



Master Thesis

**Financial Development and Economic
Growth: An Empirical Analysis**

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I.P.P.S. in Economics Sciences

THESSALONIKI 2013

Acknowledgements

I would like to thank my supervisor, Professor Panagiotis Konstaninou for his useful comments and advice.

Also, I would like to thank:

Lecturer Benjamin Karatzoglou for his valuable guidance in my thesis.

Lecturer Theologos Dergiades for helping me with data gathering.

Finally, I would like to thank Olympios-Athanasios for his support.

Contains

1. Introduction	5
2. Literature Review	6
3. Data and Summarized Statistics	12
4. Methodology	18
5. Empirical Results	22
5.1 Three-year averages	22
5.1.1 Pooled OLS Regression	22
5.1.2 Random-Effect Model	25
5.2 Five-year averages	25
5.2.1 Pooled OLS Regression	28
5.2.2 Random Effect Model	31
6. Conclusions	34
APPENDIX	38

List of Tables

Table-1 Summarize Statistics for three years averages.....	13
Table-2 Summarize Statistics for five years averages.....	13
Table-3 Pairwise correlation matrix for three year averages.....	15
Table-4 Pairwise correlation matrix for five year averages.....	16
Table-5 Pooled OLS regression (3-year averages)	22
Table-6 Pooled OLS regression with interaction of PDUMMY. (3-year averages).....	23
Table-7 Breusch- Pagan test or LM test (3-year averages).....	23
Table-8 Hausman specific test (3-year averages).....	24
Table- 9 Random Effect Model (3-year averages)	25
Table-10 Random Effect Model using interaction PDUMMY (3-year averages)	26
Table-11 Pooled OLS regression (5-year averages).....	28
Table-12 Pooled OLS regression with interaction of PDUMMY (5-year averages).....	29
Table-13 Breusch- Pagan test or LM test (5-year average)	30
Table 14 Hausman specific test (5-year average).....	30
Table-15 Random Effect Model (5-year averages).....	31
Table-16 Results of Random Effect Model using interaction pdummy. (5-year averages).....	32

1. Introduction

The growth of financial sector and economy experienced in the past decades, preempted researchers to investigate the interactive relation behind this evolution and led to numerous empirical researches and investigations of the underlying mechanisms. Many researchers have focused in framing a relationship between financial development and economic growth. Obviously, there is an underlying positive correlation between financial development and economic growth, but the question, which parameters determine the financial development as a main factor that strongly affected the long-run economic growth, still remains. Additionally, the recent economic recession has been a key factor that triggered our curiosity toward further investigation of previous empirical researches.

Bagehot (1873) was a pioneer among the first researchers who worked upon founding a relationship between financial development and economic growth. Schumpeter (1911) supported a link between these two pillars based on the fact that, when the banking system works efficiently, banks favor in financing toward the profitable or innovative corporations. In addition, Hicks (1969) stated that the financial market had played an important role in the industrial revolution since the technological progress was boosted due to financial development. Similar, Joan Robinson (1952), believed that the drive force in growth rate economy should be firm-based followed by the financial system. Although, it should be mentioned than contradictory opinions like, Robert Lucas (1988), exists, supporting that economists “badly overstress” the role of the financial system.

It is important to understand the role of financial development in economic growth using the origins of financial development in order to determine the reason why different financial structures, bank-based or market-based, have different growth rates while the corresponding countries exhibit approximately the same level of financial development. In the current study, we investigate the relationship between financial development and economic growth using firm-level data, over the period 1992-2012. We apply panel data techniques to examine how the current financial crises affected financial development and economic growth and how market-based or bank-based system affected firm growth focusing on the recession period 2007-2012.

The rest of the current thesis is organized as following: section 2 displays the literature overview of financial development and economic growth, section 3 describes the data that we used in our analysis and the way they where were collected, section 4 presents the methodology used, section 5 shows the empirical results and section 6 summarizes the main conclusions from the evidences found.

2. Literature Review

Empirical methodologies examine the existence of possible correlations between financial development and economic growth based on: a) Time series analysis b) Cross-country regressions and c) Panel data analysis.

King & Levine (1993a) observed that the level of financial development was fundamental to predict economic growth, after investigating 80 countries from 1960 to 1989 using a cross-country methodology. A total of eight indicators were developed, four belonging to the financial development: a) Traditional measure of financial depth LLY, b) BANK =M3/GDP, c) PRIVATE¹, and d) PRIVY², and four corresponding to the source of growth: a) GK³ b) INV⁴ c) EFF⁵ including d) GYP⁶. The authors found a strong robustly correlation between financial development indicators, growth indicators, capital accumulation and the efficiency of capital allocation.

Additionally, in an expanded study King & Levine (1993b) also worked on the relation between finance, entrepreneurship and economic growth, using the same data sample and methodology. The main focus was given upon the endogenous productivity growth and the relation to the financial system. Their model resulted in four ways that the financial system influences business activities leading to improved productivity, as follow: 1) Financial systems evaluate entrepreneurs and select the most promising projects. 2) Financial systems mobilize resources to finance these projects. 3) Financial systems permit investors to diversify the risk associated with uncertain innovative activities. 4) Financial systems reveal the potential rewards of innovation technologies rather than continuing production with existing techniques. Overall, evidences of better financial systems stimulating further toward economic growth were traced, favoring simultaneously a productivity boost.

Pagano (1993) examined the relation between financial development and economic growth using endogenous growth model such as AK-model. The author found that the steady-state growth rate is correlated positively with the saving rate and the social marginal productivity of investment.

Demirgüç-Kunt & Maksimovic (1996) investigated the relation between financing choices of the firm and the level of development of financial markets, using firm level data over the period 1980 to 1991 from 30 development and under developing countries. To evaluate the possible

¹ PRIVATE, is the ratio of claims on nonfinancial private sector to domestic credit.

² PRIV/Y is the gross claims on the private sector to GDP.

³ GK is a capital accumulation.

⁴ INV is the ratio of investment to GDP.

⁵ EFF is the efficiency of capital allocation.

⁶ GYP: the real growth rate of GDP per capita

association between financing choices of the firm and the level of development of financial markets, authors used indicators from stock market, bank system, financial structure and economic growth. More specifically:

1. From the stock market, a) MCAP⁷ b) TVT⁸ and c) TOR⁹ indicators were used, combined with a weighted index for market development, named (INDEX1), and an additional (INDEX2)¹⁰ index, who is referred as “an argument index of (INDEX1)” firstly introduced by Korajczyk’s (1994).
2. From the bank sector a) M3/GDP b) PRIV/GDP¹¹ and c) BANK/GDP¹² d) FINDEX1¹³ and e) FINDEX2¹⁴ indexes were applied.
3. From the financial structure, a) NFATA¹⁵ and b) NSNFA¹⁶ indexes were used.
4. The economic growth indicators a) inflation rate (INFL) and b) rate of GDP (GROWTH) were applied.

Moreover, authors used proxies’ to estimate firms and their characteristics as follow; a) PROFIT¹⁷ b) DIVTA¹⁸ c) NTDS¹⁹, d) TA/GDP²⁰, e) LTD/TE²¹, and f) STD/TE-TD/T²². The authors concluded to three important conclusions:

- A) negative correlations between stock market development and the ratio of long-term and short-term debt of firms.
- B) Relationship between banking sector and firms leverage is statistically significant and positive correlated.
- C) There is no correlation between firms leverage and stock market.

This paper was the first research in literature that explored the effects of financial market development, stock market development and firm financing choices using empirically microeconomics evidences.

Levine & Zervos (1998) using cross-country analysis and data from 1976 to 1993 for 49 countries, predicted that stock market liquidity and banking development are positively and robustly correlated to the rates of economic growth, such as capital accumulation, productivity growth and saving rates. They investigated the relationship between stock market liquidity, banking development and economic growth using accordingly indicators from the above sectors.

From the stock market they used six indicators: a) Turnover²³ b) Value

⁷ MCAP is the ratio of stock market capitalization to GDP.

⁸ TVT is the ratio of total volume of shares traded to GDP.

⁹ TOR is the ratio of total value of shares traded to market capitalization.

¹⁰ INDEX2 is the extent of mispricing of securities relative to a domestic CAPM for each country.

¹¹ PRIV/GDP is the ratio of domestic credit to the private sector.

¹² BANK/GDP is the deposit bank domestic assets to GDP.

¹³ FINDEX1 is the average of M3/GDP and PRIV/GDP.

¹⁴ FINDEX2 is the averages of BANK/GDP, private non-bank assets to GDP, and assets of private insurance and pension companies to GDP.

¹⁵ NFATA : net fixed assets to total assets.

¹⁶ NSNFA : net sales to net fixed assets.

¹⁷ PROFIT is the ratio of earnings to total assets.

¹⁸ DIVTA is the ratio of dividends to total assets.

¹⁹ NDTS is the non-debt tax shield which is earnings before taxes minus the ratio of corporate taxes paid to corporate tax rate, deflated by total assets.

²⁰ TA/GDP is the total assets divided by the GDP of country.

²¹ LTD/TE is the book value of long term debt divided by book value of equity.

²² STD/TE and TD/T are the book value of short term and total debt divided by book value of equity.

²³ Turnover is the value of trades of domestic shares on domestic exchanges divided by the value of domestic shares

Traded²⁴ c) Capitalization²⁵ d) Volatility²⁶, e) CAPM integration²⁷ and f) APT²⁸. Two indicators from banking sector: a) M2/GDP and b) Bank Credit²⁹ and four from the economic growth: a) output growth, b) capital stock growth c) productivity growth and d) savings.

The authors found a positive link between financial development and economic growth. Furthermore, they observed that financial factors are an integral part of economic growth process and stock market equality.

Demirgüç-Kunt & Maksimovic (1998) focused on the role of financial and legal system toward firms' growth, working on a sample of 30 developed and under developing countries over the period 1986 to 1991. Their work investigated the evidence of constraints that delayed firms growth at rates greater than that they could obtain by relying in internal financing and short term borrowing. A prediction model of firms' potential growth rate was introduced proving that the possibility of a firm exceeding a certain growth level per each country was directly related to specific features of countries legal and financial system. The results confirmed that an active stock market and a well developed legal system were important in facilitating firm growth due to access to external funds thus growing faster; however it should be noticed that firms' reported ROCE was lower. Consistent to Zervos & Levine results, again the size of the stock market by itself was not so important in financing and mobilizing financing compared to the activity level of the market. Thus, developed institutions push firms toward external funding but with a noticeable impact on firm's profitability. Last, the authors did not find any evidence that government subsidies to firms were associated to firms' growth while these subsidies did not promote the economic environment in which firms obtained financial markets resourced for financial growth .

Beck, Levine & Loayza (1999) investigated the empirical relationship between the level of financial intermediary development versus i) economic growth, ii) total factor of productivity, iii) physical capital accumulation and iv) private saving rate, applying two methodologies:

A) A cross-country regression which uses as instrument variable the legal origin of the country for a sample of 63 countries over the period 1960 to 1995. The authors defined two conditions under which the variables of sample's legal origin were used to determine the financial development. 1) The legal origin should be exogenous to economic growth and 2) they should be correlated with the financial intermediary development.

²⁴ Value Traded is the value of trades of domestic shares on domestic exchanges to GDP.

²⁵ Capitalization is the value of listed domestic shares on domestic exchanges divided by GDP.

²⁶ Volatility as a twelve month rolling standard derivation estimate that is based on market returns.

²⁷ CAPM is the capital asset pricing model.

²⁸ APT is the arbitrage pricing theory.

²⁹ Bank Credit as the value of loans made by commercial banks and others deposit-taking banks to the private sector to the GDP.

B) A dynamic panel data analysis using five years averages data from 77 countries over the period 1960 to 1995.

For each of the above four cases tested, the cross-country analysis showed that:

i) It existed a significant relationship between the exogenous variables of financial intermediary development and economic growth. ii) A strong link between financial intermediary development and the total factor of productivity was observed. iii) The relationship between financial intermediary development and physical capital accumulation was weaker than the relationship between financial intermediary development and the total factor of productivity growth. iv) The financial intermediary development appears to have a positive influence on the rate of private saving. In addition, using the dynamic panel data analysis, the authors observed that:

i) The financial intermediary development had a major impact on the economic growth and there was a strong positive correlation between them. ii) There is a relationship between financial intermediary development and the total factor of productivity. iii) The financial intermediary development was strongly and positively correlated with physical capital accumulation when using alternative sets of information. iv) The financial intermediary development was not correlated with the private saving rate.

Levine (2000) applied a broad cross-country analysis for a sample of 48 countries over the period 1980 to 1995 investigating the link between economic growth toward market-based or bank-based countries, examining the relationship between the financial structure and sources of economic growth³⁰. In order to explore these relations, the author used indicators from financial structure, financial development and sources of economic growth. More specifically he used five indicators from the financial structure and financial development: a) activity³¹ b) size³² c) efficiency³³ d) regulatory³⁴ and e) undeveloped³⁵.

Last, the author applied the simple conditioning information set, such as: (i)

³⁰ Sources of economic growth a) physical capital accumulation b) total factor productivity growth and c) private saving rate.

³¹ Activity is a measure of the activity of stock markets relative to that of banks, from this measure the author used two index a) the total value of traded ratio is the value of domestic equities traded on domestic exchanges divided by GDP and b) bank credit ratio is the value of deposit money bank credits to the private sector as a share of GDP.

³² Size is a measure of the size of stock markets relative to that of banks, from this measure the author used two index a) Market capitalization ratio is the value of domestic equities listed on domestic exchanges divided by GDP and b) bank credit ratio. From this two index authors found size that it is equal to the logarithm of market capitalization ratio to the bank credit ratio.

³³ Efficiency is a measure of efficiency of stock market relative to that of banks, from this measure the author used a) total value of traded ratio b) turnover ratio is the value of stock transaction relative to market capitalization and as measure of efficiency of the banking sectors he used overhead costs it is the overhead costs of the banking system relative to banking system assets. The structure – efficiency is equal to the logarithm of the total value traded ratio times overhead costs. If the values of structure-efficiency are larger than the financial system is based on the market.

³⁴ Regulatory is an aggregate measure of regulatory restriction on commercial bank activities.

³⁵ Undeveloped is a dummy variable which takes the value 1 if the country has below median value of bank credit, market capitalization and total value traded ratios are greater than median values of overhead expenditures and zero otherwise.

the black market premium, (ii) the share of exports and imports to GDP (iii) the inflation rate and (iv) the ratio of government expenditures to GDP.

Levine was led to some more interesting conclusion. First, the financial structure was not statistically significant to the economic growth. Secondly, market-based systems had positive relationship with the long-run economic growth but the bank-based systems had negative relationship with the long-run economic growth. The importance of this research yields in applying broad cross-country analysis to the conflict between market-based and bank-based systems and a numerous theoretical models of financial structure were applied in practice.

Demirgüç-Kunt & Maksimovic (2002) investigated the firm's access to external financing and corresponding growth, comparing bank-based and market-based systems. They used panel data techniques for firm-level data from 40 countries over the period 1989-1996. The authors estimate for each firm the internal financed growth rate (IG) and short-term financed growth rate (SFG), using the following indexes: 1) STCOUNT³⁶, 2) LTCOUNT³⁷ and 3) DTCOUNT³⁸. Furthermore, to define firm measurement: 1) NFATA³⁹, 2) NSNFA⁴⁰ and 3) SIZE⁴¹ indexes were used. The authors found no evidence that the relative level of development of the security markets and the size of banking sector, by itself, affect firms' access to external financing. In addition, they found that banking system is related to short term financing while securities markets are linked with long term financing, both affecting firms' ability to obtain financing in different ways. Authors confirmed that securities markets are not significantly related with the ability of firms do obtain external financing.

Carlin & Mayer (2003) explore the link between the institutional structures of 14 developed countries, the comparative growth and investments across a sample of 27 industries over the period 1970 to 1995. To determine the long-run relation between the country structure, industry characteristics, growth and investment authors applied OLS regression, 2SLS regression with instrumental variables and the Sargan statistics of over-identification test, in order to check the validity of the instruments. The authors found that: 1.) the relationship between institutional structure and cross-industry growth for the developed countries is more closely associated with the investment in R&D rather than investment in fixed capital, 2.) there exists a positive correlation between banking concentration and the growth of bank-dependent industries when counties have low GDP per capita, 3.)

³⁶ STCOUNT is the proportion of firms that grow at average rates exceeding the IG rate.

³⁷ LTCOUNT is the proportion of firms that grow at average rates exceeding the SFG rate.

³⁸ DTCOUNT is the proportion of firms in a country that grow at rate that exceeds IG but does not exceed SFG.

³⁹ NFATA is the ratio of net fixed assets to total asset.

⁴⁰ NSNFA is the ratio of net sales to net fixed assets.

⁴¹ SIZE is the ratio of total assets of the firm to the GDP of country

the financial system is directly associated to activities in the developed countries.

Beck & Levine (2004) examined the long-run relationships between stock markets, banks and economic growth using five year average panel data over the period 1976 to 1998 taking data from 40 countries. Stock market was estimated using a) Turnover Ratio, b) Value Traded and c) Market Capitalization, while bank sector was estimated by Bank Credit. Furthermore, the authors used the same conditioning information sets as Levine (2000). They estimated the model using two ways OLS regressions and the GMM estimator setting the real growth GDP per capita as a dependent variable.

OLS Regressions showed that the relationship between stock markets, banks and economic growth are positive correlated. GMM estimators One-Step and Two-Step Results showed that the stock market and banks are positively and statistically correlated with economic growth, while Turnover Ratio and Bank Credit are positive correlated in all regressions.

3. Data and Summarized Statistics

In the current thesis, we tried to create a homogenous sample that represents in the optimal way the characteristic of each country's economy choose for the analysis, thus we gathered data from different sectors of industries, like:

- Automobiles & Parts
- Beverages
- Chemicals
- Construction & Materials
- Electronic & Electric Equipment
- Food Producers
- General Industries
- Household Goods & Home Constructions
- Industrial Metals & Mining
- Leisure Goods
- Personal Goods
- Technology Hardware & Equipment
- Tobacco

The data-sets were collected from international resources like DataStream and World Bank database. As mentioned previously, since our main scope is to investigate the impact of economic recession to financial development & economic growth, we applied our analysis over two samples of data-set, 3-year averages versus 5-year averages, aiming for a greater sensitivity for the rescission period 2007-2012. The first sample included 88.906, 3-year average observation, over the period (1992-2012), for 40 countries while the second sample included 50.804, 5-year average observations corresponding to a period of eighteen years (1992-2010), for the same sample of countries.

Table-1 of Appendix shows in detail the countries which were selected in the analysis and the corresponding number of the firms per each country. Table-2 of Appendix displays the financial indexes of the companies, the macroeconomic variables, the financial structure variables and other useful variables upon which our models were regressed. All variables in our models are converted in US dollars.

Table-1 & Table-2 below, present the summarize statistics for the sample variables. Additionally, the GDP PER CAPITA and INFLATION RATE in descending order are displayed while Table-3 & Table-4 display the pairwise correlation matrix for the 3-year and 5-year data-set average, respectively.

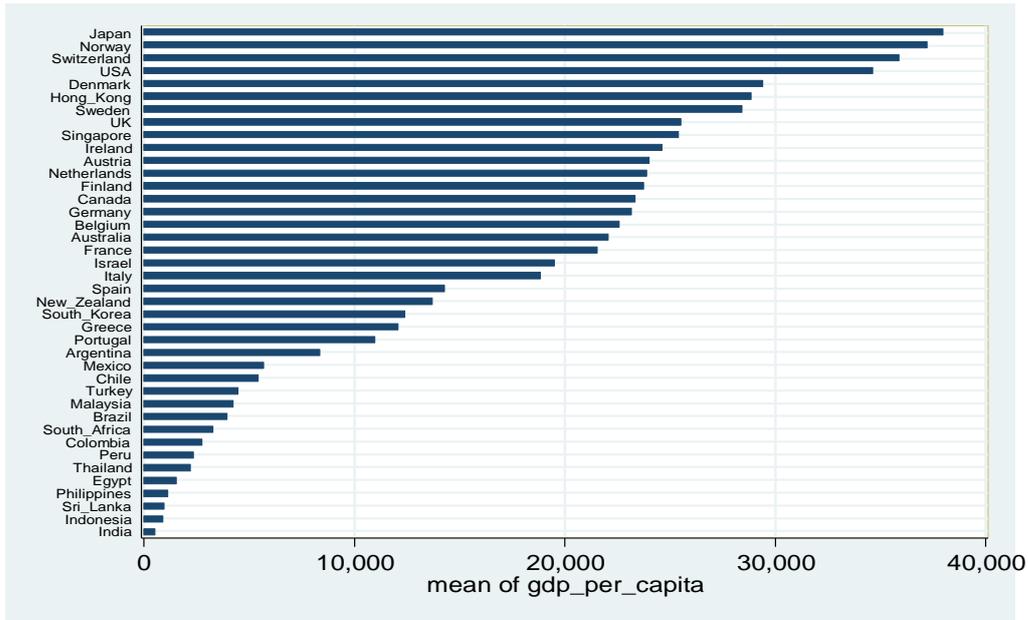
Table-1 Summarize Statistics for three years averages

Variables	Obs	Mean	Std. Dev	Min	Max
IG	58969	-.0123574	2.697981	-238.3955	246.8587
SFG	42736	-1.000198	.0102068	-2	-.625
GRC	56466	1.574346	78.21571	-306.7675	12540
Growth	88900	.0228295	.0219628	-.0623413	.0915795
GDP	88904	2.54e+12	3.62e+12	1.14e+10	1.16e+13
GDP per capita	88904	20890.35	13065.02	334.8047	41167.76
Turnover	76161	.9234732	.6791046	.0278494	3.810684
Bank	76107	1.00404	.5113395	.1143849	2.45317
Assets/GDP					
Inflation	88775	9.092993	96.93465	-3.83415	1740.412
Law & Order	88904	4.926719	1.071357	1	6
NSFNA	59205	3.604536	175.129	-13522.27	25839.2
SIZE	61487	1.63e-06	8.87e-06	-1.03e-08	.0004037
Civil – law dummy	88906	.4033249	.4905677	0	1
Creditor right index	88906	2.319922	1.359887	0	4
Shareholders right index	88906	3.836501	1.306438	0	5
Market	88906	.6375273	.480717	0	1

Table-2 Summarize Statistics for five years averages

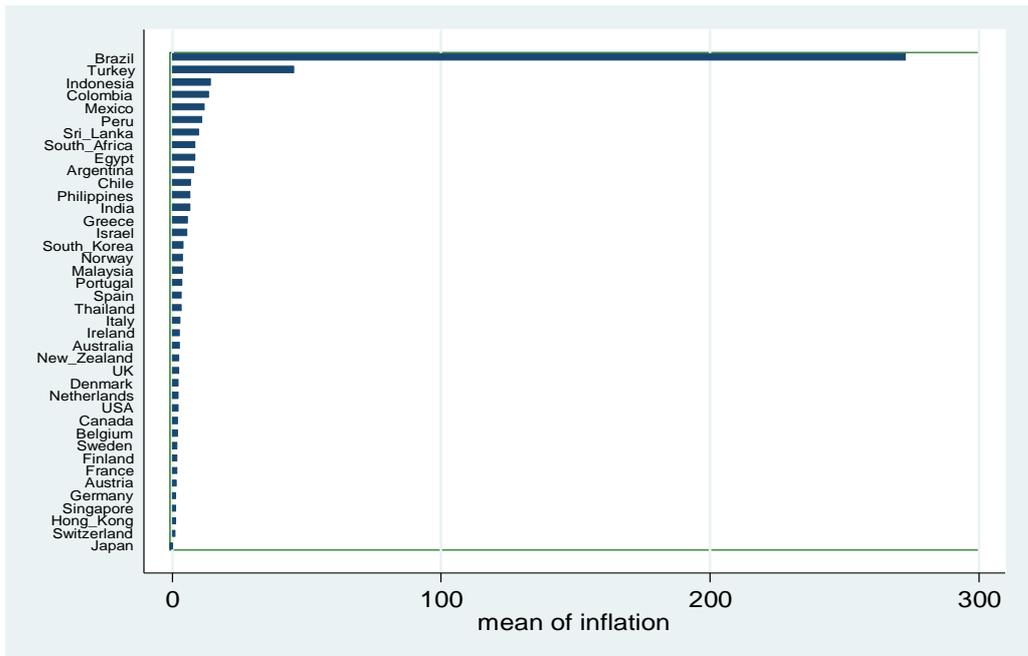
Variables	Obs	Mean	Std. Dev	Min	Max
IG	34847	-.157284	2.202881	-205.8	76.22569
SFG	26898	-1.000163	.0092922	-1.75	-.6666667
GRC	33146	1.741168	83.30562	-260.2967	1254
Growth	50800	2.51e+12	3.59e+12	1.21e+10	1.15e+13
GDP	50804	0.222822	.019281	-.0252238	.072327
GDP per capita	50804	20750.74	12990.58	351.8866	40868.39
Turnover	50804	.9847008	.7255171	.0617825	3.810684
Bank	50707	1.013995	.5041564	.1346813	2.436898
Assets/GDP					
Inflation	50761	9.403111	78.42685	-2.700605	1066.369
Law & Order	50804	4.939685	1.058273	1.058333	6
NSFNA	34998	5.038957	249.6074	-1105.636	28699.96
SIZE	36270	1.54e-06	8.30e-06	-2.02e-09	.0003744
Civil – law dummy	50804	.4033541	.4905755	0	1
Creditor right index	50804	2.319896	1.359883	0	4
Shareholders right index	50804	3.836509	1.306442	0	5
Market	50804	.6375285	.4807187	0	1

Graph 1 GDP per capita



From the graph above notice Japan has the higher GDP per capita and India country last in our sample.

Graph 2 INFLATION rate



From the graph above we notice that Brazil has the higher Inflation rate and Japan the last value of our sample.

Table-3 Pairwise correlation matrix for three year averages.

	IG	SFG	GRC	Turnover	Bank Asset/GDP	Growth	GDP per capita	Inflation	Size	NSNFA	Law&Order	Civil Law Dummy	Market
SFG	0.042 (0.3843)												
GRC	-0.0020 (0.6390)	0.0001 (0.9877)											
Turnover	-0.0193**** (0.0000)	-0.0079 (0.1359)	-0.0014 (0.7636)										
Bank Asset/GDP	0.0117** (0.0108)	0.0117** (0.0270)	-0.0088 (0.0625)	-0.0691**** (0.0000)									
Growth	0.0068 (0.1007)	-0.0028 (0.5572)	0.0019 (0.6575)	-0.2622**** (0.0000)	-0.3341**** (0.0000)								
GDP per capita	-0.0114**** (0.0057)	-0.0110**** (0.0235)	0.0007 (0.8757)	0.3031**** (0.0000)	0.4347**** (0.0000)	-0.4189**** (0.0000)							
Inflation	0.0000 (0.9551)	-0.0009 (0.8510)	-0.0004 (0.9337)	-0.0385**** (0.0000)	-0.0921**** (0.0000)	0.0364**** (0.0000)	-0.1054**** (0.0000)						
Size	0.0015 (0.7233)	0.0036 (0.4508)	-0.0013 (0.7629)	-0.0474**** (0.0000)	0.0144**** (0.0013)	0.0007 (0.8594)	-0.0358**** (0.0000)	-0.0046 (0.2583)					
NSNFA	-0.0034 (0.4129)	0.0852**** (0.0000)	0.0335**** (0.0000)	-0.0041 (0.4448)	-0.0033 (0.4729)	0.0024 (0.5970)	-0.0045 (0.2683)	-0.0007 (0.8733)	-0.0027 (0.5035)				
Law&Order	-0.0032 (0.0425)	-0.0055 (0.2586)	-0.0026 (0.5359)	0.0910**** (0.0000)	0.3453**** (0.0000)	-0.1695**** (0.0000)	0.6746**** (0.0000)	-0.0979**** (0.0000)	0.0035 (0.3824)	-0.0020 (0.6184)			
Civil Law Dummy	0.0107**** (0.0097)	0.0120 (0.0128)	-0.0022 (0.6055)	-0.0199**** (0.0000)	-0.1883**** (0.0000)	-0.0091**** (0.0069)	0.0747**** (0.0000)	0.0620**** (0.0000)	-0.1175**** (0.0000)	0.0028 (0.4931)			
Market	-0.0117**** (0.0044)	-0.0082**** (0.0904)	0.0076**** (0.0695)	0.1301**** (0.0000)	-0.1503* (0.0000)	0.0455**** (0.0000)	0.0455**** (0.0000)	0.1156**** (0.0000)	0.0434**** (0.0000)	-0.0029 (0.4822)	-0.0227**** (0.0000)	0.1259**** (0.0000)	-0.4840**** (0.0000)
Pdummy	-0.0092**** (0.0256)	0.0037 (0.4489)	-0.0032 (0.4433)	0.4051**** (0.0000)	-0.0869**** (0.0000)	0.2072**** (0.0000)	0.1160**** (0.0000)	-0.0404**** (0.0000)	0.0185**** (0.0000)	-0.0018 (0.6537)	-0.1397**** (0.0000)	-0.0001 (0.9848)	-0.0000 (0.9942)

*, ** and *** are significant levels for 1%, 5% and 10% respectively. With **** we represent the value are significant for all level and for ***** for significant level 5% and 10%. The p-value is in parenthesis.

Table-4 Pairwise correlation matrix for five year averages.

	IG	SFG	GRC	Turnover	Bank Asset/GDP	Growth	GDP per capita	Inflation	Size	NSNFA	Law&Order	Civil Law Dummy	Market
SFG	0.0046 (0.4568)												
GRC	-0.0095*** (0.0890)	0.0019 (0.7637)											
Turnover	-0.0217**** (0.0001)	-0.0014 (0.8155)	0.0002 (0.9776)										
Bank Asset/ GDP	0.0120**** (0.0258)	0.01000 (0.1007)	-0.0102*** (0.0625)	-0.0189**** (0.0000)									
Growth	0.0165**** (0.0021)	-0.0063 (0.2981)	0.0008 (0.8894)	-0.3344**** (0.0000)	-0.3688**** (0.0000)								
GDP per capita	-0.0155**** (0.0037)	-0.0043 (0.4805)	0.0043 (0.4339)	0.5557**** (0.0000)	0.4347**** (0.000)	-0.5030**** (0.0000)							
Inflation	0.0009 (0.8711)	-0.0002 (0.9696)	0.0009 (0.8679)	-0.0532**** (0.0000)	-0.1124**** (0.0000)	0.0255**** (0.0000)	-0.1345**** (0.0000)						
Size	0.0005 (0.9228)	0.0033 (0.5845)	-0.0015 (0.7894)	-0.0441**** (0.0000)	0.0186**** (0.0004)	-0.0077 (0.1413)	-0.0359**** (0.0000)	-0.00028 (0.5977)					
NSNFA	-0.0037 (0.4877)	0.08541**** (0.0000)	-0.0001 (0.9792)	-0.0041 (0.4448)	0.0045 (0.3987)	-0.0048 (0.3702)	-0.0045 (0.4018)	-0.0011 (0.8328)	-0.0030 (0.5726)				
Law& Order	-0.0040 (0.4514)	-0.0043 (0.4858)	0.0000 (0.9985)	0.1044**** (0.0000)	0.3582* (0.0000)	-0.2115**** (0.0000)	0.6875**** (0.0000)	-0.1430**** (0.0000)	0.0037 (0.4763)	-0.0033 (0.5315)			
Civil Law Dummy	0.0106**** (0.0485)	0.0082 (0.1805)	-0.0048 (0.9848)	-0.0297**** (0.0000)	0.1898**** (0.0000)	-0.2028**** (0.0000)	-0.0069 (0.1192)	0.0975**** (0.0000)	0.0638**** (0.0000)	0.0059 (0.2714)	-0.1207**** (0.0000)		
Market	-0.0120**** (0.0254)	-0.0047 (0.4438)	0.0078 (0.1556)	0.1468**** (0.0000)	-0.1357**** (0.0000)	0.0290**** (0.0000)	0.1121**** (0.0000)	0.0560**** (0.0000)	-0.0238**** (0.0000)	-0.0063 (0.2373)	0.1305**** (0.0000)	-0.4840**** (0.0000)	
Pdummy	-0.0130** (0.0153)	0.0089 (0.1444)	-0.0061 (0.2634)	0.4406**** (0.0000)	0.1024**** (0.0000)	-0.3112**** (0.0000)	0.1092**** (0.0000)	-0.0478**** (0.0000)	0.0187**** (0.0004)	-0.0030 (0.5804)	-0.1337**** (0.0000)	-0.0001 (0.0000)	0.0000 (0.9934)

*, ** and *** are significant levels for 1%, 5% and 10% respectively. With **** we represent the value are significant for all level and for ***** for significant level 5% and 10%. The p-value is in parenthesis

In Table-3 we notice that:

- The short-term financed growth rate (SFG) is weakly positive correlated with internal financed growth rate (IG), but not statistical significant.
- The growth rate of company (GRC) is weakly negative correlated with (IG) but weakly positive correlated with (SFG).
- Turnover is weakly and negative correlated with (IG), (SFG) and (GRC) but is statistically significant with (IG) for all levels.
- Bank Assets/GDP is statistically correlated and positively for 5% with (IG) and (SFG) but negatively correlated for (GRC) and Turnover.
- The Size of Firm is positively correlated but not statistically significant with (IG), (SFG) & Growth and negatively correlated with (GRC).
- NSNFA has negative correlation with (IG) and positively statistically significant with (SFG) and (GRC).
- The Civil law dummy is positively and statistically correlated for all level with (IG).
- Market is negative correlated with (IG) for all level and (SFG) for significant level 10% and positive correlated with (GRC) for 10% significant level.

Similar, Table-4 displays the pairwise correlation matrix for the 5-year average for the same sample of countries and data. In a quick glance, we notice significant differences between the two pair sets, specifically:

- The growth rate of company (GRC) is negatively and statistically significant correlated with the internal financed growth rate (IG), showing a stronger correlation than the 3 year average data set.
- Turnover ratio is positive correlated with the (GRC), while in the 3-year average it is negative.
- Bank Assets/GDP is positive correlated with (SFG) and significant negative correlated with (GRC), while in the 3 year average the significance level is reversal.
- Growth is positive and significant correlated with (IG) for the 5-year average while being only correlated for the 3 year average.
- Inflation is positive correlated with (GRC) while in the 3 year average it has a negative correlation.
- Size of firm is negative correlated with Growth, contrary to 3-year average.
- NSNFA is negative correlated with (GRC) and Growth, contrary to 3-year average.
- The civil law dummy is positive correlated with Size, contrary to 3-year average.
- Market is negative and significant correlated with Bank Assets/GDP and positive correlated with (GRC), while in the 3-year average the significant level is switch reversal.

4. Methodology

In order to determine the relationship between financial development and economic growth with an emphasis on the recent economic recession, we apply unbalanced panel data analysis.

Panel data analysis or longitudinal data set is a combination of time series and cross section analysis. The panel data analysis consists of two categories.

A) Balanced Panel: A panel is defined as balanced when all (individuals, firms, countries etc.) are observed at all periods.

B) Unbalanced Panel: A panel is defined as unbalanced when the number of (individuals, firms etc.) have missing period.

In general terms the basic linear model is expressed as:

$$y_{it} = \alpha_i + x'_{it}\beta_{it} + u_{it} \quad (1) \quad \text{for } i = 1, \dots, N \text{ and } t = 1, \dots, T$$

Where y_{it} is the dependent variable, x_{it} are $1 \times k$ vectors of observations on the explanatory variables or the independent variables, β are $k \times 1$ vectors parameters to be estimated for the explanatory variables x_{it} , u_{it} is disturbances and α_i is the intercept term. α_i and β coefficient are estimated using the three methods:

1) Pooled Regression (OLS) or Population Averaged Model which estimates a single equation using all data, under the assumption that any latent heterogeneity has been averaged out.

2) The fixed – effect model is expressed as:

$$y_{it} = \alpha_i + x'_{it}\beta_{it} + \mu_i + v_{it} \quad (2)$$

Where $u_{it} = \mu_i + v_{it}$, μ_i is an individual specific effect and v_{it} is a remainder disturbance and $v_{it} \sim N(0, \sigma^2)$. This model is estimated by using dummy variables (LSDV).

3) The random-effect or the error component model is expressed as:

$$y_{it} = \alpha_i + x'_{it}\beta_{it} + \theta_{it} \quad (3)$$

where $\theta_{it} = \varepsilon_i + v_{it}$, ε_i is the error term of cross-section and $v_{it} \sim N(0, \sigma^2)$ is the error term of individual observations.

The differences between Fixed-Effect model and Random-Effect model are:

1. Fixed-Effect model have different coefficient for different individual, firms, countries etc, while the random effect model has only one coefficient for different individual, firms, countries etc.

2. Random-effect is more efficient than Fixed-effect model.
3. Random-effect investigates differences in error variance components across firms, individual, countries, times periods etc, while the fixed-effect model explores the intercepts across group (firms, individual, countries, periods times etc).

In order to decide which of these models is better for our estimation we run first the Hausman test under the null hypothesis (H_0) that the firms effects are random versus alternative hypothesis (H_1) that the firms' effects are fixed.

In our analysis we apply unbalanced panel data technique estimated as company-period. We use unbalanced panel data due to different numbers of firms per each country and the existence of missing value in time periods. In order to determine a link between financial development and economic growth, we took a referee point in the measure of firm growth model from (DemirgüçKunt & Maksimovic 2002) such as: IG (internal financed growth rate) and SGR (short-term financed growth rate). Moreover, we used as measure of firm growth the growth rate of company (GRC) which we estimated form firms' revenue.

Specifically we used the following formulas to estimate growth rate of firms:

$$IG_t = ROA_t / (1 - ROA_t) \quad (4)$$

$$SFG_t = ROLTC_t / (1 - ROLTC_t^{42}) \quad (5)$$

$$GRC_t = REVENUE_t - REVENUE_{t-1} / REVENUE_{t-1} \quad (6)$$

For each of the firms' growth formula above we run three regressions as depended variables to investigate the relationship between firm's growth and financial development, as following:

$$IG_t = \beta_0 + \beta_1 TUNROVER + \beta_2 \frac{BANK\ ASSETS}{GDP} + \beta_3 GRWOTH + \beta_4 GDP\ PER\ CAPITA + \beta_5 INFLATION + \beta_6 SIZE + \beta_7 NSNFA + \beta_8 LAW\ \&\ ORDER + \beta_9 MARKET + \beta_{10} CIVIL\ LAW\ DUMMY + \beta_{11} PDUMMY + \varepsilon \quad (7)$$

$$SFG_t = \beta_0 + \beta_1 TUNROVER + \beta_2 \frac{BANK\ ASSETS}{GDP} + \beta_3 GRWOTH + \beta_4 GDP\ PER\ CAPITA + \beta_5 INFLATION + \beta_6 SIZE + \beta_7 NSNFA + \beta_8 LAW\ \&\ ORDER + \beta_9 MARKET + \beta_{10} CIVIL\ LAW\ DUMMY + \beta_{11} PDUMMY + \varepsilon \quad (8)$$

$$GRC_t = \beta_0 + \beta_1 TUNROVER + \beta_2 \frac{BANK\ ASSETS}{GDP} + \beta_3 GRWOTH + \beta_4 GDP\ PER\ CAPITA + \beta_5 INFLATION + \beta_6 SIZE + \beta_7 NSNFA + \beta_8 LAW\ \&\ ORDER + \beta_9 MARKET + \beta_{10} CIVIL\ LAW\ DUMMY + \beta_{11} PDUMMY + \varepsilon \quad (9)$$

⁴² $ROLTC_t = Total\ Assets * (1 - (Short\ term\ debt / Total\ Assets))$

The definition of each variable in the model is shown in detail in Table-2 of the Appendix. The above equations (7,8&9) have the same independent variables as the model of (Demirgüç-Kunt & Maksimovic 2002), in addition we have introduced the following variables:

- Variable “MARKET”, which takes the value 1 for market-based systems and zero for bank-based systems as defined by Demirgüç-Kunt and Levine (1999)
- Variable “CIVIL LAW DUMMY” from La Porta et al. (1998) which takes value 1 from Civil Law Countries and zero for Common Law Countries
- Variable “NSNFA” as a proxy for firm characteristic
- PDUMMY variable which is a period dummy which takes value 1 for the last three years and last five years respectively or zero otherwise.

We introduced PDUMMY variable in order to investigate how the financial crises affect the economic growth in the last five year, corresponding to the economic recession. We used Market-dummy and Civil Law-dummy variables to classify which company grows more rapidly. Furthermore, we investigate how financial crises affects bank or market based systems and legal system of the countries. Last, we apply three and five year’s averages to eliminate the economic cycles in our analysis.

First we regress the Pooled OLS for the equations (7), (8)&(9) to investigate the relationship between the dependent and independent variables with each others. Consecutively we run again the Pooled OLS regression, this time using the interaction of PDUMMY for each variable in the following form:

$$IG_t = \beta_0 + \beta_1 TOR + \beta_2 \frac{BANK}{GDP} + \beta_3 GRWOTH_N + \beta_4 GDP_{CAP} + \beta_5 INF + \beta_6 SIZE_N + \beta_7 NSNFA_N + \beta_8 LAW ORDER + \beta_9 MARKET_N + \beta_{10} CIVIL LAW + \varepsilon \quad (10)$$

$$SFG_t = \beta_0 + \beta_1 TOR + \beta_2 \frac{BANK}{GDP} + \beta_3 GRWOTH_N + \beta_4 GDP_{CAP} + \beta_5 INF + \beta_6 SIZE_N + \beta_7 NSNFA_N + \beta_8 LAW ORDER + \beta_9 MARKET_N + \beta_{10} CIVIL LAW + \varepsilon \quad (11)$$

$$GRC_t = \beta_0 + \beta_1 TOR + \beta_2 \frac{BANK}{GDP} + \beta_3 GRWOTH_N + \beta_4 GDP_{CAP} + \beta_5 INF + \beta_6 SIZE_N + \beta_7 NSNFA_N + \beta_8 LAW ORDER + \beta_9 MARKET_N + \beta_{10} CIVIL LAW + \varepsilon \quad (12)$$

Secondly, we tested our variables using LM test or Breusch & Pagan test to investigate if the Pooled OLS regression is better than the Random-effect applying null hypothesis $H_0: \sigma_\alpha^2 = 0$ versus $H_1: \sigma_\alpha^2 > 0$.

We run Hausman specific test to investigate if the unique of errors (v_{it}) are correlated to the regressors. The test have the null hypothesis H_0 : the companies’ effects are random versus H_1 : the companies’ effects are fixed, in order to decide it Fixed-Effect model or Random-Effect will be used.

The Hausman test showed that the Random-Effect Model is more accurate for our equations to estimate the possible relationship between financial development and economic growth.

We use these estimations to see how the bank based system and market based system affect economic growth and which of these systems was affected more from the financial crisis. Last, we compare the results between three years and five year averages.

5. Empirical Results

5.1 Three-year averages

5.1.1 Pooled OLS Regression

The following table displays the results of Pooled OLS regression for equations (7), (8) and (9). More specifically column (1) represents the internal financed growth rate (IG), column (2) the short-term financed growth rate (SFG) and column (3) the growth rate of company (GRC).

Table-5 Pooled OLS regression (3-year averages)

Variable	(1) IG	(2) SFG	(3) GRC
CONS.	-0.0630 (-0.81)	-1.001*** (-2655.63)	4.601 (1.66)
TURNOVER	-0.0295 (-1.34)	-0.0000722 (-0.67)	-0.841 (-1.09)
BANK ASSETS/GDP	0.0786* (2.82)	0.000277* (2.05)	-1.836 (-1.88)
GROWTH	0.650 (0.088)	-0.00132 (-0.39)	-1.807 (-0.07)
GDP per capita	-0.00000336* (-2.27)	-1.60e-08* (-2.26)	0.0000805 (1.55)
INFLATION	-0.0000366 (-0.19)	-0.000000275 (-0.29)	-0.00194 (-0.28)
SIZE	-522.6 (-0.37)	3.054 (0.46)	-5503.5 (-0.11)
NSNFA	-0.0000488 (-0.72)	0.0000151*** (25.83)	-0.00000310 (-0.00)
LAW&ORDER	0.0128 (0.83)	0.0000637 (0.86)	-0.606 (-1.11)
MARKET	-0.00749 (-0.25)	0.0000174 (0.12)	1.305 (1.19)
CIVIL LAW DUMMY	0.0325 (1.06)	0.000244 (1.65)	0.685 (0.62)
PDUMMY	-0.0189 (-0.56)	0.000191 (1.19)	-0.0921 (-0.08)
R ²	0.001	0.019	0.000
Adj. R ²	0.001	0.019	-0.000
No. of observation	46844	35310	43985

Standard errors in parentheses *p<0.05, **p<0.01, ***p<0.001

As shown above in column (1), the (IG) model has negative relationship with TUROVER, INFLATION, SIZE, NSNFA, MARKET and PDUMMY but not statistically significant. Furthermore, (IG) is negatively and statistically significant with GDP per capita, while it is significant positively only toward BANK ASSETS/GDP.

Column (2) indicates that (SFG) of firms have negative relation only with GROWTH and INFLATION and with GDP per capita is negatively significant per each country. Furthermore, SFG have positive relationship with all the other variables while showing statistically significant toward BANK ASSETS/GDP and NSNFA.

Last, in column (3) (GRC) has positive link with GDP per capita and the legal system of country but negative relation with all the others variables.

Table-6 Pooled OLS regression with interaction PDUMMY (3-year averages)

Variables	(1) IG	(2) SFG	(3) GRC
CONS.	0.00649 (0.49)	-1.000*** (-15802.98)	1.755*** (3.74)
TOR	-0.0282 (-0.72)	0.0000761 (0.37)	-2.651 (-1.95)
BANK/GDP	0.119 (1.64)	-0.0000370 (-0.09)	-3.073 (-1.22)
GROWTH _N	0.992 (0.51)	0.000428 (0.05)	-168.4* (-2.52)
GDP _{CAP}	0.000000297 (0.09)	3.84e-09 (0.22)	-0.000137 (-1.13)
INF	0.00241 (0.19)	0.00000398 (0.06)	0.365 (0.84)
SIZE _N	-2171.9 (-0.88)	1.732 (0.15)	-32658.2 (-0.39)
NSNFA _N	-0.0000950 (-0.48)	-0.0000110* (-2.33)	0.000499 (0.07)
LAW ORDER	-0.0277 (-0.90)	0.0000173 (0.11)	1.918 (1.81)
MARKET _N	-0.0735 (-1.27)	-0.0000748 (-0.26)	1.236 (0.62)
CIVIL LAW	0.0512 (0.92)	-0.0000844 (-0.29)	0.237 (0.12)

R ²	0.000	0.000	0.000
Adj. R ²	0.000	-0.000	0.000
No. of observation	46844	35310	43985

Standard errors in parentheses *p<0.05, **p<0.01, ***p<0.001

Table-6 above displays the results of Pooled OLS regression using interaction of PDUMMY in each variable. In the previous step simple Pooled OLS we found that GDP per CAPITA is negatively significant in relation with (IG) while in the current regression Pooled OLS with interaction of PDUMMY we notice that these variables have positive, but not significant, relation.

In column (2) comparing (SFG) model with the correspondent column of Table-5 we observe that variables (such as Turnover, Growth, GDP per CAPITA and Inflation) which showed negative relation with SFG at present regression indicate a positive relation. On the other hand, variables such as Bank Assets/GDP, NSNFA, MARKET and Legal System now exhibit negative relation toward SFG.

Finally, in the GRC model, column (3), the variables that affect more the PDUMMY are GDP per capita, Inflation, NSNFA and Law & Order while all other variables remain unchanged.

To sum up, in all three models applied, we found that GDP per CAPITA and Inflation rate were more affect by the financial crises.

The following table represents the Breusch-Pagan test or LM test and investigates if the Pooled OLS results are better than Random Effect.

The null hypothesis $H_0: \sigma_a^2=0$ versus $H_1: \sigma_a^2>0$

Table-7 Breusch- Pagan test or LM test (3-year averages)

Variables	Chi-square	Prob.
IG	3017.09	0.0000
SFG	321.67	0.0000
GRC	0.00	0.4796

From Table-7 we reject the null hypothesis for (IG) and (SFG) due to p-value<0.05 which indicates the existence of random effect model, while we accept the null hypothesis for (GRC) model. The test shows the existence of both random effect and fixed effect in our analysis. In order to decide if random or fixed effect will be chosen, we run a priori the Hausman test.

Table-8 Hausman specific test (3-year averages)

Variables	Chi-square	Prob.
IG	0.03	0.9848
SFG	0.14	0.9330
GRC	0.75	0.6880

The results of Hausman test shows that Random-Effect Model be used due to p-value>0.05

5.1.2 Random-Effect Model

The Random-Effect model investigates the relationship between the independent variables in our model or explanatory variables with the dependent variables IG, SFG and GRC.

Table- 9 Random Effect Model (3-year averages)

Variable	(1) IG	(2) SFG	(3) GRC
CONS.	-0.0171 (-0.18)	-1.000*** (-2082.54)	3.786 (1.05)
TURNOVER	-0.00859 (-0.38)	0.0000111 (0.10)	-1.385 (-1.59)
BANK ASSETS/GDP	0.103** (2.91)	0.000252 (1.41)	-1.881 (-1.45)
GROWTH	0.258 (0.38)	-0.00170 (-0.56)	4.330 (0.17)
GDP per capita	-0.00000506** (-2.68)	-1.61e-08 (-1.67)	0.000114 (1.63)
INFLATION	-0.0000368 (-0.23)	-0.000000198 (-0.24)	-0.00277 (-0.43)
SIZE	-754.4 (-0.37)	1.325 (0.14)	2609.3 (0.04)
NSNFA	-0.0000461 (-0.58)	0.0000147*** (27.47)	0.00000568 (0.00)
LAW&ORDER	0.00497 (0.28)	0.00000297 (0.03)	-0.427 (-0.64)

MARKET	-0.0155 (-0.33)	-0.00000430 (-0.02)	2.068 (1.20)
CIVIL LAW DUMMY	0.0304 (0.64)	0.000294 (1.18)	0.595 (0.35)
PDUMMY	-0.0409 (-1.40)	0.000174 (1.27)	-0.482 (-0.42)
No. of observation	46844	35310	43985

Standard errors in parentheses *p<0.05, **p<0.01, ***p<0.001

In Table-1 we observe that companies which have high internal financed growth rate (IG), in column (1), belong to countries that also have high value of Bank Assets/GDP and are statistically significant. On the other hand the GDP per capita affects negatively the (IG) model, so as an increase in value of (IG) will tend to decrease the corresponding GDP per capita. Last, we did not found any significant relation between IG toward Turnover, Growth, Inflation, Size, NSNFA, Legal System and Market dummy.

The short-term financed growth rate (SFG), in column (2), shows that the NSNFA plays an important role if the company's' needs for short term borrowing. Moreover, the activity of stock market (Turnover) and banking sector (Bank Assets/ GDP) have positive relation with short term borrowing of a firm but fail to indicate the financial amount needed.

The growth rate of company (GRC), in column (3), shows that none of the variables is statistically significant and present a strong impact in company's growth. Nevertheless, we found that when Turnover and Bank Assets/GDP have negative relation with (GRC) when the country is based in the market-based system.

In the Table-10 below, we display the results of Random effect model and the interaction of financial crisis in our analysis.

Table-10 Random Effect Model with interaction PDUMMY (3-year averages)

Variables	(1) IG	(2) SFG	(3) GRC
CONS.	0.00609 (0.30)	-1.000*** (-9340.56)	2.691*** (3.69)
TOR	-0.00582 (-0.17)	0.0000380 (0.21)	-2.508 (-1.89)
BANK/GDP	0.0523 (0.82)	-0.000307 (-0.82)	0.260 (0.11)
GROWTH _N	-0.0914 (-0.05)	-0.00344 (-0.41)	-145.7* (-2.19)
GDP _{CAP}	0.00000217	9.86e-09	-0.000142

	(0.70)	(0.64)	(-1.20)
INF	0.0113 (1.00)	0.0000324 (0.58)	0.314 (0.73)
SIZE _N	-2437.5 (-1.15)	-0.956 (-0.10)	-20052.4 (-0.25)
NSNFA _N	-0.0000526 (-0.29)	-0.0000154*** (-3.69)	0.000507 (0.08)
LAW ORDER	-0.0864 (-1.66)	-0.000197 (-0.76)	0.179 (0.09)
MARKET _N	0.0298 (0.60)	-0.000384 (-1.48)	0.00340 (0.00)
CIVIL LAW	0.0298 (0.60)	-0.000384 (-1.48)	0.00340 (0.00)
No. of observation	46844	35310	43985

Standard errors in parentheses *p<0.05, **p<0.01, ***p<0.001

In Table-10, we can see that the interaction of PDUMMY with the other variables, affects more SFG and GRC than IG model. This happens because in the SFG model the company's characteristics (NSNFA) is negatively and statistically significant, while in the GRC model, as shown at Table-9, none of the variables is statistically significant with GRC. In the current regression, under the new affect of PDUMMY interaction, we found that Growth rate has positive and significant relation with the (GRC).

Summarizing the three-year average regressions we found that the same independent variables exhibit different impacts in all three models used in our analysis, more specifically:

Size of firm (where the money comes from in company) and NSNFA (how money are invested in company) affect more the short term financing growth rate than the internally growth rate and growth rate of company. This happens because companies may needs immediately available funds for their inventory or other short-term assets.

Inflation rate affects firms' growth in two ways, one it increases the nominal interest rate and secondly it decreases the marginal income from investments. Additionally, the risk of country (Law & Order) and Legal System play an important role in long term financing. Last, when we applied the financial crises PDUMMY in Market variable we found that firms belonging to bank-based systems were affect more by the economic recession than countries of market-based system.

5.2 Five-year averages

5.2.1 Pooled OLS Regression

Table-11 displays the results of Pooled OLS regression for (IG) column (1), (SFG) column (2) and (GRC) model column (3).

Table-11 Pooled OLS regression (5-year averages)

Variable	(1) IG	(2) SFG	(3) GRC
CONS.	-0.104 (-1.23)	-1.000*** (-2444.48)	4.764 (1.43)
TURNOVER	-0.0182 (-0.83)	-0.0000425 (-0.40)	-0.519 (-0.61)
BANK ASSETS/GDP	0.0904** (3.09)	0.000196 (1.39)	-2.175 (-1.91)
GROWTH	1.661* (1.97)	-0.00172 (-0.44)	-7.461 (-0.22)
GDP per capita	-0.00000263 (-1.72)	-7.69e-09 (-1.06)	0.0000907 (1.51)
INFLATION	-0.000000535 (-0.00)	-0.000000105 (-0.09)	0.000136 (0.01)
SIZE	-346.4 (-0.24)	2.466 (0.36)	-6348.4 (-0.11)
NSNFA	-0.0000355 (-0.73)	0.00000446*** (13.95)	-0.0000159 (-0.01)
LAW & ORDER	0.00840 (0.50)	0.00000447 (0.06)	-0.488 (-0.75)
MARKET	-0.0106 (-0.35)	0.0000510 (0.36)	0.999 (0.81)
CIVIL LAW DUMMY	0.0299 (0.96)	0.000144 (0.97)	0.0879 (0.07)
PDUMMY	-0.0275 (-0.89)	0.000206 (1.42)	-0.899 (-0.75)
R ²	0.001	0.008	0.000
Adj. R ²	0.001	0.007	-0.000
No. of observation	34545	26573	32477

Standard errors in parentheses *p<0.05, **p<0.01, ***p<0.001

As shown above, in column (1), the (IG) has positively significant relation with banking sector variable (Bank Assets/GDP) and Growth rate of countries, while it occurs a negative relation toward Turnover, GDP per capita, Inflation rate and characteristics of firm (Size & NSNFA).

Column (2) indicates that (SFG) of companies has positive statistically significant relation only with NSNFA, while it has positive relation with Bank Assets/GDP, Size, Law& Order, Market System and Legal System. On the other hand, activities of stock market (Turnover), Growth rate, GDP per capita and Inflation rate affect negatively the short-term borrowing of firms.

Last, in column (3), growth rate of company (GRC) has positive relation with GDP per capita, Inflation rate, Market and Legal System of country but is negative related with all the others variables of the model.

Table-12 Pooled OLS regression with interaction of PDUMMY (5-year averages)

Variable	(1) IG	(2) SFG	(3) GRC
CONS.	0.00340 (0.23)	-1.000*** (-14807.18)	2.081*** (3.62)
TOR	-0.0247 (-0.72)	0.0000683 (0.38)	-1.797 (-1.36)
BANK/GDP	0.179** (2.77)	-0.000282 (-0.74)	-2.526 (-1.01)
GROWTH _N	2.018 (1.36)	-0.00301 (-0.41)	-81.13 (-1.43)
GDP _{CAP}	0.000000928 (0.30)	9.74e-09 (0.63)	-0.0000590 (-0.49)
INF	-0.00325 (-0.27)	0.0000253 (0.43)	0.0726 (0.16)
SIZE _N	-1331.6 (-0.61)	1.317 (0.13)	-24079.5 (-0.29)
NSNFA _N	-0.0000862 (-0.51)	4.78e-08 (0.05)	0.000230 (0.05)
LAW ORDER	-0.0456 (-1.62)	0.0000539 (0.36)	1.193 (1.10)
MARKET _N	-0.0636 (-1.25)	0.0000123 (0.05)	1.586 (0.81)
CIVIL LAW	0.00112 (0.02)	-0.000194 (-0.79)	0.566 (0.31)
R ²	0.001	0.000	0.000
Adj. R ²	0.000	-0.000	-0.000
No. of observations	34545	26573	32477

Standard errors in parentheses *p<0.05, **p<0.01, ***p<0.001

Table-12 shows the results of Pooled OLS regression using interaction of PDUMMY. In the previous analysis (simple Pooled OLS model) we found that Growth rate is positively significant with (IG) model while in the current regression we found that this variable has positive, but not significant

relation. Additionally, GDP per capita and (IG) have positive relation among them, in contradictory to that of the simples Pooled OLS model.

In column (2), comparing short-term financed growth rate (SFG) model with the corresponding column of Table-11, we observe that variables such as Turnover, GDP per capita and Inflation rate which showed negative relation with (SFG) now indicate a positive relation. On the other hand, variables such as Bank Assets/GDP and Legal System now have negative relation toward (SFG).

Finally, in column (3) of growth rate of company (GRC) model, the variables that affect more the PDUMMY are GDP per capita, NSNFA and Law & Order while all the other variables remain unchanged.

The following table displays the results of Breusch-Pagan test for Random Effect model with null hypothesis $H_0: \sigma_a^2=0$ versus $H_1: \sigma_a^2>0$

Table-13 Breusch- Pagan test or LM test (5-year average)

Variables	Chi-square	Prob.
IG	1897.90	0.0000
SFG	8.43	0.0018
GRC	0.00	0.4887

From Table-13 we reject the null hypothesis for (IG) and (SFG) due to $p\text{-value}<0.05$ which indicates the existence of random effect model, while we accept the null hypothesis for (GRC) model. The test shows the existence of both random effect and fixed effect in our analysis. In order to decide if random or fixed effect will be chosen, we run again a priori the Hausman test.

Table 14 Hausman specific test (5-year average)

Variables	Chi-square	Prob.
IG	1.08	0.5842
SFG	0.47	0.7918
GRC	0.65	0.7237

The results of Hausman test shows that Random-Effect Model be used due to $p\text{-value}>0.05$.

5.2.2 Random Effect Model

Similar [Table-15](#) displays the Random-Effect model with and without interaction of PDUMMY variable using 5-year average data-set.

Table-15 Random Effect Model (5-year averages)

Variable	(1) IG	(2) SFG	(3) GRC
CONS.	-0.132 (-1.36)	-1.000*** (-1894.87)	4.746 (1.20)
TURNOVER	-0.00323 (-0.14)	-0.0000721 (-0.66)	-0.945 (-1.03)
BANK ASSEST/GDP	0.104** (3.10)	0.000223 (1.26)	-2.195 (-1.63)
GROWTH	1.874* (2.28)	-0.00273 (-0.76)	-5.581 (-0.16)
GDP per capita	-0.00000330 (-1.90)	-4.05e-09 (-0.42)	0.000111 (1.56)
INFLATION	-0.0000101 (-0.05)	3.39e-08 (0.04)	-0.000377 (-0.04)
SIZE	-486.9 (-0.27)	-0.178 (-0.02)	-3499.8 (-0.05)
NSNFA	-0.0000361 (-0.68)	0.00000401*** (14.43)	-0.00000493 (-0.00)
LAW&ORDER	0.0104 (0.57)	-0.000112 (-1.19)	-0.435 (-0.58)
MARKET	-0.0132 (-0.34)	0.0000674 (0.27)	1.425 (0.90)
CIVIL LAW DUMMY	0.0286 (0.74)	0.000143 (0.58)	-0.0349 (-0.02)
PDUMMY	-0.0322 (-1.17)	0.000211 (1.83)	-1.175 (-1.03)
No. of observation	34545	26573	32477

Standard errors in parentheses *p<0.05, **p<0.01, ***p<0.001

From column (1), internal financed growth rate (IG) model we observe that has positively significant relation with banking sector (Bank Assets /GDP) and Growth rate, while Law&Order and Legal System of the country has only positive link. On the other hand, (IG) has negative relation with the others variable of model.

The short-term financed growth rate (SFG), in column (2), shows that the NSNFA plays an important role in demand for short-term borrowing by the

firms. Moreover, indexes like: Bank Assets/GDP, Inflation rate, Legal System and Market have positive relation with (SFG). Nevertheless, the following indexes: Turnover, Growth, GDP per capita, Size and Law&Order of the countries have negative relation with (SFG). It can be referred from above that if the stock market is declining than it has an impact on the short-term borrowing, which is also directly affected by the Law&Order index.

The growth rate of company (GRC), in column (3), shows a positive relation between GDP per capita and Market. Furthermore, all the other variables of are related negatively with (GRC).

Table-16 Random Effect Model with interaction PDUMMY (5-year averages)

Variable	(1) IG	(2) SFG	(3) GRC
CONS.	0.00322 (0.19)	-1.000*** (-9335.84)	2.633*** (3.71)
TOR	-0.0190 (-0.58)	-0.0000137 (-0.09)	-1.847 (-1.41)
BANK/GDP	0.138* (2.29)	-0.000554 (-1.69)	-0.110 (-0.05)
GROWTH _N	1.271 (0.91)	-0.00769 (-1.20)	-64.78 (-1.14)
GDP _{CAP}	0.00000237 (0.80)	1.46e-08 (1.08)	-0.0000737 (-0.62)
INF	0.00289 (0.26)	0.0000528 (1.01)	0.0252 (0.06)
SIZE _N	-1609.2 (-0.80)	-1.493 (-0.18)	-16305.4 (-0.20)
NSNFA _N	-0.0000580 (-0.37)	-0.000000123 (-0.15)	0.000347 (0.07)
LAW ORDER	-0.0455 (-1.72)	0.000165 (1.27)	0.649 (0.61)
MARKET _N	-0.0681 (-1.42)	-0.0000940 (-0.43)	1.001 (0.52)
CIVIL LAW	-0.00706 (-0.16)	-0.000450* (-2.09)	0.608 (0.33)
No. of observations	34545	26573	32477

Standard errors in parentheses *p<0.05, **p<0.01, ***p<0.001

Table-16 displays the results of Random-Effect with the interaction of financial crisis variable. In column (1) we observe that the banking sector (Bank Assets/GDP) affects positively significant the internally growth rate (IG) of company. Furthermore, we found that the legal system affects negatively significant the short term financing growth rate (SFG) of each

country. On the other hand, the growth rate of company (GRC), column (3), none of explanatory variables affects statistically significant the (GRC).

Summarizing the five-year average regressions we found that the same independent variables exhibit different impacts in all three models used in our analysis, more specifically:

Size of firm and NSNFA affects more the short-term financing growth rate (SGF) than the internal financed growth rate (IG) and growth rate of company (GRC).

Growth rate of country affects more the internal financed growth rate (IG) and short-term financed growth rate (SFG).

Stock markets variable (Turnover) affects negatively the growth rate of companies (GRC), while the banking sector (Bank Assets/GDP) affects positively only the internal financed growth rate (IG), due to usage of retained earnings into financing future growth of the companies.

Finally, when we applied the interaction of financial crises in Market variable we found that firms belonging to bank-based system were affect more by the economic recession than market-based systems.

6. Conclusions

The present thesis is an empirical analysis that aims to investigate the relationship between financial development and economic growth using panel data techniques with an emphasis on the recent economic recession. In our analysis we applied Pooled OLS regression and Random-Effect Model over a 3-year average and 5-year average for a data-set of 40 countries, collected from DataStream and World Bank during the period 1992-2012. The two data-sets were chosen in respect to a more sensitive testing of the impact of the financial crisis.

Comparing the 3-year to the 5-year results we found some key differences in variables' impact that seem to affect differently the financial development & economic growth of either bank-based or market-based system. Growth rate affects negatively the internal financed growth rate (IG) of firms in the 3-year average, while it presents a positive impact in the 5-year average. Legal System and Market variables, also exhibit a positive impact to (IG) for the 3-year average, while they affect negatively the 5-year average of (IG). Stock market activity (Turnover) and Law & Order index affect positively the short-term financed rate (SFG) of firms for the 3-year average, while they exhibit a negative impact on the 5-year average. Last, the banking sector (Bank Assets/GDP) affects positively the growth rate of company (GRC), while in the 5-year average it affects negatively the (GRC).

Based on our findings, we align with past researches on the positive relation between financial development and economic growth. This became obvious even stronger for the data-set falling into the current financial crisis period (2007-2012). Although financial structures (stock market & banking sector) were the first to be directly affected by the crisis, we evidenced that countries and firms' growth were also negatively affected by the latter spread out.

It should be mentioned that, although our main reference starter from Demirgüç-Kunt & Maksimovic (2002) previous work, in contradictory to their results, we evidenced that banking sector (Bank Assets/GDP) has a negative impact on short-term financed growth rate for the 3-year average data-set, while in the 5-year average it also exhibits a negative impact in firm Growth rate.

Finally, we want to emphasize that, our 5-year average dataset lacks 2 years values (2011-2012) compared to the 3-year average, due to PDUMMY omitted collinearity. This raises a reliability question concerning the direct comparison of the two data sets, due to the significant diversity change we exhibit in some of the variables. For these reasons, we propose a future re-

evaluation of the same datasets when all values will be available and a longer crisis or after-crisis values will be available.

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APPENDIX

Table 1

Firm-level data

Country	Numbers of firms	Total number of observation in 20 years
Argentina	50	1.029
Australia	483	10.122
Austria	67	1.386
Belgium	88	1.827
Brazil	277	5.796
Canada	629	13.188
Chile	136	2.835
Colombia	59	1.218
Denmark	82	1.701
Egypt	81	1.680
Finland	78	1.617
France	478	10.017
Germany	450	9.430
Greece	200	4.137
Hong-Kong	590	12.306
India	935	19.572
Indonesia	230	4.788
Ireland	45	903
Israel	168	3.528
Italy	158	3.318
Japan	1150	24.067
Malaysia	652	13.692
Mexico	108	2.268
Netherlands	101	2.121
New Zealand	63	1.323
Norway	97	2.037
Peru	69	1.449
Philippines	67	1.407
Portugal	64	1.365
Singapore	420	8.820
South Africa	230	4.830
South Korea	497	10.437
Spain	74	1.554
Sri Lanka	91	1.913
Sweden	223	4.683
Switzerland	127	2.667
Thailand	264	5.544
Turkey	134	2.793
United Kingdom	904	18.984
United States	2.123	44.583
Total observations	12.742	266.703

Table 2

Financial index of Companies	Macroeconomics variables	Financial Structure	Others Variables
Dividends ⁴³	Gross Domestic Products (GDP) ⁴⁴	Bank Assets/GDP ⁴⁵	Dummy Civil versus Common Law ⁴⁶
Net Profit (Income) ⁴⁷	Real GDP per Capita ⁴⁸	Stock Market Turnover Ratio ⁴⁹	Creditor Rights ⁵⁰
Total Assets ⁵¹	Inflation ⁵²		Shareholders Rights ⁵³
Net Sales or Revenue ⁵⁴	Growth ⁵⁵		Market ⁵⁶

⁴³ DIVIDENDS provide for paid-common represent the value of common dividends declared for the year. For most countries outside of the U.S and Canada it includes the interim paid if any, plus the proposed find dividend declared after the year end. If not reported separately, it is the dividend charged to retained earnings.

⁴⁴ GDP (constant 2000 US\$) GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2000 U.S. dollars. Dollar figures for GDP are converted from domestic currencies using 2000 official exchange rates. For a few countries where the official exchange rate does not reflect the rate effectively applied to actual foreign exchange transactions, an alternative conversion factor is used.

⁴⁵ BANK/GDP is the value of total assets of the deposit bank dividend by GDP.

⁴⁶ Dummy Civil vs Common Law from La Porta et al. (1998) takes value 1 from Civil Law Countries and zero for Common Law Countries.

⁴⁷ NET PROFIT (INCOME) bottom line represents income after all operating and non operating income and expense, reserves, income taxes, minority interest and extraordinary items.

⁴⁸ GDP per capita (constant 2000 US\$) GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant U.S. dollars

⁴⁹ TURNOVER is the total value of shares traded in the stock market dividend by the market capitalization for the each period.

⁵⁰ CREDITOR RIGHTS is an index that ranges from zero to four from La Porta et al.(1998)

⁵¹ TOTAL ASSETS represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets.

⁵² INFLATON as measured by the annual growth of the GDP implicit deflator shows the rate of prices change in the economy as a whole. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in cost currency.

⁵³ SHAREHOLDERS RIGHTS is an index that ranges from zero to five from La Porta et al.(1998)

⁵⁴ NET SALES or REVENUE represents gross sales and other operating revenue less discounts, returns and allowances.

⁵⁵ GROWTH is the growth rate of real GDP per capita.

⁵⁶ MARKET is a variable that takes value 1 for market-based system and zero for bank-based system as defined by Demirgüç-Kunt and Levine(1999)

Table 2 continues

Financial index of Companies	Macroeconomics variables	Financial Structure	Others Variables
Long Term Debt ⁵⁷			PDUMMY ⁵⁸
Short Term Debt & Current Portion of Long Term Debt ⁵⁹			NSNFA ⁶⁰
Total Debt ⁶¹			SIZE ⁶²
Total Capital ⁶³			
Total Liabilities ⁶⁴			
Total Shareholders' Equity ⁶⁵			

⁵⁷ LONG TERM DEBT represents all interest bearing financial obligations, excluding amounts due within one year. It is shown net of premium or discount.

It includes but is not restricted to:

Mortgages, Bonds, Debentures, Convertible debt, Sinking fund debentures, Long term bank overdrafts, Long term notes, Long term bills, Medium term loans, Long term royalties, Long term contracts, Industrial revenue bonds.

Notes payable, due within one year and to be refunded by long term debt when carried as non-current liability. Long term prepaid contracts, Advances and production payments, Talent and broadcasting rights, Capitalized lease obligations, Revolving credit, Long term advances from subsidiaries/associated companies, Compulsory convertible debt (South Africa), Eurodollar borrowing, Long term liability in connection with ESOP, Federal Home Loan advances.

It excludes:

Current portion of long term debt, Pensions, Deferred taxes, Minority interest

Footnotes: A. Includes current portion, C. includes some long term provisions and/or other long term liabilities D. Includes current portion of long term debt and is not comparable, F. Includes short term borrowings, G. No standard text, H. Adjusted to exclude long term liabilities and/or provisions.

⁵⁸ PDUMMY is the variable that takes value 1 for last 5 year and zero otherwise.

⁵⁹ SHORT TERM DEBT & CURRENT PORTION OF LONG TERM DEBT represents that portion of debt payable within one year including current portion of long term debt and sinking fund requirements of preferred stock or debentures.

It includes but is not restricted to: Current portion of long-term debt (field 18232)

Notes payable, arising from short-term borrowings, Current maturities of participation and entertainment obligations,

Contracts payable for broadcast rights, Current portion of advances and production payments, Current portion of long term debt that must be paid back during the next twelve months and included in long term debt, Bank Overdrafts

Advances from subsidiaries/associated companies, if the term of the loan is not known it is assumed to be long term debt, Current portion of preferred stock of a subsidiary, Treasury tax and loan demand notes, Short sales of U.S. government securities, Eurodollar borrowings, if not reported separately and the amount cannot be separated

⁶⁰ NSNFA is the ratio of Net Sales (Profit) to Net Fixed Assets in this cases I use as proxy Sales (Profit) to Total Assets

⁶¹ TOTAL DEBT represents all interest bearing and capitalized lease obligations. It is the sum of long and short term debt.

⁶² SIZE is the ratio of Total Assets to the GDP of country.

⁶³ TOTAL CAPITAL represents the total investment in the company. It is the sum of common equity, preferred stock, minority interest, long-term debt, non-equity reserves and deferred tax liability in untaxed reserves. For insurance companies policyholders' equity is also included.

⁶⁴ TOTAL LIABILITIES represent all short and long term obligations expected to be satisfied by the company.

It includes but is not restricted to: Current Liabilities, Long Term Debt, Provision for Risk and Charges (non-U.S. corporations), deferred taxes, and deferred income.

Other liabilities: Deferred tax liability in untaxed reserves (non-U.S. corporations), unrealized gain/loss on marketable securities (insurance companies), Pension/Post retirement benefits, Securities purchased under resale agreements (banks). It excludes: Minority Interest, Preferred stock equity, Common stock equity, Non-Equity reserves.

⁶⁵ TOTAL SHAREHOLDERS EQUITY equal to Total Assets- Total Liabilities

Table 2 continues

Financial index of Companies	Macroeconomics variables	Financial Structure	Others Variables
Return on Equity(ROE) ⁶⁶			
Retained Earnings ⁶⁷			

⁶⁶ RETURN ON EQUITY (ROE) is the ratio of Net Income (Profit) to Total Shareholders' Equity.

⁶⁷ RETAINERD EARNINGS is the difference between Net Profit (income) –Dividends