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Transplantation of Anglo-American corporate governance and its impact on financial market growth: A comparative analysis of nineteen developing countries 1995-2014.

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Abstract

Since the late 1990s, developing countries have been encouraged by international financial organisations to adopt a shareholder primacy corporate governance model. It was anticipated that in an increasingly globalised financial market, countries which introduced corporate governance practices that favour investors would gain a comparative advantage and attract more capital leading to financial market growth.

Focusing on nineteen developing countries between 1995-2014, this paper uses quantitative analysis to investigate whether adopting shareholder primacy corporate governance norms has had any impact on the growth of financial markets. Time series indices are prepared for national corporate governance regulations and financial market development, along with three control indices to isolate and focus on the impact of changes in corporate governance regulation on financial market growth. Then a lagged multilevel regression between all these indices is used to investigate the strength of causality between the adoption of pro-shareholder corporate governance and the growth of the financial market.

This is the first paper to use Bayesian methods to analyse the impact of corporate governance on financial development using panel data. This paper for the first time in the literature finds that, for developing countries, shifting towards a shareholder primacy model in corporate governance has only a very small effect on the growth of financial markets. Overall financial, economic, and technological controls have much more impact on the growth of financial markets. Therefore, the paper recommends that developing countries should not solely focus on shifting their law towards shareholder primacy, which at its worst can encourage rent seeking behaviour favouring foreign investors and domestic elites at the cost of innovation. Rather they should take measures to promote the independence of market regulators, create efficient enforcement of rights in the courts, dispose commercial litigation quickly, enhance productivity and support innovation to improve financial market growth.

Keywords: *Quantitative corporate governance, graded response model, multi-level regression, Bayesian statistics, leximetrics*

1. Introduction

Corporate governance has become a focal point for a wide variety of issues ranging from business standards to accounting standards, from corporate social responsibility to supply chain management, from a band aid to financial crisis, via a tool for ensuring macro/microeconomic stability to a way of improving political economy. Corporate governance has spread into almost all strands of interdisciplinary studies in law, economics and finance. From the 1970s, with repeated accounting frauds and related crises, there was a growing clamour for a solution to all these problems, and so theoreticians and practitioners dusted off old ideas and 'reinvented' corporate governance in the early 1990s. Suddenly, the world seemed to be in the grip of a new mania. This coincided with the period following the grand success of neo-liberal economic ideology during the 1980s, and the fall of the Soviet Union seemed to provide final proof of the superiority of 'free market' principles. There followed a period of intense transplantation of legal ideas, with the international financial organisations emphasising that '[T]he improvement of corporate governance practices is widely seen as one important element in strengthening the foundation for individual countries' long-term economic performance and in contributing to a strengthened international financial system.'[1] This economic rationale was also picked up by the United Nations Conference on Trade and Development which promised that improvements to corporate governance would 'facilitate investment flows and mobilize financial resources for economic development.'[2] This drove convergence and transplantation, specifically in the area of company law and corporate governance in developing countries.

The major international corporate governance code disseminated around this time period was the OECD Principles of Corporate Governance, which was based primarily on the shareholder value corporate governance model, although it also provided limited space for stakeholder models. So, in effect what was being recommended to developing countries was a shareholder value model based on the Anglo-Saxon model. The claim was that if a country adopted a shareholder primacy corporate governance model, then foreign investors would invest in that country, stimulating the financial market, and local investors would also pitch in, leading to further growth of the financial market. Surplus capital can be used for economically useful – but less well-funded – activities, leading to economic growth and a sustainable future. The present research paper uses empirical analysis to investigate these claims and tries to find out whether changing the corporate governance of a country for the 'better', that is, by

[1] The 1999 Memorandum of Understanding between the World Bank and OECD, establishing the framework for the Latin American Roundtable among a series of Regional Corporate Governance Roundtables

[2] UNCTAD, 'Guidance on good practices in corporate governance disclosure' UNCTAD/ITE/TEB/2006/3

implementing a pro-shareholder approach, has any link with financial market growth in that country.

The author has also produced a separate paper which analyses whether the corporate governance regulations around the world are indeed converging towards a shareholder primacy model, based on the OECD Principles of Corporate Governance, and calculates the rate of such change over time. It shows that the corporate governance regime in all developing countries rapidly converged to the OECD Principles, however the rate has slowed down since 2008[3] The present research paper will, for the first time, investigate whether adopting shareholder primacy corporate governance has any long term overall impact on the growth of the financial market in developing countries, in order to scrutinise the claims from international financial organisations that strong pro-shareholder corporate governance is fundamentally linked to improved long-term financial and economic performance.

The quantitative research was undertaken in a number of steps. First, we replicate the dynamic corporate governance index created in the companion paper.[4] Second, a Bayesian factor analysis was then used to build up a separate multi-country multiyear index of financial market growth, and three control indices of similar timescales comprised of a total of ten variables taking into account macroeconomic indicators, financial inclusion indicators, and proxies for technological innovation.

Finally, a Bayesian multilevel lagged regression model was constructed, using the five indices. The financial market index was used as a dependent variable, the dynamic corporate governance index as predictor variable, and the three control indices as control variables. Four country level control variables were used for each country. This is the most comprehensive paper in the literature examining the impact of corporate governance. It also uses innovative Bayesian modelling to better predict the actual impact of corporate governance by taking into account the dynamic nature of legal development.

[3] See Navajyoti Samanta, 'A leximetric analysis of evolution of corporate governance regulations in 21 countries' (2019) XX Corporate Governance: The International Journal of Business in Society XXX-XXX. In this paper a database on the evolution of corporate governance in twenty-one countries for twenty years (1995-2014) was created. Local experts in corporate governance in those jurisdictions were asked to fill out a detailed questionnaire based on archival and allied qualitative research. The aim of this phase was to collect data on fifty-two separate company and corporate governance variables based on the OECD Principles of Corporate Governance and previous indices for twenty years (1995-2014). The variables were scaled polynomially, i.e., the value could be zero, or one, or two which meant the survey went beyond a simple yes/no response in order to take into account systems which use optional rules or 'soft law'. Thereafter, a graded response model was used with a Kalman filter to create a dynamic corporate governance index for twenty-one countries over a twenty year period. A dynamic index allowed the researcher to distribute the changes identified over a period of time rather than confining them to just one year. It is widely acknowledged that laws and regulations take some time to show their impact, hence considering development of corporate governance over a number of years yielded more realistic results.

[4] ibid

The research finds that a shift towards a pro-shareholder value model in developing countries has little impact on the growth of financial markets, especially in comparison to the impact of economic and other control factors like increased investment in R&D and growth in high technology-led export-based industries. It also shows that the rule of law is twice as important as the quality of corporate governance in promoting market growth. These findings carry profound policy implications for developing countries: they should put more emphasis on promoting the independence of market regulators, create efficient enforcement of rights in the courts, and dispose commercial litigation quickly. Such measures would be considerably more effective in terms of stimulating financial market development than simply changing corporate governance regulations to make them more shareholder-friendly. Similarly, improving economic growth factors and investing in R&D-led high technology-based export industries would be far more effective in terms of boosting financial market growth than simply adopting more pro-shareholder regulations and norms.

This article is divided into four parts. In Part II the paper reviews the existing literature on the impact of corporate governance focusing on the limitation of the variable selection like insufficient focus on shareholder primacy norms and inadequacy of methods used to analyse the corporate governance impact. Part III discusses the innovative methodology used in this research paper, which aims to overcome the limitations of the existing literature by using Bayesian factor analysis and multilevel regression modelling. In Part IV, the results are analysed, concentrating on the debates surrounding impact of adopt of shareholder primacy corporate governance on growth of financial markets.

2. Literature review

As explained before, this article solely focuses on finding out if change in corporate governance model towards a more shareholder primacy approach had any positive impact on financial growth of the countries adopting such stance. As such this review focuses on literature which discusses on the dependent and control variables used in such impact studies.

2.1 Literature on Dependent variables

Dependent or outcome variables are defined as those which are affected by the independent or predictor variables. In this study, the dependent variables are financial market growth indicators? which are theorised to be affected by changes in the independent or predictor variables, namely, corporate governance regulations.

It is necessary to briefly review the dependent variables used by other researchers; La Porta et al. (1997)[5] divided dependent variables into measures of three categories – equity finance, debt finance and microeconomic data (based on the WorldScope database). As a measure of equity finance they used the ratio of stock market capitalisation to GNP, number of listed firms in relation to its population, number of initial public offerings (IPOs) in relation to its population; as a measure of debt finance the total bank debt of the private sector and the total face value of corporate bonds were used; and four parameters were used as a measure of microeconomic performance (limited to public companies): the median ratio of market capitalisation to sales of companies, the median ratio of market capitalisation to cash flow, the median ratio of total debt to sales of all firms and the median ratio of total debt to cash flow. La Porta, Lopez and Shleifer (2006)[6] refreshed their stock market development parameters to adjust with the changes from public enforcement to private enforcement. They use seven proxies to quantify the development of the financial market – the first variable was 'ratio of stock market capitalization to gross domestic product (GDP) scaled by the fraction of the stock market held by outside investors'; the second variable was a log of the 'number of domestic publicly traded firms in each country relative to its population'; the third variable was 'the value of initial public offerings in each country relative to its GDP'; the fourth variable sought to reflect the access to equity for new and medium-sized firms from securities market, it was an index (scaled from 1-7) compiled by the Global Competitiveness Report 1999[7] from interviews and surveys with business executives in various countries; the fifth variable was block premium and acted as a proxy for private benefits for control, the researchers computed it by 'taking the difference between the price per share paid for the control block and the exchange price 2 days after the announcement of the control transaction, dividing by the exchange price and multiplying by the ratio of the proportion of cash flow rights represented in the controlling block'; the sixth variable looked at the 'average percentage of common shares owned by the top three shareholders in the 10 largest nonfinancial, privately owned domestic firms in a given country', it acted as a proxy for ownership concentration; the seventh variable measured 'the ratio of traded volume to GDP' and acted as a proxy for liquidity. Djankov et al.[8] used six of the dependent variables used by La Porta, Lopez and Shleifer (2006)[9] and dropped the access to

[5] La Porta et al., 'Legal Determinants of External Finance' (1997) 52 (3) Journal of Finance 1131-1150
[6] La Porta et al., 'What Works in Securities Laws' (2006) Journal of Finance 1-32
[7] Klaus Schwab et al. (eds), *The Global Competitiveness Report 1999* (Oxford University Press, New York).
[8] Simeon Djankov et al., 'The Law and Economics of Self-Dealing' (2005) <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=864645>
[9] La Porta et al. (n 6)

equity index. Armour, Deakin et al. (2008)[10] similarly look at four time series financial development indicators – stock market capitalisation as a percentage of GDP, the value of stock trading as a percentage of GDP, the stock market turnover ratio and also the number of domestic firms listed in the stock market.

On the basis of the available literature the author selected five indicators to act as a measure of financial market development - market capitalisation, annual foreign direct investment, number of listed companies, S&P global equity index and stock turnover ratio. As the paper aims to isolate the long term macrofinancial effects it will be better to adapt variables from Armour, Deakin et al. (2008) which are more resilient to short term impacts than the variables used in the single year impact studies of LLSV et al. etc. The detailed theoretical and established connections between corporate governance and these dependent variables are explained in Appendix B.

2.2 Literature on Control variables

Dependent or outcome variables are generally affected by several other variables, as discussed in the earlier section we are generally interested in knowing only the effect of a particular predictor or independent variable. To isolate the impact of predictor variables we categorise the other variables that have an effect on the dependent variable as control variables. Ideally predictor and control variables should not be correlated (both within and between themselves) but both are expected to have some correlation with the dependent variables. Valid research requires a demonstration from previous studies that the selected control variables are correlated to the dependent variables. Hence, before the control variables used in this study are described and justified, the control variables used in similar studies in the past will be briefly examined.

In their 1997 paper[11], La Porta et al. while looking to isolate the impact of investor rights on external finances, first controlled for GDP growth as 'such a growth is likely to affect both valuations and market breadth';[12] the second control was a log of real GNP as the growth of 'capital markets might be an increasing returns to scale activity, and therefore larger economies might have larger capital markets';[13] they then control for the rule of law in the sense that it would allow to act as a proxy for likelihoods of implementation of law on books to law in

[10] John Armour, Simon Deakin et al., 'Shareholder Protection and Stock Market Development: An Empirical Test of the Legal Origins Hypothesis' (2008) ECGI Working Paper No.108/2008 available at <http://ssrn.com/abstract=1094355>

[11] La Porta et al. (n 5)

[12] ibid

[13] ibid

action, and therefore a country with stronger rule of law is expected to have a better capital market as investors are supposed to feel more secure in investing in such jurisdictions. La Porta et al. did not control for GDP per capita as the correlation between GDP per capita and rule of law was around 0.87 and thus controlling for GDP per capita would not significantly add to the explanatory power of the predictor variable (which in the case of La Porta et al. was investor rights, a precursor of corporate governance).

In their 2006 paper[14] on examining the effect of securities laws on stock market development, La Porta et al. controlled for log GDP per capita on the basis that 'economic development is often associated with capital deepening.';[15] they then controlled for the efficiency of the judiciary on the basis that 'richer countries might have higher quality institutions in general, including better property rights and rule of law, which could be associated with better financial development regardless of the content of the laws.'[16] They also refer to their earlier studies in 1997 and 1998 as a rationale to control for anti-director rights and legal origin on the basis that investor protection derived from corporate law and legal origin are associated with stock market development. La Porta et al. also tried to evaluate the relative importance of components of investor protection in securities law and they then variedly controlled for (1) supervisor attributes; (2) rule-making powers; (3) investigative powers; (4) orders; and (5) criminal sanctions.

Djankov et al. in their 2008 published paper[17] investigated the impact of the 'legal protection of minority shareholders against expropriation by corporate insiders' (which they called the anti-self-dealing index) on stock market development (which was comprised of five variables – ratio of Stock market capitalization to GDP, control premium, log of firm to population ratio, average ratio of IPO to GDP and ownership concentration). To isolate this impact Djankov et al. controlled for log of per capita Gross Domestic Product on the basis that an increase in economic wellbeing would allow for surplus cash which could be invested in the financial market; to control for enforcement they looked at a log of the time taken to collect on a bounced check; following the La Porta et al. hypothesis of the financial market being influenced by legal origin they controlled for the type of legal origin (whether or not the country was under a common law system); disclosure and liability in publishing a prospectus is controlled 'to deal with the problem of the validity of the instrument'[18] and to take into account as financial market

[14] La Porta et al. (n 6)
[15] ibid
[16] ibid
[17] Djankov et al. (n 8)
[18] ibid

indicators 'heavily focus on disclosure'; tax evasion is controlled for as it is significant 'for stock market capitalization and log domestic firms per capita and it is a subjective variable highly correlated with perceptions of the quality of corporate governance as proxied by the perceived incidence of insider trading or the perceived quality of financial disclosure',[19] therefore to rule out the effect of the informal economy on financial market indicators, Djankov et al. use tax evasion as a control; they next control for newspaper circulation as it can be a proxy for 'public opinion pressure, [which] through the media could also curb private benefits', thus a control for newspaper circulation can effectively allay concerns that the benefits of disclosure come not from anti self-dealing measures but 'from the effects of the open media working as a watchdog'; finally Djankov et al. look at whether investor protection is a by-product of political determinants rather than legislative competence in drafting robust anti self-dealing regulations, so they control for legislative competitiveness and proportional representation in legislature on the basis of the model (Volpin and Pagano 2005) that one sided legislative assemblies with 'higher proportional electoral systems are conducive to weaker investor protection'. Djankov et al. also use the control variables to construct alternate theories and test their original hypothesis.

Armour, Deakin et al. in 2008[20] while analysing the possibility of a link between shareholder protection and stock market development controlled for legal origin, state of economic development proxied by level of per capita GDP and countries' positions on the World Bank 'rule of law' index.

The final 2008 paper[21] from La Porta et al. summarised the research development in correlating financial growth with legal origin hypothesis. In this paper they control for per capita income as a very crude proxy for quality of judiciary and hence enforcement; they also control for measure of human capital, proxied by average years of schooling in 1960, as growth in education leads to growth of the economy in general. In a telling conclusion highlighting the importance of correct control variables, La Porta et al. state that 'If politics were appropriately controlled for in the regressions legal origin would not matter.'[22]

Thus, control variables should adhere to the following qualities:

- they must affect any one of the preceding financial market variables or directly related economic growth variables with supporting literature

[19] ibid
[20] Armour, Deakin et al. (n 10)
[21] La Porta et al., 'The Economic Consequences of Legal Origins' (2008) 46 (2) Journal of Economic Literature 285-332
[22] ibid 312

- they should not directly affect the corporate governance framework variables

Fourteen control variables are used in this paper – annual percentage growth rate of GDP, purchasing power parity conversion factor, current account balance, real interest rate, external debt stocks, commercial bank branches per head of population, mobile cellular telephone subscriptions per head of population, electric power consumption per capita, high-technology (products with high R&D intensity) exports in current USD, the number of patent and trademark applications filed at USPTO, human development index, GINI index, peace index and rule of law. The control index can be subdivided into four broad categories: macroeconomic indicators, human development and financial inclusion indicators, proxies for enforcement and indicators for industrial value addition through an increase in R&D thereby striking a balance between micro and macro factors impacting financial market growth. The control variables in this paper are the most comprehensive used to date in the literature. All the important factors impacting the financial market growth are represented and no significant parameter is absent. The detailed theoretical and established connections between financial market growth and these control variables are explained in Appendix C.

3. Methodology

3.1 Construction of a dependent financial index and control index using Bayesian factor analysis

The present research uses five variables to measure and construct the financial growth index and fourteen variables to create the control index for financial growth. Out of the control variables, four are country level indicators (human development index, GINI index, peace index and rule of law), which means these variables are time independent i.e. there is little variation in these variables over time, while the remaining ten vary for each country per year. Until now most researchers have used one variable as a proxy for financial growth or have performed multiple regression analysis with different dependent variables to analyse the link between change in corporate governance and financial growth. This type of analysis fails to take into account the latent nature of financial growth which can only be expressed or measured by a factor analysis of several variables thereby adequately 'explain[ing] the observed relationship among a set of observed variables in terms of a smaller number of unobserved

variables'[23]. This is the first paper to adopt a broad parameter impact analysis to investigate the influence of control variables and changes in corporate governance on financial market growth. All the variables have been scaled during analysis, so that data across different scales can be brought to comparable scales. Standardised scores retain the order of values and do not alter the spread of the distribution. The construction of the financial market index gave rise to methodological issues of measurement similar to those encountered when constructing the index for corporate governance development.[24] However, IRT would not be the proper solution as the financial market growth variables are continuous in nature. Therefore, a factor analysis model would 'provide a flexible framework for modelling multivariate [financial] data by a […] latent factor.'[25] The traditional method of performing factor analysis is using the Maximum likelihood factor analysis which 'relies on large sample theory, and it is consequently often recommended to use it only in large samples (e.g. N=200 or more). In smaller samples, Maximum likelihood factor analysis can run into problems like model non-convergence, negative residual variances etc. Bayesian statistics typically perform better in small samples, and may therefore be useful in studies that rely on smaller sample sizes.'[26] As data is available for 17-20 years per country, a Bayesian factor analysis will give a better fit index than using a Maximum likelihood estimator.

For a more detailed analysis of the transformation from classical factor model to Bayesian please refer to Appendix D.

3.2 Structural model

Once the panel data[27] for financial development index, control variables and the corporate governance index[28] is obtained, the next step would be to ascertain the relationship between the variables, especially whether there is a causal effect of change in corporate governance on financial development. Regression techniques have become quite common in law and

[23] Daniel B. Rowe, *Multivariate Bayesian Statistics: Models for Source Separation and Signal Unmixing* (CRC Press 2003)

[24] See generally Samanta (n 3)

[25] Joyee Ghosh and David Dunson, 'Default priors and efficient posterior computation in Bayesian Factor analysis' available at < http://people.ee.duke.edu/~lcarin/DunsonBayesianFA.pdf> accessed 12 June 2018

[26] Dirk Heerwegh, 'Small Sample Bayesian Factor Analysis' Working Paper SP03 (2014) available at <http://www.phusewiki.org/docs/Conference%202014%20SP%20Papers/SP03.pdf> accessed on 12 June 2018; see also Navajyoti Samanta, 'Utilising item response theory in computing corporate governance indices' (2015) 2 (4) Edinburgh Student Law Review (ESLR) 103-116

[27] Sometime also referred to as time series cross sectional data. In the present study the panel data matrix for regression analysis will be approximately 21(countries)x20(time period)x3(indices). Please note that the control index will be divided into group/country level indicators and individual/time level indicators as the model progresses.

[28] See Samanta (n 3)

economics literature and are a useful tool to estimate quantitatively the effect of causal variables on dependent variables.[29] Detailed model development from simple regression to multilevel hierarchical lag model[30] along with relevant computer codes are available in Appendix E.

As evidenced by experience, the effect of the change in corporate governance on financial development is gradual, control variable vary at different rates and different countries are affected at different rates, therefore we need a multilevel hierarchical lag model. We have the following model:

$$Y_{jt+1} \sim N(\beta 0_j + \beta 1 X1_{jt} + \beta 2 X2_{jt+1} + \varepsilon_i, \sigma^2_j)$$

this gives us the first level model, then we have a second level regression fit for each country,

$$\beta 0_j \sim N(\gamma_0 + \gamma_g X3j, \sigma^2_\beta)$$

where j is the country and t is the time period, Y_{jt+1} is the dependent or outcome variable for individual country j in time t+1; $\beta 0_j$ is the constant or the intercept value which varies with country, β1 is the regression coefficient which would provide a quantitative estimation of effect of the corporate governance index, represented by $X1_{jt}$. Similarly, β2 provides an estimation of effect of the control index, represented by $X2_{jt+1}$. ε_i is the error term. X3 is the country level indicators, g represents the number of country level indicator, in our research it is 4, and γ represents the country level indicator coefficient $\gamma_0,\ldots, \gamma_4$. We assume that the errors in the second level regression is distributed normally over mean 0 and standard deviation σ_β. This model can also be referred to as no pooling as separate models are fit within it for each country The corporate governance index ranges from 1995-2014, however the financial index and control index data for 2013-14 is incomplete. So, for corporate governance the time period 1995-2011 (17 years) is used with the corresponding financial and control index for time period 1996-2012. Thus, the financial and control index lags one year behind the corporate governance index.

3.3 Convergence analytics

First, it was found that Yxi (the dependent variable) was not converging properly when its prior was obtained from the regression analysis [line 5 in code snippet 7]. So, a separate Bayesian factor analysis is run for Yxi and the value is fed into the main regression model.

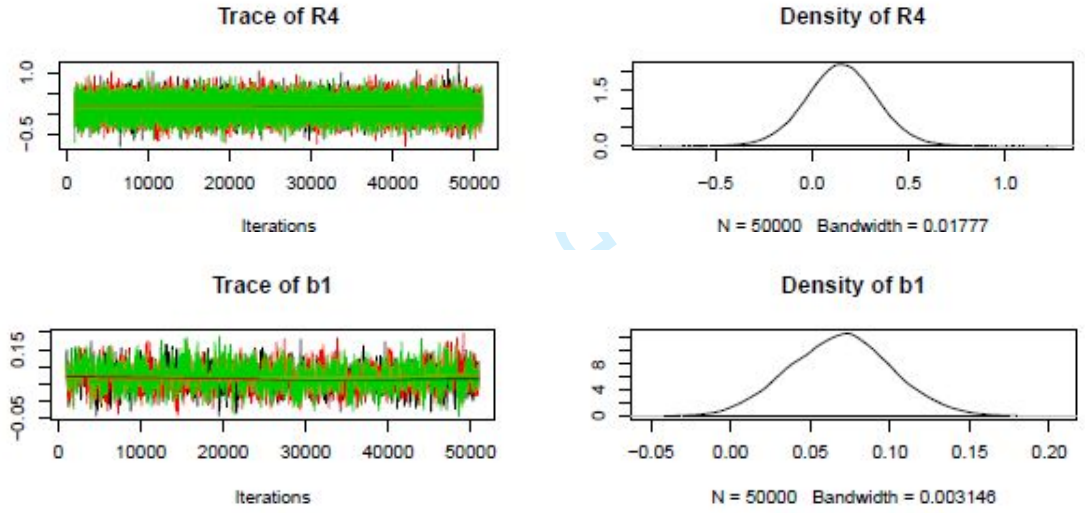
[29] See generally Alan O. Sykes, 'An Introduction to Regression Analysis' Chicago Working Paper in Law & Economics <http://www.law.uchicago.edu/files/files/20.Sykes_.Regression.pdf> acceded 10 June 2015

[30] For instances of usage of lag effect in calculating impact of corporate governance see generally Barry D Baysinger and Henry N. Butler, 'Corporate governance and the board of directors: Performance effects of changes in board composition.' (1985) Journal of Law, Economics, & Organization 101-124; Jarrad Harford, Sattar A. Mansi and William F. Maxwell, 'Corporate governance and firm cash holdings in the US.' (2008) 87 Journal of Financial Economics 535-555.

Second, the control variable index was split into three indices to reflect the underlying nature of the variables being factored in – so the new indices represented economic growth, financial inclusion and increase in investment in R&D and technology led export. This is also backed by the density model which had three distinct peaks.

Third, priors for precision terms for country level indicators, which were fixed at dgamma(0.01,0.01) [line 1 code snippet 7] was changed to dgamma(2,0.6) for quicker convergence.

On implementing these measures, the model converges. The trace plots below on the left show that the MCMC chains have converged and the density plots on the right show the spread of the output. Uniform density plots and converging trace plots signify that the Bayesian model being run in this research has converged and is statistically valid. A couple of graphs are shown here the entirety of trace plots and density plots is available on request.[31]



A further proof that the model is stable is provided by the Gelman and Rubin's convergence diagnostic, if the value is 1± 0.05 the variable is said to have converged. Below are Gelman and Rubin's convergence diagnostic for the regression coefficients:

Variable	Mean estimate of convergence diagnsotic
β1	1.010659
β2	1.0047
β3	1.011442
β4	1.001846
γ0	1.000046
γ1	1.000867

[31] Please note that the entire convergence plots along with the replication images for the intermediate models are available on request. Please contact the author at n.samanta@sheffield.ac.uk

γ2	1.000028
γ3	1.001067
γ4	1.001472

4. Results

In order to interpret the regression coefficients adequately, it is important to get reacquainted with the dimensions of the variables being studied. The outcome variable (financial market growth) mean varies between -0.4844 to 5.591; corporate governance mean ranges from -3.5342 to 2.3799; control 1 mean varies from -0.8121 to 6.6033; control 2 mean varies from -0.9637 to 2.5223; control 3 mean varies from -0.5443 to 7.0813; HDI ranged between 1.7082 to 1.6582; GINI values ranged between -1.9387 and 1.3871; peace index ranged between -1.8611 and 1.5248; rule of law ranges from -1.6202 to 1.9709.

The results of the regression analysis with the mean estimate and 95% credible interval are summarised below:

Coefficients	Mean estimate	2.5% quantile	97.5% quantile
Corporate governance (b1)	0.0659	0.0033	0.129
Control 1 (economic) (b2)	0.4169	0.3308	0.4961
Control 2 (technological inclusion) (b3)	0.0848	0.0136	0.1535
Control 3 (industrial value addition) (b4)	0.3706	0.2825	0.451
Country level common intercept (R0)	-0.1392	-0.2875	0.0103
HDI (R1)	-0.0793	-0.35	0.1962
GINI (R2)	-0.0083	-0.1713	0.1566
Peace index (R3)	-0.0208	0.2494	0.207
Rule of law (R4)	0.161	-0.2072	0.5279

The country level varying intercepts (b0) are as following:

	Mean	2.5% quantile	97.5% quantile
Brazil	-0.1224	-0.2705	0.0247
China	0.0135	-0.2306	0.2638
Chile	-0.17	-0.3029	-0.0345
Colombia	-0.1564	-0.2914	-0.0209
India	-0.0192	-0.2122	0.1755
Indonesia	-0.1617	-0.2993	-0.0226
Peru	-0.2059	-0.338	-0.0706
Pakistan	-0.2707	-0.4467	-0.0912
Poland	-0.317	-0.4609	-0.167
Russia	-0.2549	-0.4292	-0.0781
Argentina	-0.2608	-0.3983	-0.1204
South Africa	-0.1275	-0.2725	0.01512
Iran	-0.2877	-0.4322	-0.1441

Kenya	-0.1923	-0.3366	-0.0517
Nigeria	-0.2074	-0.3563	-0.0628
Hong Kong	0.27	0.094	0.4502
Philippines	-0.2464	-0.385	-0.108
El Salvador	-0.1702	-0.3029	-0.0342
Vietnam	-0.0575	-0.2212	0.1059

5. Analysis

The paper finds a mean estimate for corporate governance impact on financial market growth in developing countries of around 0.07. To put this in context, the mean estimate for control variables like economic growth coefficient (b2) is 0.42 and industrial value addition coefficient (b3) is 0.37. Therefore, the positive impact of economic growth factors on financial market growth is six times greater than shifting the law towards shareholder primacy corporate governance. Similarly, technology-led industrial growth has almost five times more impact on financial market growth than a change in the national corporate governance model towards more shareholder value.

Another way of analysing the data would be to state that the model shows that, keeping other factors constant, increasing the size of the economy and high technology output by 1.25 times will double the level of financial development, while to achieve the same result by improving corporate governance would require an impossible fifteen-fold increase in the amount of shareholder value measures within the national corporate governance regime. As seen in the other article in this special issue,[32] the corporate governance regimes in all these countries reached peak shareholder value orientation around 2007, and it is possible therefore to claim that there is no scope for the level of change required in corporate governance models to make any significant further contribution to financial market growth. Armour, Deakin et al. also found that 'increases in shareholder protection have not led to greater stock market development, as might have been expected.'[33] However they also posited that given the data was for 1995 to 2005, 'the strengthening of shareholder rights which took place in the 1990s and 2000s has not been having its principal intended effect.' This research paper confirms that even over a longer time period, shift to shareholder value orientation of a national corporate governance model does not have any noticeable impact on financial market growth.

[32] Navajyoti Samanta, 'A leximetric analysis of evolution of corporate governance regulations in 21 countries' (2019) XX Corporate Governance: The International Journal of Business in Society XXX-XXX

[33] Armour, Deakin et al. (n 10) 42

The model also finds that country level factors like GINI coefficient, peace index and HDI have little or no impact on financial market growth. It is interesting to note that HDI affects financial market development negatively. This can be explained on the basis that that lower HDI implies lower wages, which would attract more FDI and hence greater financial development. However, lower HDI also paradoxically reduces the amount of technology-led exports and R&D expenditure, both of which have a high impact on financial market growth.

The model also finds that rule of law is twice as important as adopting shareholder primacy models on the growth of financial markets. This is in line with the common understanding that investors move to countries with a stable legal and judicial system.

Therefore, the central premise on which convergence on shareholder primacy corporate governance was effected, namely that the adoption of shareholder primacy corporate governance stimulates financial market growth, has been proven false in this research paper. It has shown that, over the long term, changes in corporate governance regulations have little effect on the growth of financial markets in developing countries. Economic factors and investment in R&D and technology-led export industries have approximately six and five times, respectively, more impact on the growth of the financial market than changes in corporate governance regulations.

It was also found that rule of law is almost two and a half times more important for the growth of the financial market than corporate governance regulations. It can therefore be argued that the quality of law enforcement is far more important than the quality of law on the books in terms of fostering the sustainable growth of the financial market. This perhaps illustrates one of the major areas of improvement for developing countries – it is imperative that securities market regulators and commercial law courts are perceived to be independent, consistent, objective, efficient, transparent and that their orders are enforceable in a timely fashion. While developing countries have rapidly adopted regulations providing for ever-increasing shareholder control and influence, they have rarely invested adequately in ensuring the integrity and efficiency of regulators and enforcement mechanisms. It can thus be suggested that instead of applying window-dressing by rearranging corporate governance norms or plucking the low hanging fruit of adopting shareholder value regulations, countries should concentrate on increasing the efficiency of adjudication processes and enforcement authorities in order to put financial market growth on a more sustainable footing.[34] Countries should invest more in

[34] See generally, OECD, 'G20/OECD Principles of Corporate Governance 2015' available at <https://www.oecd.org/daf/ca/Corporate-Governance-Principles-ENG.pdf> accessed 1 January 2019; see also OECD, 'Participatory Development and Good Governance' (1995) Development Co-operation Guidelines Series.

upgrading judicial infrastructures and providing market regulators with sufficient financial resources and legislative powers. Regulators should be encouraged to take a proactive stance in enforcing legal rules in order to ensure that laws are not simply rules 'on the books' but are actually implemented in practice. It is possible to predict that improvements in the rule of law based around an efficient and effective market regulator, as well as an independent judiciary, operating according to efficient and reliable processes, will contribute significantly to sustainable financial market growth, regardless of the precise content of corporate governance regulation.

While it is difficult to exercise a radical influence on economic growth in a short space of time, it is much easier to have a significant impact on R&D investment and encourage technology-based industries. It is therefore suggested that, in order to achieve sustainable growth in financial markets, developing countries should adopt policies encouraging R&D and focussing on high technology-led export industries. These policies could take the form of: favourable tax regulations for R&D investments; incentives for high technology industries such as easier access to credit, tax credits, simpler rules for doing business, fewer opportunities for regulatory arbitrage, greater ease of filing regulatory documents, and so on; and discouraging financial transactions which legitimise unproductive rent-seeking behaviour, for example by imposing higher tax rates on buy backs of shares, and rationalising capital gains tax rules, especially when they are being used as the primary avenue to seek returns on investment.[35]

6. Conclusion

We now know that changing corporate governance to align it with the shareholder primacy model does not yield any significant long-term effect on financial market growth in developing countries. This research paper thus proves that changes in corporate governance regulations to make it pro-shareholder have had little effect on the growth of financial markets in developing countries. At best the shareholder value model is a waste of time; at worst developing countries are being shoehorned into a one size fits all model which benefits foreign investors and domestic elites, but in the long term may irreparably harm the country's innovative capacity by allowing excessive rent-seeking on the part of the investors. This means it is time to think beyond the existing shareholder primacy corporate governance paradigm, and to rebuild a new corporate law structure based on sustainable economic growth, eschewing short term profit

[35] See generally William Lazonick, 'Stock Buybacks: From retain and reinvest to downsize and distribute' (2015) Working paper Centre for Effective public management at Brookings

making.[36] It is necessary to question the rationale for society's decision to use law to provide the twin privileges of separate legal personality and limited liability to companies. Is it for the benefit of the few or is it for a wider societal good? Companies should not be treated like disposable financial and tax efficient vehicles, but rather as repositories of long-term investment, where investors look not for quick speculative profits but for long-term sustainable returns. Investors need to view themselves as force multipliers for long term sustainable economic growth. It is vital to move beyond the paradigm that the responsibility of companies is solely to be profit generating machines for their shareholders and that greed is good. Companies should act as trustees for all their stakeholders – employees, customers, creditors, shareholders, local communities etc. As Jack Welch commented "On the face of it, shareholder value is the dumbest idea in the world. […] Shareholder value is a result, not a strategy […] Your main constituencies are your employees, your customers and your products."[37]

[36] See generally Blanche Segrestin and Armand Hatchuel, 'Beyond Agency Theory, a Post-crisis View of Corporate Law' (2011) 22 British Journal of Management 484–499.
[37] See Francesco Guerrera, 'Welch condemns share price focus' *Financial* Times (New York, 12 March 2009); see also John Kay, *Obliquity: Why our goals are best achieved indirectly* (Profile Books 2010)

APPENDIX – B

Foreign Direct Investment (FDI) – International Monetary Fund defines net FDI as 'the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments.'[38] There is a wide array of literature which empirically connects improvement in corporate governance with an increase in FDI.[39] The rationale is that a country which adopts a stronger corporate governance regime (which provides higher investor protections) gives a competitive advantage to that country as 'Investors "cherry pick" the countries to which they allocate capital, based on the strength of investor protections. After countries undertake corporate governance reforms, they are more likely to draw in foreign investments.'[40] Fazio and Talamo investigated this transmission channel using a 'two-stage version of the gravity model and investigate[d] the determinants of FDI flows with special reference to the institutional factors, after controlling for a number of traditional variables and potential incentives, such as wages and taxes.'[41] They found that robust corporate governance is an important factor in attracting FDI.[42]

Market capitalisation of listed companies – Standard & Poor defines market capitalisation or market value as 'the share price times the number of shares outstanding. Listed domestic companies are the domestically incorporated companies listed on the country's stock exchanges

[38] World Development Index < http://data.worldbank.org/indicator/BX.KLT.DINV.CD.WD> accessed 20 January 2015

[39] See Yao Lu, 'Corporate Governance Reforms and Firm-Level Allocation of International Capital Flows' (2010) < http://ssrn.com/abstract=1544967>; Lucian A. Bebchuk and Michael S. Weisbach, 'The State of Corporate Governance Research' (2010) 23 (3) Review of Financial Studies 939-961

[40] International Finance Corporation (World Bank Group), 'Global Corporate Governance Forum - Better Companies, Better Societies' (2010) < http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2011/07/08/000333037_20110708022840/Rendered/PDF/628780NEWS0Glo00Box0361495B0PUBLIC0.pdf> accessed 20 January 2015

[41] Giorgio Fazio and G.M. Chiara Talamo, 'How attractive is good governance for FDI' (2008) 9 International Finance Review 33-54, 50

[42] ibid. See also Giuseppina Maria Chiara Talamo, 'FDI, mode of entry and corporate governance' in Neri Salvadori and Pasquale Commendatore (eds), *Geography, structural change and economic development* (Edward Elgar Publishing 2009); Giuseppina Talamo, 'Corporate Governance and Capital Flows' (2012) PRA Paper No. 35853 < http://mpra.ub.uni-muenchen.de/35853/> accessed 20 January 2015; Ali Adnan Ibrahim, 'Developing governance and regulation for emerging capital and securities markets' (2007-08) 39 Rutgers Law Journal 111; Ozden Deniz, 'The importance of corporate governance for a well performing financial system: Reforming corporate governance in developing countries' (2011-12) 14 (2) Duquesne Business Law Journal 219

at the end of the year.'[43] The rationale behind linking shareholder primacy corporate governance with market capitalisation is the empirical evidence that 'firms with stronger shareholder rights had higher firm value, higher profits, higher sales growth, lower capital expenditures, and made fewer corporate acquisitions'[44] this 'enhances the investors' optimism in the firm's future cash-flow and growth prospects'[45] leading to higher share prices and therefore higher market capitalisation.[46]

Number of IPOs – Initial public offering generally allows the shares of a company to be listed at a stock exchange and be bought and sold by the public.[47] Given the long history of stock exchange scams where unsuspecting investors were lured into buying worthless shares,[48] it is quite natural that strict corporate governance guidelines have been innovated to ensure continuing confidence amongst investors.[49] Microeconomic firm-level evidence shows that 'firms with stronger [corporate] governance structures have higher IPO valuations and better long term operating performance than their peers.'[50] Thus, as Prof. Coffee posits, Anglo-American style shareholder primacy corporate governance may be instrumental in assuring

[43] World Development Index < http://data.worldbank.org/indicator/CM.MKT.LCAP.CD?cid=GPD_31> accessed 20 January 2015

[44] Gompers et al. (n 39)

[45] Faizul Haque, Thankom Arun and Colin Kirkpatrick, 'Corporate governance and financial market a conceptual framework' < http://virtusinterpress.org/additional_files/journ_coc/full-text-papers-open-access/Paper012.pdf> accessed 20 January 2015

[46] For an alternate method but similar results see Bebchuk et al. (n 42); Lawrence D. Brown and Marcus L. Caylor, 'Corporate governance and firm valuation' (2006) 25 (4) Journal of Accounting and Public Policy 409-434; for country specific examples see Akmalia Mohamad Ariff, Muhd Kamil Ibrahim and Radiah Othman, 'Determinants of firm level governance: Malaysian evidence' (2007) 7 (5) Corporate Governance 562-573; Bernard S. Black, 'The Corporate Governance Behavior and Market Value of Russian Firms' (2001) 2 Emerging Markets Review 89-108; see generally Kashif Rashid and Sardar M. N. Islam, *Corporate Governance and Firm Value Econometric Modellling and Analysis of Emerging and Developed Financial Markets* (Pergamon Press 2008)

[47] See generally Reena Aggarwal and Pietra Rivoli, 'Fads in the initial public offering market?' (1990) Financial Management 45-57.

[48] Historically we can refer to various bubbles especially the South Sea bubble, in modern times there were Ponzi scammers like Bernard Madoff, corporate accounting fraudsters like Bernard Ebbers (WorldCom), Andrew Fastow (Enron), Byrraju Ramalinga Raju (Satyam), inside traders like Tang Wanxin, Harshad Mehta, Raj Rajaratnam etc.

[49] See generally Tim Loughran, Jay R. Ritter and Kristian Rydqvist, 'Initial public offerings: International insights.' (1994) 2 (2) Pacific-Basin Finance Journal 165-199; Carsten Burhop, David Chambers and Brian R. Cheffins, 'Regulating IPOs: Evidence from Going Public in London and Berlin, 1900-1913' (2012) ECGI - Law Working Paper No. 180/2011 <http://ssrn.com/abstract=1884190>

[50] Jay C. Hartzell, Jarl G. Kallberg, and Crocker H. Liu, 'The role of corporate governance in initial public offerings: evidence from real estate investment trusts.' (2008) 51 (3) Journal of Law and Economics 539-562; for a different viewpoint which shows that firms with higher management quality but greater number of anti-takeover regulations (which goes against a shareholder primacy corporate governance principle as it negates market for corporate control) outperforms other firms in post IPO stock return performance and obtain higher IPO valuation

greater protections for minority shareholders and increased financial transparency and thereby lead to an upsurge in the number of IPOs.[51]

Number of listed domestic companies - Listed domestic companies are the domestically incorporated companies listed on the country's stock exchanges at the end of the year.[52] It is widely used as a proxy for financial market development[53] as a vibrant financial market governed by adequate corporate governance regulation would induce private companies to seek equity funds and relinquish control.[54]

As there is high correlation between the number of firms and the number of IPOs, this survey uses the total number of listed domestic companies as part of the dependent index.

S&P global equity index - S&P Global Equity Indices measure the U.S. dollar price change in the stock markets covered by the S&P/IFCI and S&P/Frontier BMI country indices.[55] The theoretical basis for linking the equity index with corporate governance lies in the doctrine of market for corporate control,[56] where it is hypothesised that if managers of a company are unable to produce the desired results in the form of higher share prices then the shareholders would divest those shares, resulting in the fall of share prices and thereby opening the entrenched management to the perils of takeover and consequent loss of position. Thus, a shareholder oriented corporate governance is theorised to positively impact stock market performance.[57]

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see Thomas J. Chemmanur, Imants Paeglis, and Karen Simonyan, 'Management quality and antitakeover provisions.' (2011) 54 (3) Journal of Law and Economics 651-692; see Garry D. Bruton et al., 'Governance, ownership structure, and performance of IPO firms: the impact of different types of private equity investors and institutional environments' (2010) 31 (5) Strategic Management Journal 491-509 for empirical evidence that concentrated ownership improves IPOs' performance thereby supporting agency theory argument.

[51] John C. Coffee Jr., 'The Future as History: The Prospects for Global Convergence in Corporate Governance and Its Implications' (1999) Columbia Law School Center for Law and Economic Studies Working Paper No. 144 <http://ssrn.com/abstract=142833> published as (1998-1999) 93 Northwestern University Law Review 641.

[52] World Development Index < http://data.worldbank.org/indicator/CM.MKT.LDOM.NO> accessed 20 January 2015

[53] See Paolo Mauro, 'Stock Returns and Output Growth in Emerging and Advanced Economies' (2000) IMF Working Paper No. 00/89 < http://ssrn.com/abstract=879628 > published at (2003) 71 (1) Journal of Development Economics 129; Carol Ann Frost, Elizabeth A. Gordon, and Andrew F. Hayes, 'Stock exchange disclosure and market development: an analysis of 50 international exchanges.' (2006) 44 (3) Journal of Accounting Research 437-483; Alberto Chong and Florencio López-de-Silanes, 'Corporate governance and firm value in Mexico' (2006) < http://ssrn.com/abstract=1820043 >

[54] See generally Diane K. Denis and John J. McConnell, 'International corporate governance' (2003) 38 (1) Journal of financial and quantitative analysis 1-36; Andrei Shleifer and Robert W. Vishny, 'A survey of corporate governance.' (1997) 52 (2) The journal of finance 737-783.

[55] World Development Index < http://data.worldbank.org/indicator/CM.MKT.INDX.ZG?cid=GPD_31>

[56] See generally (n 47).

[57] See Leora F. Klapper and Inessa Love, 'Corporate governance, investor protection, and performance in emerging markets' (2004) 10 (5) Journal of corporate Finance 703-728; Jackie Krafft et al., 'Corporate

Traded volume of stocks traded – Stocks traded refers to the total value of shares traded during the period.[58] It is controlled for foreign exchange price fluctuation. This variable provides a measure of financial market depth, liquidity (consequently the fall in the cost of access to capital)[59] and acts as an indicator of market development and growing financialisation.[60] All these factors are affected by changes in corporate governance.[61]

APPENDIX – C

Macroeconomic Indicators

Log GDP – this variable adjusts for the generally observed exponential growth of GDP and gives a clearer picture about the actual growth rate of GDP. This also, to an extent, nullifies the

Governance, Industry Dynamics and Firms Performance: An Empirical Analysis of a Best Practice Model' (2008) 74 (4) Louvain Economic Review 455; Brian B. Kin, 'Stock Returns, Corporate Governance, and Long-Term Economic Growth' (2009) 35 (2) Ohio Northern University Law Review 685; Simon Deakin, 'Corporate Governance, Finance and Growth: Unravelling the Relationship' (2010) 1 Acta Juridica 191; Robert M. Bowen, Shivaram Rajgopal and Mohan Venkatachalam, 'Accounting choice, corporate governance and firm performance' (2002) Working paper, University of Washington at Seattle; William Lazonick and Mary O'sullivan, 'Maximizing shareholder value: a new ideology for corporate governance' (2000) 29 (1) Economy and society 13-35; Bernard Black, 'The corporate governance behaviour and market value of Russian firms' (2001) 2 (2) Emerging Markets Review 89-108; Wang Hui, 'Debt Financing, Corporate Governance and Market Valuation of Listed Companies' (2003) 8 Economic Research Journal 3; for link between share performance and performance linked executive pay see John E. Core, Robert W. Holthausen and David F. Larcker, 'Corporate governance, chief executive compensation, and firm performance' 1999 51 Journal of Financial Economics 371-406; Kevin J. Murphy, 'Corporate performance and managerial remuneration: An empirical analysis' (1985) 7 (1) Journal of Accounting and Economics 11-42; Anne T. Coughlan and Ronald M. Schmidt, 'Executive compensation, management turnover, and firm performance: An empirical investigation' (1985) 7 (1) Journal of Accounting and Economics 43-66; for local markets see Bernard S. Black, Hasung Jang, and Woochan Kim, 'Does corporate governance predict firms' market values? Evidence from Korea' (2006) 22 (2) Journal of Law, Economics, and Organization 366-413; Chong-En Bai. et al., 'Corporate governance and market valuation in China' (2004) 32 (4) Journal of Comparative Economics 599-616; Rob Bauer, Nadja Guenster and Roger Otten, 'Empirical evidence on corporate governance in Europe: The effect on stock returns, firm value and performance' (2004) 5 (2) Journal of Asset Management 91-104; for an alternate perspective to argue that corporate governance does not impact share price see John E. Core, Wayne R. Guay and Tjomme O. Rusticus, 'Does Weak Governance Cause Weak Stock Returns? An Examination of Firm Operating Performance and Investors' Expectations' (2004) <http://ssrn.com/abstract=533582> published at (2006) 61 (2) The Journal of Finance 655.

[58] World Development Index < http://data.worldbank.org/indicator/CM.MKT.TRAD.CD?cid=GPD_31>

[59] Ross Levine and Sara Zervos, 'Stock Markets, Banks, and Economic Growth' (1998) 88 (3) The American Economic Review 537-558; Christina Biedny, 'Financial Development and Economic Growth: Does Stock Market Openness Matter' (2012) 11 (1) Journal of International Business & Law 225-238; see generally John C. Jr. Coffee, 'Racing towards the Top: The Impact of Cross-Listing and Stock Market Competition on International

autocorrelation in real GDP values.[62] Log GDP acts as a proxy for economic growth. It is an accepted theory that there is a two way linkage between GDP and FDI, scholars like Hansen,[63] Basu et al.,[64] Hsiao[65] etc. have clearly enumerated the long term relationship between FDI and GDP. There is also an accepted relationship between GDP and the stock index,[66] as higher log GDP usually translates into an increase in industrial output, which *pari passu* in turn should increase share prices. The data will be sourced from WB WDI dataset.

Log GNP – log GNP adjusts for the actual growth of GNP, it thus provides for the growth in market value of all the goods and services produced in one year by labour and property supplied by the citizens of a country. Therefore it can account for an increase in the industrial productions, based on the investment made in a different country and consequently can supplement GDP values which focus solely on the geographical location of production. Scholars like Cutler et al.,[67] Dhakal et al.,[68] Mahdavi[69] etc. have shown that there is a causality

Corporate Governance' (2002) 102 (7) Columbia Law Review 1757; see generally Hamid Mohtadi and Sumit Agarwal, 'Stock market development and economic growth: Evidence from developing countries' (2001) <http//www. uwm. edu/mohadi/PA-4-01. Pdf>

[60] Asli Demirgüç-Kunt and Ross Levine, 'Stock market development and financial intermediaries: stylized facts' (1996) 10 (2) The World Bank Economic Review 291-321

[61] See generally Thomas Clarke, *International corporate governance: A comparative approach* (Routledge, 2007); Michel Aglietta and Antoine Rebérioux, *Corporate governance adrift: a critique of shareholder value* (Edward Elgar Publishing, 2005); Paddy Ireland, 'Financialization and corporate governance' (2009) 60 North Ireland Legal Quarterly 1; Kee H. Chung, John Elder and Jang-Chul Kim, 'Corporate governance and liquidity' (2010) Journal of Financial and Quantitative Analysis 265-291; Hayong Yun, 'The choice of corporate liquidity and corporate governance' (2009) 22 (4) Review of Financial Studies 1447-1475; Oliver E. Williamson, 'Corporate finance and corporate governance' (1988) 43 (3) The Journal of Finance 567-591.

[62] For advantages of using log GDP and its impact on health please refer to Aghion et al., 'The relationship between health and growth: when Lucas meets Nelson-Phelps', (2010) National Bureau of Economic Research No. w15813 available at <http://scholar.harvard.edu/files/aghion/files/relationship_between_health.pdf>

[63] Henrik Hansen and John Rand, 'On the causal links between FDI and growth in developing countries' (2006) 29 (1) The World Economy 21-41

[64] Basu et al., 'Liberalization, FDI, and growth in developing countries: a panel cointegration approach' (2003) 41 (3) Economic Inquiry 510-516.

[65] Frank S.T. Hsiao and Mei-Chu W. Hsiao, 'FDI, exports, and GDP in East and Southeast Asia—Panel data versus time-series causality analyses' (2006) 17 (6) Journal of Asian Economics 1082

[66] See generally Holger Sandte, 'Stock Markets vs GDP Growth: A Complicated Mixture' (2012) WestLB Mellon Asset Management Viewpoint 1 – 8 available at http://us.bnymellonam.com/core/library/documents /knowledge/AlphaTrends/Stock_Markets_vs_GDP.pdf; Lena Saeed Shiblee IV, 'The Impact of Inflation, GDP, Unemployment, and Money Supply On Stock Prices' (2009) available at http://dx.doi.org/10.2139/ssrn.1529254; N Groenewold Fraser, 'Share Prices and Macroeconomic Factors' (1997) 24 (9-10) Journal of Business Finance & Accounting 1367-1383

[67] Cutler et al., 'What moves stock prices?' in Peter L. Bernstein and Frank L. Fabozzi (eds.), *Streetwise: The Best of the Journal of Portfolio Management* (Princeton University Press 1998) 56-63.

[68] Dharmendra Dhakal et al., 'Causality between the money supply and share prices: a VAR investigation' (1993) Quarterly Journal of Business and Economics 52-74.

[69] Saeid Mahdavi and Ahmad Sohrabian, 'The link between the rate of growth of stock prices and the rate of growth of GNP in the United States: a Granger causality test' (1991) The American Economist 41-48.

between market variations and GNP. The data will be sourced from WB WDI dataset. However owing to the high correlation between log GDP and log GNP, we will not use log GNP.

Log PPP – Purchasing power parity determines the relative value of different currencies, thus an increase in PPP would allow researchers to estimate the economic growth especially when the real GDP (which is pegged to a historic USD value) can fluctuate based on varying exchange rates. Thus log PPP complements both log GDP and log GNP in proxying for macroeconomic growth by stabilising inflationary forces.[70] This connection between PPP, capital flow, exchange rates and market growth has been explored by other researchers like Hung,[71] Ammer,[72] Sarno,[73] etc. The data will be sourced from the WB WDI dataset.

Balance of payment or **Current a/c balance** – this records all the financial transactions between the economy of the country and rest of the world, it can be crudely defined as the difference between the cost of import and export of all goods and services. Balance of payment has a direct effect on exchange rates,[74] exchange rate has direct impact on FDI.[75] Also if a country had suffered a balance of payment crisis its financial market would have reacted adversely during that period,[76] controlling for balance of payment would allow for the negation of such variations. The data will be sourced from the WB WDI dataset.

[70] B Chowdhry et al., 'Extracting inflation from stock returns to test purchasing power parity' (2005) 95 (1) American Economic Review 255-276

[71] Mao-Wei Hung and Yin-Ching Jan, 'Use of deviations of purchasing power parity and interest rate parity to clarify the 1997 Asian financial crisis' (2002) 5 (2) Review of Pacific Basin financial markets and policies 195

[72] J Ammer and JP Mei, 'Measuring international economic linkages with stock market data' (1996) 51 (5) Journal Of Finance 1743-1763

[73] Lucio Sarno and Giorgio Valente, 'Deviations from purchasing power parity under different exchange rate regimes: Do they revert and, if so, how?' (2006) 30 (11) Journal of Banking & Finance 3147–3169; See also Akram et al., 'Does the law of one price hold in international financial markets? Evidence from tick data'(2009) 33 (10) Journal of Banking & Finance 1741-1754.

[74] Magda Kandil, 'Exchange Rate Fluctuations and the Balance of Payments: Channels of Interaction in Developing and Developed Countries' (2009) 24 (1) Journal of Economic Integration 191-174

[75] See generally Michael W. Klein and Eric Rosengren, 'The real exchange rate and foreign direct investment in the United States: relative wealth vs. relative wage effects' (1994) 36 (3) Journal of international Economics 373-389; Kenneth A. Froot and Jeremy C. Stein, 'Exchange rates and foreign direct investment: an imperfect capital markets approach' (1992) NBER Working Paper No. 2914; Bruce A. Blonigen, 'Firm-specific assets and the link between exchange rates and foreign direct investment' (1997) The American Economic Review 447-465; Linda S. Goldberg and Charles D. Kolstad, 'Foreign direct investment, exchange rate variability and demand uncertainty.' (1994) NBER Research Working paper No. 4815 published at (1995) 36 (4) International Economic Review 855.

[76] See generally Matthieu Bussière, 'Balance of payment crises in emerging markets: how early were the 'early' warning signals?' (2013) 45 (12) Applied Economics 1601-1620

Deposit and lending interest rates – The World Bank defines interest rate spread as the interest rate charged by banks on loans to private sector customers minus the interest rate paid by commercial or similar banks for demand, time, or savings deposits. The Central banks of countries vary the interest rates and so stimulate or slow down economies by increasing or restricting the flow of money and easy credit. Therefore the interest rates have a direct impact on the financial market.[77] Thus, interest rates can be used to control for monetary policy and structural shocks, inflationary pressure etc. and its effect on financial market.[78] The data will be sourced from the WB WDI dataset.

External debt – this is the public debt that is owed to foreign financial institutions.[79] International lenders keep an eye on the ratio of GDP to external rate to secure themselves against the risk of default.[80] Thus when the foreign investment dries up smaller economies can fall into a growth trap where because of lower investment there is slower economic growth.[81] Research has now clearly shown that higher external debts lead to ever increasing debt servicing burden, which has a negative effect on the productivity of labour and capital, leading to adverse effects on long term economic growth.[82] Hence, it is important to control for the

[77] Md Mahmudul Alam and Md Gazi Salah Uddin, 'Relationship between interest rate and stock price: empirical evidence from developed and developing countries.' (2009) 4 (3) International Journal of Business and Management 43; Clive Coetzee, 'Monetary conditions and stock returns: a South African case study' (2002) EconWPA working paper no. 0205002; Zivanemoyo Chinzara, 'Macroeconomic uncertainty and emerging market stock market volatility: The case for South Africa' (2010) Economic Research Southern Africa Working paper 187.

[78] See generally Ronald Mangani, 'Monetary policy, structural breaks and JSE returns.' (2011) 73 Investment Analysts Journal 27-35; K. S Mallick and M. R. Sousa, 'Inflationary pressures and monetary policy: evidence from BRICS economies.' (2011) Quantitative and Qualitative Analysis in Social Sciences Conference available at www. qass. org. uk/2011-May_Brunel-conference/Mallick.pdf; Michael Hewson and Lumengo Bonga-Bonga, 'The effects of monetary policy shocks on stock returns in South Africa: a structural vector error correction model' (2005) Economic Society of South Africa Conference, Durban.

[79] World Development Index defines external debt stock as 'Total external debt is debt owed to nonresidents repayable in currency, goods, or services. Total external debt is the sum of public, publicly guaranteed, and private nonguaranteed long-term debt, use of IMF credit, and short-term debt. Short-term debt includes all debt having an original maturity of one year or less and interest in arrears on long-term debt.' <http://data.worldbank.org/indicator/DT.DOD.DECT.CD?cid=GPD_31>

[80] See generally Daniel Cohen and Jeffrey Sachs, 'Growth and external debt under risk of debt repudiation.' (1986) 30 (3) European Economic Review 529-560.

[81] Pierre Villa, 'Financial constraint and growth in the developing countries' (1998) 49 (1) Revue Economique 103-117

[82] Hameed et al., 'External debt and its impact on economic and business growth in Pakistan.' (2008) 20 International Research Journal of Finance and Economics 132-140; See also Cristina Checherita-Westphal and Philipp Rother, 'The impact of high government debt on economic growth and its channels: An empirical investigation for the euro area.' (2012) 56 (7) European Economic Review 1392-1405; For a neoclassical economic perspective see Peter A. Diamond, 'National debt in a neoclassical growth model.' (1965) The American Economic Review 1126-1150.

negative impact of debt pressure and systemic shocks on financial growth especially in smaller emerging economies.[83]

2.5.2 Financial and technological inclusion and human development indicators

Banks per capita – the number of banks per capita can be considered as a rough approximation of financial inclusion and the development of the banking sector. Financial inclusion plays a vital role in allowing marginal populations to directly or indirectly access capital and influence economic growth.[84] A robust banking sector is also an indicator of a vibrant stock market and long-term economic growth.[85] This phenomenon is however largely confined to economies with lower financial inclusion (such as the majority of developing countries) where a large part of the population does not have access to formal capital structures and have to depend on usurious loans and thus have rippled negative economic effects.[86] Hence, to isolate the effects of corporate governance on the overall financial market it is important from the context of developing countries that we control for varying financial inclusion.

Access to ICT - information and communication technology has led to the structural reorganisation of the financial market through extending trade, reorganising capital and enhancing the availability of information.[87] Easier access to ICT encourages SMEs and populations from weaker economic areas to interact with the economic mainstream and can

[83] See generally Catherine A. Pattillo et al., 'External debt and growth' (2002) International Monetary Fund working paper No. 02/69; see also Benedict J. Clements et al., 'External debt, public investment, and growth in low-income countries.' (2003) International Monetary Fund Working paper no. 2249; Augustin Kwasi Fosu, 'The external debt burden and economic growth in the 1980s: evidence from sub-Saharan Africa.' (1999) 20 (2) Canadian Journal of Development Studies 307-318.

[84] See Levine and Zervos (n 83); See also Thorsten Beck and Ross Levine, 'Stock markets, banks, and growth: Panel evidence.' (2004) 28 (3) Journal of Banking & Finance 423-442.

[85] Ross Levine, 'The legal environment, banks, and long-run economic growth.' (1998) Journal of Money, Credit and Banking 596-613.

[86] See Vighneswara Swamy, 'Financial Inclusion, Gender Dimension, and Economic Impact on Poor Households' (2014) 56 World Development 1-15; Jake Kendall, 'Local financial development and growth' (2012) 36 (5) Journal of Banking and Finance 1548-1562; Mohammad Shafi and Ali Hawi Medabesh, 'Financial Inclusion in Developing Countries: Evidences from an Indian State' (2012) 5 (8) International Business Research 116; Panicos O. Demetriades and Kul B. Luintel, 'Financial development, economic growth and banking sector controls: evidence from India.' (1996) The Economic Journal 359-374; Mandira Sarma and Jesim Pais, 'Financial inclusion and development.' (2011) 23 (5) Journal of International Development 613-628. For a developed country perspective see Klaus Neusser and Maurice Kugler, 'Manufacturing growth and financial development: Evidence from OECD countries.' (1998) 80 (4) Review of Economics and Statistics 638-646.

[87] Maryam Farhadi et al., 'Information and Communication Technology Use and Economic Growth' (2012) 7 (11) PLoS ONE available at http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0048903

lead to economic growth, there have been studies with panel data which have shown links between ICT use and the growth rate of GDP per capita.[88] Therefore, information on inclusion measured by the number of internet users and the number of mobile subscriptions per 1000 inhabitants provides a general control metric for its effect on financial and economic growth.[89]

Access to electricity and **power consumption per capita** – access to electricity and electricity consumption per capita is a proxy for the level of industrialisation and therefore has a direct effect on foreign direct investment and other financial market indicators.[90] It is thus believed that access to electricity would become a part of access to resources and augment the classical growth theory.[91] Several researchers have shown bi-directional causality between economic growth and power consumption,[92] therefore, it is imperative that access to electricity and power consumption per capita be used as a control variable to insulate the effects of corporate governance policies on the growth of the financial market.

[88] ibid

[89] See generally Sanjeev Dewan and Kenneth L. Kraemer, 'Information Technology and Productivity: Evidence from Country-Level Data' (2000) 46 (4) Management Science 548-562; Sang-Yong Tom Lee et al., 'Time series analysis in the assessment of ICT impact at the aggregate level – lessons and implications for the new economy' (2005) 42 (7) Information & Management 1009; Hwan-Joo Seo and Young Soo Lee, 'Contribution of information and communication technology to total factor productivity and externalities effects' (2006) 12 (2) Information Technology for Development 159-173; for a review of the literature see Erik Brynjolfsson and Shinkyu Yang, 'Information Technology and Productivity: A Review of the Literature' (1996) 43 Advances in computer 179–214; for a developed country perspective see K Motohashi, 'ICT diffusion And Its Economic Impact In OECD Countries.' (1997) 20 STI Reviews 13-45; J Jalava and M Pohjola, 'Economic growth in the new economy: Evidence from advanced economies.' (2002) 14 (2) Information Economics and Policy 189–210.

[90] Alice Shiu and Pun-Lee Lam, 'Electricity consumption and economic growth in China.' (2004) 32 (1) Energy policy 47-54; Jiahai Yuan et al., 'Electricity consumption and economic growth in China: cointegration and co-feature analysis.' (2007) 29 (6) Energy Economics 1179-1191; Sajal Ghosh, 'Electricity consumption and economic growth in India.' (2002) 30 (2) Energy policy 125-129; Nicholas Apergis and James E. Payne, 'Energy consumption and economic growth in Central America: evidence from a panel cointegration and error correction model.' (2009) 31 (2) Energy Economics 211-216; Yemane Wolde-Rufael, 'Electricity consumption and economic growth: a time series experience for 17 African countries' (2006) 34 (10) Energy Policy 1106-1114; Galip Altinay and Erdal Karagol, 'Electricity consumption and economic growth: evidence from Turkey.' (2005) 27 (6) Energy Economics 849-856; for a developed country perspective see S Smiech and M Papiez, 'Energy consumption and economic growth in the light of meeting the targets of energy policy in the EU: The bootstrap panel Granger causality approach' (2014) 71 Energy Policy118-129; Jaruwan Chontanawat et al., 'Does energy consumption cause economic growth?: Evidence from a systematic study of over 100 countries' (2008) 30 (2) Journal of Policy Modeling 209-220.

[91] Anis Omri and Bassem Kahouli, 'Causal relationships between energy consumption, foreign direct investment and economic growth: Fresh evidence from dynamic simultaneous-equations models' (2014) 67 Energy Policy 913-922

[92] John Asafu-Adjaye, 'The relationship between energy consumption, energy prices and economic growth: time series evidence from Asian developing countries' (2000) 22 (6) Energy economics 615-625; Ugur Soytas and Ramazan Sari, 'Energy consumption and GDP: causality relationship in G-7 countries and emerging markets' (2003) 25 (1) Energy economics 33-37; for a counter opinion see Shyamal Paul and Rabindra N. Bhattacharya,

Human development index – this 'is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living. The HDI is the geometric mean of normalized indices for each of the three dimensions.'[93] HDI can therefore act as a proxy for level of education, health and general standard of living.[94] It is theorised that the improvement of HDI is concurrent and co-dependent on economic growth as a more educated long living population should foster more economic growth which in turn would increase spending on health and education leading to a virtuous cycle.[95] Due to the relative stability of the variable over time, this variable is used as a country level control indicator.

Gini coefficient –is an ad hoc measure for income inequality.[96] It is theorised that a higher Gini coefficient denoting a higher income inequality would result in more conflicts, skewed political decisions favouring further accumulation of capital and lower spending on developing human capital[97] leading to less sustainable economic growth.[98] However this view has been challenged by numerous scholars who argue that in the short and medium term income inequality actually fosters higher economic growth.[99] However a different strand of scholarship

'Causality between energy consumption and economic growth in India: a note on conflicting results' (2004) 26 (6) Energy Economics 977-983.

[93] United Nations Development Programme, *Human Development Report 2014*; for a more critical view see Mark McGillivray, 'The human development index: yet another redundant composite development indicator?' (1991) 19 (10) World Development 1461-1468; Ambuj D.Sagar and Adil Najam, 'The human development index: a critical review' (1998) 25 (3) Ecological economics 249-264; Jack Hou, 'The dynamics of Human Development Index' (2014) The Social Science Journal doi:10.1016/j.soscij.2014.07.003; Martin Ravallion, 'Troubling tradeoffs in the Human Development Index' (2012) 99 (2) Journal of Development Economics 201-209

[94] See Technical notes in United Nations Development Programme, *Human Development Report 2014* available at http://hdr.undp.org/sites/default/files/hdr14_technical_notes.pdf

[95] Alejandro Ramirez et al., 'Economic Growth and Human Development' (1997) Yale University working paper no. 18; Gustav Ranis et al., 'Economic growth and human development' (2000) 28 (2) World development 197-219; Gustav Ranis and Frances Stewart, 'Dynamic Links between the Economy and Human Development' (2005) Department of Economics and Social Affairs (UN) Working Paper available at http://economics.ouls.ox.ac.uk/12091/1/Ranis%2520%26%2520Stewart.pdf; Sudhir Anand and Amartya Sen, 'The income component of the human development index' (2000) 1 (1) Journal of human development 83-106; Ghulam Akhmat et al., 'Impact of financial development on SAARC'S human development' (2013) Quality and Quantity 1-16.

[96] Robert Dorfman, 'A formula for the Gini coefficient' (1979) The Review of Economics and Statistics 146.

[97] See generally Amparo Castelló and Rafael Doménech, 'Human capital inequality and economic growth: some new evidence' (2002) 112 (478) The economic journal C187-C200.

[98] Torsten Persson and Guido Tabellini, 'Is Inequality Harmful for Growth? Theory and Evidence' (1991) University of California at Berkley working paper no. 91-155; Alberto Alesina and Dani Rodrik, 'Distributive politics and economic growth' (1991) National Bureau of Economic Research working paper no. 3668 available at <http://www.nber.org/papers/w3668> published at (1994) 109 (2) The Quarterly Journal of Economics 465.

[99] See Kristin J. Forbes, 'A Reassessment of the Relationship between Inequality and Growth' (2000) American economic review 869-887; Hongyi Li and Heng-fu Zou, 'Income Inequality is not Harmful for Growth: Theory and Evidence' (1998) 2 (3) Review of Development Economics 318-334; Robert J. Barro, 'Inequality and Growth

finds a direct correlative link between 'increases in wealth inequality and stock market participation, smaller increases in consumption inequality and the fraction of indebted households, and a decline in interest rates'[100] especially in booming economies. Therefore, in spite of several shortcomings, Gini coefficient gives a proxy for poverty and inequality which is not adequately measured by HDI. Due to the relative stability of the variable over time, this variable is used as a country level control indicator.

2.6 Enforcement quality

Global Peace Index – this index attempts to calculate the relative peace in a country. It compiles around 22 individual qualitative and quantitative indicators under 'three broad themes: the level of safety and security in society; the extent of domestic or international conflict; and the degree of militarisation.'[101] Civil strife and conflicts have significant negative economic effects as they raise expenditure on violence containment thereby increasing the cost of business etc. Most developing countries score lower on the peace index and are theorised to lose between 5%-10% of their GDP on violence containment.[102] The link between conflicts and economic growth seems quite clear, conflicts lead to diversion of resources from economically useful ventures to more security oriented sectors with less economic return.[103]

in a Panel of Countries' (2000) 5 (1) Journal of economic growth 5-32; see also Simon Kuznets, 'Economic growth and income inequality' (1955) The American Economic Review 1-28.

[100] Jack Favilukis, 'Inequality, stock market participation, and the equity premium' (2013) 107 (3) Journal of Financial Economics 740-759; for the knock on effect of income inequality especially on asset pricing see Daniel Barczyk and Matthias Kredler, 'Inequality and asset prices' (2015) Working Paper available at < http://danielbarczyk-research.mcgill.ca/research_files/Asset_Dec15.pdf >; Yilin Zhang, 'Income Inequality and Asset Prices: A Cross-Country Study' (2013) working paper available at http://dx.doi.org/10.2139/ssrn.2021287

[101] Institute of Economics & Peace, *Global Peace Index: Measuring peace and assessing country risk* (2014) available online at http://www.visionofhumanity.org/sites/default/files/2014%20Global%20Peace%20Index%20REPORT.pdf

[102] Institute of Economics & Peace, *The economic cost of violence containment: a comprehensive assessment of the global cost of violence* (2014) available at http://www.visionofhumanity.org/sites/default/files/The%20Economic%20Cost%20of%20Violence%20Containment.pdf

[103] John Bates Clark, 'For a historical treatment of the issue see The Economic Costs of War' (1916) 6 (1) The American Economic Review 85-93; William S. Rossiter, 'The Statistical Side of the Economic Costs of War' (1916) 6 (1) The American Economic Review 94-117; for a more recent treatment of the issue see Ron P. Smith, 'The economic costs of military conflict' (2014) 51 (2) Journal of Peace Research 245-256; Frances Stewart and Valpy Fitzgerald, *The Economic and Social Consequences of Conflict* (Oxford University Press 2000); Vincenzo Bove and Leandro Elia, 'The impact of American and British involvement in Afghanistan and Iraq on health spending, military spending and economic growth' (2014) 14 (1) The BE Journal of Macroeconomics 325–339; Gregory D. Hess, 'The economic welfare cost of conflict: an empirical assessment' (2003) CESifo Working Paper No. 852; Edward Miguel et al., 'Economic shocks and civil conflict: An instrumental variables approach' (2004) 112 (4) Journal of political Economy 725-753; Paul Collier, 'On the economic consequences of civil war' (1999) 51 (1) Oxford economic papers 168-183; Richard Dorsett, 'The effect of the Troubles on GDP in Northern Ireland' (2013) 29 European Journal of Political Economy 119-133; Alberto Abadie and Javier Gardeazabal, 'Terrorism and the world economy' (2008) 52 (1) European Economic Review 1-27

The peace index can also stand as a proxy for political stability.[104] In recent years terrorism has led to short lived but major distortions in financial markets.[105] The peace index is available only from 2007 onwards. The unavailability of data for the major part of the time period studied in this research, along with the probable relative stability of the variable over time, this variable is best used as a country level indicator.

Rule of law – the index is sourced from the World Justice Project, it comprises of '47 indicators organized around 8 themes: constraints on government powers, absence of corruption, open government, fundamental rights, order and security, regulatory enforcement, civil justice, and criminal justice.'[106] Rule of law is important for economic and financial growth at several levels - it repudiates crony capitalism leading to fair allocation of resources, reduces incidences of corruption like bribery etc.; a vibrant judicial system can control excesses of executive and legislature and provide a safety net for foreign investors, a perception of higher rule of law along with confidence in judicial integrity and impartial market regulators would thus allow for a growth in inflow of capital and more robust capital market.[107] Therefore a country with better rule of law would have higher economic development and market growth.[108] Rule of law

[104] See generally Cristina Bodea and Ibrahim A. Elbadawi, 'Political Violence and Economic Growth, (2008) World Bank, Washington available at https://openknowledge.worldbank.org/handle/10986/6805; Alberto Alesina et al., 'Political instability and economic growth' (1996) 1 (2) Journal of Economic growth 189-211.

[105] Christos Kollias et al., 'European Markets' Reactions to Exogenous Shocks: A High Frequency Data Analysis of the 2005 London Bombings' (2013) 1 (4) International Journal of Financial Studies 154; for ripple effects of interconnected stock exchanges in a globalised world see also M Pericoli and M Sbracia, 'A primer on financial contagion' (2003) 17 Journal of Economic Surveys 571-608; I. Meric and G Meric, 'Co-movements of European equity markets before and after the 1987 crash' (1997) Multinational Finance Journal 137-152; W N Goetzmann et al., 'Long-term global market correlations' (2005) 78 (1) The Journal of Business 1-38; Lorenzo Cappiello et al., 'Asymmetric Dynamics in the Correlations of Global Equity and Bond Returns' (2006) 4 (4) Journal of Financial Econometrics 537-572; F Longin and B Solnik, 'Is the correlation in international equity returns constant: 1960–1990?' (1995) Journal of International Money and Finance 3-26.

[106] World Justice Project, WJP Rule of Law Index 2014 at http://worldjusticeproject.org/rule-of-law-index

[107] Randall Peerenboom (eds.) *Asian Discourses of Rule of Law* (Routledge 2003); see also Timothy A. Canova, 'Financial Market Failure as a Crisis in the Rule of Law: From Market Fundamentalism to a New Keynesian Regulatory Model' (2009) Chapman University Law Research Paper No. 09-39 <http://ssrn.com/abstract=1489492> published as (2009) 3 Harvard Law & Policy Review 369; Kenneth W. Dam, *The law-growth nexus: The rule of law and economic development* (Brookings Institution Press 2007); Jan-Erik Lane, 'Law and economics in the ASEAN +3 region: The rule of law deficit' (2011) 38 (10) International Journal of Social Economics 847-857; Banjo Roxas et al., 'Effects of rule of law on firm performance in South Africa' (2012) 24 (5) European Business Review 478-492; Stephan Haggard and Lydia Tiede, 'The Rule of Law and Economic Growth: Where are We?' (2011) 39 (5) World Development 673-685; Witold J. Henisz, 'The institutional environment for economic growth' (2000) 12 (1) Economics & Politics 1-31; T Krever, 'The Legal Turn in Late Development Theory: The Rule of Law and the World Bank's Development Model' (2011) 52 (1) Harvard International Law Journal 287-319

[108] The only exception seems to be China, see JiangYu Wang, 'Rule of Law and Rule of Officials: Shareholder Litigation and Anti-Dumping Practice in China' (2008) Rule of Law in China Series Policy Brief No. 4 http://dx.doi.org/10.2139/ssrn.1126202; Kenneth W. Dam, 'China as a Test Case: Is the Rule of Law Essential for Economic Growth?' (2006) U Chicago Law & Economics, Olin Working Paper No. 275 http://ssrn.com/abstract=880125; Yingyi Qian, 'How Reform Worked in China' (2002) William Davidson

can also act as a proxy for political stability along with judicial and administrative independence.[109] The WJP rule of law index is available only from 2007 onwards. The unavailability of data for the major part of the time period studied in this research, along with the probable relative stability of the variable over time, this variable is best used as a country level indicator.

2.7 Industrial value addition through R&D

High technology export – WB defines high-technology exports as products with high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery.[110] It can act as a proxy for the level of industrialisation in a society, as per the theories of comparative and competitive advantages of international trade, it is the ultimate goal of societies to move from low value addition to high technology exports through lowering the costs of manufacture.[111] Thus we would expect to find mature developing countries to have higher technological exports and be recipients of higher technology transfer.[112] These exports also influence the inflow of FDI[113] and have a bidirectional positive effect on the financial market and economic growth.[114]

Institute Working Paper Number 473 http://dx.doi.org/10.2139/ssrn.317460; for a similar perspective but from competition law see Bruce M. Owen et al., 'Antitrust in China: The Problem of Incentive Compatibility' (2006) Stanford Law and Economics Olin Working Paper No. 295 <http://dx.doi.org/10.2139/ssrn.595801> also published at (2005) 1 (1) Journal of Competition Law and Economics 123; Franklin Allen et al., 'Law, finance, and economic growth in China' (2005) 77 (1) Journal of financial economics 57-116.

[109] See Lars P. Feld and Stefan Voigt, 'Economic Growth and Judicial Independence: Cross Country Evidence Using a New Set of Indicators' (2003) CESifo Working Paper Series No. 906 <http://ssrn.com/abstract=395403> published at (2003) 19 (3) European Journal of Political Economy 497; Kenneth W. Dam, 'The Judiciary and Economic Development' (2006) U Chicago Law & Economics, Olin Working Paper No. 287 <http://dx.doi.org/10.2139/ssrn.892030>; Paul H. Rubin, 'Legal Systems as Frameworks for Market Exchanges' (2003) <http://dx.doi.org/10.2139/ssrn.413626> published in Claude Menard and Mary M. Shirley (eds) *Handbook of New Institutional Economics* (Springer 2005) 205-228.

[110] WB WDI 2014 available online at <http://data.worldbank.org/indicator/TX.VAL.TECH.CD>

[111] See generally Belay Seyoum, 'The role of factor conditions in high-technology exports: An empirical examination' (2004) 15 (1) The Journal of High Technology Management Research 145-162; Belay Seyoum, 'Determinants of levels of high technology exports an empirical investigation' (2005) 13 (1) Advances in Competitiveness Research 64; for a more specific case study see Miaojie Yu, 'Moving up the value chain in manufacturing for China' in Yiping Huang and Juzhong Zhuang (eds.) *Can PRC escape the middle-income trap* (2011); Kevin P. Gallagher and Roberto Porzecanski, 'Climbing Up the Technology Ladder? High-Technology Exports in China and Latin America' (2008) Center for Latin American Studies Working paper series; Abhijit Sharma and Michael Dietrich, 'The Structure and Composition of India's Exports and Industrial Transformation (1980–2000)' (2007) 21 (2) International Economic Journal 207-231; for a developed country perspective see Pontus Braunerhjelm and Per Thulin, 'Can countries create comparative advantages? R&D expenditures, high-tech exports and country size in 19 OECD countries, 1981–1999' (2008) 22 (1) International economic journal 95-111.

[112] See generally Lei Yang and Keith E. Maskus, 'Intellectual Property Rights, Technology Transfer and Exports in Developing Countries' (2008) CESifo Working Paper Series No. 2464 also published at (2009) 90 (2) Journal of Development Economics 231-236; Frederick M. Abbott, 'Comparative Study of Selected Government Policies for Promoting Transfer of Technology and Competitiveness in the Colombian Pharmaceutical Sector' (2007) United States Agency for International Development - Programa MIDAS, Public Law Research Paper; Brett

Number of patent and trademark applications –acts as a proxy for investment in R&D, level of industrialisation and as an indicator of technological activities.[115] There is an established link between R&D and economic growth,[116] however its effect on the financial market is uncertain. Some commentators and researchers show a negative link between increased R&D expenditure and stock prices, arguing shareholder short-termism[117] while other scholars argue for positive long term impact.[118] There is yet another branch of research which links R&D and capital expenditure to corporate governance and tries to explain that the transmission channel for the effects of R&D on the financial market runs through the emergence and pre-eminence of Anglo-American corporate governance which may focus on short term turnovers.[119] Thus

Berger and Robert F. Martin, 'The Chinese Export Boom: An Examination of the Detailed Trade Data' (2013) 21 (1) China & World Economy 64-90.

[113] See Louis T. Wells, *Third world multinationals: The rise of foreign investments from developing countries* (MIT Press Books 1983); Haishun Sun and Frank Tipton, 'A Comparative Analysis of the Characteristics of Direct Foreign Investment in China, 1979-1995' (1998) 32 (2) The Journal of Developing Areas 159; Alviny So, 'Shenzhen Special Economic Zone: China's Struggle for Independent Development' (1988) 9 (2) Canadian Journal of Development Studies 313-323; Sanjaya Lall, 'Technological change and industrialization in the Asian newly industrializing economies: achievements and challenges' in Linsu Kim and Richard R. Nelson (eds.) *Technology, learning, & innovation: Experiences of newly industrializing economies* (Cambridge University Press 2000) 13-68; Sanjaya Lall, 'Export performance, technological upgrading and foreign direct investment strategies in the Asian newly industrializing economies: with special reference to Singapore in ECLAC, Division of Production, Productivity and Management, Unit of Investment and Corporate Strategies, 2000 available at http://repositorio.cepal.org/bitstream/handle/11362/4461/S00080739_en.pdf?sequence=1

R&D stands in a unique position among the variables studied in that it behaves as a control variable (it affects economic growth and the financial market) and at the same time also shows characteristics of interdependent variable (it is directly affected by the type of corporate governance policies chosen by the polity).

[114] Sajid Anwar and Lan Phi Nguyen, 'Foreign direct investment and export spillovers: Evidence from Vietnam' (2011) 20 (2) International Business Review 177-193; Qun Bao et al., 'Do High-technology Exports Cause More Technology Spillover in China?' (2012) 20 (2) China & World Economy 1-22; I. E. Frolov and K. K. Lebedev, 'Assessing the impact of high-technology exports on the growth rate and structure of the Russian economy' (2007) 18 (5) Studies on Russian Economic Development 490-500; for a developed country perspective see Robert T. Green and Arthur W. Allaway, 'Identification of export opportunities: a shift-share approach' (1985) The Journal of Marketing 83-88; for a critical view of high technology export oriented economy see Ishak Shari, 'Economic growth and income inequality in Malaysia, 1971–95' (2000) 5 (1) Journal of the Asia Pacific Economy 112-124.

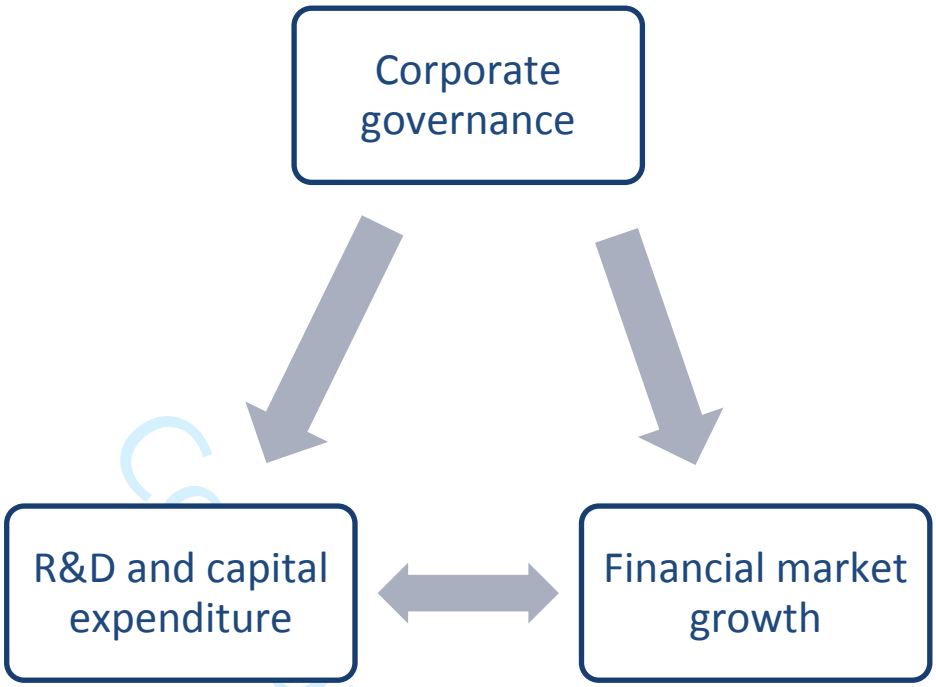
[115] Daniele Archibugi and Mario Pianta, 'Measuring technological through patents and innovation surveys' (1996) 16 (9) Technovation 451-468.

[116] See J. Schumpeter, *The Theory of Economic Development* (Harvard University Press 1934); H. Ansoff, *Corporate Strategy* (McGraw-Hill 1965); Edward J. Malecki, 'Technology and Economic Development: The Dynamics of Local, Regional, and National Change' (1997) University of Illinois working paper series; David T. Coe and Elhanan Helpman, 'International R&D spillovers' (1995) 39 (5) European Economic Review 859-887; Nancy L. Stokey, 'R&D and economic growth' (1995) 62 (3) The Review of Economic Studies 469-489; for a developed country perspective see Walter G. Park, 'International R&D spillovers and OECD economic growth' (1995) 33 (4) Economic Inquiry 571-591; Edwin Mansfield, 'Contribution of R&D to economic growth in the United States' (1972) Science 477-486; Rachel Griffith et al., 'Mapping the two faces of R&D: productivity growth in a panel of OECD industries' (200) 86 (4) Review of Economics and Statistics 883-895; Beñat Bilbao-Osorio and Andrés Rodríguez-Pose, 'From R&D to innovation and economic growth in the EU' (2004) 35 (4) Growth and Change 434-455.. for a view that intellectual property regime, which may affect R&D, affects economic growth see Keith E. Maskus, 'Intellectual Property Rights And Foreign Direct Investment' (2000) Centre for International Economic Studies Working Paper No. 22; Robert E. Litan et al., 'Rules for Growth: Promoting Innovation and Growth Through Legal Reform' Yale Law & Economics Research Paper No. 426, Stanford Law and Economics Olin Working Paper No. 410, UC Berkeley Public Law Research Paper No. 1757982; Rod Falvey et al., 'Intellectual Property Rights and Economic Growth' (2005) Internationalisation of Economic Policy Research Paper No. 2004/12 published at (2006) 10 (4) Review of Development Economics 700; Bryan Christopher Mercurio, 'Reconceptualising the Debate on Intellectual Property Rights and Economic Development' (2010) 3 (1) The Law and Development Review 65; Lewis Davis and M. Fuat Sener, 'Intellectual Property Rights, Institutional Quality and Economic Growth' (2012) working paper series available at <http://dx.doi.org/10.2139/ssrn.1815258>.

[117] See P. Drucker, 'A crisis of capitalism' *Wall Street Journal* (30 September 1986) 31; J. Stein, 'Takeover threats and managerial myopia' (1988) 96 Journal of Political Economy 61–80; M. Porter, 'Capital disadvantage: America's failing capital investment system' (1992) 70 Harvard Business Review 65–82; B. Hall, 'The stock market's valuation of R&D investment during the 1980's' (1993) 83 American Economic Review 259–264

[118] See S.H. Chan et al., 'Corporate research and development expenditures and share value' (1990) 26 Journal of Financial Economics 255–276; S. Szewczyk et al., 'The valuation of corporate R&D expenditures: evidence from investment opportunities and free cash flow' (1996) 25 Financial Management 105–110; L. Chan et al., 'The stock market valuation of research and development expenditures' (2001) 56 Journal of Finance 2431–2456; Mohsen Saad and Zaher Zantout, 'Stock price and systematic risk effects of discontinuation of corporate R&D programs' (2009) 16 (4) Journal of Empirical Finance 568-581; for studies which show mixed results see D. Chambers et al., 'Excess returns to R&D-intensive firms' (2000) 7 Review of Accounting Studies 133–158; A. Eberhart et al., 'An examination of long-term abnormal stock returns and operating performance following R&D increases' (2004) 59 Journal of Finance 623–650.

[119]See Alfred Haid and Jürgen Weigand, 'R&D, liquidity constraints, and corporate governance' (2001) Journal of Economics and Statistics 145-167; Kee H. Chung, Peter Wright and Ben Kedia, 'Corporate governance and market valuation of capital and R&D investments' (2003) 12 (2) Review of Financial Economics 161; Rob Bauer,



However, on the balance of probability it would be best to use R&D as a control variable and ignore the effects of corporate governance on R&D to solely focus on the impact of corporate governance on financial market growth.

APPENDIX – D

The classical factor model can be defined as below:

$$\Sigma = \Lambda\Phi\Lambda' + \Psi \qquad (2)$$

Where Λ is a p x k matrix of factor loading i.e. the contribution of each variable to the final index, p is the number of observed indicators or variables, k is the number of latent trait factors being measured, and Ψ is the diagonal p x p matrix with uniqueness on the diagonal.[120]

This can also be represented in terms of observed variable y as:

$$y_i = \Lambda\eta_i + \varepsilon_i,\ \varepsilon_i \sim N_p(0, \Sigma) \qquad (3)$$

Where Λ is a p x k matrix of factor loading, p is the number of observed indicators or variables (j = 1,…,p), k is the number of latent trait factors being measured, i is the number of observation per indicator (i = 1,…,n), ε_i is the residual with a diagonal covariance matrix Σ and $\eta_i \sim N_k(0, I_k)$ which is a vector of standard normal latent factors.[121] In our research p=5 (number of

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Robin Braun and Gordon L. Clark, 'The emerging market for European corporate governance: the relationship between governance and capital expenditures, 1997–2005' (2008) 8 (4) Journal of Economic Geography 441-469

[120] Kanti V. Mardia, John T. Kent and John M. Bibby, *Multivariate Analysis* (San Diego Academic Press 1980)

[121] See generally Hedibert Freitas Lopes and Mike West, 'Bayesian model assessment in factor analysis' (2004) 14 Statistica Sinica 41 available at

variables), k=1 (number of latent trait, which in this research is the financial development index) and i=18 (number of observation which is the time period).

To convert equation (9) into a fully Bayesian approach it is necessary to 'compute the posterior density over all unknown parameters in the model conditional on the observable indicators and any prior information.'[122] To do this the equation (9) can be rewritten as:

$$y_{ij} \sim N(\gamma_{j0} + \gamma_{j1}\xi_i, \omega_j^2) \qquad (4)$$

Where γ is the factor loading, ξ is the single latent factor and ω^2 is the measurement error variances. This can expressed as a likelihood function as:

$$\mathcal{L} \equiv p(Y \mid \theta) \propto \prod_{i=1}^{n}\prod_{j=1}^{p}\phi\left(\frac{y_{ij} - \gamma_{j0} - \gamma_{j1}\xi_i}{\omega_j}\right) \qquad (5)$$

Where Y is the n x p matrix of observed indicators, θ = {Γ, ψ, ξ} is the matrix set of unknown parameters comprising of factor loading [$\Gamma = (\gamma_{10},..., \gamma_{p1})'$], measurement error [$\psi = (\omega_1^2, \ldots, \omega_p^2)'$] and latent factor variable [$\xi = (\xi_1,...,\xi_n)'$], and ϕ is the standard normal density.

Extrapolating prior distribution over the components of θ from equation (5) can be represented as:

$$\begin{aligned} p(\theta) &= p(\xi_1,...,\xi_n)p(\gamma_1|\omega_1^2)p(\omega_1^2)...p(\gamma_p|\omega_p^2)p(\omega_p^2) \\ &= \prod_{i=1}^{n} p(\xi_1)\prod_{j=1}^{p} p(\gamma_j|\omega_j^2)p(\omega_j^2) \end{aligned} \qquad (6)$$

Equation (12) fits the Bayes rule of posterior density being proportional to the prior times likelihood. This factorial equation can be operationalised as:

$$\xi_i \sim N(\mu_\xi, \sigma^2), \qquad i = 1,...,n \qquad (7)$$

$$\gamma_j|\omega_j^2 \sim N(g_{j0}, \omega_j^2 G_{j0}), \qquad j = 1,...,p \qquad (8)$$

$$\omega_j^2 \sim inverse - Gamma\left(\frac{\nu_{j0}}{2}, \frac{\nu_{j0}\omega_{j0}^2}{2}\right), j = 1,..., p \qquad (9)$$

Where g_{j0} and G_{j0} are user specified hyper-parameters of initial values for intercept and slope for the simulations. As stated earlier ω_{j0}^2 is the measurement error variances. The mean, standard deviation and the initial values for the common priors for the inverse Gamma densities are provided. As Simon Jackmann envisages, in the absence of prior information about factor loading large values are set for the elements of the prior sum of square matrices[123] and run the simulations for a longer period of time until the model converges. It is a resource-intensive method but is simpler to execute.

<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.10.8242&rep=rep1 &type=pdf> accessed 12 June 2018; David John Bartholomew, *Latent Variable Models and Factor Analysis* (2nd edn, Wiley 1999).

[122] Simon Jackmann, *Bayesian Analysis for the Social Sciences* (Wiley 2009) 438

[123] ibid 439

A one dimension latent variable model for financial growth is fitted, with p=5 set of underlying indicators, using a Bayesian model and a Gibbs sampler. The initial value of g_{j0} and G_{j0} as 0.5 is taken as a halfway point between 0 and 1 and for latent variable ξ_i and the item parameters the lack of identification by imposing normalisation. Thus restrictions are imposed on the latent variable with fixed mean and variance and thereby inducing local identification; similarly for item parameters a restriction on sign will rule out invariance to rotation and provide global identification. Moreover, normalising latent variables to a fixed location eliminates translations and ensures that the latent variable and item parameters are jointly identified. This will also ensure the identification of measurement error variance parameters. Therefore, a Bayesian rule for the financial development index can be written as:

$$p(\theta|Y) \alpha p(\theta).p(Y|\theta) \quad (10)$$

which obtains the prior value of the index from p(θ) – the probability of a set of unknown parameters comprised of factor loading, measurement error and latent factors, from equation (12) and likelihood of p(Y|θ), i.e. probability of the observed value given the probability of unknown parameters, from equation (11). As there are multiple unknown parameters it is not possible to solve them algebraically. To compute this it is necessary to rely on Gibbs sampler, 'building up a Monte Carlo based approximation to the posterior density by sequentially sampling from low dimensional conditional densities'.[124]

From equation (16) a total of n+3p parameters are obtained, so to approximate the value of latent variable output it is necessary to simulate the values across n+3p dimensional distribution. A N(0,1) prior for latent variable output is specified, thereby imposing normalising restrictions, inverse Gamma priors of (0.01, 0.01) are also specified for the measurement error variance parameters. The JAGS code implementing these for preparing the control index is as below:

[124] ibid 438, 442

```
######           Bayesian factor analysis for Control index       ######
#                         Adapted from Simon Jackmann                    #
# http://jackman.stanford.edu/mcmc/book/Examples/factanal/factorMCMC.R #

for(fcl in 1:X2n){            ## loop over each country

for(i in 1+(17*(fcl-1)):17*fcl){ ## loop over observations for each year

for(j in 1:10){                    ## loop over indicators

X2mu[i,j] <- X2gamma[j,1] + X2gamma[j,2]*X2xi[i]

X2[i,j] ~ dnorm(X2mu[i,j],X2tau[j])

             }

            }

## prior for latent variable

for(i in 1+(17*(fcl-1)):17*fcl){  ## loop over observations for each yr

      X2xistar[i] ~ dnorm(0,1)

      X2xi[i] <- (X2xistar[i]-mean(X2xistar[]))/sd(X2xistar[])

                                  }

## priors for the measurement parameters
for(j in 1+(10*(fcl-1)):10*fcl){  # loop over 10 control indicators per
country
## intercepts and slopes
X2gamma[j,1:2] ~ dmnorm(g0[1:2],G0[1:2,1:2])
## measurement error variances
X2tau[j] ~ dgamma(.01,.01)T(.00000001,5)
X2omega[j] <- 1/sqrt(X2tau[j])
                                 }

   }

 ######                    END OF BFA FOR CI                  ######
```

Code snippet 1

Please note that we follow similar codes for preparing the financial development index which is the factor analysis of five variables; however as the financial development index is on the left hand side of the final regression analysis, [please refer to equation (17)], there is a clash between setting the prior for latent variables for the financial development index [refer to lines 19-27 in the codes above] in the Bayesian factor analysis model and the regression model. Hence the prior for computing the Bayesian factor analysis to produce the financial development index is provided by a nested prior from the regression model.

APPENDIX E

Development of structural model

A simple regression model can be represented mathematically as:

$$Y_i = \beta 0 + \beta 1 X_i + \varepsilon_i \qquad \text{for } i = 1,\ldots,n, \qquad (1)$$

where Y_i is the dependent or outcome variable for individual/count i, similarly X_i is the independent or explanatory variable for individual i, β0 is the constant or the intercept value, i.e. the estimated value of Y_i if X_i is 0, β1 is the regression coefficient which would provide a quantitative estimation of effect of X_i on Y_i and ε_i is the error term.

In a regression model, like in equation (1), where there is a single explanatory variable, the model is referred to as a simple regression model. In social sciences literature it is difficult to find simple regression models as we know from qualitative experience that outcomes are often determined by more than one factor. So it is necessary to introduce more variables on the right hand side of the equation (1) to isolate the effect that the explanatory variable has on the outcome variable:

$$Y_i = \beta 0 + \beta 1 X1_i + \beta 2 X2_i + \varepsilon_i \qquad \text{for } i = 1,\ldots,n \qquad (2)$$

In this equation there are two sets of independent variables on the right hand side, $X1_i$ can be designated as the explanatory variable or the variable whose effect on Y_i is being investigated and $X2_i$ is the control variable, i.e. any other independent variable which also affects Y_i. Equation (2) is an example of multiple regression as there are more than one variable whose effects are being estimate on the outcome variable. Equation (2) can also be written as:

$$Y_i \sim (\beta 0 + \beta X_i, \sigma^2), \qquad \text{for } i = 1, \ldots, n, \qquad (2.1)$$

where X is an n by 2 matrix (as there are two independent variables) with i^{th} row X_i or using multivariate notation,

$$Y_i \sim (\beta 0 + \beta X, \sigma^2 I),$$

where Y is a vector of length n, X is a n by 2 matrix of predictors, β is a column vector of length 2 and I is the n by n identity matrix.[125]

Pooled regression

In the present research paper the individual countries can be denoted as j, there are 19 countries, so j = 1 to 19, Y the outcome variable is the financial development index prepared by the Bayesian factor analysis of five factors, X1 the explanatory variable is the corporate

[125] Andrew Gelman and Jennifer Hill, *Data analysis using regression and multilevel/hierarchical modelling* (Cambridge University Press 2007) 38

governance index prepared by utilising the graded response model on fifty two variables, X2 the control variable is the control index created from fourteen variables. However, in addition to individual countries j it is necessary to also add a factor for time, as the study is longitudinal in nature, so equation (2) can be rewritten as:

$$Y_{jt} = \beta 0 + \beta 1 X1_{jt} + \beta 2 X2_{jt} + \varepsilon_{jt} \quad (3)$$

For this research t = 1 to 20, to account for twenty year period, and as stated earlier, j = 1 to 19 for nineteen countries. Equation (13) can also be represented as a distribution in terms of:

$$Y_{jt} \sim N(\beta 0 + \beta 1 X1_{jt} + \beta 2 X2_{jt} + \varepsilon_i, \sigma^2)$$
$$\sigma^2 \sim N(0, \omega^2) \quad (3.1)$$

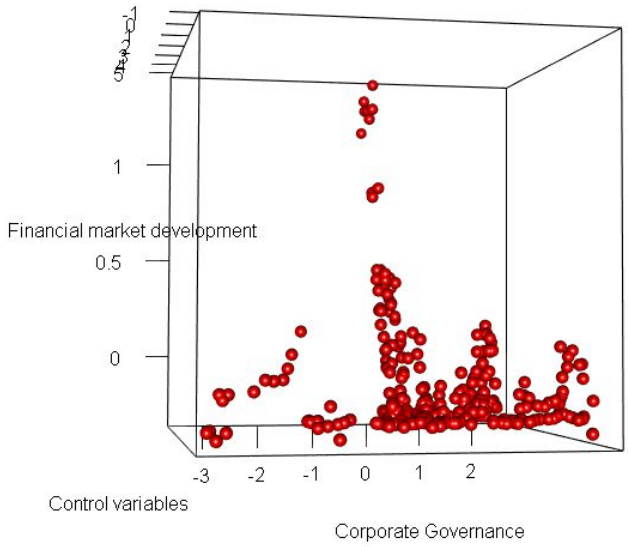
The model as described in equation (3) and (3.1) can also be designated as a complete pooling model as group indicators are not included in the model,[126] in other words the coefficients β0, β1 and β2 do not vary across countries and time period. This is computed using the following JAGS code:

```
1  for(i in 1:X1n*20) {  ## loop over all countries across all time period
2    Yxi[i] ~ dnorm(Rmu[i], Rtau) ## likelihood
3    Rmu[i] <- b0 + b1*z.theta[i] + b2*X2xi[i]
4                                    }
5  Rtau ~ dgamma(.01,.01)    ## prior for tau
6  b0 ~ dnorm(0,1.0E-12)    ## prior for beta - intercept
7  b1 ~ dnorm(0,1.0E-12)   ## prior for beta – corporate governance
8  b2 ~ dnorm(0,1.0E-12)  ## prior for beta – control index
```

Code snippet 2

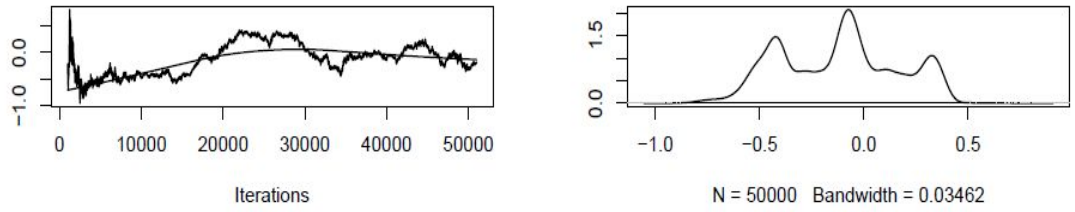
The code in line 2 and 3 executes the simple OLS equation (3.1). The prior distribution is set between line 5 to 8. The output in a 3d format is as below:

[126] ibid 251



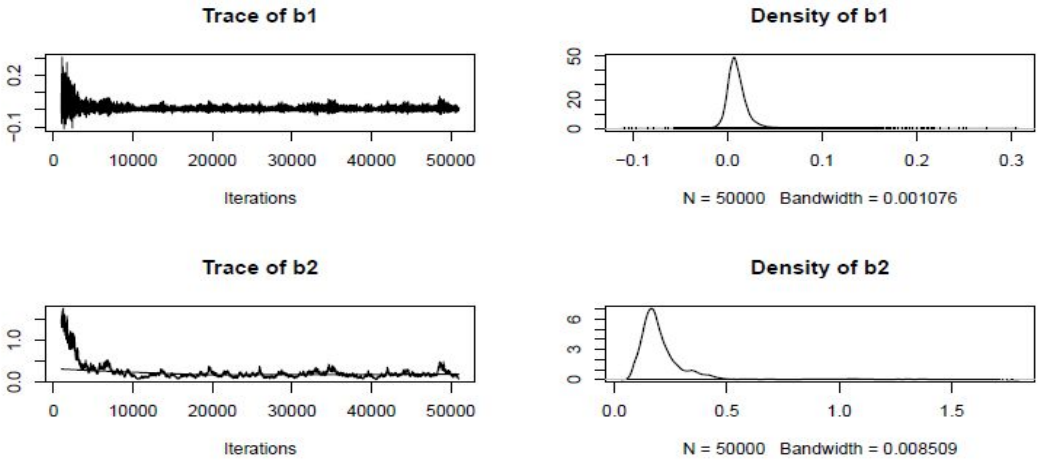
The graph shows that there is a low correlation between corporate governance and financial growth, however, there is also high dispersion, with distinct peaks of high correlation, it suggests that there are some factors within the model which have high correlation with the financial market development, however using pooled OLS these factors cannot be properly discerned. Therefore, the model should be refined further.

Similarly, a visual check for convergence can be carried out in a Bayesian model to inspect the trace plot, if a model has converged then the trace plot moves along a central line and the density plot is usually uniform. Trace and density plot of the intercept is as below:



The trace plot clearly suggests that the model had not stabilised even after 50,000 iterations and is likely to be biased, inefficient and/or inconsistent. The density plot on the above right shows that there are at least three distinct intercept categories. This indicates that despite relative convergence (as shown below) in the coefficients the groups are not homogenous and the model needs to be explored further to fully explain the links between corporate governance and financial growth. Thus, although OLS pooled regression 'captures not only the variation of what emerges through time or space, but [also] the variation of these two dimensions

simultaneously'[127], our analysis shows that errors may not be independent and homoscedastic over time, and hence pooled OLS regression leads to erroneous results.[128]



Unpooled regression

Therefore, to take into account the peaks in the model, the next step would be to let the intercept vary with the country.

The new derived equation will be:

$$Y_{jt} = \beta 0_j + \beta 1 X1_{jt} + \beta 2 X2_{jt} + \varepsilon_{jt} \quad (4)$$

$$Y_{jt} \sim N(\beta 0_j + \beta 1 X1_{jt} + \beta 2 X2_{jt} + \varepsilon_i, \sigma^2) \quad (4.1)$$

where j is the country and t is the time period. This model can also be referred to as no pooling as separate models are fit within it for each country.[129] In computation terms this model is referred to as a Bayesian Inference for Panel Data Regression Model with a Non-Hierarchical

[127] Federico Podestà, 'Recent developments in quantitative comparative methodology: The case of pooled time series analysis' DSS PAPERS SOC 3-02 <http://localgov.fsu.edu/readings_papers/Research%20Methods/Podesta_Pooled_Time_Series_Cross_Section.pdf> accessed 10 June 2018

[128] Podestà lists five major complications for using OLS procedure on pooled data: 1) errors tend to be dependent from a period to the next, 2) the errors tend to be correlated across countries (or groups), 3) errors tend to be heteroskedastic, such that they may have differing variances across ranges or sub sets of nations. In other words, countries with higher values on variables tend to have less restricted and, hence, higher variances on them, 4) errors may contain both temporal and cross-sectional components reflecting cross-sectional effects and temporal effects. Errors tend to conceal unit and period effects. In other words, even if we start with data that were homoscedastic and not auto-correlated, we risk producing a regression with observed heteroskedastic and auto-correlated errors. This is because heteroscedasticity and auto-correlation we observe is a function also of model misspecification. The misspecification, that is peculiar of pooled data, is the assumption of homogeneity of level of dependent variable across units and time periods. In particular, if we assume that units and time periods are homogeneous in the level (as OLS estimation requires) and they are not, then least squares estimators will be a compromise, unlikely to be a good predictor of the time periods and the cross-sectional units, and the apparent level of heteroscedasticity and auto-correlation will be substantially inflated, 5) errors might be non-random across spatial and/or temporal units because parameters are heterogeneous across subsets of units. In other words, since processes linking dependent and independent variables tend to vary across subsets of nations or/and period , errors tend to reflect some causal heterogeneity across space, time, or both.

[129] Gelman and Hill (n 34) 251

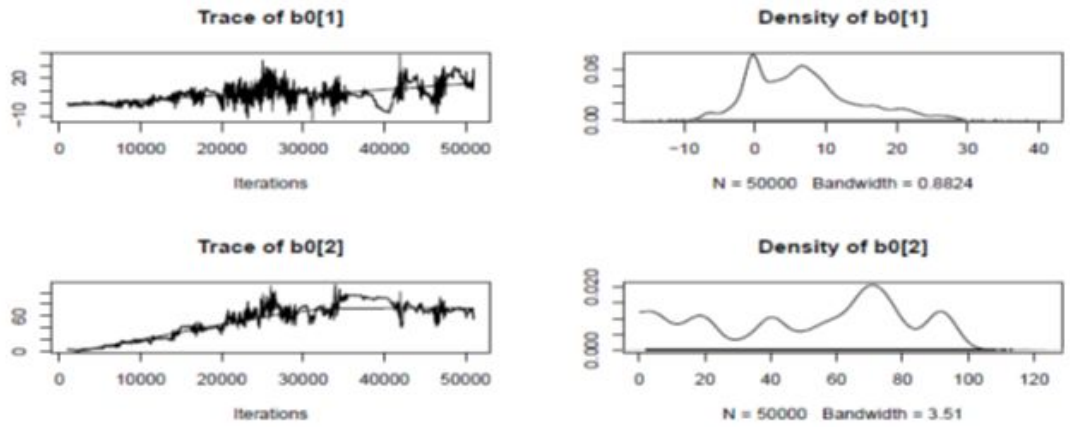
model for Unobserved Unit Level Heterogeneity. This is better than letting the slopes (the regression coefficients) vary as well, because then cross validation cannot be performed at country level.[130] The following JAGS code is used:

```
1  for(Ri in 1:Yn) {                    ## loop over countries
2
3    for(Rloop in 1+(20*(Ri-1)):(20*Ri)) {      ## loop over time periods
4
5        Rmu[Rloop] <- b0[Ri] + b1*z.theta[Rloop] + b2*X2xi[Rloop]
6
7        Yxi[Rloop] ~ dnorm(Rmu[Rloop], Rtau)        ## likelihood
8                                              }
9                    }
10 for(Rti in 1:Yn) {
11
12   b0[Rti] ~ dnorm(0, 0.001)   ## priors for country specific intercept
13
14                   }
15
16 b1 ~ dnorm(0, 0.001)              ## prior for beta
17 b2 ~ dnorm(0, 0.001)                ## prior for beta
18 Rtau ~ dgamma(.01,.01)                ## prior for tau (precision)
```

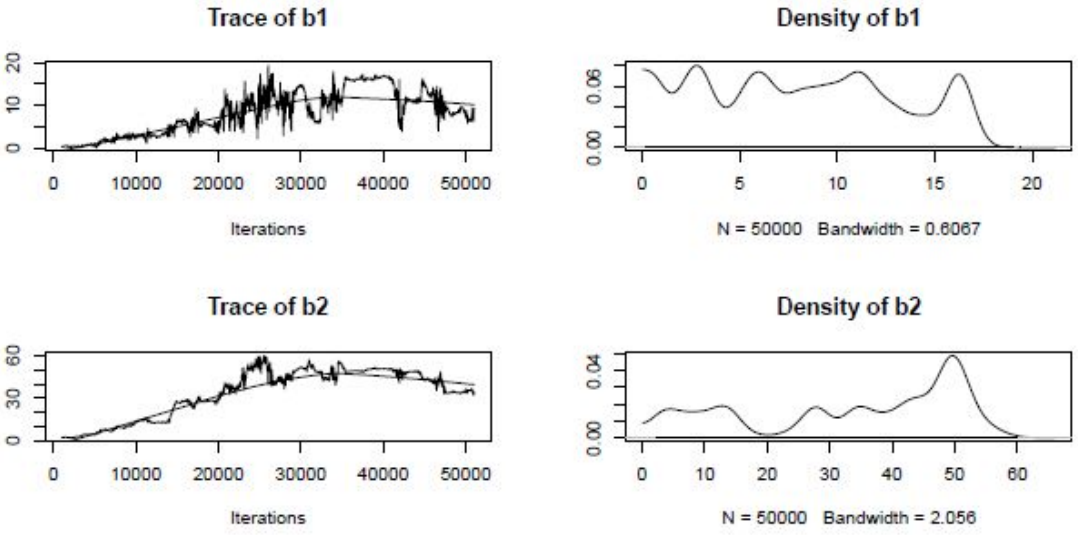
Code snippet 3

Line 1 to 9 sets out the main argument, Yxi is the financial development index for each country, it is in a 420 by 1 matrix, each cell represents one country and one year. Similarly there is a 420 by 1 matrix for Z.theta which is the corporate governance index and X2xi which is the control index. Line 7 provides the distribution of financial development which is normal over mean Rmu and standard deviation Rtau. Rmu is bounded by the regression equation as stated in equation (4). So Rmu is a function of an intercept β0 which is allowed to float across countries and a constant coefficient β1 across all countries for corporate governance and β2 for control index. So we get 21 intercepts, the convergence and density plots for couple of $\beta 0_1$,…., $\beta 0_{21}$ is as below:

[130] Andrew Gelman, 'Multilevel (hierarchical) modelling: what it can and can't do' (2005) <http://www.stat.columbia. edu/~gelman/research/unpublished/multi.pdf > accessed 10 June 2018



Almost all of them show instability and from the density plot and bandwidth[131] we find that coefficient for corporate governance index and control index have also become less stable.[132]



Random unpooled

The relative instability of β0 shows that the model is a random effects model, so the next step will be to introduce unit specific heterogeneity and reduce standard deviation of the priors. As we see from the previous JAGS code lines 10-14, there is a fixed normal prior, we would let this prior to vary.[133]

[131] John DiNardo and Justin L. Tobias, 'Nonparametric Density and Regression Estimation' (2001) 15 (4) Journal of Economic Perspectives 11, 16 <http://www.uibk.ac.at/econometrics/dl/jep01fall/02_nonparametric.pdf> accessed 10 June 2018

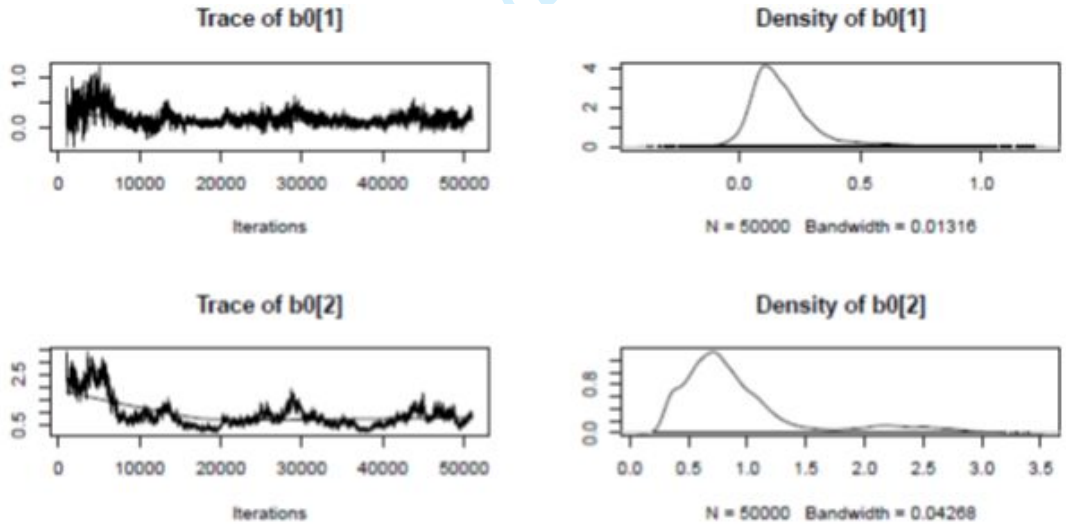
[132] Please note that the entire convergence plots along with the replication images for the intermediate models are available on request.

[133] For background in this technique refer to Jackman (n 202); Simon Jackman, 'Estimation and Inference Are Missing Data Problems: Unifying Social Science Statistics via Bayesian Simulation.' (2000) 8 Political Analysis 307—332; Simon Jackman, 'Estimation and Inference via Bayesian Simulation: An Introduction to Markov Chain Monte Carlo.' (2000) 44 American Journal of Political Science 375-404.

```
for(Ri in 1:Yn) {                    ## loop over countries

  for(Rloop in 1+(20*(Ri-1)):(20*Ri)) {      ## loop over time periods

      Rmu[Rloop] <- b0[Ri] + b1*z.theta[Rloop] + b2*X2xi[Rloop]

      Yxi[Rloop] ~ dnorm(Rmu[Rloop], Rtau)        ## likelihood
                                          }
                  }
 for(Rti in 1:Yn) {

b0[Rti] ~ dnorm(0, Rtau.alpha) ## priors for country specific intercept

                   }

 b1 ~ dnorm(0,1.0E-12)          ## prior for beta
 b2 ~ dnorm(0,1.0E-12)           ## prior for beta
Rtau.alpha ~ dgamma(.01,.01)     ## prior for tau.alpha (precision)
Rtau ~ dgamma(.01,.01)            ## prior for tau (precision)
Rsigma <- 1/sqrt(Rtau)             ## std dev of idiosyncratic errors
Rsigma.alpha <- 1/sqrt(Rtau.alpha)  ## std dev of unit-specific terms
```

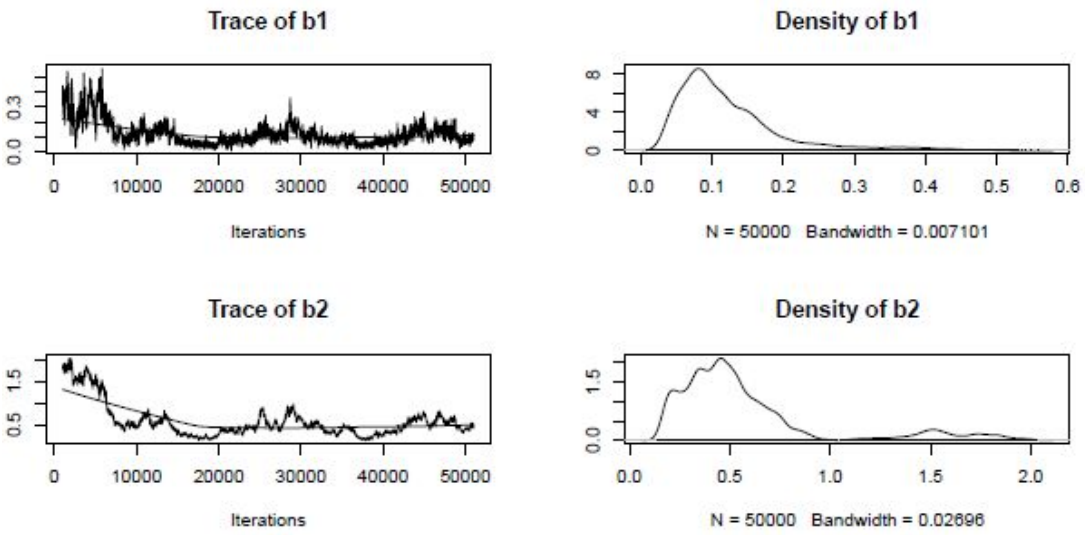
Code snippet 4

The new model lets the standard deviation float to account for unobserved unit level heterogeneity. We find that there is comparatively more convergence for $\beta 0_1$,…., $\beta 0_{19}$, as depicted below:



and the coefficient for corporate governance and control index becomes relatively stable with some strong variations in the tail.[134]

[134] Please note that the entire convergence plots along with the replication images for the intermediate models are available on request.



Multilevel hierarchical

This proves that the next step to further converge the model would be to pick up variables from the control data set which do not vary much over the entire dataset and are not uniformly available. Also 'the multilevel model gives more accurate predictions than the no-pooling and complete-pooling regressions, especially when predicting group averages.'[135] We take out GINI coefficient, HDI indicator, rule of law and peace coefficient from the Bayesian factor analysis to act as a country level indicator with its own prior distribution.

So algebraically we can represent the new relationship drawing from equation (4.1) as:

$$Y_{jt} \sim N(\beta 0_j + \beta 1 X 1_{jt} + \beta 2 X 2_{jt} + \varepsilon_i, \sigma^2_j) \quad (5)$$

this gives us the first level model, then we have a second level regression fit for each country,

$$\beta 0_j \sim N(\gamma_0 + \gamma_g X 3 j, \sigma^2_\beta) \quad (5.1)$$

where j represents the country and t represents the year, X3 is the country level indicators, g represents the number of country level indicator, in our research it is 4, and γ represents the country level indicator coefficient $\gamma_0,\ldots, \gamma_4$. We assume that the errors in the second level regression is distributed normally over mean 0 and standard deviation σ_β.

The JAGS code for implementing equations (5) and (5.1) is as below:

[135] Gelman and Hill (n 34) 5

```
for(Ri in 1:Yn) {                    ## loop over countries

 for(Rloop in 1+(20*(Ri-1)):(20*Ri)) {  ## loop over time periods

   Yxi[Rloop] ~ dnorm(Rmu[Rloop], Rtau)    ## likelihood for find-dev

   Rmu[Rloop] <- b0[Ri] + b1*z.theta[Rloop] + b2*X2xi[Rloop]

                                     }

               }

for(Rti in 1:Yn) {

b0[Rti] ~ dnorm(Rhat[Rti],Rtau.alpha) ## priors for unit-specific terms

 Rhat[Rti]  <-  R0  +  R1*X3[Rti,1]  +  R2*X3[Rti,2]  +  R3*X3[Rti,3]  +
R4*X3[Rti,4]

             }

 R0 ~ dnorm(0,1.0E-12)
 R1 ~ dnorm(0,1.0E-12)
 R2 ~ dnorm(0,1.0E-12)
 R3 ~ dnorm(0,1.0E-12)
 R4 ~ dnorm(0,1.0E-12)

 b1 ~ dnorm(0,1.0E-12)                ## prior for beta1 - corp gov
 b2 ~ dnorm(0,1.0E-12)                ## prior for beta2 - control
```

Code snippet 5

We can try two different priors strategy – one favoured by Gelman and Hill giving a uniform distribution[136]

```
 Rtau.alpha <- pow(Rsigma.alpha, -2) ## prior for tau.alpha (precision)
 Rtau <- pow(Rsigma, -2)             ## prior for tau (precision)

 Rsigma ~ dunif(0,100)               ## std dev of idiosyncratic errors
 Rsigma.alpha ~ dunif(0,100)         ## std dev of unit-specific terms
```

Code snippet 6

and the other by Simon Jackmann favouring a Gamma distribution computed via the Poisson density[137]

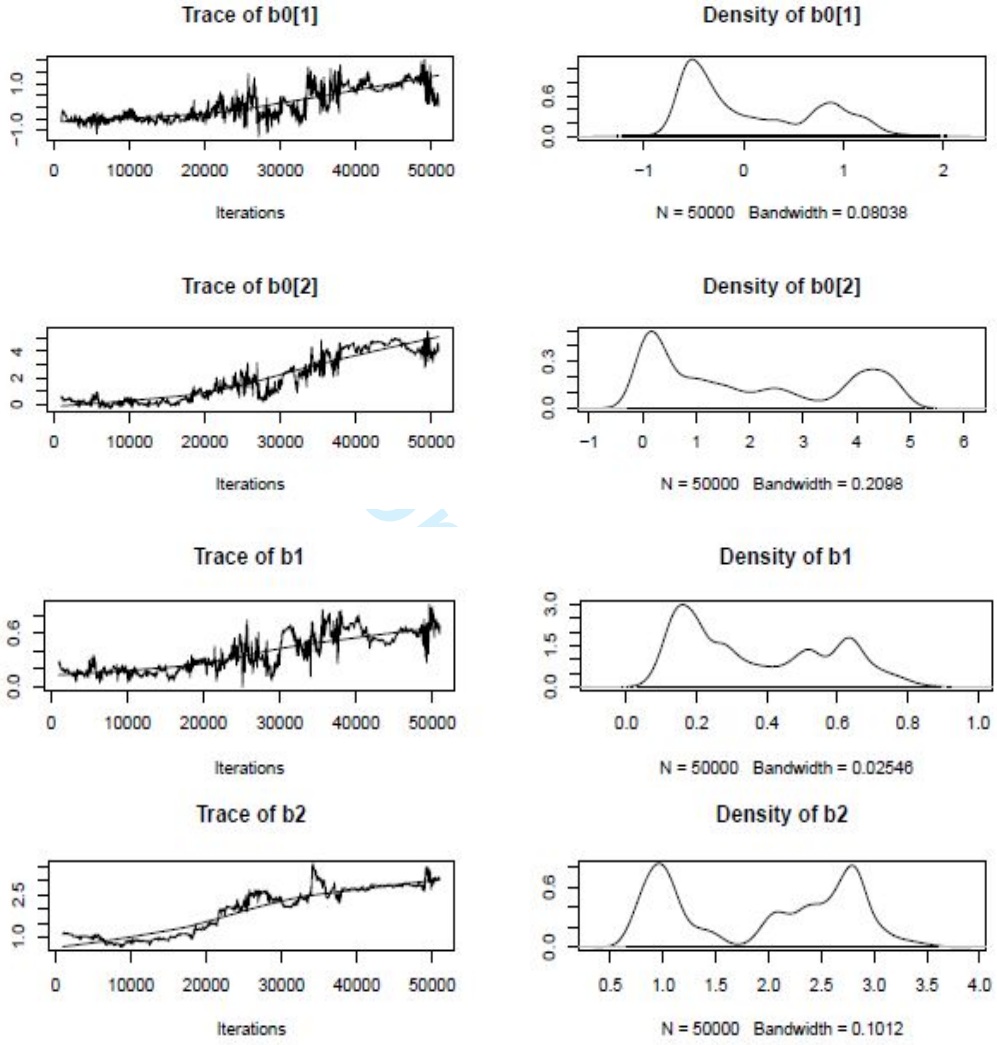
```
Rtau.alpha ~ dgamma(.01,.01)        ## prior for tau.alpha (precision)
Rtau ~ dgamma(.01,.01)               ## prior for tau (precision)

Rsigma <- 1/sqrt(Rtau)                ## std dev of idiosyncratic errors
Rsigma.alpha <- 1/sqrt(Rtau.alpha)     ## std dev of unit-specific terms
```

Code snippet 7

[136] The Uniform Distribution < https://stat.ethz.ch/R-manual/R-devel/library/stats/html/Uniform.html>
[137] The Gamma Distribution < https://stat.ethz.ch/R-manual/R-devel/library/stats/html/GammaDist.html>

Both give very similar results, however Gamma distribution is found to take a bit longer to converge.

Comparison of coefficient for corporate governance and control index is as below



It shows that the model has not yet converged.[138]

[138] Please note that the entire convergence plots along with the replication images for the intermediate models are available on request. Please contact the author at n.samanta@sheffield.ac.uk