect, we employ the standard formula (1), the data regarding average number of total tourist arrivals (based upon data from Chart 1) and the average length of stay in days (based upon data from Chart 3) for the sample period 1990-2010.

The obtained results imply that 7 772 beds are needed in order to meet the average tourism demand in Macedonia under the assumed optimal accommodation capacity occupancy rate of 75%.

$$Number\ of\ beds = \frac{560\,402\ tourists \times 3.8\ stay}{365\ nights \times 75\%\ usage} = \frac{2\,129\,528}{274} = 7\,772\ beds$$

In case of a minimal accommodation capacity occupancy of 60%, in order to meet the average tourism demand in Macedonia, it is necessary to have 9 724 beds on disposal in hotel capacities.

$$Number\ of\ beds = \frac{560\,402\ tourists \times 3.8\ stay}{365\ nights \times 60\%\ usage} = \frac{2\,129\,528}{219} = 9\,724\ beds$$

If we make a comparative analysis of the estimated values regarding the number of needed hotel beds with the existing ones, we can conclude that there is an over dimension of hotel accommodation capacities in Macedonia. Namely, during the sample period, the hotels in Macedonia have an average of 14 581 beds (State Statistical Office, 2011), which is 1.5-2 times larger than the calculated needs.

The presence of such imbalance between the current capacities and the tourism demand is reflected in the low average hotel accommodation occupancy rate of 39% in the sample period. The calculations are made by employing the standard equation for average accommodation capacity occupancy (European Commission – Eurostat, 2007). Such a low occupancy rate rules out the possibility for efficient and profitable working of hotels in Macedonia. Also, it hampers the opportunity for offering competitive price of tourism services within the region.

Calculating the required number of rooms in hotel accommodation capacities

The second calculation deals with the needed hotel rooms in Macedonia. Based on the fact that the number of beds and the number of rooms are mutually connected and complementary in the sense that they both create the tourism accommodation supply, this calculation is based and uses the already calculated needs for beds, presented in the first calculation.

In addition, these estimates are based on the standards for average room occupancy. Namely, in a well-known hotel, that indicator is 1.7 persons per room (p/r), while in a business hotel, that factor is lower representing 1.2 p/r. At the same time, the calculation is extended with additional, third indicator of 1.45 p/r, as an average value between these two points, in order to obtain more accurate outcomes.

By analogy to the first calculation regarding the needed number of beds, in this case we carry out the calculations with both variants for average accommodation occupancy rate, i.e. 75% and 60%.

In that respect, if the average accommodation occupancy is 75%, the calculations show that 7 772 beds are required. Based on that number, the optimal number of rooms, calculated by formula (2) is:

- 4 572 rooms, with an average use of 1.7 p/r;

- 6 477 rooms, with an average use of 1.2 p/r; and

- 5 360 rooms, with an average use of 1.45 p/r.

$$Number\ of\ rooms = \frac{7\,772\ beds}{1.7\ p/r} = 4\,572\ rooms$$

$$Number\ of\ rooms = \frac{7\,772\ beds}{1.2\ p/r} = 6\,477\ rooms$$

$$Number\ of\ rooms = \frac{7\,772\ beds}{1.45\ p/r} = 5\,360\ rooms$$

The calculations undertaken assuming 60% average hotel accommodation occupancy rate imply that 9 724 beds are needed. Based on that figure, the optimal number of rooms is:

- 5 720 rooms, with an average use of 1.7 p/r;

- 8 103 rooms, with an average use of 1.2 p/r; and

- 6 706 rooms, with an average use of 1.45 p/r.

$$Number\ of\ rooms = \frac{9\,724\ beds}{1.7\ p/r} = 5\,720\ rooms$$

$$Number\ of\ rooms = \frac{9\,724\ beds}{1.2\ p/r} = 8\,103\ rooms$$

$$Number\ of\ rooms = \frac{9\,724\ beds}{1.45\ p/r} = 6\,706\ rooms$$

The above calculations produce opposite conclusions depending on the initial assumptions behind the calculation. On one hand, the comparison between the projected optimal hotel capacities and the current ones imply that there is an over dimension. On the other hand, working under more conservative assumptions, the calculations show that there is a room for capacity enlargement.

So, within the sample period 1990-2010, the average number of hotel rooms in Macedonia is 6 748, which is 1.2 time larger than the projected optimal needs based on ideal working conditions: 75% of average capacity occupancy rate and 1.7 p/r.

However, the second calculation, based on the average capacity occupancy rate of 60% and 1.45 p/r, produces results that are closer to the current number of hotel rooms in Macedonia. In addition, the calculations show that there is a possibility for increasing the existing number of hotel rooms for 18%. However, this conclusion applies only when the hotel capacities work with minimum cost-effectiveness rate of 60% and with an average occupancy of 1.2 p/r.

CONCLUSIONS AND RECOMMENDATIONS

The tourism in Macedonia should be observed in a broad, macroeconomic framework as the only way for creating an analytical framework for identifying all tourism impacts with a special emphasize on the economic effects. Therefore, certain preconditions must be created in a sense of strengthening the cooperation between all key actors in tourism. Although significant efforts have been made in promoting tourism potentials of Macedonia, yet the modest and limited budget is the biggest obstacle in achieving greater competitive advantages. As a result, the last Travel & Tourism Competitiveness Report for 2011 ranked Macedonia at the 76th place out of 139 countries.

Creating sufficient tourism supply which will meet the foreseen tourism demand is a challenge of every country that seeks a planned tourism development. This study found out an extremely limited average duration of tourists' stay during the sample period 1990-2010 of only 3,8 days. Moreover, the comparative analysis of the estimated values regarding the number of needed hotel beds with the existing ones, pointed out to an over dimension of hotel accommodation capacities in Macedonia. Namely, the hotel beds in Macedonia are 1.5-2 times larger than the calculated needs for beds. The presence of such imbalance between the current capacities and the tourism demand is reflected in the low average hotel accommodation occupancy rate of only 39%. Consequently, Macedonian hotels lost the possibility for efficient work as well as the opportunity for creating competitive tourism prices in the region. The calculations regarding required number of hotel rooms produced opposite conclusions depending on the initial assumptions behind the calculations. On one hand, the comparison between the projected optimal hotel capacities and the current ones implied an over dimension of 1.2 times (75% of average capacity occupancy rate and 1.7 p/r). On the other hand, working

under more conservative assumptions and with minimum cost-effectiveness rate (60% and 1.2 p/r), the calculations showed that there is a room for capacity enlargement of 18%.

However, the calculated values can serve as a starting point for initiating more serious analysis, which may provoke the need for undertaking measures and activities for supporting and enhancing tourism development in Macedonia.

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OPENNESS OF THE CAPITAL MARKET IN MACEDONIA

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Abstract

Macedonia is a small relatively open economy and its interest rate policy is very much linked to its exchange rate policy. The more integrated it became with the international financial market the more the interest rate policy will be dependent on the exchange rate regime.

One reason to analyze the behavior of the interest rate level in Macedonia is the differential between the interest rates in Macedonia and the Euro zone. In accordance with the uncovered interest rate parity, the more open the economy is the domestic interest rate should be converging to the Euro zone interest rate. If the difference, i.e. the parity spread, is high in an environment of integrated financial sector and Macedonia and still experiencing high interest rates, then the differential may be explained as a premium for the expectation of future depreciation and/or devaluation of the Macedonian Denar. Explanation then might be that there exist a misalignment within the fixed exchange rate regime in Macedonia thus, creating incentives for the market to expect depreciation/devaluation. The type of expectation (whether they are rational or adaptive) is very important, as shown in this paper.

Key words: *Interest rate parity, capital account, rational and adaptive expectations.*

Why measuring the capital account openness

Higher degree of openness on one side may allow increased ability to finance larger current account deficits and increase the level of foreign savings and may affect the efficiency of capital allocation thus, reduce distortion with higher return on investment and higher productivity growth. On the other side Stiglitz (2002) argues that pressuring emerging countries in the 90s to relax the barriers on capital flow was a mistake and led to currency crises.

What would be country specific to Macedonia to argue for restricting capital integration? One reason for more restriction might be the country's high vulnerability to external shocks and financial crises. The expansion of

bank credit reflects a structural shift to more commercial bank intermediation thus, raising credit risk, like unhedged foreign exchange exposures by borrowers.

Even if the stress tests show small balance sheet risks, the possible evergreening might easily occur in the banking sector if the borrowers were not as creditworthy as the bank's risk managers estimated, having in mind the business environment in Macedonia and the external challenges the country might face with the Greece fiasco. That is why it is important that an overall strong monetary institution with good financial regulation and strong supervision are on place in Macedonia. Strong institutional set up could help reducing vulnerability and the interest rates and set a firm ground for implementing more growth oriented policies.

On the question how the openness of the capital account affects economic growth, Sebastian (2000) shows that there is evidence that an open capital account positively affects growth only after a country has achieved a certain degree of economic development. Further, he concludes, that this provides support to the view that there is an optimal sequencing for capital account liberalization. For Macedonia thus, still remains a dilemma. The more open the capital account the higher the ability to finance larger current account deficits. But, does the economic growth in Macedonia provide that certain degree of economic development as Sebastian points out?

The degree of openness of the capital account is affecting also, the degree to which the expansionary fiscal policy is crowding out the private investment and the ability to which the monetary policy affect the aggregate demand.

The global crises urge analysis of the capital account openness in the face of the possible sudden stops of inflow of capital and current account reversals as well. Sebastian (2004) finds no systematic evidence suggesting that countries with higher capital integration face a higher probability of having crises. But he also finds that once a crisis occurs, countries with higher capital mobility may face higher costs in terms of economic growth decline.

Macedonia, as one with fixed exchange rate, if it have high capital and labor mobility, vis-à-vis the EU countries with which it fix the exchange rate, will have less need for exchange rate adjustment and will be better off with the existing regime. But how much is the capital mobile and how much is the labor mobile is a matter for further empirical research.

Measures of the capital account openness

One simple measure of capital openness is the inflow of capital as percentage of GDP. A useful presentation of the behavior of capital flows as % of GDP one can find in Sebastian (2000).

In Macedonia the direct investment and the portfolio investment are relatively low (average for the period 1998-2004 of $ US 92 per capita or cumulative FDI and portfolio investments of 5 % of cumulative GDP for the same period).

The degree of capital market integration can be estimated by examining the convergence of the private rate of returns to capital across countries. In their famous work Feldstein and Horioka (1980) analyzed the behavior of the saving and investment. The argument there was that in an environment of perfect capital mobility there is no correlation between the saving and investment. Interesting results from the work of Montiel (1994) after implementing the Feldstein and Horioka approach is the benchmark of saving ratio coefficient of 0.6. If a country has a coefficient of regression higher than 0.6 it can be said that the country has a rather closed capital account. Another interesting work, on this rather quantitative indicator (the saving-investment), is presented by Buch (1999). A price measure of capital mobility shows that in integrated financial markets rates of return on identical financial assets must be the same.

One test of the degree of capital mobility uses the fact that the assumption of international mobility of capital implies that consumers can smoothen consumption over time by borrowing and lending on (internation-

al) capital markets. Hence, tests on the correlation of consumption and net domestic output can be used to assess the degree of capital mobility (Bayoumi 1998).

Klein and Olivei (1999) use the IMF's exchange arrangements and exchange restrictions data to construct index of capital mobility. The index is defined as the number of years that in accordance with the IMF's binary data the country in question has had an open capital account.

Another interesting measure for effective degree of financial openness of an economy is the Stilianos and Christopher cointegration test of interactions among the current account, budget balances and real interest rates.

The model

Here a measure of openness of the capital account in an empirical environment follows the Edwards and Khan (1985) and Haque and Montiel (1991). The rational of the model is:

The domestic interest rate - i is a structural feature of the economy and can be expressed as a weighted average of the uncovered interest parity rate - i* and the domestic "Endemic" interest rate if the capital market is closed - i'.

The algebraic representation is:

$$i = \psi\, i^* + (1 - \psi)\, i' \text{ or } i - i^* = (1 - \psi) * (i' - i^*);\ 0 \leq \psi \leq 1 \qquad (1)$$

Where the index of capital mobility - ψ is a measure of the openness thus:

0 ← closed capital market ← ψ → open capital market → 1

ψ → 1 open thus, external financial influences outweigh the domestic monetary factors in the determination of the domestic market clearing interest rate.

ψ → 0 closed thus, external financial influences play no role in the determination of the domestic market clearing interest rate.

The model is based on the money demand and supply approach rather than calculating the Fisher approach for the domestic interest rate.

The standard money supply function is:

$$M = R + D = R(-1) + D + \Delta R \qquad (2)$$

R – domestic currency value of foreign exchange reserves

D – stock of the domestic credit outstanding

Δ – first difference operator

By using the BoP identity, the money supply function can be written:

$$M = R(-1) + D + CA + Kag + Kap \qquad (3)$$

CA – domestic currency value of the current account

Kag – public capital account

Kap – private capital account

The money supply that would correspond to a situation with closed private capital account denoted as M' is the actual money supply less the portion of reserve flows accounted for by private capital movements:

$$M' = R(-1) + D + CA + Kag = M - Kap \quad (4)$$

The money demand function is:

$$\log (Md/P) = a0 + a1 * i + a2 * \log(y) + a3 * \log(M/P)(-1) \quad (5)$$

y – real output

P – domestic price level – CPI

The interest rate i' is that value of i that satisfies the money market equilibrium:

$$\log (M'/P) = \log (Md/P)$$

Thus, from the equation (5) we have:

$$i' = - (ao/a1) + (1/a1) * \log(M'/P) - (a2/a1) * \log(y) - (a3/a1) * \log(M/P)(-1) \quad (6)$$

The following algebra will derive the equation that we should estimate. Firstly, we take equation (6) and substitute in (1). Secondly, we take the new expression of – i and substitute it in the money demand equation (5). Thirdly, take the result of this algebraic exercise and the equation (3) to derive the final specification for estimation:

$$\log(M/P)=-a0*(1-\psi)+a1*\psi*i*+(1-\psi)*\log(M'/P)+a2*\psi*\log(y)+a3*\psi*\log(M/P)(-1)+e \quad (7)$$

Data

The dependent variable in our specification is the log of the real money supply measured as M1 (because I am using the money market interest rate) divided by the consumer price index-CPI. The independent variables are the logs of the lagged real money, real GDP, real value of – M' (M1 minus the domestic currency value of private capital flows – inward direct investment and portfolio investment inflow) and the money market interest rate variable.

The frequency is monthly data for the period 1998-2004. For the monthly data I produce monthly GDP data from the quarterly GDP data by using the monthly industrial index data as weights. BoP and monetary data are from the NBRM. The GDP and industrial index data are from the State Statistical Office. For the foreign interest rate I use LIBOR/EURIBOR from the Deutsche Bundesbank statistics.

Estimating rational expectations

The interest rate variable – i in (7) is the defined uncovered interest parity condition. It is derived as money market interest rate plus expected depreciation in the exchange rate (that is proxied by the actual exchange rate change that takes place between periods):

$$i = EURIBOR + E(\Delta FX\%) \quad (8)$$

E – expectation operator

FX% exchange rate change between periods

The M' was derived as M1 minus the MKD value of capital inflow.

Since the specification incorporates rationally expected variable, a lagged dependent variable and an endogenous variable-log(M'/P); a generalized nonlinear two stage procedure (Wickens 1982) was used in the estimation of the equation (7).

To ensure that the instruments used show no contemporaneous correlation with the residuals, only the lagged values were used for EURIBOR, real GDP, money supply, CPI, imports, foreign exchange reserves, industrial index and exports.

Rational versus adaptive expectations

Philip (1994) show that uncovered interest parity test coefficients can be expressed as functions of the parameters of expectations mechanism. His research is on the base of usually rejection of the uncovered interest parity and rational expectations in the empirical studies. That is why we reestimate the equation (7) with adaptive expectations by utilizing the Kalman filter latter.

Kalman filter is a recursive algorithm for sequentially updating the one step ahead estimate of the state mean and variance given new information. It can be applied in our case to model unobserved variable with adaptive expectations. Technically, the procedure is to form a preliminary estimate of the state and then revising that estimate by adding a correction to it. The magnitude of the correction is determined by how well the preliminary estimate predicted the new observation.

The Kalman filter can help in dealing with purely temporary shocks alternated with purely temporary shocks. It is also useful to implement a learning process and apply the Bayeseian approach to update the prior probabilities of the separate filters if the characteristic of the time series evolve over time. In this way we ensure not to use one fixed model for each and every time. More on the use of Kalman filter see in Bomhof (1983). See Sun (2000) for time varying coefficient of capital mobility within adaptive expectations.

Results from a model with rational expectations

The following table illustrates results from the two stage least squares non-linear estimation made in E-Views.

Dependent Variable: LM1CPI
Method: Two-Stage Least Squares
Date: 10/13/05 Time: 20:03
Sample(adjusted): 1997:10 2004:12
Included observations: 87 after adjusting endpoints
Convergence achieved after 10 iterations
LM1CPI=-C(1)*(1-C(2))+C(3)*C(2)*INTEIBOR+(1-C(2))*LOG(M1FDI)
+C(4)*C(2)*LOG(GDP)+C(5)*C(2)*DLM1CPI
Instrument list: INTEIBOR(-1) GDP(-1) M1(-1) CPI(-1) IMPORT(-1) IND(
-1) WAG(-1) FDI(-1)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	143.4910	343.7868	0.417384	0.6775
C(2)	0.995959	0.007049	141.2873	0.0000
C(3)	0.001522	0.002841	0.535765	0.5936
C(4)	0.090992	0.062978	1.444822	0.1523
C(5)	0.923898	0.036430	25.36079	0.0000
R-squared	0.938498	Mean dependent var		4.282949
Adjusted R-squared	0.935498	S.D. dependent var		0.087895
S.E. of regression	0.022323	Sum squared resid		0.040862
Durbin-Watson stat	1.795003			

We can see that the coefficient-C(2) estimate of ψ is almost 1 and the interpretation would be significant perfect capital mobility and financial integration. The money demand coefficients: C(1), C(3), C(4) are not significant and only the lagged money demand coefficient is significant-C(5).

In January 2001 there was a significant inflow of investments in the telecommunication sector in Macedonia and that outlier can cause biased results.

The split of time series in two periods, one from January 1999 until December 2000 and the other from February 2001 until December 2004 shows the following results (E-Views prints available from the author upon request):

Period	Coefficient C(2) estimate of ψ	t-statistic
1999:01 – 2000:12	0.874	12.785
2001:02 – 2004:12	0.780	2.908

Both estimations show significant relatively open capital account. The interesting finding is that in the second period the capital market is more closed.

Results from a model with adaptive expectations

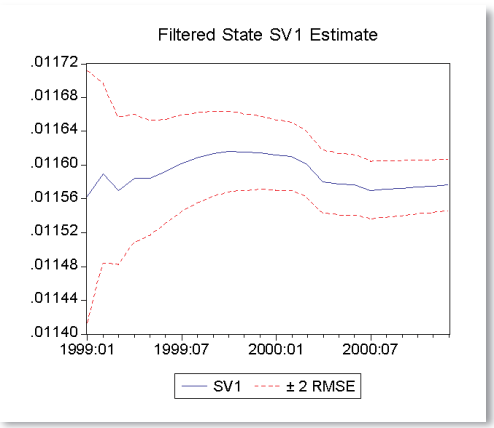
We run the Kalman filter estimation as well. This is more realistic type of assumption because allows for a time varying parameter on openness of capital account as well.

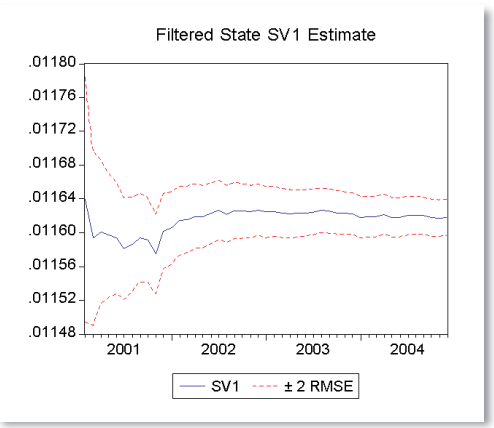
The results from the estimation on the time varying parameter are shown in the figures and were:

1.The parameter shows significant closed capital account.

2. The differences in the results are dramatic and depending on the type of expectations.

The results from the estimations for the two periods (one from January 1999 until December 2000 and the other from February 2001 until December 2004) are illustrated in the next figures (E-Views output available from the author upon request):





From the above figures we can see that the capital account was closed in Macedonia for the period with small changes across time. The relatively closed capital account has implications that the fixed exchange rate can still be a beneficial regime for the case of Macedonia if the economic agents have adaptive expectations. If the economic agents in Macedonia have adaptive expectations, the monetary policy in Macedonia still have relatively more powerful effect compared to the fiscal policy on the domestic demand and the trade balance.

The capital openness and the institutional set up

If the capital account is more liberalized the domestic financial market might be more vulnerable. The market stabilizing role is on the National Bank-NBRM with its supervision authority. On the other side we have the market regulating institutions as the Ministry of finance to correct certain market failures as to continue to impose or to reduce the capital flow with the amending in the legislation in joined cooperation with the NBRM.

Another way to explain the importance of the issue is to ask whether there is openness of the capital account sufficient to concern the NBRM in its policy of fixing the exchange rate and to concern the government for the possible influence on economic growth.

In Macedonia the interest rate differential is higher compared with the EU countries thus, either there are capital mobility issues or the differential is due to lack of confidence of the exchange rate policy (that is the credibility of the NBRM's policy). There is legitimate reason to believe that Macedonia pays an interest rate premium due to fear of depreciation. Is that fear rational is another issue. Still, our findings of closed capital account in an environment of adaptive expectations can be an argument for preferring the existing exchange rate regime.

We know that with the fixed exchange regime and higher degree of capital mobility the monetary policy is less effective and the fiscal policy is the only tool to smooth the economic cycles. But are the Macedonian governments using the fiscal tools efficiently so far?

The authorities in Macedonia still recognize the unstable economic environment thus; the fixed exchange regime and the possible further increase of the capital mobility and financial activity will most likely again increase the importance of the fiscal policy in affecting the aggregate demand. The alternatives of the fixed exchange regime like inflation targeting or monetary aggregate targeting would be unworkable given the unpredictability of the monetary transmission mechanism. In contrast, limited flexibility—a narrow band—could be manageable. But this would have too small an effect on banks' and borrowers' behavior to justify the risks associated with departing from the existing well-functioning anchor (IMF 2005).

Conclusion

The topic of monitoring the capital market openness is of crucial importance for Macedonia given the confirmed dedication to the fixed exchange rate.

Just for now it seams that Macedonia can keep the current exchange rate regime as long as capital markets remain relatively closed (if the expectations are adaptive). In that case the observed differences in the interest rates between Macedonia and the rest of Europe are most likely due to domestic factors. The more open becomes the capital market, the more problematic becomes the pegging monetary policy. The higher degree of the capital openness will require a choice of the corner solutions-either a more purely pegged exchange rate system – euroization or currency board or towards a purely floating system with either monetary aggregate nominal anchor or inflation as the nominal anchor (in accordance with the impossible trinity theorem).

NBRM will be less able to affect interest rates as capital markets open, if it continues to pursue a pegged exchange rate. If it continues to fix the exchange rate it will have only one policy tool to pursue the one goal, in accordance with the Tinbergen (1952) rule. It cannot target interest rates and fix the exchange rate regime at the same time. If it wants to target the interest rate it must allow for the exchange rate regime to float. The risk is that if it wants to hold down the interest rates to world level, in a floating environment, it would either print money or cause a loss of the reserves. This is why the institutional strength of the system is of importance.

The NBRM should conduct a thorough cost benefit analyses of removing/imposing capital controls in Macedonia. The cost of possible crises should be compared with the cost of having distortion in the capital

market. This is of special interest for Macedonia which suffers from sectoral deficiencies. The speculative reversals, a decline in external competitiveness, exchange rate appreciation, loss of control over the monetary base and inflation are some of the detrimental effects that can be provoked by surges in capital flows if the economy suffers from fundamental sectoral deficiencies (Oplotnik 2002).

In Macedonia the concentration of export in the production sector is high thus, in terms of flexible regime every shock on the exporting sectors might result in radical disturbances in the price level.

In theory, capital account liberalization should allow for more efficient global allocation of capital, from capital-rich industrial countries to capital-poor developing economies. For Macedonia, the EU membership provides a strong incentive for policymakers to adopt and maintain sound policies, with obvious benefits in terms of long-term growth. On contrary, the expected membership will be unlikely to boost capital market integration to a significant degree and to trigger huge capital inflows in Macedonia. The membership in the EU will require that Macedonia abolish remaining entry barriers into their financial sectors and hereby import institutional stability. Seen from this angle, the benefits of further capital account liberalization may outweigh the risks of such a strategy. At the moment this is still a distant future to trigger such analyses taking into account the recent failure to NATO membership expectations and the fragile expectation of EU candidature.

Capital account liberalization could pose major risks if implemented in unfavorable circumstances. In the case of Macedonia with the fixed exchange rate regime, and especially when domestic macroeconomic policies might not be consistent with the requirements of the regime, it can be a reason for crises. For instance, capital account liberalization can aggravate risks associated with imprudent fiscal policies by providing access to excessive external borrowing. The foreign borrowing and overall fiscal sustainability is very important issue in the light of the fixed exchange regime in Macedonia and higher degree of capital mobility.

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MODERN PORTFOLIO THEORY: IDENTIFICATION OF OPTIMAL PORTFOLIOS AND CAPITAL ASSET PRICING MODEL TEST

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Abstract

The tool we employ in this work is the well-known Modern Portfolio Theory (MPT), which forms the basis of virtually all quantitative portfolio management and theory today. Since its formulation half a century ago it has been seized on by the investment industry as a workable tool for investment and risk management, in particular because of its simplicity and intuitive appeal, and it remains one of the cornerstones in the foundation on which today's asset management industry rests. The MPT introduced the analysis of portfolios of investments by considering the expected return and risk of individual assets and, crucially, their interrelationship as measured by correlation. In MPT diversification plays an important role.
The Capital Asset Pricing Model (CAPM) relates the returns on individual assets or entire portfolios to the return on the market as a whole. In CAPM investors are compensated for taking systematic risk but not for taking specific risk. This is because specific risk can be diversified away by holding many different assets. We illustrate this concepts in an application on real market data. We use an optimization in order to find the optimal portfolios and then we test the CAPM.

Keywords: *Investments; portfolio performance; stock return; risk; volatility.*

Why measuring the capital account openness

In an asset allocation problem the investor, who can be the trader, or the fund manager, or the private investor, seeks the combination of securities that best suit their needs in an uncertain environment. In order to determine the optimum allocation, the investor needs to model, estimate, access and manage uncertainty. The most popular approach to asset allocation is the mean-variance framework, where the investor aims at maximizing the portfolio's expected return for a given level of variance and a given set of investment constraints. Under a few assumptions it is possible to estimate the market parameters that feed the model and

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then solve the ensuing optimization problem. This approach is highly intuitive. Sample estimates make sense only if the quantities to estimate are market invariants, i.e. if they display the same statistical behaviour independently across different periods. In equity like securities the returns are approximately market invariants: this is why the mean-variance approach is usually set in terms of returns.

We introduce in the next section some important theoretical concepts of asset management including a short literature review. The basis of any investment is the desire to obtain a return on that investment. The investor or asset manager must accept some amount of risk in order to obtain the return. In other words, the risk taken on by the investor is the price paid for the opportunity for a positive return, and the desired level of return thus determines the exact amount of risk taken on by the investor. This is a fundamental investment relationship, which investors must consider when deciding whether to invest in either a single asset or a portfolio of assets. The modern portfolio theory originally dates back to 1952, when Harry Markowitz published his article on what he called *'portfolio selection'*. In this article he established a framework for describing portfolios of assets in terms of the means on their returns, the variance of their returns, and the correlation between the returns on assets. For this reason the approach is also known as *mean-variance analysis*.

We test in section 3 some of the most important findings of Modern Portfolio Theory, the determination of the best efficient frontier and the Capital Asset Pricing Model test. We analyze in this section the stocks of ten international companies, part of the Standard and Poor stock index. We have selected a five years period, from March 31, 2006 to March 31, 2011. We end the work with some principal findings and conclusions, including some suggestions for further work.

2. Modern portfolio theory

2.1. Literature review

Portfolio theory took form as an academic field when Harry Markowitz published the article *'Portfolio Selection'* in 1952. Markowitz focuses on a portfolio as a whole; instead of security selection he discusses portfolio selection. Previously, little research concerning the mathematical relations within portfolios of assets had been carried out. Markowitz began from John Burr Williams' *Theory of Investment Value*. Williams (1938) claimed that the value of a security should be the same as the net present value of future dividends. Since the future dividends of most securities are unknown, Markowitz claimed that the value of a security should be the net present value of expected future returns. Markowitz claims that it is not enough to consider the characteristics of individual assets when forming a portfolio of financial securities. Investors should take into account the comovements represented by covariances of assets. If investors take covariances into consideration when forming portfolios, Markowitz argues that they can construct portfolios that generate higher expected return at the same level of risk or lower level of risk with the same level of expected return than portfolios ignoring the co-movements of asset returns. Risk, in Markowitz' model (as well as in many other quantitative financial models) is assessed as the variance of the portfolio. The variance of a portfolio in turn depends on the variance of the assets in the portfolio and on the covariances between its assets. Markowitz' mean variance portfolio model is the base on which much research within portfolio theory is performed. It is also from this model that the Black-Litterman model was developed. The Black-Litterman model builds on the Markowitz model and it is hence important to understands Markowitz' model.

Markowitz shows that investors under certain assumptions, *theoretically*, can build portfolios that maximize expected return given a specified level of risk, or minimize the risk given a level of expected return. The model is primarily a normative model. The objective for Markowitz has been not to explain how people select portfolios, but how they should select portfolios (Sharpe, 1967). Even before 1952 diversification was a well accepted strategy to lower the risk of a portfolio, without lowering the expected return, but until then, no thorough foundation existed to validate diversification. Markowitz' mean-variance portfolio model has remained to date the cornerstone of modern portfolio theory (Elton & Gruber, 1997).

2.2. Principal aspects

The basis of any investment is the desire to obtain a return on that investment. Since there is no such thing as a free lunch, the investor or asset manager must accept some amount of risk in order to obtain the return. In other words, the risk taken on by the investor is the price paid for the opportunity for a positive return, and the desired level of return thus determines the exact amount of risk taken on by the investor. This is a fundamental investment relationship, which investors must consider when deciding whether to invest in either a single asset or a portfolio of assets.

In order to properly evaluate investments we need a measure of return on those investments. We are not interested in asset prices, but rather in the returns on those assets. The return calculation presented in the next section is very simple. We apply it both to assets and to portfolios of assets. Financial risk is commonly quantified by some measure of variance of asset returns. We are interested in the variation of asset returns over time, and since we need some sort of reference point relative to which returns can be measured, we apply a measure of risk that relates every observation to the average or mean of all observations available. Variance is a simple measure of variation around an average. The standard deviation of returns is therefore defined as the square root of returns variance.

As mentioned above, the risk of a portfolio, quantified by its volatility, is heavily dependent on the exact nature and magnitude of the covariance or correlation between asset returns. If the returns on assets in the portfolio are correlated, there may exist opportunities for reducing the level of total portfolio risk by selecting appropriate assets and asset weights, in an attempt to offset individual asset risks against each other. In other words we attempt, in a structured manner, to exploit the fact that asset returns often move in somewhat consistent patterns relative to each other. Because the returns on assets are only very infrequently perfectly correlated, including several assets in a portfolio will tend to reduce overall portfolio risk. A very large number of stocks in a portfolio will entail larger transaction costs. The risk of adverse performance from a single stock increases with a large number of stocks. For these reasons the portfolio manager, in his quest for diversification, should attempt to exploit more precisely the characteristics of individual assets and asset classes.

In the quest for this type of non-naive or intelligent diversification, we thus need to establish an objective function that can guide our efforts towards making a selection of stocks that exploits each stock's particular characteristics in an efficient manner. We must specify precisely what is meant by the term 'efficiency' in a portfolio context. In general, efficiency is defined as the utilisation of resources in such a manner that the maximum output or gain is generated. Implicit in this definition is the quality of optimality. In a portfolio context we define efficiency as the maximum attainable return for a given level of volatility, or alternatively, the minimum attainable volatility for a given level of return. We designate efficient portfolios as those portfolios that cannot be improved upon in terms of the return versus risk trade-off. It is thus not possible to alter an efficient portfolio without paying a price in the form of lower return or higher volatility. As we shall see, the vast majority of attainable portfolios are not efficient in the strict mean-variance sense, which suggests that we can improve on them at no cost (in terms of return or volatility) by altering their composition.

The minimum-variance portfolio is the portfolio (that is, the combination of asset weights) that, given the particular return and risk characteristics of each asset, generates the lowest amount of risk achievable. In other words, the minimum variance portfolio specifies the asset weights that generate the lowest possible portfolio risk, without any additional constraints on the desired level of return or on the maximum or minimum extent to which an asset can enter into the portfolio. The efficient frontier is the line between the minimum-variance portfolio and the maximum variance portfolio that traces out all attainable portfolios (asset combinations) that produce optimal/efficient portfolios. In other words, the efficient frontier is the line in return/risk space that traces out all the portfolios for which we cannot obtain a higher level of return for a given level of risk, or alternatively for which we cannot obtain a lower level of risk for a given level of return. The portfolio that maximises return relative to risk (the Sharpe Ratio) is the portfolio that lies on the tangency point between the Asset Allocation Line and the efficient frontier.

One such theory, which has proven extremely robust and rugged since its birth in 1964, is the *Capital Asset Pricing Model* (CAPM). It basically proposes that an asset's return can be described completely by a combination of a market return and the asset's covariation with that market. Its logic is simple. The idea is that investors are compensated for taking on necessary risk but not for taking on unnecessary risk. It provides a framework for separating risk into necessary (systematic or market-related) risk, and unnecessary (unsystematic, asset-specific or residual) risk. The CAPM simply postulates that a linear relationship exists between the return on an asset and the return on the market, and that asset returns can thus be explained by a single factor, namely the market return.

3. Efficient frontier and Capital Asset Pricing Model test

In this section we analyze ten well known stocks, part of the U.S. market. We apply on these time series all the concepts we saw in the previous section. First, we determine the returns from the selected stock prices *(Total Return Data)*. Using the returns, we calculate the variance-covariance and the correlation matrices useful for the efficient frontier construction. Then we choose 5 stocks of the 10 in order to determine the risky asset Efficient Frontier. We select the stocks so that to determine the "best" Efficient Frontier. We tried to choose stocks from completely different industry sectors in order to differentiate as much as possible my portfolio. All the selected stocks are part of the S&P 500 index. The period is from March 31, 2006 to March 31, 2011 (monthly observations). We can see in the table below first five observations of the selected stocks.

Table 1. Selected stocks (currency: US $).

HASBRO	*COCA COLA*	*JOHNSON & JOHNSON*	*HOST HOTELS & RESORTS*	*EXXON MOBIL*	*EDISON INTL*	*WHIRL POOL*	*TITANIUM METALS*	*BANK OF AMERICA CORP.*	*RED HAT*
tot return ind	tot return ind	tot return ind	tot return ind	tot return ind	tot return ind	tot return ind	tot return ind	tot return ind	tot return ind
13613,37	3425,67	4358,96	3325,16	9706,93	3945,54	1215,57	48,06	3619,08	51,28
13811,85	3413,33	4446,94	3075,29	9771,32	3999,74	1198,88	59,52	3571,33	41,68
14882,98	3521,1	4528,09	3071,45	12046,83	4000,97	1127,2	75,81	3592,89	44,06
14410,84	3450,74	4635,78	3198,63	11340,88	4308,64	1197,57	71,67	3429,32	41,91
13397,01	3597,31	4737,24	3248,84	10851,85	4504,71	1097,32	66,93	3502,41	41,3

Let's transform now prices in returns (in percentages) using: $R_t = \frac{P_t - P_{t-1}}{P_{t-1}} = \frac{P_t}{P_{t-1}} - 1$, where P_t is the price at time t and is the return at time t. In table 2, we have the return sample mean and standard deviation for each price series. The standard deviation, given as the square root of the variance, is a good estimator of the process volatility.

Table 2. Expected return and standard deviation.

Stocks	*HASBRO*	*COCA COLA*	*JOHNSON & JOHNSON*	*HOST HOTELS & RESORTS*	*EXXON MOBIL*
Exp. Return	0,0131	0,0088	0,0032	0,0075	0,0081
Standard Deviation	0,0767	0,0489	0,0401	0,1625	0,0589
Stocks	**EDISON INTL**	**WHIRLPOOL**	**TITANIUM METALS**	**BANK OF AMERICA CORP.**	**RED HAT**
Exp. Return	0,0054	0,0145	0,0377	0,0002	0,0243
Standard Deviation	0,057	0,1409	0,1689	0,1743	0,1479

As we can see, all the expected returns are positive. The corresponding parameters for the S&P index are 0,4 basis points (expected return) and 44 basis points (standard deviation). We have in table 3 the variance-covariance matrix for the ten selected stocks. We observe that all relations between assets are positive except 'Whirlpool' and 'Exxon Mobil'. The covariance between these two stocks is *-0,00072*.

Table 3. Covariance matrix.

Stocks	HASBRO	COCA COLA	JOHNSON & JOHNSON	HOST HOTELS & RESORTS	EXXON MOBIL	EDISON INTL	WHIRL POOL	TITANIUM METALS	BANK OF AMERICA CORP.	RED HAT
HASBRO	0,00588	0,00084	0,00131	0,00492	0,00116	0,00156	0,00466	0,0021	0,00528	0,00241
COCA COLA	0,00084	0,00239	0,00114	0,00166	0,00097	0,00084	0,00218	0,0017	0,00338	0,00077
JOHNSON & JOHNSON	0,00131	0,00114	0,00161	0,00203	0,00046	0,00098	0,00286	0,00074	0,00372	0,00104
HOST HOTELS & RESORTS	0,00492	0,00166	0,00203	0,02641	0,00048	0,00222	0,01492	0,01184	0,01515	0,00477
EXXON MOBIL	0,00116	0,00097	0,00046	0,00048	0,00347	0,00116	-0,00072	0,00262	0,00045	0,00042
EDISON INTL	0,00156	0,00084	0,00098	0,00222	0,00116	0,00325	0,00207	0,00252	0,003	0,00245
WHIRLPOOL	0,00466	0,00218	0,00286	0,01492	-0,00072	0,00207	0,01984	0,00485	0,01627	0,0046
TITANIUM METALS	0,0021	0,0017	0,00074	0,01184	0,00262	0,00252	0,00485	0,02852	0,00589	0,00686
BANK OF AMERICA CORP.	0,00528	0,00338	0,00372	0,01515	0,00045	0,003	0,01627	0,00589	0,0304	0,00514
RED HAT	0,00241	0,00077	0,00104	0,00477	0,00042	0,00245	0,0046	0,00686	0,00514	0,02188

We have calculated in table 4 the correlation matrix of the ten selected assets. As we can see from the table, almost all the stocks are positively correlated. The only negative correlation is between 'Whirlpool' and Exxon mobil', equal to -0,08879.

Table 4. Correlation matrix.

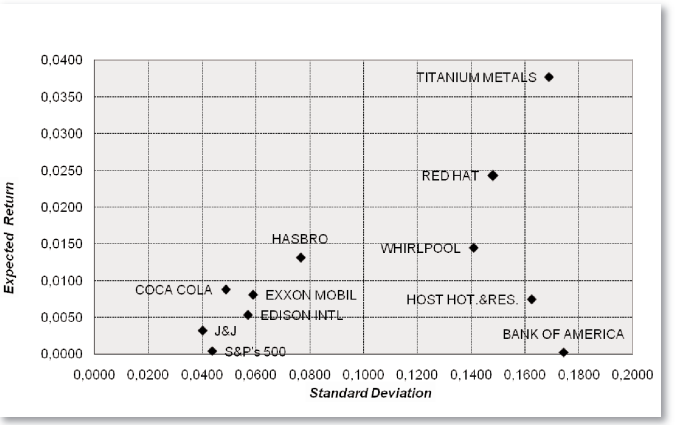
Stocks	HASBRO	COCA COLA	JOHNSON & JOHNSON	HOST HOTELS & RESORTS	EXXON MOBIL	EDISON INTL	WHIRL POOL	TITANIUM METALS	BANK OF AMERICA CORP.	RED HAT
HASBRO	1	0,22682	0,43263	0,40189	0,26119	0,36333	0,43928	0,16477	0,40169	0,2157
COCA COLA	0,22682	1	0,59225	0,21254	0,3422	0,30675	0,32261	0,20941	0,40302	0,10778
JOHNSON & JOHNSON	0,43263	0,59225	1	0,31631	0,1994	0,43671	0,51424	0,11092	0,54078	0,17752
HOST HOTELS & RESORTS	0,40189	0,21254	0,31631	1	0,05089	0,24354	0,66269	0,43855	0,5436	0,20169
EXXON MOBIL	0,26119	0,3422	0,1994	0,05089	1	0,35082	-0,08879	0,26819	0,04437	0,0487
EDISON INTL	0,36333	0,30675	0,43671	0,24354	0,35082	1	0,2619	0,26589	0,30695	0,2956
WHIRLPOOL	0,43928	0,32261	0,51424	0,66269	-0,08879	0,2619	1	0,20745	0,67379	0,22426
TITANIUM METALS	0,16477	0,20941	0,11092	0,43855	0,26819	0,26589	0,20745	1	0,20345	0,27941
BANK OF AMERICA CORP.	0,40169	0,40302	0,54078	0,5436	0,04437	0,30695	0,67379	0,20345	1	0,20276
RED HAT	0,2157	0,10778	0,17752	0,20169	0,0487	0,2956	0,22426	0,27941	0,20276	1

We choose now 5 of the 10 initial assets in order to determine the best efficient frontier. There are different approaches that we can use in order to select the best assets. One of these is to take the assets with the highest Sharp Ratio. Another way we can use is to take the assets that are less risky than the others, so with a lower variance, fixing a constant level of expected return and vice versa. We use the first approach, so we calculate the Sharpe Ratios for each stock.

So let's initially see an expected return - standard deviation plot of the ten risky assets. We can see the level of risk associated to the expected return for each asset. We can say for example, that is much better investing in the 'Titanium Metals' asset than in the 'Bank of America' asset because the first asset has a bigger expected return and a lower risk represented by the standard deviation.

Figure 1.

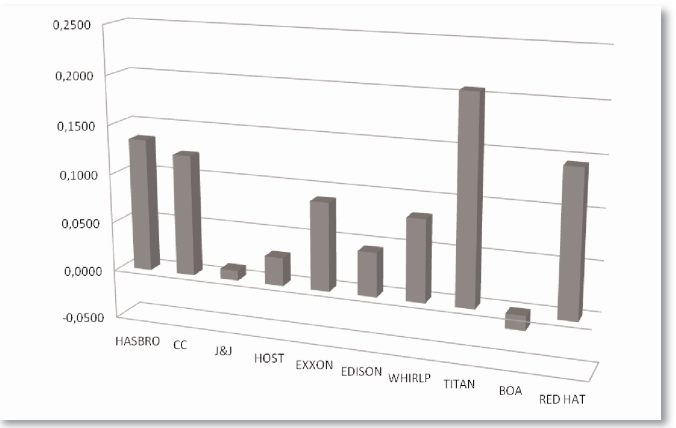
Risk-return plot



We can evaluate better the asset performances in the Sharp Ratio histogram. This is the Sharp ratio formula: $SharpeRatio = \frac{R - rf}{\sigma}$, where $\bar{R}$ *rf* and *σ* are the expected return, the risk free rate and the standard deviation. We can say by the Sharp Ratio histogram (figure 2) that the best five risky assets are: Hasbro, Coca Cola, Exxon, Titanium Metals and Red Hat. So these are my five selected assets.

Figure 2.

Sharpe ratio histogram.



Now we determine the efficient frontier for these five assets without imposing any short selling constraint. So the problem is to minimize risk for a given level of excpected return.

$$\min_{\omega} \boldsymbol{\omega}'\boldsymbol{\Sigma}\boldsymbol{\omega}$$
$$s.t.\ \boldsymbol{\omega}'\boldsymbol{\mu} = \mu_p$$
$$\boldsymbol{\omega}'\mathbf{1} = 1$$

,where ω is the portfolio weights vector, Σ is the variance-covariance matrix and μ is the returns vector. The solution is:

$$\omega_* = \frac{C\mu_P - B}{AC - B^2}\boldsymbol{\Sigma}^{-1}\boldsymbol{\mu} + \frac{A - B\mu_P}{AC - B^2}\boldsymbol{\Sigma}^{-1}\mathbf{i}$$
$$A = \boldsymbol{\mu}'\boldsymbol{\Sigma}^{-1}\boldsymbol{\mu} \quad B = \boldsymbol{\mu}'\boldsymbol{\Sigma}^{-1}\mathbf{i} \quad C = \mathbf{i}'\boldsymbol{\Sigma}^{-1}\mathbf{i}$$
$$\omega_* = D + E\mu_P = \frac{A\boldsymbol{\Sigma}^{-1}\mathbf{i} - B\boldsymbol{\Sigma}^{-1}\boldsymbol{\mu}}{AC - B^2} + \frac{C\boldsymbol{\Sigma}^{-1}\boldsymbol{\mu} - B\boldsymbol{\Sigma}^{-1}\mathbf{i}}{AC - B^2}\mu_P$$

, where **i** is the unitary vector. We can see the component values in the table below.

Table 5. Computed parameters.

	COMPONENTS
A	*0,0887*
B	*5,4851*
C	*592,972*
D	*22,511*

The equation of the Efficient Frontier will be:

$$\sigma_p = \sqrt{\frac{C\mu_p^2 - 2B\mu_p + A}{AC - B^2}}$$

These are the first seven points that we use in order to draw the efficient frontier:

Table 6. Seven efficient frontier points.

Efficient Frontier Points	
Return	***Standard Deviation***
-0,05000	*0,306852198*
-0,04900	*0,301766812*
-0,04800	*0,296683043*
-0,04700	*0,291600976*
-0,04600	*0,286520701*
-0,04500	*0,281442315*
-0,04400	*0,276365923*

The Global Minimum Variance (GMV) portfolio is a fully-invested portfolio with the minimum volatility value. As mentioned before, the volatility can be estimated by the standard deviation. The GMV portfolio belongs to efficient frontier and is located on its left end. These will be the parameters for the GMV portfolio.

$$\omega_V = \frac{\mathbf{\Sigma^{-1}i}}{\mathbf{i'\Sigma^{-1}i}} \qquad \sigma_V = \frac{1}{\sqrt{C}} \qquad \mu_V = \frac{B}{C}$$

The Tangent Portfolio combines this optimal combination of risky assets with a risk-free asset. It has the highest Sharp Ratio. These will be the parameters for the Tangent Portfolio.

$$\omega_E = \frac{\mathbf{\Sigma^{-1}\mu}}{\mathbf{i'\Sigma^{-1}\mu}} \qquad \sigma_V = \frac{\sqrt{A}}{B} \qquad \mu_V = \frac{A}{B}$$

We have in the table 7 the corresponding weights for each asset for both the Tangent and the Global Minimum Variance portfolio. We have calculated the portfolio standard deviation and return in each case.

Table 7. GMV and Tangent Portfolio parameters.

Portfolio	GMV	Tangent
HASBRO	*0,141211*	*0,227764*
COCA COLA	*0,535853*	*0,399318*
EXXON M.	*0,300541*	*0,098452*
TITANIUM M.	*-0,021347*	*0,164878*
RED HAT	*0,043742*	*0,109589*
Sum of Weights	*1*	*1*
Standard deviation	*0,04106602*	*0,05429774*
Return	*0,00925018*	*0,01617144*

We determine now the expected return and the standard deviation of the equally weighted portfolio generated with the 5 selected stocks and the equally weighted portfolio generated with the 10 stocks. An equally weighted portfolio would have the same amount of money invested in each unique stock. Therefore, the number of shares of each stock would be different, with more shares of cheaper stocks. An equally weighted portfolio would have to be rebalanced more frequently to maintain equal weight, because stocks prices would diverge quickly. We have in the table below the portfolio standard deviation and return for the two equally weighted portfolios.

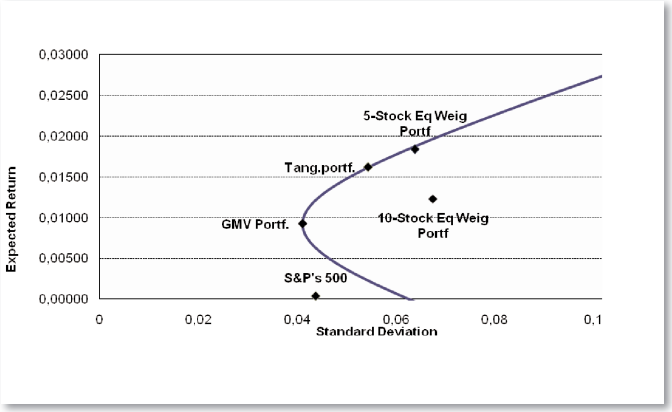
Table 8. Return and standard deviation for the two equally weighted portfolios.

Portfolio	5-Stock Equally Weighted	10-Stock Equally Weighted
Standard deviation	*0,06381338*	*0,067447*
Return	*0,01838952*	*0,012266*

We have in figure 3 the graphical representation of the Efficient Frontier and other relevant portfolios. The Efficient Frontier includes all the efficient portfolios. There are no portfolios with the same standard deviation and a greater return and vice versa. All the rational agents will choose their portfolio in this curve (tangency point with the indifference curves). The Market Index Portfolio is as we expected on the left side of the efficient frontier. The Market Index Portfolio is composed by 500 risky assets including the our five assets of the efficient frontier. As we can see by the graph we can obtain a greater expected return than the S&P portfolio's one without changing the level of standard deviation. We can do this by moving up vertically the Index Portfolio until we reach the Efficient Frontier. So we can say that it exists an Efficient Frontier portfolio more efficient that the Index Portfolio. We reach the same conclusion for the two equally weighted portfolios. So, the two equally weighted portfolios have a lower expected return than the efficient frontier portfolios with the same standard deviation.

Figure 3.

Efficient frontier and some relevant portfolios.



Now we will see the same portfolio compositions imposing the short selling constraint. In finance, short selling (also known as shorting or going short) is the practice of selling assets, usually securities, that have been borrowed from a third part (usually a broker) with the intention of buying identical assets back at a later date to return to the lender. So, the problem in this case is:

$$\min_{\omega} \boldsymbol{\omega}'\boldsymbol{\Sigma}\boldsymbol{\omega}$$
$$s.t.\ \boldsymbol{\omega}'\boldsymbol{\mu} = \mu_p$$
$$\boldsymbol{\omega}'\mathbf{1} = 1$$
$$\boldsymbol{\omega} \geq \mathbf{0}$$

We use the excel solver in order to draw the efficient frontier with the short selling constraint. We have used 23 points and we have in the table below 7 of them.

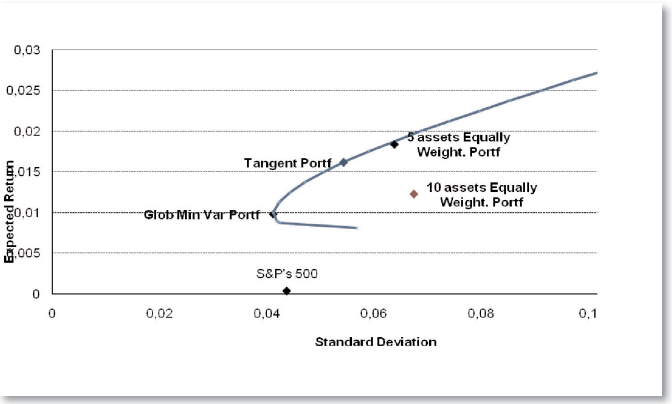
Table 8. Efficient frontier points.

Stocks	HASBRO	COCA COLA	JOHNSON	HOST HOTELS	EXXON MOBIL
HASBRO	0	0,05088	0,10271	0,14934	0,16623
COCA COLA	0,05137	0,58407	0,56742	0,52218	0,49638
EXXON MOBIL	0,94863	0,36505	0,32986	0,27947	0,24212
TITANIUM METALS	0	0	0	0	0,03249
RED HAT	0	0	0	0,04901	0,06278
Sum of Weights	1	1	1	1	1
Optimal Portfolio Return	0,0081	0,00875	0,009001	0,009999	0,011251
Target Portfolio Return	0,0081	0,00875	0,009	0,01	0,01125
Optimal Portfolio Variance	0,00322	0,001798	0,001747	0,001701	0,001792
Portfolio Standard Deviation	0,056741	0,042399	0,041794	0,041247	0,04233

We have can see in figure 4 the Efficient Frontier, the Tangent Portfolio, the Global Minimum Variance portfolio, the two equally weighted portfolios and the Market Portfolio. So we reach the same conlusion regarding the index portfolio and the two equally weighted portfolios. We can obtain a greater return with the same level of risk on the efficient frontier portfolios.

Figure 4.

Efficient frontier and some relevant portfolios (short selling constraint).



Let's determine now the Efficient Frontier with the risk free asset and the Tangent Portfolio. We use the *US INTERBANK (1 MTH) interest rates* time series in order to have an approximation for the risk free rate. We can compute the risk free rate using:

$$RF = \frac{\sum (y_t / 1200)}{n}$$

, where *y* is the *US INT.(1 Month)* time series and *n* is the number of observations.

The agent optimal choice in this case will be related to its risk aversion coefficient. The optimal portfolio will include a risk-free investment and a risky investment with weights in the risky assets proportional to the risky assets weights in the Tangency Portfolio. The agent problem is:

$$\max_{\omega_P} E[R_P] - \frac{R_A}{2} Var[R_P]$$

$$s.t. \quad R_P = \sum_{i=1}^{N+1} \omega_i R_i \qquad \sum_{i=1}^{N+1} \omega_i = 1$$

,where *i=1* identifies the risk-free investment. Solving this problem, we can find the optimal weights.

$$\boldsymbol{\omega} = \frac{1}{R_A} \boldsymbol{\Sigma}^{-1} (\boldsymbol{\mu} - r_f) \frac{\mathbf{1}' \boldsymbol{\Sigma}^{-1} (\boldsymbol{\mu} - r_f)}{\mathbf{1}' \boldsymbol{\Sigma}^{-1} (\boldsymbol{\mu} - r_f)}$$

$$\boldsymbol{\omega} = \frac{1}{R_A} \mathbf{1}' \boldsymbol{\Sigma}^{-1} (\boldsymbol{\mu} - r_f) \frac{\boldsymbol{\Sigma}^{-1} (\boldsymbol{\mu} - r_f)}{\mathbf{1}' \boldsymbol{\Sigma}^{-1} (\boldsymbol{\mu} - r_f)} = \frac{1}{R_A} (B - A r_f) \boldsymbol{\omega}_M$$

The Efficient Frontier equation is

$$\sigma_p = \frac{\mu - RF}{\sqrt{A - B * RF - 1\Sigma^{-1} \mu' * RF + C * RF^2}}$$

, where *A, B, C* are defined as before. So in this case, the Efficient Frontier is a straight line, no more a curve.

We define the weights of the Tangency Portfolio

$$w = \frac{\Sigma^{-1} \mu' - RF * \Sigma^{-1} 1'}{1\Sigma^{-1} \mu' - C * RF}$$

where *'RF'* is the risk free rate computed before. So we can obtain the portfolio standard deviation and return with the usual formulas:

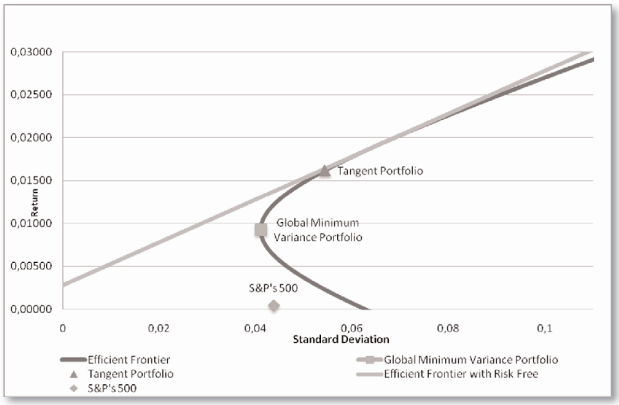
$$\sigma_p = (\omega' \Sigma \omega)^{1/2}$$

$$\mu_p = \omega' \mu$$

We have represented in figure 5 the Efficient Frontier with the risk free asset (the straight line) and the Tangent portfolio. The tangency portfolio in this case is the unique portfolio of the efficient frontier with the risk free asset that does not contain any investment in the risk free asset.

Figure 5.

Efficient frontier with and without the risk free asset (short selling allowed).



We test finally the CAPM (Capital Asset Pricing Model) for the selected stocks. We run a linear regression of the ten stock returns on the market index returns (S&P 500 in the our case).

$$R_i - R_f = \alpha_i + \beta_i (R_m - R_f)$$

Bloomberg adjusts estimated betas with the following formula:

$$Adjusted\ beta = 0{,}66 \times Unadjusted\ beta + 0{,}34$$

So these are the estimated betas with the corresponding Bloomberg adjustment:

Table 9. Estimated betas with the corresponding adjustment.

	HASBRO	COCA COLA	J & J	HOST HOT	EXXON M.	EDISON INTL	WHIRL POOL	TITANIUM M.	BANK OF AMERICA	RED HAT
Beta	0,90	0,30	0,42	2,20	0,22	0,67	1,92	1,78	1,79	1,13
Beta adj. (Bloomberg)	0,93	0,54	0,61	1,79	0,48	0,78	1,61	1,51	1,52	1,09

If the beta of an asset is equal to 1, the reaction of the asset return to the market return is proportional. If beta is greater then 1, the reaction to the market return is more than proportional and if beta is less than 1, the asset moves less than proportionally with respect to the market.

We can take for example two extreme cases from the table, 'Exxon Mobil' and 'Host Hotels & Resorts'(see the Bloomberg adjustment). We have beta equal to 0,48 for the 'Exxon Mobil' asset, so the reaction of the asset return to the market return is less than proportional. We have an opposite reaction for 'Host Hotels & Resorts' which beta is 1,79. We can say in general that we don't have extreme beta values, so 'in mean' the our assets are following the market course. We can see in the next table some statistics for the estimated models. So we have the coefficients estimates with the respective standard errors, the t-statistics and the R square coefficient.

Table 10. Relevant statistics for the estimated models (non significant coefficients in red color, betas in blue color).

	HASBRO		J & J		EXXON M.		WHIRL POOL		BANK OF AMERICA	
Beta/const estim.	0,901	0,013	0,416	0,001	0,216	0,006	1,919	0,016	1,791	0,002
Beta/const std.err.	0,196	0,009	0,107	0,005	0,173	0,008	0,338	0,015	0,465	0,02
Beta/const t test	4,588	1,46	3,874	0,302	1,249	0,765	5,672	1,103	3,849	0,086
R2	0,266		0,206		0,026		0,357		0,203	
	COCA COLA		**HOST HOT**		**EDISON INTL**		**TITANIUM M.**		**RED HAT**	
Beta/const estim.	0,298	0,007	2,204	0,01	0,666	0,004	1,778	0,039	1,13	0,024
Beta/const std.err.	0,141	0,006	0,391	0,017	0,146	0,006	0,448	0,02	0,417	0,018
Beta/const t test	2,114	1,091	5,639	0,585	4,568	0,652	3,972	2,005	2,707	1,328
R^2	0,072		0,354		0,265		0,214		0,112	

The t statistic is always less than 1.96, so we except in all cases the null hypothesis of α=0. The CAPM equilibrium is verified. The betas are all significant except in one case, the Exxon Mobil asset. We observe discrete values of R square coefficients, so we can say that there is a discrete correlation between asset returns and index returns, in this case the S&P 500.

4. Concluding Remarks

We study in this work some main aspects of Modern Portfolio Theory. We determine the optimal portfolios on a selected stock set and we estimate the Capital Asset Pricing Model. We analyse the stocks of ten international companies, part of the American market. We use the assumptions of MPT in order to minimize portfolio risk (or volatility) for a given amount of expected return, by carefully optimizing the proportions of various assets. So, we reduce our exposure to individual asset risk by holding a diversified portfolio of assets. We analyze the price time series for a five years period from March 31, 2006 to March 31, 2011. This period includes the 2007-2008 US subprime crisis that affected the financial markets of all over the world. We can say the period we have selected for our analysis is characterized by a high volatility and a negative trend caused by adverse economic events.

We observe a relatively negative trend for the ten selected stocks, especially for bank returns. The Petroleum company performs better for this five years period due to the increasing oil price. We choose 5 of the 10 initial assets in order to determine the best efficient frontier. Using the Sharp Ratio we decide that the best five companies are: Global Petroleum, Avon International, Vodafone-Panafon, DHL, Intesa San Paolo Bank. We build the efficient frontier using these five companies. A portfolio lying on the efficient frontier represents the combination offering the minimum possible risk, represented by the standard deviation, for given excepted return. All the rational agents will choose their portfolio in this curve (tangency point with the indifference curves). We reach the same conclusion for the two equally weighted portfolio: they are dominated by the efficient frontier.

Finally, we test the Capital Asset Pricing Model on ten selected stocks. The CAPM gives investors a tool for determining their investment decisions. The empirical test of the CAPM showed that the CAPM was a good

tool in predicting the price of individual assets. Although the CAPM was not perfectly accurate, it still provides a legitimate explanation of asset prices, that they're expected return is proportional to their systematic risk and the expected excess return to the market. The inaccuracies in this and other empirical tests can be improved with better proxies for the market and the risk free rate and better econometric techniques.

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