Department of Economics and Management

Doctoral Thesis in Economics

ESSAYS ON THE RISKS ASSOCIATED WITH INTANGIBLES AND HUMAN CAPITAL

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"The acquisition of the help of corporations is better than the acquisition of an army, a friend or profits."

[350–283 BC, Kautilya. *Arthashastra*. Book XI, Ch. I., translated from Sanskrit in 1915, Bangalore by Shamasastry, R.]

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Shibashish Mukherjee — Ferrara, Italy
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Chapter 1

Introduction

Over the past couple of decades it has become clear that intangibles and human capital are playing an increasingly important role in determining the value of a firm and it's risk-adjusted expected stock returns [169, 24]. The subject of intangibles and human capital is multifaceted[1] and increasingly relevant to firms and stakeholders in the 21^{st} century. Their importance is increasingly recognized in the academic literature and technical reports for valuation purposes even though they are difficult to visualize, measure or report [257]. One of the main challenges with the study of intangibles and human capital is, they are also notoriously vague and have no measures which is widely accepted. Some have argued that the problem of measurement emanates because of rigid accounting requirements with respect to intangibles generating processes such as Research and Development expenses (RND)[2]. The crux of the matter remains that the risks associated with intangibles and human capital are misunderstood since Accountants and Economists fail to agree on how to measure and value of these resources.

In academic discourse relating to intangibles[3], the lack of a consistent theory have led to several definitions [156]. Most studies on intangibles take a very narrow view, focusing only on RND. Others have tried to divide the

[1]Intangibles and human capital are of interests to researchers with diverse interests and agendas — such as Accountants, Economists, Financial Analysts, Regulators, Stock Holders, Retail & Institutional Investors, etc.

[2]See Lev and Zarowin's [176] arguments in favor of more disclosures and Skinner's critique [224] of the lobby for "more-disclosure" and thus following rejoinders and discussions by Lev [170] and Skinner [225].

[3]In literature, the same idea has been expressed as "intellectual capital" without essentially diverging from the conceptual meaning of the term.

ideas of intangibles into three categories: (i.) human, (ii.) structural and (iii.) relational[4]. This study argues that the term "intangibles" represents all encompassing assets/liabilities, with or without a separate legal identity of itself, with or without a future cash flow generating ability. Furthermore, intangibles are not only endogenous but also exogenous. For example, a country that is governed by the "rule of law", and where contracts are fiercely enforced, regulations are transparent and well defined, provides intangible benefits to the firms operating within its confines. A certain, transparent, and consistent regulatory and legal framework provides much needed investor confidence and any changes to it is a cause of concern or a potential risk.

Regulatory Risk is therefore one of the most overlooked intangibles in the entire Accounting, Finance, Economics and Management literature. In most academic studies, an exogenous factor such as regulation is hardly ever considered to be an "intangible", let alone an "intangible asset". However, the importance of regulatory bodies have never been more important[5]. Regulation Fair Disclosure (Reg FD) enacted by Securities and Exchange Commission in 2000 and Sarbanes-Oxley Act of 2002 (SOX) have been a significant regulatory change in the field of information disclosure. This has led to many discussions in academic literature[167, 59, 146]. In this study special emphasis has been given to these regulatory changes, and it is found that this regulatory change has altered the information environment, for better or for worse[6].

In accounting, the role of intangibles has been limited to the study of disclosures that are voluntary in nature. Mandatory disclosures with respect to intangibles are scarce. However, over the years several firms have found it important to disclose various intangibles related information on a voluntary basis. There are firms in the pharmaceuticals industry that go on so far as to disclose what drugs are they working on, at what stage the drugs are in the "discovery" phase, completely on a voluntary basis. Still, there are important questions about how relevant this information is in explaining the cross-

[4]There are many more classifications, either expressing the same idea or further subdividing intangibles into more finer parts. See Kaufmann and Schneider for a detailed review [156].

[5]Most economists in the United States and elsewhere now agree that the financial meltdown that was an outcome of the "Credit Crunch" in 2008, that led to the Bankruptcy of many banks, most significantly — Lehman Brothers, is an outcome of recklessly managed regulatory environment. See Rajan's paper [207] on the financial innovations .

[6]More on this in Chapter 4.

section of returns, and subsequently, the cost of capital? Do these disclosures help in reducing or increasing information asymmetry? Do they even have any impact at all? These are all important questions about the value of disclosures on intangibles, from intangibles-intensive firms. Therefore, from a stakeholders perspective, accounting and finance literature should advance what information is value relevant and explain the risks of not disclosing or not understanding disclosed information.

In management science literature human capital has been defined as a sub-division of "intangibles" or "intellectual capital." Traditionally, research interest in the area of human capital have attracted Economists with a focus mainly in Labor Economics [24, 190, 215]. However, Financial Economists and Accountants have indulged themselves with human capital by focusing on "Executive Compensation." Although the importance of human capital in a firm's valuation and its risk adjusted expected returns have long been well established in the theoretical literature [183, 184, 251, 150] there are still unavailability of clear and undisputed micro-level data for empirical research. In order to overcome such problem researchers have used industry level data to model human capital in empirical literature [104, 199, 95]. This study have tried to overcome some of these shortcomings by using a new measure for human capital in the form of Selling, General and Administrative expenses (SGA).

One key intangible category in the management science literature is organizational capital. It does not have a widely accepted method for measurement or valuation. Recently, one of the most important contributions to the empirical study of organizational capital was made by Lev and Radhakrishnan by introducing SGA its measure[171][7]. Others have divergent views on what constitutes an organizational capital and they have come up with many different definitions for its visualization or measurement. Therefore, the measurement and management issues relating to organizational capital are still wide open. Even with all these challenges researchers from various fields have arrived at a common conclusion that — it exists and its economically important. Therefore, underestimating or not understanding such a factor value is short sighted and potentially risky. Later in this, an attempt has been made to develop a new model to capture this illusive organizational capital.

[7] This study argues that this method of measuring organizational capital is restrictive and short-sighted. Please see additional arguments and critique of this view in Chapter 5.

Last but not the least, there are many similarities between human capital (measured using SGA) and structural intangibles (e.g. RND), they are both non-tradable assets and treated similarly in the accounts — expensed when incurred. Therefore, this parallel is explored in this study, to find out how these variables behave individually and collectively in explaining the cross-section of asset returns.

1.1 Objective

The main objective of any researcher, especially in the field of accounting and economics — a field in which there is no dearth of credible high quality data, is to produce new variables to study different aspects of economic life. Although intangibles and human capital augments this problem because of the lack of universally accepted variables, ones that are measured, reported, or analyzed. Therefore, to understand how intangibles and human capital explain the information environment of the risk-adjusted expected stock returns, approximate variables need to be found, that could reliably measure their economic impact.

Furthermore, in order to study a variable, it must be defined credibly. Therefore, each variable must be created following the traditional conventions found in the literature or by justifying it giving acceptable economic arguments to build its case.

It is very important for research dealing with uncertain concepts such as intangibles, where there is a lack of credible theories that can explain the expected economic impact, is to expand the literature by contributing towards the development of new theories.

Lastly, and most importantly, the objective of a researcher is to produce "evidence". Evidence is the key to understanding and accepting the reality as it presents itself. Therefore, it is fundamental for any researcher to produce new evidence to support or disregard hypothesis, general understanding or misconceptions. This is the only way forward in way of advancement in any scientific literature.

1.2 Research Framework

When dealing with dissimilar subjects such as intangibles and human capital, it is not always easy to choose a research approach. As outlined earlier, intangibles can explain a lot of different factors, starting from exogenous regulatory environment in an economic geography[8], to endogenous structural investments in RND. Similarly, human capital can be measured at a macroeconomic-level using industry level income data or at the microeconomic-level using executive compensation data.

Historically, due to the complexity of the topic many researchers have opted to approach the subject from various perspective using different methodologies. It would be dishonest to state that the approach selected in any study is completely independent to the academic background and personality of the researcher. With that in mind, this study conducts a mixed-method research. In a mixed-method, the research topic is analyzed using both qualitative and quantitative data. This makes the research more useful, diverse and academically rich. Therefore, this thesis studies not only the financial figures associated with the assets, but also the written word in the annual reports.

The study basically looks at intangibles and human capital in two ways — (i.) macro-economically and (ii.) micro-economically. Then the study divides the impact of intangibles and human capital in two distinct ways — (a.) informational effect and (b.) value relevance. This whole thesis is divided into four distinct cases: (1.) informational impact of voluntary non-financial and textual disclosures on the cost of capital, (2.) regulatory change and the search for alternative factors to study information environment, (3.) organizational capital, and (4.) human capital in comparison and amalgamation with structural capital.

1.3 Research Philosophy

As in the case of any research, this doctoral study makes some philosophical assumptions about the construct of organizations and society. This study is constituted according to what Saunders, Lewis and Thornhill [214] view as a "resource research" which falls under the *Epistemological* paradigm of *Positivism*. Obviously there are many caveats associated with a positivist

[8]Economic Geography is defined as a Sovereign boundary of a State within which the a firm operates under the enforceable legal, economic and regulatory framework.

research paradigm where, (i.) the researchers are expected to be detached from the data generation process, (ii.) the 'facts' are observable from the data, and (iii.) the 'reality' of a social world is expressed in a way similar to Natural Scientists.

There are some merits in viewing organizations as the creation of predictable individuals who work *mostly* within the boundaries of social structures, norms and laws[9]. In this social construct the researcher can take the *Ontological* position of *Objectivism* and make observations about the subject with or without minimal personal bias or prejudice affecting the conclusions drawn. The social object of such research positions is to be able to generalize the conclusions from the research in a form of "social laws", the precedence of which is available in the natural science research field.

This research position is of course not without its share of shortcomings and inherent biases, details of which are available in the text of Remenyi, Williams, Money and Swartz [208]. Because of *Axiological* reasons [141] the researcher makes choices about data, method, etc. which are intrinsic biases and therefore unavoidable to the whole research process. Therefore, this whole research, given its topic, subject field and researcher, therefore finds itself in the bottom-right quadrant of the Burrell and Morgan's "four paradigms for the analysis of social theory" - the '*Functionalist*' paradigm [45].

1.4 Research Methodology

Overall this study has a mixed method, that means both qualitative and quantitative techniques of analysis. A greater emphasis has been given to quantitative techniques because it provides clarity that cannot be achieved using qualitative techniques. This is not an indictment of qualitative techniques of research but an acknowledgment that in such techniques there is a greater deal of subjectivity that a researcher needs to worry about, and discount the emerging conclusions. That does not go on to mean that there are no biases and subjectivity involved in quantitative techniques.

[9]Legal Laws.

1.4.1 Qualitative Techniques

Content Analysis is one of the most common ways of performing qualitative research. It helps understand the subtle meanings behind the written word. This methodology has its origins in "Theology", reflecting Catholic Church's obsession with interpreting the written word in more ways than normative [159]. This methodology is most frequently used in the accounting studies, generally to study the published materials of the firms. The main idea behind performing a qualitative analysis is to create a type of score board with various units of information with which the text can be enumerated[10].

There are many ways in which the text can be enumerated. For e.g. one can count the number of times a word has been used in a given text, or count the number of lines of information provided about a subject of interest. The score can be used to count, in terms of how many actual number of times a word has been mentioned, or it could be binary — meaning if the word has been used then 1, else 0. All these are methodological decisions that must be made by the researcher while performing the content analysis. For each step a proper justification must be provided explaining how the set of choices will be useful in detecting the trend the analysis is trying to capture. The main demerit of using content analysis is the amount of subjectivity that goes into the analysis, even when the objective is to enumerate and quantify the text.

1.4.2 Quantitative Techniques

One of the benefits of being a researcher in the area of accounting and finance is that there is easy availability[11] of very high quality micro-economic data. Still, there are plenty of subjective decisions one has to make when dealing with quantitative data. Financial data is available in time series over a number of years both on accounting variables and from the stock market. Dealing with a number of firms over time creates panels of data with similar type of data being available for a number of firms over a number of years. Dealing with panel data has its own merits and demerits, especially when dealing with accounting and market data. For example, firms list on the market and go out of the market for various reasons all the time. Therefore one has to make a subjective decision about the time scale for the research

[10] Although, that may not always be the case in other fields that use content analysis.

[11] Given one has the necessary access to relevant databases such as Compustat and CRSP [73, 79].

very carefully because not all the firms will be in existence in the sample for whole time period. That can make the sample biased and the conclusions unclear or incorrect [253].

When modeling financial data one has to be aware that financial data is not like physical data — a constant. What that means is, financial data is affected by a range of problems because it is generally denominated in currencies. Therefore, at any time the value of financial data is not what it seems like. Currency values are affected by fluctuations in currency at the international markets, inflation, lags and delays in reporting etc. Therefore, one has to account for all these deficiencies when dealing with financial data, especially over a long period of time. The first rule of time series analysis is the stability of the data [245, 181], which means all data should be either real or nominal but not a mix of the two, that will give incorrect or biased estimates.

One of the most crucial decisions a researcher has to make when modeling financial data is deciding the estimation method. All the assumptions made in a model is enshrined in the estimation technique. By all accounts Ordinary Least Square (OLS) comes as the most trustworthy estimation method considering asymptotic efficiency and accuracy as parameters of judgment. But there are limitations in financial data just as exogeneity condition not being met most of the times for the independent variables and found correlated with the error term. Therefore in a panel data Generalized Least Square, 2SLS or even Maximum Likelihood estimation techniques must be explored on a case by case basis, giving justifications for each choice and explaining how each choice will effect the possible outcome of the analysis.

Last but not least, the data analysis must provide sufficient basic statistics and visual data representations such as graphs and charts to help decipher the results more intuitively.

1.5 Organization of the Thesis

Intangibles and human capital is not a singular or unitary topic but a collection. Therefore, to study them there is a need for diverse perspectives. This thesis addresses two primary problems associated with intangibles and human capital — information and value relevance. Therefore four chapters in this thesis look into each set of problems separately, which collectively addresses the risks associated with intangibles and human capital.

The thesis starts with a Literature Review in chapter 2. In this chapter the existing literature on the subject of intangibles, information disclosure, value relevance through asset pricing, cost of capital, human, organizational and other types of intangibles, are reviewed.

The next chapter (ch. 3.) focuses on the non-financial and textual disclosures which are generally voluntary in nature. This chapter tries to find out if the information given in the annual reports of firms are in any way value relevant to the asset returns. Here the expected asset returns is a measure of a firm's cost of capital.

Chapter 4. of this thesis looks into the macroeconomic intangible of regulations. Obviously, any changes to existing regulatory or legislative changes is a cause for concern to say the least. Therefore, the chapter studies the effect Regulation Fair Disclosure (Reg FD) and Sarbanes-Oxley Act of 2002 have had on the information environment of Pharmaceuticals, Biotechnology and Life Sciences firms, all listed in the United States capital markets.

In the following chapter (ch. 5.) organizational capital, which is a type of intangible commonly found in the management science literature, is modeled using accounting and market data.

In the chapter 6. the returns of portfolio assets are explained using a new human capital, structural capital and a new variable called intangible capital. This new variable is an amalgamation of both human and structural capital.

Last but not least, the final chapter (ch 7.) concludes the study with some remarks and observations.

Chapter 2

Literature Review

Many academic researchers from different fields have an interest in the subject of intangibles and human capital. This interest is inspired mainly because of two reasons — (i.) information, and (ii.) value.

Due to the difficulty in visualizing, measuring and reporting on intangibles and human capital, it is argued by many researchers that market and the investors are not fully informed about the risks associated with the intangibles and human capital when they decide to invest in a firm or a project. This line of research is being developed in the financial accounting literature. Accounting researcher rely mainly on the published information sources that are mandated by the SEC and the emphasis is clearly on the financial disclosures. Whereas, the problem with intangibles is that they are rarely represented in the accounting statements in financial terms. Some corporations give non-financial and text based disclosures about their views on the performance and risks associated with these assets, however, the research in these non-financial disclosures are scarce and needs attention. Additionally, there is a need to find alternative information sources other than just the published, mandated and voluntary disclosures made by the insiders. This thesis pays attention to these two problems of — (i.) non-financial and textual disclosures, and (ii.) alternative information sources, in the upcoming chapters.

The clear difficulty in reporting leads to the next main problem identified earlier — valuation. Without sufficient and reliable financial disclosures on intangibles and human capital, it becomes very difficult for the investors, or for that matter the market, to value the assets or assess the risks associated with them. This problem is only increased when the intangibles are classified in various groups, such as organizational, human, and structural. The question that must be asked is, are all these factors assets or are they risky too? Are they equally valuable or equally risky? Is the risk level different for each factor? If so, how to determine if there is a variance in the levels of risk, and what are the measures to value them? These are some of the question that has been addressed in next few chapters, with an emphasis on three — (i.) organizational, (ii.) human, and (iii.) structural intangibles. Additionally, a new factor is created with the amalgamation of human and structural to create an overall factor called (iv.) intangible capital, but more on that later.

In the following sections, the leading academic literature associated with information and valuation of intangibles and human capital are presented in detail. In the next section (2.1) the issues, classifications and relevance of intangibles to this study is discussed. The section following that (2.2) delves into the theoretical and empirical informational role of disclosures on intangibles by firms that invest in human or structural intangible is elaborated. In the next section (2.3) a discussion on Analysts is presented, they play a very critical intermediary role in the information environment of stocks in the capital markets. In section 2.4 the theoretical and empirical cross-section of asset pricing[1] is presented with a special emphasis on intangibles. Next section (2.5) discusses the ways in which returns can be used as a measure of cost of capital. Section 2.6 discusses the theory of market microstructures, which serves as a proxy for information asymmetry. In section 2.7 the literature related to a special type of intangible called organizational capital is discussed. The literature related to human capital, which is a key intangible asset for firms is presented in section 2.8 of this chapter. The section 2.9 delves into the research philosophy guiding this thesis. Section 2.10 presents the methodological framework used for the studies in the following chapters. This chapter ends with a brief summary in section 2.11.

2.1 Intangibles

The epistemological origin of the term "intangibles" lies in the theory of "creative destruction", a view put forward by noted economist Joseph Schumpeter in his *magnum opus* — "Capitalism, Socialism and Democracy" [216].

[1]Asset pricing is a well known method to study value relevance or risk loading of factors on asset returns.

In the book Schumpeter notes;

> *"Capitalism, then, is by nature a form or method of economic change and not only never is but never can be stationary. And this evolutionary character of the capitalist process is not merely due to the fact that economic life goes on in a social and natural environment which changes and by its change alters the data of economic action"* (Schumpeter, 1943, Ch. vii., pp. 82.)

This "evolutionary character of the capitalistic process" is fueled by firms creating many different types of intangibles. Still, the central question remains — what are these intangibles? As per Lev, "an intangible asset is a claim to future benefits that does not have a physical or financial (a stock or a bond) embodiment" [169] (pp. 5). International Accounting Standard 38 defines intangibles assets as "an *identifiable non-monetary* asset without physical substance" [72] (emphasis added)[2].

With all the conundrums with regards to the definitions and terminologies of intangibles, there is no convergence on classification as well. What that means is that whenever a terms such as "intangibles", "intellectual capital" or "intangible assets" is invoked, it does not mean just one thing or one set of variables. It could mean different things, collectively, or individually, to many different people or stakeholders. Therefore, many researchers have tried to categorize a set of commonly observable characteristics as a set of variables. However, the only intangible that is officially recognized in the financial accounts is "Goodwill" [252].

Financial economists, organizational theorists and management science researchers reject the exclusivity bestowed upon goodwill in the current regulatory regime as the sole measure of a firm's intangibles. Some argue instead, in favor of categorizing intangibles into (i.) human capital, (ii.) structural capital and (iii.) organizational capital, as the three basic classifications [3].

[2]There are obviously many other definitions of intangibles found in the literature. Harrison and Sullivan [136] describes "intellectual Capital", their alternate terminology for intangibles, as "...knowledge that can be converted into profit", which is a similar construct as by Lev [169]. Edvinsson and Malone [94], both pioneers in the area of intangibles and intellectual capital argues that, "intangible asset are those have no physical existence but are still of value to the company." For Bontis et al. [35] "intellectual capital is quite simply the collection of intangible resources and their flows."

[3]Edvinsson & Malone [94] and Bontis et al. [35] have used just two classification which are human and structural in their papers. Canibano et al. [51] proposed in addition of human and structural, a new type of intangible called "relational capital" in their paper.

In many empirical literature with a focus on intangibles, RND becomes the sole measure [174, 56, 175, 172]. Some have tried to include additional classifications as well such as — advertising, IT, human resources, brands, etc. [126, 127] [4].

Intangibles are not a monopoly of the microeconomics — there are many things that can be considered to be an intangible yet they are available macro-economically to all firms operating in a legal or regulatory confines of a geography. Theses intangibles are (i.) rule-of-law, (ii.) demographics, (iii.) property rights, (iv.) clarity and strict implementation of legal and regulatory framework [112]. Therefore, uncertainties associated with these factors are also a cause of concern both for insiders, investors and researchers who deal with intangibles.

2.2 Disclosures

Intangibles is of great interest to both management scientists and financial economists. As evidenced in the previous section there is still very less convergence on the definition of intangibles let alone its classifications. This creates a unique problem for the accountants, vis–à–vis reporting on intangibles. Reporting is necessary not only to meet regulatory requirements set of the Securities and Exchange Commission (SEC) in a prescribed format of Financial Accounting Standards Board (FASB), but also to inform and communicate with investors who would want to invest or have already invested in the firm's projects and endeavors. This communication with investors is of great importance to management scientists and financial economists as the level of confidence investors show in the managements determine the cost of capital of the firm, the economic viability of the project and the expected returns of the investors. In this section the theoretical and empirical literature on disclosure theory is presented with a special emphasis on intangibles.

2.2.1 Voluntary Disclosure

The main problem with accounting for intangibles is that most of it is voluntary in nature. The theoretical foundation of voluntary disclosures was laid by Grossman [124] that drew heavily from information economics theory

[4] There are many more classifications and reporting models on intangibles. For a detailed literature review please see Canibano et al. [50] and Kaufmann & Schneider [156].

proposed by Spence [229] and Akerlof [4]. According to him a monopolist, who in the case of a firm are the insiders (management), would not like to give misleading information especially when the information is *ex-post* verifiable. Milgrom [188][5] concluded in his paper that if the news is good, then the stockholders will purchase more stock, driving the price up, and *vice-versa*. Taking this relationship forward Milgrom and Roberts [187] discussed the incentives of the insiders in divulging information. Verrecchia [243] argues in his paper that in a disclosure equilibrium expectation of the market should be be marginally below the incentive of the insiders to disclose. The threshold level of disclosure increases as the proprietary cost of withholding information increases to a level where it becomes unprofitable to withhold. Wagenhofer [246] offered that in a market with competing interests, there could always be a full-disclosure equilibrium but there could never be a non-disclosure equilibrium. One of the assumptions that researchers make when conducting research on voluntary disclosure is that, information that is disseminated will be understood by the capital markets as it is intended by the insiders. Fishman and Hagerty [108] concluded from their theoretical paper that mandatory disclosures will be essential only when disclosed information is relatively difficult to understand — this observation is most pertinent when it comes to intangibles[6]. Furthermore, they modeled a situation in which not everyone understands the disclosed information. In this situation, they concluded that mandatory disclosure will only benefit informed investors, will be neutral for uninformed investor and the insiders will be real "losers" in this situation. Is this the real reason for the dearth of voluntary disclosures or is that disclosed information is misunderstood? This is one thread of literature that this study wishes to address.

2.2.2 Information Asymmetry

Intangibles provide some of the most unique challenges in understanding the information environment of firms that invest heavily in assets that are difficult to visualize, measure, report or value. Diamond & Verrecchia [86] established the link between information asymmetry and the cost of capital. That means it costs money to be uninformed. Not only for investors, but

[5] According to Milgrom [188] financial accounting is concerned with providing information to its stakeholders.

[6] This also one of the reason why there are researchers who argue in favor of more mandated disclosures when it comes to intangibles [176].

also for the firm, as the cost of raising fresh capital increases with asymmetry of information. Kim and Verrecchia [157] went so far as to claim that even disclosure of financial information such as earnings could be a cause of information asymmetry[7]. Barry and Brown [19] explored a model of market equilibrium with differential information. They found that during listing period, when there is high differential information persistent in the market, information asymmetry is related to size. Additionally, they found from the market data of NYSE, that security returns for period 1931-1980 perceived risk of low information security is higher than the perceived risk of high information securities. Therefore, investors would require higher returns to hold that risk thus the abnormal returns of the low information securities could be explained. In their next paper, Barry and Brown [20] modeled the differential information and tried to explain that amount information differs across securities, which shows that this differential information produces differences in the degree of estimation risk. Furthermore, they show that estimation risk can have effect on the various observable attributes of market equilibrium when there is a variance in the degree of information asymmetry. This variance in information asymmetry risk could have an impact on the cost of capital for the firm[8]. Easley and O'Hara [92] developed a model that shows that both private and public information have an impact on the asset returns of a firm — but more on that later in section 2.5.

2.2.3 Empirical Evidence on Structural Intangibles

There is a large and continuously growing empirical research body when it comes to intangibles. This is fueled mainly because of the various measurement and reporting challenges. RND is the most important and interesting variable when it comes to empirical financial accounting literature and it has been studied by Accountants and Economists. The relationship between the investments in RND and its impact on stock prices is a key insight [119, 142]. Tobin's Q is found to be an important explanatory variable for asset market value and RND investment in papers by Ben-Zion [25, 26] and Dukes et al. [87]. Other studies with Tobin's Q as a variable highlighting intangible-

[7]Kim and Verrecchia [157] argued that institutional investors have advanced analysis technology and therefore they could decipher implied meanings by using advanced analytical techniques, thus increasing the information asymmetry in the market.

[8]More results on the cross section of information risk estimates are found in Clarkson, Guedes and Thompson [66].

intensiveness in various industries are by Griliches [122], Hirschey & Weygandt [143], Cockburn & Griliches [71] and Hall [131]. They all found significant relationships between Tobin's Q and RND investments/expenditures.

Some researchers have analyzed market-to-book ratio with RND investments in cross-sectional model, such as Sougiannis [227] and Lev and Sougiannis [174, 175]. Time series analysis are frequently used to compensate the shortcomings of cross-sectional models. Some of the studies with time series models are Megna & Mueller [185], Lev & Zarowin [176] and Ballester, Garcia-Ayuso & Livnat [16]. All these studies found RND investments are associated with market value. As for the shortcomings of the existing studies on RND, Canibano et al. [50] noted that most empirical studies "do not consider the existence of alternative intangible factors explaining market value and returns with respect to which RND intensity may have little incremental explanatory power."

In an Initial Public Offering (IPO) scenario, Guo, Lev and Zhou [130] documented that intellectual property and technology are the most important data points for Bio-technology firms. Therefore, it debunked the "conventional wisdom" that IPOs are influenced by the reputation of the underwriting or the venture capital firm involved in the IPO. In another study by Guo, Lev and Zhou [129] they created a disclosure index based on product related information such as — (i.) product development stage, (ii.) patent protection, (iii.) venture capital backup and (iv.) ownership stake retained by pre-IPO founders. Their findings show this information is of value to the investors. The information asymmetry variables included the liquidity measure of bid-ask spreads, quoted depth and return volatility.

Some researchers have argued that the mandatory expensing of RND expenditures gives rise to mispricing of the stocks [176]. Boone and Raman [37] have provided evidence that immediate expensing of RND expenditure is causing a liquidity challenge for the firms in the market and therefore additional information about the RND activities might be useful. They hypothesized that with the increase in value of intangibles in the firm's valuation, there is a decrease in liquidity, a result of increased information asymmetry. This decrease in liquidity is because of higher transaction cost to the investors and this results in higher cost of capital to the firm[9].

[9] This conclusion has been challenged by Ronen [211]. He argued that empirical association between accounting numbers and market value cannot be a basis for accounting policy change. Also see response by Boone and Raman [36].

Researching the information environment around firms that invest in RND, Aboody and Lev [2] found that insiders take advantage of asymmetric information between them and the investors by participating in insider trading. The evidence provided by the study suggests that insiders are able to gain by trading on the information available to them before it becomes public information. The investor reaction to the information of insider trading is also significantly stronger for firms that invests in RND than those who do not.

Francis and Schipper [110] outlined the different interpretations of "value relevance" in their paper. According to them, there are four interpretations of value relevance — (i.) financial statement information such as earnings, profitability leading stock prices, by capturing intrinsic market value [197, 198, 135], (ii) financial information is value relevant by the ability of earnings to predict future dividends, future cash flows, future earnings, or future book values, (iii) implies value relevance if the "news" changes stock prices because it causes investors to revise their expectations, and (iv) financial information is value relevant if it can predict asset returns, particularly over a long window of time. From their empirical analysis, the study finds that the value relevance as explained by the R^2 of earnings has been on a decline both for high-technology firms (identified by their spending on RND, computers, pharmaceuticals, telecommunications, etc.) and for low-technology firms (grocery stores, wood and paper products, and railroads) taken alone and combined. However, they did not find any significant reduction in the explanatory power of book value of assets and liabilities (alone of combined). Lev and Sougiannis [174] also explored the value relevance of RND capitalization to address the reliability and objectivity concerns of accounting framework setting policy. They concluded that "RND capital is reliably associated with subsequent stock returns" which was a concern for the Financial Accounting Standards Board (FASB) to allow capitalization of RND expenditures.

With a large sample data, a study by Lev, Sarath, and Sougiannis [172] hypothesized profitability bias[10] for the firms that invests in RND. Their results found evidence of profitability bias. This bias creates a systematic mispricing of the securities which is disadvantageous to firms that are conservative in their reporting policies in accordance with Generally Accepted

[10]Profitability bias is the difference in the reported profitability when RND is capitalized vs. expensed.

Accounting Principles (GAAP).

When it comes to comparing mean-variance asset returns model based on RND portfolios, a study by Chan, Lakonishok and Sougiannis [56] did not find any evidence of an association between RND spending and future stock returns from their dataset. Their study basically reaffirmed the consensus within the financial economist community that capital markets are more or less efficient and they do value the unbiased expectations of the investors about the RND spending. This results did show some association between market volatility with the RND spending that is after controlling for size, age and industry effects which might be a cost to the investors that can be explained by the lack of relevant information. Also, their evidence shows that firm that spends on RND, enjoy excess returns during the post portfolio formation.

The study by Chambers, Jennings and Thompson [55] explored the relationship between RND intensity and excess returns further from where Chan, Lakonishok and Sougiannis [56] left, and provided some additional evidence that there is indeed a relation between RND and stock returns, especially when RND intensity is measured by the ratio of unrecorded RND assets to market value of equity.

As evidenced from the above mentioned studies, RND as a measure of intangibles have been researched from various perspectives. Some studies have gone forward to include other variables or factors to study intangibles, such as Amir and Lev [8]. They studied the cellular companies because of their unique business model. The evidence from their study of the industry suggests that the financial disclosures were "inadequate". However, they agreed that the industry is aware of the inadequacies of the GAAP and the investors do not just rely on the financial information from accounting figures but also on the non-financial information (non-accounting and textual) that the company provides voluntarily[11].

2.2.4 Measuring Disclosures

In the 1990s, a lot of research in voluntary disclosure was possible because of the availability of standardized reports that measured the quality of voluntary disclosures. In 1993 Lang and Lundholm [163] studied the analyst

[11]Similarly RND has been modeled using many other perspectives. Sougiannis [227] argued in favor of increase in profitability, Deng and Lev [84] found "In-process" RND have significant associations with future cash flows.

published evaluations of a firm's disclosure policies and practices. They provide evidence from a cross-sectional analysis that the analyst given ratings increases with size, firm performance as measured by earnings and returns. There is a decreases in correlation between earnings and returns and again higher for firms that issue equity in the current or future periods. Following that, Lang and Lundholm [164] in their 1996 paper studied the disclosure practices, this time using analyst-following of the firms, using earning forecast produced by the analysts. Their sample included the disclosure ranking database created by Report of the Financial Analysts Federation Corporate Information Committee (FAF Report 1985-89) which is the predecessor of Association of Investment Management Research (AIMR) report. They concluded that "firms with more informative disclosure policies have a larger analyst following, more accurate analyst earnings forecasts, less dispersion among individual analyst forecasts and less volatility in forecast revision".

Botosan [38] in her study of disclosures using AIMR rankings found that firms with low analyst following have higher level of disclosures, and that has an association with lower cost of capital. She claimed that her results are consistent even though the research duration is just for one year. Her argument is that firms don't change their disclosure policy every year.

Sengupta [218] again using the AIMR ranking of disclosures, which was then published by Corporate Information Committee Report (CICR) found that firms with high disclosure quality has a lower cost of debt. This finding is in line with the findings of Botosan [38]. In the decade after 2000s, the standardized AIMR report stopped and therefore affected the research quantity into voluntary disclosures.

Nevertheless, many researchers have come up with their own measures of qualitative assessment of voluntary disclosures. Francis, Nanda and Olsson [109] created a self-coded disclosure index and found that firms with good earnings quality have better voluntary disclosure regime than firms with poor earnings quality. Shalev [219] also created a different disclosure quality index that is specific for the business combination scenario, and used a construction of a numerical disclosure score deflated by 'relevant' disclosures. He found that the disclosure level in business combinations decreases with abnormal levels of the purchase price allocated to goodwill.

2.2.5 Other Information Sources

The disclosure literature have been going through a *Renaissance* of its own as researchers are finding new sources of information to model the information environment. Take for example the study by Antweiler and Frank [10]. In this paper they studied the effect of about 1.5 million messages posted on the Yahoo! Finance[12] and Raging Bull website for 45 firms from the Dow Jones Industrial Average and the Dow Jones Internet Index. They used computational linguistics methods to measure bullishness. Their findings show that stock messages help predict market volatility. The effect on stock returns is statistically significant but economically small.

Tetlock [236] on the other hand explored the interaction between the news and the stock market using the daily content of the Wall Street Journal columns. He finds that high media pessimism predicts downward pressure on market prices followed by a reversion to fundamentals, and unusually high or low pessimism predicts high trading volume. These and similar results are consistent with theoretical models of noise and liquidity traders. However, they are inconsistent with theories of media content as a proxy for new information about fundamental asset values, as a proxy for market volatility, or as a sideshow with no relationship to asset markets.

Furthermore, Tetlock, Saar-Tsechansky and Macskassy [235] examine whether a simple quantitative measure of language can be used to predict individual firm's accounting earnings and stock returns. Their three main findings are — (i.) the fraction of negative words in firm-specific news stories forecasts low firm earnings, (ii.) firm's stock prices briefly under react to the information embedded in negative words, and (iii.) the earnings and return predictability from negative words is largest for the stories that focus on fundamentals. Together these findings suggest that linguistic media content captures otherwise hard-to-quantify aspects of new information in them, which investors quickly incorporate in the stock prices.

2.3 Financial Analysts

Financial analysts play a very keen role in measuring, evaluating and explaining intangibles. For e.g. Barth, Kasznik and McNichols [21] found in their study that analysts have a greater incentive to follow firms who have a larger

[12] See www.finance.yahoo.com

share of investment in intangibles that includes RND. They found that firms with sales higher than $1 million (eliminating financial and utilities firms) have an increase in following by analysts as the size of the firm increases, its investment in RND and advertising increases, because they are perceived to be mis-priced. Therefore in this section the literature relating to analysts is presented.

2.3.1 Analyst-Following: The Theory

Sell side analysts play a key role of information intermediary in the market and it has been evaluated with some caution and care in the theoretical literature. Beyer et al. [27] notes that these analysts are very informative to the market. Sell side analysts face very little regulation and they have interest in moving "strategically" in the market. Information can not only be expropriated from the analyst forecasts and recommendation, but also from the following of a firm, timing of a forecast or recommendation, etc.

Analysts are very conscious of their reputation in the market and they like to be as accurate they can be in their earning forecasts [240]. Graham [120] predicted that if analysts are unsure of the accuracy of their forecast they are very likely to herd. Beyer and Guttman [28] find that analysts are more likely to produce "optimistic" forecasts in the event of greater private information. They are also likely to increase trading volume. Fuller and Jensen [113] shed light into the possibility of forming a nexus between managers and analysts where both start "colluding" to provide management forecasts. The stock prices are then driven by the forecast rather than the performance or the strategy of the firm.

2.3.2 Analyst Empiricism

There is also a huge body of empirical literature concerning analysts, — their motivations, incentives in following a firm, etc. In a seminal empirical study Bhushan [30] found that most of his indicators with respect to a firm's characteristics are related to some degree with analyst following. However, the study did not focus on the causality of relationship.

Hong and Kubik [147] studied the career concerns of analysts and the accuracy of their forecasts. They found that the accuracy of their forecasts is indeed important and they are rewarded for it. Further on, controlling for accuracy they found that analysts who are optimistic more likely enjoy favorable job separation. However, for analysts whose brokerage houses have the securities they follow as underwriting clients are less likely to be judged on the accuracy of their forecast.

O'Brian, McNichols and Lin [194] find that investment banking ties with clients does have an impact on the way analysts report on good news and bad news. They find that banking ties make analysts reluctant to report on bad news whereas good news is reported swiftly [13].

2.3.3 Management Forecast

The study of analysts cannot be complete without a look into Management Forecasts — the ritual forecasts given out by insiders to the market. There are many competing theories about why management indulge in the giving out forecasts, when they don't have to do it legally[14]. Hirst, Koonce and Venkataraman [144] provide a framework to evaluate the management forecasts from the perspectives of researchers, managers, investors and regulators. They conclude that management forecast characteristics are less understood, both in terms of theory and empirical research. They state that prior literature ignores the iterative nature of management earnings forecast[15].

Hutton, Miller and Skinner [149] studied the decision to supplement management forecast earnings. They classify supplements as qualitative "soft talk" and/or verifiable forward looking statements. They found that managers provide "soft talk" disclosure with equal frequency for good and bad news but are more likely to provide verifiable forward looking statements only when they forecast good news.

Baginski, Hassell and Kimbrough [15] found in their study of manager's explanations of earnings forecast for their sample size of 951 management forecasts from the year 1993-1996, that such attributions are more likely for larger firms. Less likely for firms in regulated industries and forecast issued over long horizons.

Many researchers have speculated that insiders are more eager to give out "good news" and withhold "bad news"[16]. This hypothesis has been tested by

[13]For more empiricism on analysts please see literature review paper by Beyer et al. [27].

[14]A nexus between management and analysts is the most common argument on the subject [113].

[15]See paper for more details [144].

[16]See Milgrom [188].

Wasley and Wu [248]. They found that management issues cash flow forecast to signal good news to meet investor demand for cash flow information and to pre-commit earnings in terms of cash flow, rather than accruals thereby reducing the chances of earnings management. Their results also indicate that cash flow disclosures are made to negate the impact on the earnings if there is bad news associated with it, to lend credibility to good news in earnings and to enhance credibility should the firm be young. Rogers and Van Buskirk [209] found that managers selectively disclose good news by removing the effect of the contemporaneous earnings news.

The method of providing management forecasts have also been sufficiently explored. Bowen, Davis and Matsumoto [40] found that conference calls increase the ability of the analysts to forecast earnings accurately confirming that the information environment improves with it and reduces the forecast dispersion among analysts. However, during the time period of the study, conference calls were available only to a few analysts, therefore, it could create an information asymmetry between informed and uninformed investors.

Bushee, Matsumoto and Miller [46] explored "open" conference calls that are open to everyone rather than for select few analysts. They found that the decision to make conference calls free and open depends on the investor base and the complexity of the financial statements. They also found that for firms with open conference calls there is an increase in the number of small trades and higher price volatility during the call period.

Brown, Hillegeist and Lo [44] found that cross sectional and time series tests shows that information asymmetry is negatively related to conference calls. They also found that firms that have regular conference calls enjoy a lower cost of capital. Kimbrough [158] found that conference calls are related to reduction in the analyst forecast error.

2.4 Cross-Section of Risk-Adjusted Returns

Present value theory has its origins in the most important work of the noted economist Irving Fisher. In the chapter IV. of his book "The Theory of Interest" Fisher lays down the key assumptions behind the "Second Approximation to the Theory of Interest", which are — (i.) income streams are modifiable by loans, (ii.) by other means (i.e. the choice of investment), and (iii.) there is perfect foresight [107]. Therefore, the core argument of Fisher [107] is:

> *"In consequence of such a range of choice, any given productive instrument, or any given set of productive instruments, including human beings, may produce any one of many different income streams"* (Fisher, 1930, Ch. iv., pp. 127.)

In measuring, reporting, defining and categorizing conundrums one can be forgiven for overlooking the fact that — intangibles including human capital are all but a "choice" of inputs, generating "many different income streams", one of many available to the investors to put their money in, once they decide to forgo their immediate consumption[17]. The "risks" associated with intangibles stem from three basic sources — (i.) known-knowns, (ii.) known-unknowns, and (iii.) unknown-unknowns[18]. Known-knowns are the risks investors take on with the assumption of perfect foresight and no information asymmetry. The known-unknowns refers to the risks of information asymmetry, where the insiders know something but the outsiders, who are mostly investors but could be other stakeholders, don't have all the necessary information about their prospect or performance of their investment. Unknown-unknowns is the systematic risk unknown to the insiders as well as the outsiders.

The risks with intangible-intensive firms or assets are more complex than other firms who are in the business of brick-and-mortar. It is because, with intangibles the production function is much more complex with additional variables involved making the outcome uncertain. Obviously there are risks in any investment, but an investor is assured when he sees that a Steel company is meting rocks to forge steel. It becomes a bit difficult to overstate how ridiculous it might look to a risk-averse investor investing in a pharmaceuticals firm when the outcome of all the research investments are absolutely uncertain from the point get go. With that in mind, the following sub-sections presents the theoretical and empirical development of the mean-variance asset pricing literature in some detail.

[17]See [82, 11, 12]

[18]The original idea of "unknown-unknowns" is attributed to a press statement made by Donald Rumsfeld, Ex-United States Secretary of Defense in February 2002.

2.4.1 Asset Pricing Theories

The foundation of classical financial economics was laid using the theory of capital asset pricing model (CAPM)[19] by three important researchers with three distinctly seminal papers, they are — Sharpe [221], Lintner [179] and Mossin [192][20]. They argued that all idiosyncratic risks[21] can be diversified away, and investors must focus on the systematic risk [22]. The measure of systematic risk they proposed was the returns on the market index whose empirical underpinnings was criticized by Roll [210].

Mayers [183, 184] expanded the dimension of the CAPM by including the non-tradable assets, which the Sharpe-Lintner-Mossin model ignored as they derived their models using only perfectly tradable assets.

Merton [186] contributed significantly to the field by developing the intertemporal capital asset pricing model (ICAPM) by challenging the assumptions made for a single-period model. He argued that there are transaction costs and the market is indeed not frictionless. Therefore the perfect substitutions of a liquid asset over time as assumed by the Sharpe-Lintner-Mossin model is not feasible in real time. He introduced a transformed CAPM model with wealth and a state.

Breeden [41] expanded the theory by deriving an asset pricing model with marginal utility of consumption [23].

2.4.2 Arbitrage Pricing Theory

Ross [212] introduced the idea that there could be many factors — macroeconomic and microeconomic, that could explain the cross-section of asset prices in a linear model. Connor and Korajczyk [74] contributed to the development of the econometric tests in time series and cross section with different factors

[19] Adapting the ideas of portfolio diversification from 1952 Markowitz paper [182] and discount rates from 1958 Modigliani & Miller [191] paper.

[20] Also see Treynor's unpublished manuscript [239] on his version of CAPM that predates both Sharpe and Lintner.

[21] Merriam dictionary describes idiosyncrasy "a peculiarity of physical or mental constitution or temperament". Therefore, the whole of financial literature is based on the assumption that "peculiarity" of a individual asset in terms of "choice" of income stream is unimportant to investors.

[22] Also known as the one-factor model, returns on market portfolio being the only explanatory variable used as the single factor. There is also very little agreement about what constitutes a "systematic risk" [118].

[23] See Cochrane [70] for more details.

returns. Fama and French [101, 102] extended the literature by providing the insight that accounting based factor on size and book-to-market ratio can explain the cross-section of asset prices.

2.4.3 Empirical Evidence

The empirical kinks in the classical capital asset pricing model started appearing as early as 1968 with the Fama and Babiak paper [97][24] wherein they found that dividends and earnings have a good predictive power of the stock returns. This was completely contrary to what proponents of CAPM had predicted. This empirical evidence was further advanced by Basu [22] who found that price-earnings ratio was able to predict returns better than the single-factor market portfolio. Banz [17] found that size of the asset or portfolio can also explain risk-adjusted returns. Bhandari [29] found that the common stock returns are related to the ratio of debt to equity (where debt is defined by non-common equity liabilities), controlling for beta and firm size.

Fama & French [101] in their seminal empirical paper found a decreasing relationship of returns with size and book-to-market ratio. They then proposed a three factor model created using portfolios of firms that could mimic the risk factors such as size and book-to-market ratio, they called them Small-Minus-Big (SMB) and High-Minus-Low (HML) portfolios in addition to the market portfolio mimicking the systematic risk. Carhart [52] added to that model by including a momentum factor that could mimic the short term variations in expected stock returns.

Several studies have been conducted to explore how factors based on intangible assets can explain the risk-adjusted expected stock returns. Key among them are by Lev & Sougiannis [175] and Chan, Lakonishok & Sougiannis[56] where they used RND expenditure to explain the cross-section of stock returns to various degrees of success.

2.5 Cost of Capital

Advancing the capital asset pricing model Easley and O'Hara [92] introduced the role of public and private information in determining a firms cost of capital. In their model the expected returns of the assets is the measure of a

[24] See follow-up papers on dividends [32, 98, 49, 189].

firms cost of capital because for a firm with greater information asymmetry, investors would demand higher returns. Easley and O'Hara [92] argued that for a firm with greater amount of private information, investors would demand higher returns because informed investors would benefit when new information arrives and it will be the loss of the uninformed investor as well as the liquidity trader.

Hughes et al. [148] clarified that it is in fact the liquidity traders who will be the ultimate loser when new information arrive in the market and even the uninformed investor has information advantage over liquidity trader. Nevertheless the cost of the capital depends on information asymmetry in the market. Since intangibles and human capital are idiosyncratic, they are a major source of information asymmetries prevailing in the market.

2.6 Market Microstructures

As discussed briefly in the previous sections (2.2.3) bid-ask spread is used as a legitimate measure of information asymmetry between firms and the investors in the stock market. Amihud et al. [7] noted in their book that liquidity is the "ease of trading a security". Therefore, liquidity is inversely proportional to bid-ask spread. The also identify that there are three main causes for illiquidity, which are — (i.) exogenous transaction cost, (ii.) inventory risk, and (iii.) search friction.

Copeland and Galai [76] noted that the profit of the market makers are tied to the difference in the bid-ask spread that maximized his transaction with the liquidity and information traders. With liquidity trader a market maker is expected to make money, whereas with an informed trader he is expected to lose money. Therefore, the market maker sets the bid and the ask price as such that he covers the risk of losing money to an informed trader whereas encourages a liquidity trader to make a speculative trade. Glosten and Milgrom [116] found that informed trader leads to positive bid-ask spread [25].

Therefore, this bid-ask spread has a ubiquitous role in the information environment of a firm. The liquidity measure is commonly used as a measure of information asymmetry.

[25] See literature review on market micro-structures by Easley and O'Hara [91].

2.7 Organizational Capital

Organizational capital is a special type of intangible that tries to explain almost everything that has not been explained by other measures. According to Prescott and Visscher [205] "information" is the most significant organizational capital. Hall [133, 132] in his papers treats what he describes as an "e-capital", a form of organizational capital, produced by the productivity, and achieved by the college educated and non-college educated human resources. Whereas, Black & Lynch [33] argued that a firm's training schedules, work design and employee voice could be the factors that produces organizational capital.

Spender [230] has argued that organizational capital is a "social good" available to firms in the form of a "soft capital that is allocated by its managers".

Carlin et al. [53] have argued that a firm's organizational capital can be explained by its "intrafirm communications". They theoretically show that "richer internal language have lower employee turnover." According to Atkeson & Kehoe [14] organizational capital is a "plant-specific capital good" and a result of its endogenous operations over the years that builds up plant specific "knowledge", that is measurable and transferable and from which the owners extract rents in the future once an investment has been made in the past.

Other views on organizational capital are as a result of a firm's idiosyncratic human capital [117] and/or as a result of its intellectual capital [154].

According to van Rens [242] organizational capital is a simple matter of fluctuating labor cost management. Last but not least, Lev and Radhakrishnan [171] have advocated in favor of treating the accounting measure of selling, general and administrative (SGA) expenses as a measure of organizational capital. This view is further explored by Papanikolaou & Eisfeldt [201] but they argued that the organizational capital is "embodied in the firm's key employees."

2.8 Human Capital

There has been a widespread consensus among academics from various fields that human capital is very critical to the success of firms. In the literature concerning management sciences, human capital have been repeatedly identified as the one of the key intangibles [35, 50, 94, 126, 169]. There is also a whole range of literature that is based on executive compensation.

Cheng [62] studied the role of the compensation committee in setting compensation structure for CEOs in order to provide them with incentive to invest in RND. The study hypothesized that in only two situations a CEO has an incentive to reduce investments in RND, (i) "when the CEO is approaching retirement", and (ii) "when the firm faces a small earning decline or a small loss." Both of these hypotheses have been proven to be "consistent" as the compensation structures have been found to be significantly changed in only these two situations.

Furthermore, Cheng and Lo [61] found in their study that managers successfully time the "bad news" forecast for the firms to reduce the market price of the firm when they decide to purchase shares. This phenomenon is most prevalent for the CEOs than for any other executives although they do keep litigation risk related to insider trading in mind. Obviously executives are not the only ones who work in a firm, but still can be considered to be human capital.

One of the main reason why there is not much research in the microeconomic field of human capital is because of lack of disclosed data. One variable that is found in the United States is the SGA that includes the salaries of directors, employees and various other services that a firm avail of various agencies. This variable has been used to model organizational capital in the past [171, 201], but it can be argued that this variable can be better served as a measure of human capital.

At the macro-economic[26] level some advances have been made to address the subject. Among others, Mincer [190], Schultz [215], Becker [23], and Williams [251] are some of the most prominent early adopters of the concept and offer their perspectives.

The human capital plays a critical role in the firm's valuation, however, the risk-adjusted expected stock returns are still relatively unexplored. Jagannathan and Wang [150] developed a conditional CAPM model that included human capital in order to explain risk-adjusted expected stock returns where the risk-loading can vary over time.

Similarly, Palacios-Huerta [199] paper evaluates the extent of which the international diversification puzzle can be explained when human capital is

[26]Notable advances was made at the micro-economic (accounting) level as well, see Lev & Schwartz [173].

considered part of the wealth of nations. The analysis examines whether (i) the inclusion of human capital in the wealth of portfolio of individuals, (ii) the different human capital assets held by stockholders and non-stockholders, and (iii) frictions in human capital markets, can help explain the puzzle. The methodology consists of comparing Hansen – Jagannathan bounds on the stochastic discount factor (IMRS) implied by human capital and financial returns across different countries. The results suggest that the information contained in the human capital of stockholders can greatly contribute towards explaining the international diversification puzzle.

Next, Palacios-Huerta [200] performed an empirical evaluation of the conditional CAPM with human capital to explain the cross section of variability of security returns. It develops human capital returns based on educational investments, skill premium, worker experience and other relevant features. They find that some of the measures definitely improve the performance of the model. They got their human capital data from Current Population Surveys for the period 1964-1990.

Eiling [95] uses the Aggregate Labor Income Growth as a measure of human capital albeit industry specified. The main results of the paper show that the heterogeneity of the human capital as captured by the paper affects the cross-section of stock returns. The paper uses Size-BE/ME and Size-beta to make portfolios dependent variable returns. The human capital is calculated for the following industries: goods producing, manufacturing, distribution, services, and government. The findings of the models show that the human capital CAPM estimates are a poor predictor of the cross section of stock returns, unlike the findings of Jagannathan and Wang (1996)[27].

2.9 Summary

The literature on intangibles is plenty and from various perspectives and still the risks associated with them are not clearly understood. It is a complex subject and therefore it requires careful analysis. What is evidently clear from the existing literature is that management researchers are convinced that intangibles benefit firms. Although they have not been able to pin down how firms are benefiting from their set of intangibles. On the other hand, financial economists who study market and accounting, are still skeptical of these assumed benefits from intangibles. They are indeed working toward

[27] Also see Campbell [48] and Lettau & Ludvigson [166].

more evidence and clarity about how each type of intangible helps a firm, investor or a general stakeholder.

The irony with the study of intangibles is that there is a void of variables in the jungle of data that can explain its economic impact. Even when there are variables there is little consensus amongst researchers about the economic story it can tell. Therefore, in this study various aspects of intangibles will be investigated independently from each other to find out how they relate to the exogenous macroeconomic and endogenous microeconomic risk-return structure of the firms, the information environment and the cost of capital.

Chapter 3

Non-Financial Disclosures and Cost of Capital

3.1 Introduction

In this chapter[1] the numerated non-financial and textual disclosures of largest intangibles-intensive firms from the Pharmaceutical, Biotechnology and Life Sciences industry are modeled to find out if expected returns, which is a measure of cost of capital, can be explained. Large firms in the intangibles-intensive sectors such as Pharmaceutical, Biotechnology and Life Sciences spend heavily in RND which ties most of their resources in soft assets. In order to compensate for the lack of clarity in the production function these firms are known to provide financial and non-financial voluntary disclosures. In the process of disclosing the firms often give detailed information about their strategy, product pipeline, services, and other forward looking textual information in their annual reports. Arguably this reduces

[1]Previous version of this chapter have appeared in *Indian Accounting Review* with the title "The Relevance of Intangibles Disclosure for Market Risk: An Exploratory Study of US Healthcare and Pharmaceutical Industry", volume 15, issue 1, pages 24 - 41 in 2011. This chapter have been presented at the 10^{th} *International Accounting Conference*, Kolkata, India on 8th Jan 2011; *British Accounting and Finance Association Doctoral Colloquium*, Birmingham, UK on 12th April 2011; and *Mid-Term Conference of Marie Curie Initial Training Network on Risk Management and Risk Reporting*, Deutsche Bundesbank, Berlin, Germany on 5th May 2011. Helpful comments by Prof. Swapan Chowdhuri, Prof. D.V. Ramana, Prof. Andrew Stark, Prof. Elisabeth Dedman and Prof. Martin Walker are gratefully acknowledged. Special thanks to Prof. Bhabatosh Banerjee (ed. IAR) and Dr. Dhrubaranjan Dandapat.

the information asymmetry risk associated with these firms [232].

The study evaluates the annual reports of the twenty-five of the largest Pharmaceutical firms listed in the United States capital markets for the period 2004-2006. The choice of this sector is tangentially based on investments they make in RND, which is a structural investment to drives innovation and creates intangibles and intellectual property (patents, trademarks, chemical compound, etc.). These types of intangible resources and idiosyncratic competencies [18] get largely ignored in financial statements. Studies have in the past highlighted that the relevance of financial information, such as earnings, cash flow and net assets towards the explanation of the market value is on the decline [176]. However, these firms generally make an effort to disclose non-financial information voluntarily. Therefore, there should be importance given to the non-financial text based on the forward looking information in the annual reports with a special emphasis on the Management's Discussion and Analysis (MD&A)[2]. This study extends the literature in the field of non-financial and textual interpretations of the voluntary disclosures provided in the MD&A section which are essentially forward looking.

The objective of this chapter is twofold — (i.) this chapter analyzes the non-financial textual disclosures in the annual reports to create a index of the "data availability" and "quality" of information, and (ii.) to model the numerical representation of the "availability" and "quality" of the disclosures to predict the cross-section of stock returns, which in this model is a measure of its cost of capital [92].

Exploring the field of non-financial and text based information from the annual reports for Pharmaceutical firms listed in the US is complex and delicate matter because of unavailability of standards to numerate the qualitative data. Additionally, the voluntary disclosures are not regulated by the SEC and there are no generally accepted standards available in the information marketplace. It is also important to note that these type of disclosures in the annual reports are not immune to the self-interest of 'insiders' otherwise known as 'management' [243, 88, 246, 233]. Therefore to tackle the incentives problem, firms only in one industry with a large market value are targeted to homogenise this study. This creates an equilibrium in the incentives of the insiders among competing firms and therefore assumed to be a constant to keep the dimensions of the study limited to as-is disclosures. There have been many empirical studies related to disclosure theory from

[2]SEC released an "Interpretation" guidance document on the MD&A in Dec 2003 [217].

the perspective of earnings, cash flow, book value, etc. Most of these studies [168, 227, 174, 8, 37, 56, 55, 130, 172, 84] end up by calling for further disclosures and a better regulatory framework that can ensure more quality in the disclosures, both for financial and non-financial information. This chapter will therefore extend the boundaries of the empirical disclosure research by including the non-financial and text based disclosure that plays a role in the information environment and potentially could have an impact on the cross-section of expected stock returns, which is a measure of its cost of capital.

The evidence from this chapter shows that non-financial textual disclosures on the whole does not have any explanatory power, in two separate models — (i.) one where the evidence of information is used as an indicator, and (ii.) second where the quality of information is estimated using a counting process based on the number of sentences devoted to a piece of information[3]. However, when the disclosures are divided into sub-groups of indicators which highlight a particular type of communication that a firm would like to convey, such as, — Strategy, Customer and Market, et al. the results are encouraging. The evidence shows that using the existence of an information model, 'customer and market' information has a statistically significant explanatory power. When the quality of information is used in a model, the forward looking information on 'innovation and IPR' are more relevant in explaining the cross-section of stock returns thereby having an impact on the cost of capital.

This paper is divided into four sections. In the next section (3.2) the background literature is presented. Section 3.3 presents the empirical foundation of the analysis along with the model estimate results. The section following that (3.4) discusses the literature and interprets the results, and the final section (3.4) ends with some concluding observations.

3.2 Background

3.2.1 Financial Reporting

The mandatory financial reporting to the Securities and Exchange Commission (SEC) and to the investors by corporations that are listed in the United States stock exchanges are basically made up of annual reports (10-K form)

[3]For a review of the content analysis process please see Krippendorff [159].

and quarterly filings (10-Q form)[4]. In these filings the firms give a brief performance review in the previous financial year or quarter. There are two main types of information a large corporation gives in these filings — (i.) financial and (ii.) non-financial disclosures. For the most part financial disclosures such as balance sheet, income statement, etc. are mandatory. There are also many instances of numerical disclosures in the annual reports that are not financial in nature, such as number of employees, number of patents and Intellectual Property Rights (IPR), etc. Then there is the non-financial and non-numerical information such as a discussion on the corporation's future strategy, in case of Pharmaceutical firms — their product pipeline, future prospects, market outlook, industry trends and new developments as the management sees it. All these information is primarily located in the Management Discussion and Analysis (MD&A) section of the annual report. It is obviously not a rule, and there could be exceptions, but large firms tend to give the non-financial and textual explanation of their performance only in their annual reports rather than quarterly filings.

The focus of this chapter is the numerical non-financial and textual voluntary disclosures that firms make in their annual reports. This chapter tries to understand if the forward looking non-financial information have any explanatory power when it comes to future returns, which is a measure of its cost of capital.

3.2.2 Voluntary Disclosure

In the seminal paper of Akerlof [4], he talks about the tension between the insiders (management) who have perfect information and the outsiders who does not, but would like to invest in the firm or make a purchase of a product or a service. The topic under consideration in this chapter is voluntary disclosures of non-financial and textual information made available to the investors by the insiders through their annual reports. Many authors have discussed the incentives [124, 188, 187] of insiders with a special emphasis on voluntary disclosures [5]. The principle incentives of the insiders and the

[4]There are many other types of filings but 10-K and 10-Q are the two main for large corporations.

[5]Beyer et al. [27] have aggregated from various research papers the conditions under which a firm discloses private information voluntarily, they are — (i.) costless disclosures, (ii.) investors know of new information that is available to the firm insiders, (iii.) no difference in the interpretation of new information by insiders and outsiders, (iv.) insiders

outsiders that creates or reduces information asymmetric tension, persists when it comes to voluntary disclosures in any of its forms.

Much of the empirical research regarding voluntary disclosure revolves around the financial disclosures such as earnings forecasts. Therefore, the literature have explored the incentives of the firm insiders in terms of raising equity capital [193], issuing debt [138] or personal gain [1]. However, the research on the non-financial disclosures especially on the textual interpretations of the forward-looking information that firm provides in the MD&A are not sufficiently explored. Even if some researchers such as Clarkson, Kao & Richardson have studied MD&A the focus is generally on the impact on the analysts or value relevance [67, 68].

Here in this study the forward-looking non-financial and textual voluntary disclosures are numerated to find out if the existence of the information or the quality is able to predict stock returns.

3.2.3 Measuring Written Word

Many attempts have been made in order to study non-financial disclosures, some at the industry level and some at personal level. During 1990's Association for Investment Management and Research (AIMR) created an index for measuring disclosure quality and regularly disseminated a report based on its assessments of the disclosures some of the biggest US firms made in their annual reports and other such publications. With the publication of this industry standard report on the quality of voluntary disclosures quickly a flurry of papers emerged in the disclosure literature [164, 38, 218, 138]. With this new measure of voluntary disclosures researchers studied analyst following [38], cost of capital/debt [218], information asymmetry [164] and even stock price performance [138].

After the AIMR reports ceased being published, some researchers have attempted to construct their own disclosure measuring indexes. Francis, Nanda and Olsson [109] used basic historical information about firms and other financial and non-financial information in their index of disclosure quality. Their disclosure index with all its merits does not however accommodate different types of intangibles found normally in the annual reports of an innovative firm. In another study, Shalev [219] created a different disclosure quality index that is specific for the business combination scenario, and it

want to maximize the market equity of the firm, (v.) no permanent disclosure policy.

used a construction of a numerical disclosure score deflated by the 'relevant' disclosures. The weakness of this construction is that it is very situation specific and subject to the judgment of the researcher's perception of 'relevance'.

Zambon and Bergamini [256] created a disclosure index with a focus intangibles-intensive firms that is much more comprehensive in capturing the various aspects of a firm's non-financial and textual nuances. In this model the researchers created a three-dimensional framework based on the following principles:

- nature of information (forecast and actual)
- six communication dimensions — (i.) Strategy, (ii.) Customer and Market, (iii.) Human Resources, (iv.) Innovation and IPR, (v.) Organization, and (vi.) Corporate Governance
- the depth of communication dimensions, minimal, reasonable and extensive information in five level

3.2.4 Intangibles-Intensive Firms

Firms with a heavy investments in RND is a frequent subject of study in the accounting and finance literature. Canibano, Garcia-Ayuso and Sanchez [50] in their review of papers related to the study of intangibles reflected on the various streams of literature that has been explored in the field starting from the economic nature of intangibles and their definitions. Empirically, with RND, the focus of the research agenda has been earnings, profitability and their effect on the stock price. The relationship between the investments in RND and its impact on the stock prices has also been explored [119, 142]. Some researchers have analyzed the market-to-book ratio with RND investments along with cross-sectional data, such as Sougiannis [227] and Lev & Sougiannis [174]. Time series analysis was used to cover the limitation of cross-sectionality, which implies that the probability of success of RND does not differ from industry to industry [185]. All these studies found that RND investments are an important component of the value creation process for the firms. However, for this study the need for the firms in the sample to invest in RND is tangential to the actual objective. The aim of this study is to find out if the forward-looking non-financial and textual voluntary disclosures available in the annual reports of the intangibles-intensive firms such as the ones in the Pharmaceuticals sector have any explanatory power when it comes to the value-weighted returns.

3.2.5 Management's Role

Obviously, insiders have an incentive to both disclose and withhold information in different situations. Incentives that prompt disclosure or withhold help shape the information environment around a firm. Information source such as financial statements are mandated[6], therefore insiders have to provide them to stay compliant. However, for information that are not mandated insiders have full discretion about releasing or withholding. Studies such as by Wasley & Wu [248], Rogers & Van Buskirk [209], Chen, Matsumoto & Rajgopal [60], etc. found that management guidance are to some extent motivated by self-interest of the insiders as theorized by Akerlof [4] and Jensen and Meckling [152].

Technologies have made dissemination of forward looking information, interactions with analysts and discussing past performances by the insiders ever cheaper. Reduction in dissemination costs made information available to a wider audience that helps the overall information environment [234, 40]. However, technology is just an enabler for the insiders, not the cause of the information. Even though management incentive is a key variable in the whole picture of the information environment created by the mandatory disclosures, voluntary disclosures and "cheap talk" [114], it is outside the scope of this chapter. As described in the following sections (3.3) all the firms in this study are from the Pharmaceuticals sector, large and invest heavily in RND. Therefore the incentives of insiders are assumed to be a constant as they are expected to be similar for the purpose of this study.

3.2.6 Cross Section of Returns

The asset pricing models in conjugation with disclosure theory works to study the cost of capital. Cost of capital is indeed a very important aspect of a firm's risk profile. The higher the information asymmetry the greater will be the cost of capital [92]. In the theoretical capital asset pricing model proposed by Sharpe [221], Lintner [179] and Mossin [192] they proposed that the only risk that could impact a fully diversified portfolio stock returns is

[6]Studies on mandatory disclosure are scarce as observed by Dye [89].

the systematic risk, all other risks are indeed diversifiable. Since then much empirical evidence has emerged showing that there are accounting factors such as size [17], earnings [22], debt [29], etc also to explain the cross-sectional asset prices. In 1992-1993 Fama and French [101, 102] in their seminal work found that Size ME and BE/ME ratios are an essential factor in explaining the cross-section of stock returns. In 2004 Easley and O'Hara [92] showed in their paper that information is a very important aspect that is missing from this whole equation.

This raised the interest in the information based asset pricing models, which is nothing but another method to measure the cost of capital of firms. According to Easley and O'Hara[7] investors demand a higher return from the assets that has high information asymmetry. The increased information asymmetry creates more risk and to bear that risk investors need higher returns as a compensation. Similar to Lambert et al. [162] this study uses the asset returns as the measure of its cost of capital and the information from the forward-looking non-financial and textual information from the annual reports are used a predictor.

3.2.7 Summary

In summary, this chapter would like to ask the following questions:

- If the non-financial textual voluntary disclosures can explain the value-weighted returns of the largest firms in the Pharmaceuticals sector?
- Does the quality of the information in any way impact the outcome of the analysis?
- Do the sub-divisions (or the communication types) of the non-financial disclosures have an impact on the returns?

3.3 Empiricism

3.3.1 Data

The dataset used for this chapter is randomly selected Pharmaceutical firms from the Ocean Tomo 300® Patent Index [196]. This is the industry's first

[7]See critique of the Easley and O'Hara predictions in the Hughes et al. paper [148].

index based on the value of the intellectual property, and represents a diversified portfolio of 300 firms that invests a large portion of their yearly book equity in RND (expense). The index is priced and published by NYSE Euronext (NYSE Euronext: OTPAT).

From this portfolio of 300 firms, about 50 are from the Pharmaceutical industry. From this initial portfolio of 50 firm only those that met the following criteria are selected for the study:

- The firm should be listed in a United States Stock Exchange, preferably NYSE or NASDAQ.
- The firm should publish annual reports for a period of three years from 2004 to 2006.
- Daily stock price data of the firm should be available at the Center for Research in Security Prices [78] for the entire period under consideration (2004 to 2006).
- Accounting data of the firm should be available in the Compustat database from Standards and Poor's during the entire period under consideration (2004 to 2006).

From the initial portfolio of OT300 firms that included about 50 Pharmaceutical firms only 25 met all the above criteria for a period of three years.

3.3.2 Methodology

Since the aim of this chapter is to find if the non-financial voluntary disclosures on intangibles-intensive assets have any explanatory power of returns, the scope of this chapter is limited to the US listed Pharmaceutical firms. The annual reports of the Pharmaceutical firms are qualitatively analyzed in order to numerate the disclosures based on the number of sentences conforming to a set of indicators [159] as listed in the Appendix A.1.1 (See Zambon-Bergamini [256]).

Once the indicators are numerated the variables are regressed on a cross-sectional panel data model with returns as dependent variable. The following section provides more information on the variables used in this chapter.

3.3.3 Variables

3.3.3.1 Dependent Variable

In this chapter the variable used as dependent or regressand is the continuously compounded value-weighted annual returns on assets[8].

3.3.3.2 Primary Explanatory Variable — Voluntary Disclosures

Here in this chapter the disclosure scoring model of Zambon and Bergamini is used [256][9]. The Zambon-Bergamini disclosure model has the following specifications — (i.) the nature of information (actual or forecast)[10], (ii.) six communication dimensions: strategy, human resources, customer and markets, innovation and IPR, organization, and corporate governance[11], and (iii.) the level of communication depth: no information, minimum information, reasonable information, and extensive information. For this study the Zambon-Bergamini model is adapted in a two-dimensional way: (a.) the existence of non-financial disclosures on the annual reports, and (b.) quality of the disclosed information.

In order to model the binary variable of "Information Existence" the annual report of a firm in the year $t-1$ is analyzed to find out if information about a certain variable is present or not. If the information is present then the indicator is marked '1' otherwise '0'. This will create a measure of voluntary disclosure called "Information Existence" or $InfoEx_{t-1}$.

$$InfoEx_{t-1} = ln\left[\frac{IndicatorFound}{TotalIndicators}\right]$$

$IndicatorFound$ is the number of non-financial indicators found for the firm i in the year $t-1$

[8] The returns is calculated between the last working day of December in the year $t-1$ and t using the formulation;

$$R_{i,t} = ln\frac{ME_t}{ME_{t-1}}$$

[9] The model was first introduced in 2001-03 within the EU PRISM Research project, and it is the outcome of collaboration between the University of Ferrara and the Italian Association of Financial Analysts (AIAF).

[10] To simplify, the non-financial voluntary variables are not identified as actual or forecast in this chapter.

[11] For the full list of indicators please see Appendix A.1.1.

$TotalIndicator$ is the total number of indicators in the model for the firm i in the year $t-1$

To model the voluntary disclosure quality the indicators are scored by counting the sentences [159] devoted to a particular indicator in an annual report using the following weights — (i.) for no information '0', (2) insufficient information is measured as 1 - 4 sentences, is scored '1', (3) sufficient information is measured by 5 - 10 sentences in the annual report, is scored '2', and (4) sufficient or detailed information in annual report is scored as '3'[12]. This will create a measure of voluntary disclosure called "Information Quality" or $InfoQt_{t-1}$.

$$InfoQt_{t-1} = ln\left[\frac{IndicatorFound}{(TotalIndicators * 3)}\right]$$

3.3.3.3 Other Explanatory Variables

In the regression model there is a combination of four financial control variables, they are — (i.) risk-adjusted market returns, (ii.) size, (iii.) BE/ME ratio and (iv.) RND/BE ratio.

The market return is calculated using a sample of 7,799 firms sample between the year 1975-2011 using monthly returns (for more information see Section 5.4.2.3). The stock return are adjusted for risk using the annualized one-month treasure-bill returns. To check the robustness of the measure of market portfolio the returns is Pearson correlated with annualized S&P. The Pearson correlation is found to be 97.97% and statistically significant with p-value < 0.05.

Size of the assets are calculated by multiplying the stock price with the number of shares outstanding in the December of year t.

$$lnME_t = ln(prc * shrout)_t$$

The BE/ME ratio is calculated by the dividing the book equity in the year $t-1$ by the market equity in the December of year $t-1$. Here the book equity is calculated by adding book value of common equity to the deferred taxes and investment tax credit if available, minus the carrying value of preferred stock.

[12]In the Zambon-Bergamini model five levels of information quality is used, which is reduced to just four in this chapter.

$$(BE/ME)_{t-1} = \frac{BE_{t-1}}{ME_{t-1}}$$

The RND/BE ratio is calculated by dividing the RND spending in the year $t-1$ by the book equity in the year $t-1$.

$$(RND/BE)_{t-1} = \frac{RND_{t-1}}{BE_{t-1}}$$

3.3.4 Model

In this chapter, it is hypothesized that non-financial disclosures have the ability to predict stock returns. Many studies in the asset pricing literature have argued that stock returns are only predictable by the systematic risks [221, 179, 192]. However, over the years evidence has emerged that the capital asset pricing model is in fact misspecified and there are a number of financial factors that can be used to predict stock returns, such as size [17], earnings [22], dividends[32], book-to-market ratio [101], etc. Studies have now started venturing into the other factors which are more qualitative in nature that could have the ability to predict stock returns [235].

Easley and O'Hara [92] have argued in their 2004 paper that "private" and public "information" have an impact on the cost of capital of a firm, where the expected returns on the assets are a measure of its cost of capital. They argue that for the firms with higher private information investors demand higher compensation to cover the risk of know-uncertainty[13]. Voluntary disclosure provides non-financial and descriptive textual private information to the investors. Therefore using the Easley-O'Hara model of information based capital asset pricing model[14], this study models the numerated non-financial textual disclosures to predict the expected stock returns, which, in this set-up is an estimate of the risk compensation of private information otherwise known as cost of capital.

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[13]Known-uncertainty is risk compensation for the information that are privately available with the insiders but unavailable to the investors. Similarly unknown-uncertainties are the risk compensation investors demand for bearing the systematic risk for which even the insiders have no information.

[14]Also see Lambert, Leuz & Verrecchia [162] and Hughes, Liu & Liu [148].

Non-financial and textual voluntary disclosures are given by firms to investors every year in their annual reports. Most of the non-financial disclosures are descriptive in nature which informs the investors about the future in terms of strategy, product pipeline, innovations, etc. Essentially these disclosures serve as a ring side view of what to expect from the firm in the following year. To model these disclosures, the basic assumption here is — more information is better predictor stock returns. Econometric assumptions of the factors developed through numerated non-financial disclosures is that they are distributed independently and identically with mean zero and constant variance $[InfoEx \sim N(0, \sigma^2)]$[15]. This returns model therefore is econometrically represented as follows:

$$E(R_{i,t}) = \alpha + \beta_1(R_m - R_f) + \beta_2 \sum X_{t-1} + \beta_3 \sum Y + \upsilon_i + \varepsilon_{i,t}$$

$E(R_{i,t})$ — is the expected (E being the expectation operator) annual continuously compounded value-weighted asset return for the firm i in the year t

R_m — is the return on the index market

R_f — is the risk-free rate of return

X — are the voluntary disclosure variables of firm i in the year $t-1$ as listed below;

- $InfoEx$ — is the voluntary disclosure factor that represent the total existence of information in the annual report
- $InfoQt$ — is the voluntary disclosure factor that represent the quality of information in the annual report
- $Strategy$ — represents the voluntary disclosure factor of Strategy factor, both information existence and quality measured separately
- $Cust.Mkt$ — represents the voluntary disclosure factor of Customer and Market factor, both information existence and quality measured separately

[15]Other factors are assumed to be of the same distribution.

HR	represents the voluntary disclosure factor of Human Resources factor, both information existence and quality measured separately
$Org.$	represents the voluntary disclosure factor of Organizational factor, both information existence and quality measured separately
$Inv.IPR$	represents the voluntary disclosure factor of Innovation and Intellectual Property Rights (IPR) factor, both information existence and quality measured separately
$Corp.Gov.$	represents the voluntary disclosure factor of Corporate Governance factor, both information existence and quality measured separately

Y are the financial accounting factors as listed below;

$lnME$	is the Size factor calculated of the firm i in the year t
BE/ME	is the book-by-market ratio factor of the firm i in the year $t-1$
RND/BE	is the RND-by-BE ratio factor of the firm i in the year $t-1$

υ is the firm specific estimation error distributed i.i.d $[\upsilon \sim N(0, \sigma_\upsilon^2)]$

ε is the individual and time specific estimation error distributed i.i.d $[\varepsilon \sim N(0, \sigma_\varepsilon^2)]$

3.3.5 Summary Statistics

In the Table 3a the summary statistics of the variables used in this study are tabulated. In the Panel i. the indicators[16] of the voluntary disclosures are presented. The voluntary disclosure data is processed to be numerated in two ways — (i) in the first set, the "existence" of information in the annual report is captured using a binary operator, and (ii.) in the second set, the "quality" of information[17] is identified counting the number of sentences.

[16] See Appendix A.1.1 for the detailed list of indicators under each sub-heading.

[17] See Section 3.3.4 for more details about the variables.

From the Panel i. the "Information Existence" section, it is noted that from the sample firms the average level of voluntary disclosures are found to be above 50% of the prescribed indicators. When the information is sub-divided into sub-groups of indicators it is found that the average firms in the sample gave information on 12% of the strategy indicators and 15% of the customers and market indicators. Rest of the indicators are found to be under 10% levels.

The quality of the information is gauged and numerated based on the number of sentences each firm wrote about an indicator in their annual report[18]. Using that as a measure of "Information Quality", the average of the total voluntary disclosure indicators is found to be 33%. When the variables are sub-divided into various measure of indicators similar to the previous sample, the Strategy and Customer & Market have the most amount of disclosure at 9% and 10% respectively. All other indicators are found to have less than 5% of the proposed indicators.

In the Panel ii. the mean of the accounting and market variables are presented. The average return of the sample firm over a period of three years is found to be 17%. On the other hand, the average return on the market is found to be 1%. Therefore the return of the pharmaceuticals sector is found to quite superior when compared to the average stock market during the same period. The mean BE/ME ratio is found to be 23%. It means that the firms in this sector have book equity of 23% and about 77% of its value are intangibles or forward looking. One of the main reason these sample firms are chosen is because of the investments they make in RND. With a conscious decisions firms invest in creating structural intangibles. The mean RND per BE of the sample firms over a period of three years is found to be 32%. Which means that the firms in the sample spends on an average 32% of their book equity on RND and considering the mean BE of the firms in the sample is $4.13 Billion, that is an enormous investment in creating structural intangibles. These enormous investments in RND are the chief risk for these firms as well as the investors. Therefore, this study tries to find out if the voluntary non-financial disclosures these firms make, have any explanatory power when it comes to the firm's stock returns.

Insert Table 3a — Appendix A.1.4

[18] 1 - 4 sentences is tabulated as '1'. 5 - 10 sentences is tabulated as '2'. More that 10 sentences is is tabulated as '3'. No information is tabulated as '0'. See section 3.3.4 for more information.

3.3.6 Returns Model

In the Table 3b. the Generalized Least Square Random Effect (GLS-RE) estimates are presented of the information based capital asset pricing model where the dependent variable is the annual asset return in the year t. In this table the estimates are divided into two section, (i.) one where the independent variables measure the existence of information about an indicator in the annual reports of a firm in the year $t-1$, and (ii.) the second where the quality of information is numerated in a three level scale counting the number of sentences that are written about the given indicator, again in the year $t-1$.

In the Panel i. of the table which is denoted by "Information Existence," the independent variable $InfoEx$ is the natural log of number of indicator on which information is given in the annual report by the total number of indicators. This indicator measure the existence of various types of information based on the sub-division of the list of indicators. The estimates from the Panel i. Sub-Panel i. show that the variable $InfoEx$ is not found to be statistically significant in the presence of risk-adjusted market variable, a control for the systematic risk (see a.). Additionally, it is not found to be significant in the presence of size as well in the second model (see b.). In this third model, BE/ME ratio is found to be statistically significant at 5% confidence level (p-value < 0.05) (see c.). However, information existence variable is still not found to be an significant explanatory variable of the returns.

The next set of independent variables in Sub-Panel ii. are the categorized sub-division of the voluntary disclosures — (i.) Strategy, (ii.) Customer and Market, (iii.) HR, (iv.) Organization, (v.) Innovation and IPR and (vi.) Corporate Governance[19]. The estimates in this econometric set up show that the information about customer and market is statistically significant at 5% confidence level (p-value < 0.05) (see models d., e. and f.). None of the other variables are found to be statistically significant including the risk-adjusted market variable which is a measure of systematic risk. However, in the model f. BE/ME ratio is again found to be statistically significant at 5% confidence level. The coefficient of determination R^2 for these set of variables have also increased from the previous set of less than 19.6% in the previous setup to 27.2%.

[19]All the variables are the natural log of the number of sub-indicator existence dividend by the total number of indicators variable in each sub-division of indicator.

The next Panel (ii) is where the quality of the information is defined based on the number of sentences devoted to each of the indicators. In the Sub-Panel iii. the independent variable $InfoQt$ is the total figure of the information quality. However, in none of the three models (see models g., h. and i.), estimates listed in the panel the variable is found to be a significant explanation of the returns. When the information quality is further sub-dividend into the sub-indicator groups as listed in the Sub-Panel iv. the information quality of Innovation and IPR is found to be significant explanation at 5% level in models j. and k. Although, in the model l. the estimates of Innovation and IPR is not found to be statistically significant, thus diluting the evidence. The coefficient of determination or the R^2 is also found to be as high as 24% wherein size, BE/ME and RND/BE ratios are used.

Insert Table 3b — Appendix A.1.5

3.3.7 Robustness Check

In this study the voluntary disclosures are numerated based on a qualitative analysis of the annual reports, which requires a lot of subjectivity even with the specification of the method clearly diarized. However, the variables are subsequently transformed into natural logarithms when used for econometric estimation. The estimates are calculated using GLS Fixed Effect and the Ordinary Least Square (OLS)[20] method and no difference is found with the general conclusion of the analysis. Additionally, model assumption of homoscedasticity is checked using White test for heteroscedasticity [250] and the estimates are found to be consistent and robust.

3.4 Discussion

In this chapter an attempt has been made to understand if the non-financial and textual voluntary disclosures are able to predict stock market returns. In 1983 Stoll and Whaley [232] found that small sized portfolios faced exceptionally large transaction cost which is a result of very high information asymmetry. Therefore, the obvious deduction is that, for large firms information asymmetry in the stock markets are indeed less. Over the years this

[20]Estimates not listed in this study but available from the author on request.

evidence has only increased, although there are many who find that traditional financial reporting, which consists mainly of financial information is becoming less informative [176]. If one believes the analysis of Stoll and Whaley [232], can the voluntary non-financial information from the annual reports of largest Pharmaceuticals industry firms explain the asset returns? The sample selection bar is deliberately kept low as Pharmaceuticals firms are known to give out a lot of information about their strategy, product pipeline, etc. information in their annual reports and with large firms the implied assumption here is of low information asymmetry even though some might argue that the industry where RND is the most important and substantial investment, it is inherently less informative [9]. One of key reason to be interested in the information environment of firms is because they help determine the cost of capital of the firms [92, 148].

Voluntary disclosures of firms is a difficult topic to study as there are no set measure of indicators. There are many sets of indicators used in research papers of the past to study voluntary disclosures. Some were industry made standards [164, 38], now obsolete, and some were self-developed [109, 219]. In this study Zambon-Bergamini [256] disclosure model is used with modification to suit the data and later analysis. There are mainly two reason to use this disclosure model — (i.) first it has never been used on US data, and (ii.) second, the indicators are more suited to evaluate intangible-intensive firms such as the ones in the Pharmaceuticals sector.

The study modeled non-financial voluntary disclosures to predict the returns. The non-financial disclosures on the annual reports are numerated and tabulated based on the indicator model proposed by Zambon-Bergamini [256] with the following sub-groups: (i.) strategy, (ii.) human resources, (iii.) customer and markets, (iv.) innovation and IPR, (v.) organization, and (vi.) corporate governance. The information is extracted from the annual reports on two accounts, one where just the information's existence is acknowledged and scored and second where the quality of the information is measure by counting the number of sentences devoted to a piece of information on a scale of four where '0' is the lowest and '3' being the highest score. The dependent variable, continuously compounded value-weighted returns are calculated annually from a portfolio of 25 largest Pharmaceutical firms selected at random from the list of largest firms in the sector as highlighted by Ocean Tomo 300 inter-industry index focusing on intangibles-intensive firms.

The empirical findings from this study gave a mixed picture. Overall the variable that represented the cumulative of the non-financial disclosure indicators are found to be uninformative to the market. They do not have a statistically significant explanatory power when is comes to annual value-weighted returns, a measure of its cost of capital. However, when the the disclosures are sub-dividend into the groups of indicators some of them are indeed found to have statistically significant explanatory power. The key among them is Customer & Market and Innovation & IPR. From the summary statistics one can deduce that firms in the Pharmaceuticals industry give the most amount of information on Strategy and Customer & Market when compared to other indicators but this is not the case with Innovation and IPR. The disclosures on Customer & Market is found to be significant whereas strategy is not when the measure is existence of information. However, when the quality of information is in question, Innovation and IPR is found to be more predictive of the value-weighted returns.

Overall the study finds that, for at least the large Pharmaceutical firms as the information is drilled down to the fundamentals of certain types of information, the ability of the variables to explain or predict value-weighted returns is increased.

There is obviously a need for caution when interpreting these results as numeration of qualitative information such as the written word is not always objective. A great deal of subjectivity goes into determining what disclosure indicators are important and what are not. Similarly, there is still a lot of subjectivity involved when information is evaluated based on written sentences as has been done in this study especially when the quality of the information is in question. Additionally there is always the added subjectivity with the econometric assumptions a linear regression models makes with its distribution et al. Even with these subjective shortcomings, the results are fairly robust and relevant.

3.5 Conclusion

This chapter contributes to the voluntary disclosure literature of intangibles-intensive firms. Here the impact of the non-financial and textual information is numerated to model its impact on the expected stock returns, a measure of a firm's cost of capital. Evidence from this chapter shows that the non-financial and textual information provided in the annual reports are indeed useful for the market and the investors. In the first step, using a qualitative content analysts method the written word from the annual reports of the largest Pharmaceutical firms operating in the US capital markets are enumerated. In the second step, the enumerated data from the annual reports are used to predict the future expected stock returns. The evidence from the study found significant impact of various sub-groups of non-financial indicators such as Customer & Market and Innovation & IPR can explain returns, a measure of its cost of capital. The core findings from this study is, with the improvement or increment in the quality of non-financial and textual information there is a possibility to better explain the expected future returns.

Chapter 4

Regulatory Change: A Macroeconomic-Intangible Risk

4.1 Introduction

In the late[1] 1990s and early 2000s two successive events happened that are hypothesized to have an impact on the information environment of the capital markets in the United States — (i.) the first was the implementation of Regulation Fair Disclosure (Reg FD) by the Securities and Exchange Commission (SEC) in 2000, and (ii) the second was the adoption of Sarbanes-Oxley Act in 2002 (SOX). The prevailing regulatory environment in a country is a macroeconomic intangible available to firms operating within its regulatory jurisdiction. They bear the cost and enjoy any subsequent benefits of operating in this regulatory framework. Any changes in regulation is a cause for risk as it increases uncertainties that may not be priced in the stock markets. The question this chapter raises are — did these regulatory

[1]Previous version(s) of this chapter have been presented at 7^{th} *Interdisciplinary Workshop on Intangibles, Intellectual Capital & Extra Financial Information* in Warsaw, Poland on September 29, 2011, at *Accounting Renaissance - Lessons from the Crisis and Looking into the Future. Learning from Histories and Institutions* in Venice, Italy on Nov 04, 2011, at *European Accounting Association 35th Annual Congress* in Ljubljana on May 11, 2012, at *Financial Reporting — Third Workshop* in Naples, Italy on June 15, 2012 and at *American Accounting Association 2012* in Washington DC, USA on August 07, 2012. The author would like to thank Prof. Stefano Zambon, Prof. John Holland, Prof. Baruch Lev, Prof. Martin Walker and Prof. Andrew Stark for their constructive feedback and the participants at Warsaw, Venice, Ljubljana, Naples and Washington DC workshops and conferences for their helpful comments.

changes (i.e. Reg FD and SOX) led to the eventual change in the information environment causing a macroeconomic intangible risk and contributing to information asymmetries and uncertainties? Here, with the help of two key information intermediaries of the market — (i.) News Articles and (ii.) Analysts, the liquidity measure of information environment is studied to find out the impact. Additionally, a causal relation is also explored between the News variable and Analysts to understand the directional flow of information between these intermediaries [164, 21]. The study focuses on just one industry with three sectors, (i.) Pharmaceuticals, (ii.) Biotechnology and (iii.) Life Sciences, to keep the unnecessary inter-industry noise out of the model estimates[2].

The two main information intermediaries that make the principle explanatory variable of the information environment are — (i) News Articles from Factiva database and, (ii) Analysts coverage of the firms obtained from I/B/E/S database.

News Articles are produced by the business press and it plays an important role in forming and facilitating the information environment around a firm [47]. Analysts are also a key market participant who analyzes the publicly available information, collects private signals from the insiders through various meetings, interactions and personal research through conference calls, etc. and produces earnings forecasts thus contributing to the information environment around the firms [27]. This study compares the role of these two market participants that are the enablers of the information environment around a firm using various liquidity based econometric tests.

The evidence produced through this empirical set-up shows that the regulatory reforms of Reg FD and SOX collectively changed the information environment since their implementation. The impact analysis of News and Analysts on the liquidity based information environment show that before the regulatory reforms Analysts were contributing in reducing the information environment, however the roles were reversed somewhat. News was able to reduce the information asymmetry whereas Analysts contributed to it. There could be several reason why Analysts are found to be contributing to the information asymmetry — the key among them is based on their business model of selling information for a price. Many small investors don't have access to the Analysts reports. In a discriminatory information sharing set-up

[2]The key reason to select this industry is because of the Research and Development (RND) investments, which makes their information environment an ideal set-up to study.

a few privileged few get information from the insiders thereby contributing to asymmetry of information. After the regulatory reforms the impact of both these variables are visibly reduced.

In terms of causal relation between the two information intermediaries News and Analysts, the Analysts are still driving more information into the market, which means that there is a unidirectional causal relation between Analysts and News going from Analysts to News. This is also found to be a result of the regulatory reforms.

In the next section (4.2) the background literature of the study is presented. The following section (4.3) discusses the empirical issues such as sample, methodology, model and the economic outcome of the various estimates. The next section (4.4) discusses the econometric results in a wider context of the research and how the findings in this study advances the knowledge of information environment affected and created by News Articles and Analysts. Finally, the paper ends with some concluding remarks in the final section (4.5).

4.2 Background

4.2.1 Industry Background

The pharmaceuticals, biotechnology and life sciences sector from the larger Pharmaceuticals industry in the United States have witnessed tremendous growth during the past 21 years (1990-2010). It is evident from the growth in the number of firms (Appendix B.2.1) and their combined market capitalization[3] (MV – Appendix B.2.2) that it has been a high growth sector since the early nineties. The growth in the number of new firms coming into the capital markets has been quite consistent and steep since the early 1990s. That growth have shown stagnation or recession only after 2008-09 when the wider American economy went into recession due to the burst of the housing bubble followed by the credit crunch in the financial markets.

This rapid growth in the number of firms entering the capital markets has

[3]The market capitalization figure is not for the entire market but only for the sample dataset selected for this study that meet the selection criteria. Please refer to the section Sample Selection Criteria (Section 4.3.2) for more information about the selection criteria. Although the market capitalization figures are not absolute, they are expected to be a good representation of the growth seen by the sectors over the years.

not been matched by the annual returns from the sector. As Appendix B.2.3 shows that the financial returns have been quite volatile for the sector over the years with some years witnessing high growth followed with no return or in some cases, negative returns. What is interesting from the returns graph (B.2.3) is that almost all the negative returns follow the burst of a bubble in other industry segments, which represents how closely the sector is related to the wider American economy. For example the sector witnessed a slowdown in return during the short recession of 1991-1992. During the dot-com bubble the sector witnessed a slowdown after the initial exuberance of 2000 for two consecutive years before returning to any respectable returns expected by the investors. The sector then witnessed slowdown when the housing bubble burst in 2008, showing glimpses of recovery only in the year 2010 without any guarantee of its sustainability[4].

4.2.2 Regulatory Change Risk

Any change in the regulation or an enactment of any law that aims to regulate the market has some inherent risks. A regulatory framework is a macroeconomic intangible and therefore any changes to it introduces new cost for the firms. These risks are largely because of the uncertainties associated with the new environment and investors are comfortable with certainties not changes.

There are largely two broad levels of regulations associated with the sample under investigation in this chapter — (i.) the first is the Food and Drug Administration (FDA) regulatory framework under which the Pharmaceuticals, Biotechnology and Life Science function, and (ii.) the information environment in the capital markets regulated broadly by SEC and Financial Accounting Standards Board (FASB)[5]. The scope of this study is limited to the information environment.

The two main regulations that is hypothesized to have an impact on the information environment of the sample firms came into effect during the period of 2000-2002. They are Regulation Fair Disclosure of 2000 (Reg FD) and

[4]See raw data of the graphs that are not tabulated in this chapter but are available from the author on request.

[5]Additionally the sample data has to conform to the legal and political environment of a country such as the United States. A study by Baginski, Hassell and Kimbrough [15] showed that in two comparable business environment except for their legal structure, US is considered to be more litigious when compared to Canada. However, these factors are outside the scope of this study.

Sarbanes–Oxley Act of 2002 (SOX). Primarily, to deter ‘selective disclosure’ of information to a small group whereas a larger base of small investors remained at a disadvantage [140, 46][6]. Moreover, during this period a number of irregularities and frauds committed by executives of large US corporations came to light[7]. These regulations, especially SOX, are also to some extent as a result of the public and the political pressure on the American legislature to curb the various accounting and insider trading frauds. This chapter studies the period before and after the implementation of Reg FD and SOX to find out how the News Articles and Analysts impacted the information environment because of this regulatory and legislative changes.

4.2.3 Information Environment

The information environment of a firm develops because of the demand and supply of information [188]. On the supply side, disclosures about a firm’s assets and liabilities are made by insiders (managers such as CEOs, CFOs, etc.), whose knowledge about the firm is expected to be precise. On the demand side the users of the information such as analysts and investors need information to revise their expectations about the firm’s performance. If the information about the firm’s expected performance is ‘good’ then investors would increase their investments in a firm and if the information is ‘bad’ then investors would try to sell off their shares [188].

Firms that are operating in highly technical and knowledge intensive industries such as Pharmaceuticals, Biotechnology and Life Sciences would not want to disclose proprietary information. Company insiders on the other hand have incentive to withhold information and use it to their benefit [243] since their payoff is tied to the performance of the firms. Insiders would want to give out ‘good news’ and suppress ‘bad news’ [88], moreover it is difficult for the investors and analysts to identify if insiders are manipulating information at all unless they receive signals about information that is probably

[6]Heflin, Subramanyam, and Zhang [140] found in their study that post Reg FD implementation the “information efficiency” before earnings announcements have increased, the ability of Analysts to predict stocks accurately are not reduced and there is a “substantial” increase in the trading volume. Bushee et al. [46] used a database on conference calls and finds that post Reg FD there is a significant negative impact on the managers’ decision to hold conference calls, however they did not find any evidence that it reduced the levels of disclosures.

[7]Enron, WorldCom, etc

available to the insides [233]. When the demand for information raises to an extent that the payoff of disclosing information is higher than withholding it, then insiders have an incentive to disclose [90].

Heavy reliance on the financial reporting as the primary source of information is risk as they are slow and sometimes delayed. Moreover, there are doubts expressed about the reliability and completeness of financial information [176, 2]. Especially for the firms in the industry where the value of the firm comes not only from its capital investments but also from its expenses in RND, human capital, operational efficiency and relations within the industry to hedge operations risks [174, 255][8].

There are, however, other information intermediaries that try to overcome the shortcomings of financial reporting. Tetlock [236] used the Wall Street Journal (WSJ) columns employing a software generated variables to model "investor sentiments." Furthering this line of research in the next paper Tetlock et al. [235] used WSJ and Dow Jones News Services (DJNS) News stories to create a crude measure of "good news" and "bad news" and used it to predict earnings and stock returns using the data from Factiva database. Other have used News data from Dow Jones News Service (DJNS) [237] and Dow Jones Interactive Publication Library (DJIPL) [57] database to model the information environment. With the rising interest in alternative sources of information (See Appendix B.2.5) and furthering this line of research using Factiva database, this study uses the News Articles count data to explore its impact on the information environment in the capital markets of United States.

4.2.4 Analysts Coverage

There are many incentives for an Analyst to follow or unfollow a firm, some of them can be personal [137] and others could be institutional [42]. There could also be exogenous factors such as the "precision" of the information already available in the market thus deterring Analysts to follow firms [106]. Therefore it should come as no surprise that the overall Analyst following of sample firms from this study has been on the decline (See Appendix B.2.4).

[8]Firms in the pharmaceuticals sector are known to hedge their risks by forming RND relationships within the industry and by buying options on a drug that are in the development phase to diversify their product pipeline and share the risks of failure [81]. Moreover, some of the firms are outsourcing the RND to companies in the emerging markets to reduce costs, increase productivity and hedge risks [34].

This decline in the Analyst following is a cause of concern for the management of the firms as it is in their interest to have a healthy levels of Analyst covering their firm because it increases market liquidity [213] and reduces the cost of capital [39]. This essentially points towards the reduction of information asymmetry risk hypothesis.

Lang and Lundholm [164] have found in their study that the firms that provide "qualitatively" more information to the market, would make it worthwhile for the analysts to invest time and effort to produce earning forecasts and recommendations. This means the causality of the Analyst following runs from information towards coverage [13].

On the other hand, Analysts want to follow firms that are promising in the future [137]. Therefore, the decision to follow a firm by the analysts can also be made based on the expectations of the analysts from the firm's investments. Barth, Kasznik and McNichols [21] found in their study that analysts follow firms that have huge investments in RND creating opportunity for growth in the future. This means the decision to follow a firm by Analysts is based on the real of perceived information asymmetries associated with the firms.

Therefore, the question of information asymmetry and its causality with respect to information is still dichotomous at best. This chapter models the information environment based on the liquidity measure of bid-ask spread and uses Analysts coverage of firms to find out if they have any impact.

4.2.5 Liquidity Based Information Economics

This study make use of the liquidity measure of bid-ask spread to model the information environment. This idea of using bid-ask spread as a measure of information environment is not a novel one and there are plenty of studies that has made use of this measure in their study of asymmetric information associated with the capital markets and insiders [249, 213, 129]. Still, it is necessary to explain the basic economics of the market liquidity.

As Amihud et al. [7] noted in their book, there are mainly three reasons for illiquidity in the stock markets — (i.) "exogenous trading costs", (ii.) "inventory risk" and (iii.) "search friction". The ask price (offer) is that an investor has to pay to acquire a stock and face tradeoff of lower price in the future. The bid price is the holding risk the same investor faces, should the prices go lower. On the other hand, the market makers who facilitate the trade and bear the inventory risk of holding a stock until he finds a suitable buyer, in addition to the risk of trading with an informed investors are priced in the difference in the ask price and the bid price. Therefore, the larger the risk of information asymmetry the larger will be the spread in the ask and bid price causing illiquidity [76, 116, 6].

For pharmaceuticals, biotechnology and life sciences firms the information environment between market and insiders is expected to be divergent. The firms typically have to get their products (drug molecule, formula, etc.) approved by the FDA before launching any product into the market. The quality and safety of the drugs produced by these firms aside — a non-negotiable aspect, the investors have no way to pick the winning firms or invest in products that are expected to be the next blockbuster drug.

The role liquidity measure of bid-ask spread plays in the informational efficiency of the market is well documented by Amihud & Mendelson [6] and Copeland & Galai [76][9]. This study tests the level of information asymmetry in the pharmaceuticals, biotechnology and life sciences sectors over the study period of 1990-2010, testing the impact separately for information intermediary variables such as News Articles and Analysts.

4.2.6 Summary

In summary, this chapter asks the following three basic questions:

1. Did the regulatory reforms (i.e. Reg FD and SOX) have an effect on the information environment as determined by the liquidity measure?

2. *Ceteris Paribus*, do News Articles and Analysts have any statistical impact on the liquidity measure of information environment?

3. What is the causal relationship between News and Analysts post regulatory reforms?

[9] Copeland and Galai [76] described the relation between the dealer and market where the dealer is self-serving and wants to maximize his own profit. If the bid-ask spread is too high, then the dealer loses revenues, and if the spread is too small, informed investors might take advantage of the asymmetric information generating above normal returns.

4.3 Empiricism

4.3.1 Sample Selection Criteria

The sample firms selected for this study belongs to the Pharmaceuticals, Biotechnology and Life Sciences sector operating in the three main capital markets of United States — NYSE, AMEX, NASDAQ. In the 21 year study period 1990-2010, the firms are identified using the industry identifier Global Industry Classification Standard (GICS)[10] and about 308 firms are found in these three sectors. Upon removal of firms with no data the study is left with a sample size of 219 firms with 4746 firm years under consideration. In order to avoid survivor bias no restriction has been applied in terms of minimum size (financial or otherwise) or longevity, etc. to filter out firms. All firms with data have been accepted in the sample.

4.3.2 Data Description

For this study financial journalists are assumed to be an independent group that follows the performance, growth prospects, management actions, and investor's reactions and also from time-to-time provide their own analysis of the current situation based on their own observations. The event of a journalist reporting occurs only when there is new information available or an update on previous information, their own analysis of the information or someone else release their analysis of the publicly available information about the firm. This study assumes that the News Articles are distributed independently and identically or i.i.d ($News \sim N(0, \sigma^2)$).

News Articles about the firms in the study are collected from the Factiva[11] database. In this database the names of the firms are used as keywords to search for News items[12] in a particular year. Once the number of News

[10]BioTech (GIC 352010), Pharmaceuticals (GIC 352020) and Life Sciences Tools & Services (352030)

[11]Factiva is a news media repository used for information and research and maintained by Dow Jones & Company. Access has been kindly grated to this database by Manchester Business School's access management system.

[12]Each of the firm's names is used as a keyword inside a time period (for e.g. 01-Jan-1992 to 31-Dec-1992). When searched, the database returns news items irrespective of it being "good news" or "bad news". One of the key features of the database is that it includes news reports from more than 600 continuously updating newswires and eliminates duplicate that increases the reliability of the news report.

item per firm per year is returned by the database, it is noted down and the same process is followed for the next year. Firms that have changed their official names during its lifetime have been taken into consideration, as long as the corresponding permanent number (PERMNO, from Compustat) is unchanged. The new names of the firms have been used as search terms along with the old names and the number of News Articles found for them in any particular year has been reported as the final figure of News Articles for that firm.

The Analyst Following data is based on the earnings forecast data available from the I/B/E/S database. The decision by the Analysts to cover a firm is assumed to be distributed i.i.d ($AF \sim N(0, \sigma^2)$) without an endogenous influence[13]. The earnings forecast data is recorded by Thomson Reuters I/B/E/S database found int the WRDS website [254][14].

Market data such as stock price [15], bid price, ask price, market makers, trading volume[16] data has been downloaded from The Center for Research in Security Prices (CRSP) database maintained by University of Chicago Booth School of Business [79]. The accounting data such as Earnings per Share data is collected from the Compustat database [73]. The market data is monthly that has been annualized to match the News per year and Analyst following per year data. The Market Equity ME, Bid-Ask spread, price volatility and returns are calculated monthly and annualized by averaging across the year.

[13]There is evidence in the literature that the assumption of analyst independence is unrealistic. Analysts face career concerns and sometimes institutional pressure to follow or report favorable earnings forecasts. This assumption is made here for the sake of econometric simplicity and the factors influencing the decision of analysts to follow a firm is outside the scope of this study. See Beyer et al. [27] for more details and relevant references.

[14]Accounting data, analyst forecast, and security price data has been downloaded from the integrated multipurpose database hosted by Wharton School of the University of Pennsylvania — Wharton Research Data Services (WRDS) [254]. This integrated database gave access to Compustat, I/B/E/S and CRSP databases. Access has been kindly granted to the database by Manchester Business School's access management team.

[15]Some of the stock price data (negligible as compared to the volume of the overall data) was reported negative in the CRSP dataset. This happens in CRSP database when the day's price is not recorded in the database due to some error, then the mechanism is set as such that the price data takes the average of the bid-ask price with a negative symbol in front of it indicating the recording error. The negative sign has been eliminated and the bid-ask average data has been used as the days price. Due to the negligible amount of such error, it is not expected to cause any bias in the overall analysis.

[16]Volume of the shares traded in the stock is the average shares traded in month.

4.3.3 Summary Statistics

In the Table 4 the summary statistics are presented of the primary dependent variables such as relative bid-ask spread SR and average absolute bid-ask spread S. Additionally, the table summarizes that the primary explanatory variables are the $News$ and Analysts AF that are modeled in the later part of the study. Information control variables such as Earnings per Share $lnEPS$, Market Equity ME, Market Makers MM, average Stock Price $lnPrc$, average Returns $lnRet$, Trading Volume $lnVol$, Price volatility $lnVola$ and Turnover Ratio $lnTURN$[17] are also summarized.

In the Panel i. the pairwise Pearson's correlation coefficient are listed along with its signification denoted by (*). Two of the most important correlations needs to be pointed out here. As dependent variables relative spread ratio and average absolute bid-ask spread are used. Evidence from the variable show that both are only 64% (significant at p-value < 0.05) correlated to each other.

Using ratios as an economic factors is cause for econometric risk of spurious regression, as pointed out by Kronmal[160]. Therefore, to avoid the suspicion of spurious regression the models are estimated in the following sections using both, (i.) a ratio, and (ii.) the absolute liquidity spread given by S.

The second issue that needs to be pointed out here is the correlation between the News and AF which is found to be 19% (significant at p-value < 0.05). Correlation is not necessarily causation, therefore in the final part of this analysis a causal relation between News and Analysts is explored in greater detail. Other than that, all information controls used in this study are found to statistically significantly correlated to the information environment measured by the liquidity factor of bid-ask spread. Lastly, the mean bid-ask spread ratio is found to be 0.11 and the absolute bid-ask spread is $0.16 averaged across 219 firms and 21 year sample period.

Insert Table 4 — Appendix A.2.1

4.3.4 Estimation Methodology

Similar to Amihud and Mandelson [6] in this study the relative bid-ask spread is used as a measure of information environment. However, using a ratio al-

[17] TURN = Trading volume/shares outstanding

ways comes with the econometric risks of spurious correlation [160], therefore similar to Guo, Lev and Zhou [129] paper, this study uses the average absolute bid-ask spread as one of the dependent variables.

The models are estimated in two basic econometric framework. First, they are estimated to exploit the cross-sectional contemporaneous covariances, with explanatory variable and control variables all from the same time period to find out if the assumption of joint normality of the information restrictions in anyway reduces the informativeness of the primary explanatory variables — News or Analysts. Second, the time-series of the primary explanatory variables with at the least two time lags are explored to find out if they are able to explain the information environment with the delayed effect. The basic econometric framework is as follows;

$$y_{i,t} = \alpha_{i,t} + \beta x_{i,t} + \vartheta_{i,t} ...(1)$$

y	is the dependent variable
x	is the exogenous independent variable
α	is the slope coefficient
β	is the beta of the independent variable
i	is the individual firms where i = 1, 2, 3, ..., N
t	is the time period measured in years
ϑ	is the exogenous and independent error term distributed i.i.d$\vartheta \sim N(0, \sigma_{\vartheta}^2)$

The estimation methodology used in the study is Generalized Least Square with Random Effect (GLS-RE) error distribution. In Ordinary Least Square (OLS) method, the estimates of the α is treated as a constant. Since the data in this study are in a panel of firms, there is a need to model the covariances of the firm panels so that that vector estimates are robust and efficient. Therefore ,with GLS-RE estimation α is given by;

$$\alpha = \beta_1 + \upsilon_i ...(2)$$

Here the υ is distributed i.i.d $\upsilon \sim N(0, \sigma_{\upsilon}^2)$. Therefore with this substitution in the basic econometric model 1;

$$y_{i,t} = \beta_1 + \beta x_{i,t} + \upsilon_i + \varepsilon_{i,t}...(3)$$

Here the error term is combined of two factors, (i.) $\varepsilon_{i,t}$ varies across individual firms and time and (ii.) υ_i that varies only across the individuals[18]. The main reason to estimate the models using GLS-RE is based on the assumption that the independent variables are assumed to be uncorrelated to the individual error term ε_i.

4.3.5 Information Environment — Structural Break

The years around 2000, 2001 and 2002 had been quite volatile for the whole of American economy. The problem started with a dotcom bubble and a few high profile accounting scandals it soon culminated to other parts of the economy. Since pharmaceuticals, biotechnology and life science industry are considered to be hi-tech — the sector experienced downturns (see graphs: Appendix B.2.1-4). All these problems in the American economy led to the two back-to-back regulatory changes which are the focus of this study: Regulation Fair Disclosure (Reg FD) in 2000 and Sarbanes-Oxley act of 2002 (SOX).

Both these changes impact the information environment in the US equity markets where company insiders give out information to external parties and intermediaries. The first regulation, Reg FD discourages discrimination disclosures or selective disclosures and the second standardizes and prescribes financial and non-financial disclosures. These disclosures happened in quick succession therefore there is no way to study the information environment focusing on just one of the factors. Therefore, this study hypotheses that theses regulatory changes collectively changed the information environment.

To model the information environment the study uses two measure — (i.) the bid-ask relative spread and (ii.) the absolute spread. The first measure of information environment is based on the dollar difference in the bid and ask price of a stock with respect to the stock price.

$$SR = \frac{ask - bid}{(ask + bid)/2}...(4)$$

ask is the asking price of stock charged by the seller

[18] For more information see Gujarati [128].

bid is the buying price of stock at which a market maker purchases the stock

lnSR is the natural log of bid-ask spread ratio

The second measure of information environment is given by the absolute bid ask spread itself.

$$S = ask - bid...(5)$$

S is the bid-ask spread

This study utilizes the Chow Test[19] [64] to explore if the regulatory changes that happened between 2000-2002 changed the information environment. To perform a Chow Test one needs to know the approximate dates on which the expected structural break happened. The Reg FD was implemented in 2000 and SOX was adopted in the year 2002, the year 2002 is chosen to be the year in which the structural break is to be tested. This gives sufficient time for the Reg FD to have an effect on the environment and SOX regulation to be known to the market. Additionally, Reg FD was implemented in the later part of 2000 giving it no time to shape the information environment in that year therefore the effect realistically can be expected to happen only in 2001 and 2002 onwards. Therefore, the study time period is sub-divided in additional two time period: 1990-2001 and 2002-2010[20].

To study the information environment the study uses two main variables – (i.) the news articles and (ii.) analyst following. Both these variables are exogenous information intermediaries. They use publicly available information to analyze and disseminate processed information. This study therefore models the information environment measure of bid-ask spread using news and analysts to find out their role in explaining asymmetric information risk. Below is the empirical model that tests the information environment and the possible structural break using a dynamic model with news and analysts following as additional explanatory variables:

[19]The Chow Test formula for F-test is as follows (see Gujarati [128], p. 276);

$$F = \frac{(RSS_R - RSS_{UR})/k}{RSS_{UR}/(n_1 + n_2 + 2k)} \sim F_{[k,n_1+n_2+2k]}$$

[20]The break is also tested for the 2001 and 2003 and the results are found to be same.

$$lnSR_t = \alpha + lnNews_{i,t} + lnNew_{i,t-1} + SR_{i,t-1} + lnAF_{i,t} + \varepsilon_{i,t}...(6)$$

$lnNews$	is the annual news articles data collected by Factiva database
$lnAF$	is the annual analyst following of a firm captured by the number analysts producing forecasts
ε	is the error term distributed i.i.d $\varepsilon \sim N(0, \sigma_\varepsilon^2)$

In the first attempt to understand the impact that News and Analyst have on the dependent variables the whole time period is estimated using Ordinary Least Square (OLS). Although the data is in a panel, OLS estimator is used to find out the slope coefficients ignoring the heterogeneity between firms assuming that there is no difference between the estimates throughout the time period. The estimates show that News and its first lag have statistically significant explanatory power as the t-value of the coefficients -0.24 and -0.11 are both lower than minus two standard deviation away from mean. The first lag of bid-ask spread is also statistically significant. Additionally, Analyst following in the model can also explain the current information environment but the lag has no explanatory power, therefore ignored. The R^2 is approximately 49% which means that these variables are able to explain the around half of the covariances of the bid-ask spread in the model.

When the estimates are calculated for two sub-divisions of the time period, some fluctuations are found. For example the coefficient estimate of News from the whole time period 1990-2010 and 1990-2001 is about one-third higher. The bid-ask spread ratio of 1990-2010 and 2002-2010 is more than 50% less. Although, not much changes are found the estimates of analyst following. However, the explanatory power of these variables decreases significantly in the fractured time periods. ranging from 38% and 18%.

Therefore following the Chow Test — residual sum of squares (RSS) and degrees of freedom (Df) are tabulated in the Table 4a. Using the formula presented in the footnote 19 of this chapter the Chow F-stat is calculated from the regression of the period 1990-2001 and 2001-2010 and the pooled regression period of 1990-2010. The Chow F-Stat is found to be 20.30 which is statistically significant following the F-distribution table (see table for 5, 929 — where 5 is the number of estimates in the model and 929 being the number of estimates adjusted degrees of freedom). This can only mean there is a structural break in the information environment as measured by bid-ask spread which is a result of the regulatory changes of Reg FD and SOX. This break in the information environment represents the information asymmetry risk caused by regulatory and legislative efforts. In the following sections, who benefited and who lost from the regulatory changes will be analyzed in the greater detail[21].

Insert Table 4a — Appendix A.2.2

4.3.6 Adverse Selection Model

This section is divided into two sub-sections. In the first section the role played by the News Articles data in the information environment is analyzed. In the second section the informational role played by analysts is explored.

4.3.6.1 News Articles

Many papers have previously explored the information environment using various sources of News data [206, 57, 236, 235, 237], which includes Factiva. In this study the News data is collected for each firm in each year from the Factiva database to study in a panel setting, if the information environment can be explained by this News Articles data, and if so what difference does the regulatory reforms had ever since. Therefore, in this section there are two basic questions that are being explored — (i.) do News Articles data from the Factiva database have an impact on the information environment, and (ii.) do regulatory reforms (Reg FD and SOX) change the impact of news on both bid-ask spread models?

In the Table 4b the Generalized Least Square Random Effect (GLS-RE) estimates of the dynamic panel model with relative spread ratio SR and average absolute spread S as dependent variables are presented with News as the key explanatory variable. The basic empirical model is given as follows:

$$lnSR = \alpha + lnNews_{i,t} + \sum X_{i,t-1} + \sum Y_{i,t} + \upsilon_i + \varepsilon_{i,t} ...(7)$$

$lnNews$ is the natural log of News Articles data from the Factiva database

[21] The model is estimated for Spread S as a measure of information environment as well, and no change is found from the established conclusion from the measure SR, therefore the estimates of S are not reported in the interest of space. The estimates are available from the author on request.

X	are the dynamic control variables such as first and second lag of $lnNews$
Y	contemporaneous control variables such as:

$lnEPS$	is the natural log of earnings-per-share
$lnME$	is the natural log of market equity
$lnMM$	is the natural log of the number of market makers
$lnPrc$	is the natural log of the average price of the stock
$lnRet$	is the natural log of the annualized value-weighted returns calculated from monthly market equity data
$lnVol$	is the natural log of the trading volume
$lnVola$	is the natural log of annualized volatility of the stock prices observed monthly
$lnTURN$	is the natural log of the trading volume by shares outstanding ratio

υ_i	is the error term that captures the covariance across individual firms, assumed to be i.i.d distribution; $\upsilon \sim N(0, \sigma_\upsilon^2)$
$\varepsilon_{i,t}$	is the error term that captures the covariance across firms and time periods, assumed to be i.i.d distribution; $\varepsilon \sim N(0, \sigma_\varepsilon^2)$

In the Panel i. the GLS-RE estimates are for the whole period, assuming there is no impact of the regulatory changes on the information environment. To that effect two models are estimated, (i.) where the dependent variable is the relative spread ratio SR and (ii.) the other is the average absolute bid-ask spread S. Additionally, a dynamic auto-regressive panel data model is also estimated with both dependent variables.

In the first type of model (see SR. i. and S. iii.), the only restrictions that have been imposed are the previously known information control variables [249, 129]. In this model the magnitude of News Articles is found to be negative and statistically significant. Therefore, it means that with a percentage increase in the number of news articles the relative bid-ask spread reduces by 14% and the absolute bid-ask spread reduces by 11% respectively. The model is able to explain 72% and 62% variations in this model using the coefficient of determination R^2. When the dynamic auto-regressive model is estimated with one contemporaneous and two lag variables of News (see SR ii. and S. iv.), the model can explain relatively less of the cross-sectional variation, however using the magnitudes of the variables one can deduce that the previous years of news have statistically significant explanatory power when it comes to relative spread ratio. This power does not appear when the model is estimated of the average absolute spread, making the evidence weak.

In the Panel ii. the information environment of the sub-sample 1990-2001 is GLS-RE estimated because of the previous evidence of structural break (see section 4.3.5). The News is not found to be statistically significant except when the model is estimated in the dynamic auto-regressive mode (see SR. vi. and S. viii.). Even then the evidence is weakened as only the relative bid-ask spread ratio (SR. vi.) is the only one significant contemporaneously and not the average absolute bid-ask spread (S. viii.). The explanatory power of the model is weakened by the coefficient of determination R^2 reducing to 21.9% and 9.6% respectively.

Panel iii. tabulates the sub-sample information environment which is estimated for 2002-2010. This is the period after the implementation of regulatory reforms Reg FD and SOX. The evidence from the estimates show (SR. ix. and S. xi.) that the explanatory power of News have further reduced. However, the control variables, such as the number of market makers, the price of the stocks and average annual volatility of the assets are found to be statistically significant. When the relative spread ratio (SR. x.) is estimated in the dynamic auto-regressive model with two lags of News, the variables are found to be statistically significant with p-value<0.05. The R^2 have further reduced from the previous model estimates to just 14%.

This analysis shows that with the regulatory reforms the ability of news to influence the liquidity of the assets have reduced over the years. One explanation of this outcome is because of the emergence of new technologies and platforms on which information is consumed and shared with increasing speed. Additionally, the regulatory reforms have sped up the process tremendously.

Insert Table 4b — Appendix A.2.3

4.3.6.2 Analyst Coverage

In this section the Analyst coverage is used as the primary explanatory variable to explain the information environment. Analysts are obviously an important intermediary in the stock markets, they research stocks and follow them on a short or long term. Here, due to modeling necessity, due to dealing with annual data, any analyst that produces an earnings forecast about a firm are *ex-post* assumed to be following the firm for the whole year. Many papers have previously studied Analysts, their personal and institutional motivations, compensation and career concern in following a firm [137, 21, 147, 194]. In this study the objective is to understand their role in the information environment of high-tech firms and the changes to that effect due to the regulatory reforms of Reg FD and SOX.

Therefore, in this section two questions are explored in great detail, (i.) do analysts have an impact on the information environment of high-tech firms in the Pharmaceuticals sector, and if it does, (ii.) what happened to it since the implementation of regulatory reforms that was expected to change the information environment. From the previous sections, it has been established that the information environment did go through a structural break and the impact of news to influence the asset liquidity has subsequently diminished.

In the Table 4c the GLS-RE estimates of the dynamic panel model with relative spread ratio SR and average absolute spread S as dependent variables are presented with News as the key explanatory variable. The basic empirical model is given as follows:

$$lnSR = \alpha + lnAF_{i,t} + \sum X_{i,t-1} + \sum Y_{i,t} + \upsilon_i + \varepsilon_{i,t} ...(8)$$

$lnAF$	is the natural log of Analyst Following data from the I/B/E/S database that captures the number of analysts producing earnings forecasts
X	are the dynamic control variables such as first and second lag of $lnAF$ [see previous section for all other variables]

In the Table 4c the GLS-RE estimates of adverse selection model with Analysts coverage as the primary explanatory variable is tabulated in three panels — (i.) in the Panel i. the estimates from the whole time period is tabulated ignoring the effect of the regulatory changes, (ii) in the Panel ii. the sub-period 1990-2001, before the implementation of regulatory reforms are estimated and, (iii.) finally, the sub-period 2002-2010 is tabulated in the last panel (see Panel iii.).

In Panel i. the evidence shows that Analysts coverage have a weak explanatory power when the regressand is either relative bid-ask spread ratio or the average absolute bid-ask spread. In the first model with relative spread ratio (SR. i.) the coefficient of analyst is 0.27 and statistically significant with p-value < 0.05. However, in the dynamic auto-regressive model (SR. ii.) the explanatory power of analysts is conspicuously missing. Although the second lag of analyst follows is found to be negative and statistically significant (p-value<0.05). When the dependent variable is average absolute spread (S. iii.), the Analyst coverage does not seem to have an impact. However, in the dynamic auto-regression panel data model (S. iv.) with absolute bid-ask spread as a depended variable all the AF variables, the contemporaneous AF, first and second lag AF are statistically significant (p-value<0.05). Although the coefficient of determination R^2 appears to have reduced to 2.9%.

In the next Panel (ii.) the models are estimated for the sub-period 1990-2001. In this period, the first model with the relative bid-ask spread ratio as dependent variable (SR. v.) the Analyst coverage appears to be statistically significant with p-value <0.05. When the magnitude of the variable is compared to the previous time period, it has increased by 6 basis points to 33% where the coefficient of determination is around 71%. However, when the same model is estimated with the absolute average bid-ask spread (S. vii.) as the dependent variable the coefficient is not significant, which dilutes the empirical evidence. When the dynamic auto-regressive panel data models are estimated (SR. vi. and S. viii.) the evidence that AF could predict or explain the liquidity factors are more scarce.

In the last Panel (iii.) the ability of AF explain the relative or absolute bid-ask spread is very weak (see SR. ix. and S. xi.). The coefficient of determination when compared to the previous models with similar restrictions have also diminished from as high as 85% to 51%.

Overall, the evidence show that analysts were better placed in having an impact on the bid-ask spread based liquidity factors before the implementation of regulatory reforms. Since the reforms of Reg FD and SOX the ability of Analysts to produce ‘new information’ in order to have an impact on the liquidity based information environment factors appears to have significantly reduced.

Insert Table 4c — Appendix A.2.4

4.3.7 The Case for Difference in Firm Size

Most studies in accounting and finance, study the relations between information environment using the market equity as a measure of firm size [129, 54]. This is a problem, especially when regulatory size as defined by the US government categorizes firms based on the number of employees[22]. This distinction is important to consider as the regulatory cost of small-medium enterprises (<500 emp.) is not expected to be the same as large firms, therefore the compliance cost of small firms is expected to be different (i.e. higher) [63]. A firm's information environment is partly formed by mandatory disclosures which is regulatory requirement. SOX is part of that mandatory-requirement regime. This study divides the sample firms into smaller sub-samples with firms that are (i.) regulatorily 'large' (with >500 emp.) and (ii.) firms that are regulatorily SME (<500 emp.). Since all firms in the sample are listed in the US stock markets (NYSE, AMEX and NASDAQ) the assumptions are — (a.) the regulatory framework is uniform although the cost might be different, (b.) insiders are self-serving[23], and (c.) investors are risk-averse and have uniform expectations.

One of the key argument for this size distinction is that — firms are not expected to change their disclosure behavior solely because of the fluctuations in the market equity as determined by the stock market, but a regulatory requirement including measure of size as understood by the government can be expected to have a cost. Therefore, in this section the information environment of hi-tech firms (Pharmaceuticals, etc.) are explored with News Articles as the key explanatory variable with the imposition of size factor to the dataset in all three time period as identified earlier.

4.3.7.1 Firm Size & News Articles

In Table 4d and 4e the GLS-RE estimates the liquidity based information environment model with (i.) relative bid-ask spread ratio and (ii.) absolute average bid-ask spread ratio as dependent variable. The basic econometric models for large and SME asset portfolios is given below:

[22]Firms are categorized as Large when they exceed 500 employees. Conversely the small-medium enterprises (SME) are the ones with less than 500 employees.

[23]The hypothesis is that insiders of small-medium enterprises would want to improve the information environment by providing more information as compared to a large firm so that they can attract more analysts, diversify the investors base and lower the risk of extreme volatility.

$$lnSR = \alpha + lnNews_{i,t} + \sum X_{i,t-1} + \sum Y_{i,t} + \upsilon_i + \varepsilon_{i,t}; If, Emp_{i,t} > 500...(9)$$

$$lnSR = \alpha + lnNews_{i,t} + \sum X_{i,t-1} + \sum Y_{i,t} + \upsilon_i + \varepsilon_{i,t}; If, EMP_{i,t} < 500...(10)$$

$Emp_{i,t}$ is the number of annual employees of firm i in year t from the Compustat database

In Table 4d the estimates are presented for the regulatorily large firms in all three time period. In the Panel i. assumption is that there is no impact of the regulatory reforms on the information environment as explained by the News Articles, i.e. the hypothesis is, no impact of News Articles in explaining the liquidity measure, and even if the alternate hypothesis is correct, then there is no change that happened after the regulatory reforms of Reg FD and SOX.

In all four models of Panel i. (see i. ii. iii. and iv.) the News is found to have a statistically significant effect (p-value<0.05) with negative coefficient. It means that, with 1% increase in news articles the bid-ask spread (average of relative SR. i. and absolute S. iii.) reduces by 32%. However, this evidence does not follow through when the assumption is of 'no-impact' because of regulatory reforms dropped.

In the Panel ii. the empirical evidence is tabulated of the effect of News on the information environment for the large firms before the regulatory reforms 1990-2001. The estimates show that the explanatory power of News have completely evaporated during this period. None of the estimates, from the model with information restrictions such as $lnEPS$, et al. (SR. v. and S. vii.) or the model with dynamic auto-regressive panel data model (SR. vi. and S. viii.), are statistically insignificant.

In the period after the regulatory reforms the News appear to have an improved outlook on its effect on the information environment created by the liquidity factor of bid-ask spread. With relative bid-ask spread (SR. x.) as the dependent variable in the dynamic auto-regressive panel data model only the contemporaneous News have a statistically significant impact (p-value $<$ 0.05). For the model with information factors as restrictions (SR. ix.), $lnEPS$ and $lnVola$ is found to be statistically significant but not the News variable. However, when the absolute bid-ask spread is the dependent variable (S. xi.), in addition to $lnEPS$, $lnVola$ does appear to have a significant effect on the information environment. In sum, one can say that the effect of News articles effect if measured for the whole period 1990-2010 would be entirely misleading. The impact of News is marginally better in the 2002-2010 than having no-effect before the regulatory reforms in 1990-2001 period, are signs of improvement.

The estimates of the portfolio with SMEs firms are tabulated in the Table 4e. From the Panel i. it is observable that the ability of News to explain the liquidity measure of information environment is non-existent especially for the full period of 1990-2010, for both model with relative bid-ask spread ratio and average absolute bid-ask spread as dependent variable (see SR. i. and S. iii.). However, when the dynamic auto-regressive panel data model are estimated (see SR. ii. and S. iv.) the News in all three time period are statistically significant (p-value < 0.05). This could be because there are other information factors, which are not included in the model, that could better explain the information environment rather than News, at least for small firms.

In 1990-2001 which is before the regulatory reforms, independent variable such as $lnEPS$ is found to be statistically significant, rather than News variable (see SR. v.). In the same period the dynamic auto-regressive panel data model found that News is statistically significant contemporaneously and in its second lag (see SR. vi.). When the dependent variable is changed to average absolute bid-ask spread this evidence is diluted because none of the variables appear to be significant (see S. vi.). However, the News variable in the dynamic auto-regressive model that too at the second lag is found to be statistically significant (see S. viii.).

From the Panel iii. it is observable that News does not fare any better after the regulatory reforms especially for the small firms. However, other variables such as volatility variable is found to significant, which reaffirms the suspicion that there are other explanatory variables that are not included in the model that could be important towards the explanation of the information environment of small firms, just not News variable (see SR. ix. and S. xi.). Again, news is found to be significant in the dynamic auto-regressive panel data model with both dependent variables (see SR. x. and S. xii.).

In sum, the evidence from this section goes on to show that News is a better explanatory variable for large firms and not small firms. Additionally, the ability of News to explain the information environment have increased after the regulatory reforms not diminished. However, there are unexplained variables that could have a better impact on the information environment which are not included in the model.

Insert Table 4d — Appendix A.2.5

Insert Table 4e — Appendix A.2.6

4.3.7.2 Firm Size & Analysts Coverage

Despite the importance of researchers with interest in analysts and their performance in the stock market as information intermediaries [27] there is hardly any study done on the effectiveness of analysts in having an impact on the wider information environment with the exceptions of Gintschel & Markov [115] and Heflin et al. [140]. Even so these studies have ignored the impact that analysts could have on the information environment by their ability to uncover 'new information'. In this section the impact of analyst converge is explored using the liquidity factors of information environment using relative bid-ask spread and average absolute bid-ask spread as dependent variables. Analyst's earnings forecast is used as a measure of Analyst following of a stock captured for a firm i in the year t. The analysis further sub-divides the sample into assets that are there before the regulatory reforms and after with size being one of the determining factors for them to be included in the analysis. The determination of size based on the US governments regulatory measure of size, which is based on the number of employees (Large $>$ 500 Emp. and SME $<$ 500 Emp.). The below given econometric model represents the same ideas mathematically;

$$lnSR = \alpha + lnAF_{i,t} + \sum X_{i,t-1} + \sum Y_{i,t} + \upsilon_i + \varepsilon_{i,t}; If, Emp_{i,t} > 500...(11)$$

$$lnSR = \alpha + lnAF_{i,t} + \sum X_{i,t-1} + \sum Y_{i,t} + \upsilon_i + \varepsilon_{i,t}; If, EMP_{i,t} < 500...(12)$$

In the Table 4f the GLS-RE estimates of the model number 6 is tabulated where the dependent variables are relative bid-ask spared and average absolute bid-ask spread. The estimates are for the regulatorily large firms and the principle explanatory variable is annual logarithmic analyst coverage of stocks. In the Panel i. the estimates are calculated for the whole time period ignoring the effect of the regulatory changes to the information environment. When the relative bid-ask spread is the dependent variable (see SR. i.) the Analysts does appear to have a statistically significant effect (p-value < 0.05) on the liquidity measure of information. However, in the dynamic auto-regressive panel data model only the second lag of analyst following seems to have any significant effect (see S. ii.). This evidence gets diluted when the dependent variable is average absolute bid-ask spread (S. iii.). Here the Analyst does not seem to have any impact on the information environment when many information based factors are placed as restrictions to the model. Although, the dynamic auto-regressive panel data model does confirm that the second lag of Analyst coverage is still significant in effecting the information environment (see S. iv.). This can only mean that persistence and experience of the analysts in following a firm does pay off in the longer term even though the short term effect are not readily visible.

In the Panel ii. the estimates are tabulated for the large firms before the regulatory reforms in the information environment. The evidence shows that the variable Analysts is able to statistically significantly (p-value < 0.05) explain the liquidity factor of information environment using both dependent variables (SR. v. and S. vii.) and the information restrictions such as $lnEPS$ et al. The magnitude of the coefficient of Analyst is 0.32 and 0.35 for the respective models which is in fact positive. This can only mean that a 1% increase in analyst following increases the bid-ask spread by 32% or 35% respectively, thereby contributing to the information asymmetry risk. However, when the dynamic auto-regressive model is estimated (SR. vi. and S. viii.) only one model could produce a statistically significant evidence of Analysts having a significant impact that too at a second lag level.

In the Panel iii. the estimates of the impact of Analysts to the information environment especially for large firm is tabulated. The evidence show that the effect Analysts had before the regulatory reforms, has completely been washed away as there are no significant explanatory factors found that can explain the information environment (see SR. ix. x. and S. xi. xii.). As found in the previous sections the variable of volatility is significant in this model set-up as well.

In the Table 4g the GLS-RE estimates of the asset portfolio of SME firms are tabulated where the dependent variables are relative bid-ask spread and average absolute bid-ask spread. The estimates are tabulated for all three time period, 1990-2010 which is the full sample time period and 1990-2001 is the before the regulatory reform time period and 2002-2010 is the after the regulatory reform time period.

From the Panel i. it is observable that for small firms Analysts ability to impact the information environment is very weak. Except for the dynamic auto-regressive model with average absolute bid-ask spread as the dependent variable (see S. iv.) no other model has Analysts displaying any significant impact. Furthermore, in the next Panel (ii.) the evidence does not get any better for Analysts. Here only the dynamic auto-regressive model could be estimated before the regulatory reforms because of lack of data (see SR. v. and S. vi.). The Panel iii. also shows that the ability of Analysts to explain the information environment using the liquidity measure of bid-ask spread is not significant (see SR. vii. and S. viii.).

Overall, from this section the evidence points that even though for large firms Analysts were able to produce 'new information' to have an impact on the information environment, especially before the regulatory reforms, for small firms the evidence is particularly weak. This is especially true when the sample time period is dividend between before and after the regulatory reforms.

Insert Table 4f — Appendix A.2.7

Insert Table 4g — Appendix A.2.8

4.3.8 The Case for 'New Firm Effect'

In this section a new variation of the previous tests are estimated to find out how the information from News Articles and Analysts play out with firms that are 'new' and 'old'.

As noted earlier, the sample firms in this test are from the hi-tech industry such as Pharmaceuticals, Biotechnology and Life sciences listed in the United States. Many researchers such as Amir, Lev, and Sougiannis [9] have speculated if the financial industry understands such firms and if the analysts are capable of producing convincing and accurate forecasts because of the actual and perceived complexities associated with the firms, their products and services. Therefore, some have argued that even if there are additional "mandated" disclosures, the possibility is scant that the information environment will be any better [155, 202]. In this section, this line of reasoning is exploited further and hypothesized that firms at different ages have a different ability or necessity to disclose financial and non-financial information. With that in mind firms are categorized on the amount of time they have spent in the stock markets as a determinant of their age and an analysis is done on their respective information environment with News and Analysts as explanatory factors. Therefore the research question is – can news or analysts explain the information environment, which is measured by the liquidity factor of bid-ask spread when the firms are newly listed in the stock markets or when it is in the stock market for a number of years? If so, what are the effects and how different or similar they are?

To model this idea, the listing year in the stock market (NYSE, AMEX, NASDAQ) is considered as $Year_0$. For the next five consecutive years the firm is considered to be 'new', therefore;

$$t_n^{new} = Year_1, Year_2, Year_3, Year_4, Year_5 ...(13)$$

Consequently, the firms that consecutively listed in the stock market for over 5 years are considered to be 'old'[24];

$$t_n^{old} = if, n > 5...(14)$$

After the stock is listed the firms try to grow rapidly wherein they raise capital in the stock market, hire new employees, bring new products to markets, clock growing revenue, etc. When the firms grow older in the stock market it is expected to have achieved a certain level of reputation with its financial earnings and stock performance and several other factors. Therefore, the hypothesis in this study is that the information disclosure necessity and regulatory requirement and cost are very different from the ones that are in the stock market for at least five years[25]. The econometric model to explain the information environment of 'New Firm Effect' for News and Analysts is given below;

$$lnSR = \alpha + lnNews_{i,t} + \sum X_{i,t-1} + \sum Y_{i,t} + \upsilon_i + \varepsilon_{i,t}; If, Age_{i,t} < 5...(15)$$

$$lnSR = \alpha + lnNews_{i,t} + \sum X_{i,t-1} + \sum Y_{i,t} + \upsilon_i + \varepsilon_{i,t}; If, Age_{i,t} >= 5...(16)$$

$$lnSR = \alpha + lnAF_{i,t} + \sum X_{i,t-1} + \sum Y_{i,t} + \upsilon_i + \varepsilon_{i,t}; If, Age_{i,t} <= 5...(17)$$

$$lnSR = \alpha + lnAF_{i,t} + \sum X_{i,t-1} + \sum Y_{i,t} + \upsilon_i + \varepsilon_{i,t}; If, Age_{i,t} > 5...(18)$$

[24] The firm's actual age is not factored in, just its listing age because of lack of data.

[25] The cut off age of five years would appear arbitrary but that amount of time in the stock market will give a firm a certain maturity time in terms of accounting and stock market performance. The model has been tested with lower and higher ages with similar results.

4.3.8.1 'New Firm Effect' and News Articles

In the Table 4h the GLS-RE estimates are tabulated for the 'New Firms' in all the three time periods as identified in the previous sections. As usual, to model the information environment two dependent variables are used here, (i.) the relative bid-ask spread and (ii.) average absolute bid-ask spread. In the Panel i. the time period for the estimated model is 1990-2010 which is the full sample period under study. The evidence from this panel, which ignores the impact of the regulatory reforms on the information environment shows that News is unable to explain the liquidity measure of bid-ask spread. Which means that News does not effect the information environment. However, the only bright side of this panel is that, in the dynamic auto-regressive panel data model the second lag of News is found to be statistically significant (p-value < 0.05) (see SR. ii.).

In the Panel ii. the story does not see any improvement. Here the estimates are for the effect News have had before the regulatory reforms on the information environment just for the new firms. As it turn out, very little impact. The estimates on three out of four model in this time period is not statistically significant (SR. v. and S. vii. viii.). The only model that has a statistically significant for the News is the dynamic auto-regressive panel data model (see SR. vi.) with relative spread ratio as the dependent variable with -0.18 as the magnitude of the coefficient. The coefficient of determination or the R^2 is found to be only 13.1%.

In the last panel of this table (Panel iii.), the estimates are for the time period after the implementation of the regulatory reforms Reg FD and SOX. The evidence does not show any improvement (see SR. ix. and S. x.). Which leads to the overall conclusion from this section that News for the 'New Firms' does not have any statistical impact on the liquidity measure of information environment. It means that News does not produces enough new information for the market to lower the information asymmetry risk.

Next, in Table 4i. the estimates of the firms that are modeled to be 'Old Firms' are tabulated. From the Panel i. two things are observable, first is that news have an explanatory power in the time series dynamic model in all lags (see SR. ii and S. iv.). However, this power is lost with the imposition of other information intermediary control variables whereas market makers and volatility are found to be statistically significant (see SR. i and S. iii.).

From the Panel ii. the period before the regulatory reforms, the overall significance of News has further reduced. In the dynamic auto-regressive panel data model with relative spread ratio as the dependent variable (SR. vi.) only the contemporaneous and the second lag of News variable is found to be significant. In the other model with information controls, $lnEPS$ is found to have a significant impact on the information environment (SR. v.).

In the final panel of this section, since the regulatory reforms the ability of News to impact the information environment has marginally improved than before the regulatory reforms (see SR. x. and S. xii.). However, there could be other reasons for this effect where exogenous technological changes and updates can't be completely ruled out. Overall one can deduce from this section that News have a better ability of impact the information environment if the firms are old and mature in the stock market because the evidence from the 'New Firms' is abysmal to say the least.

Insert Table 4h — Appendix A.2.9

Insert Table 4i — Appendix A.2.10

4.3.8.2 'New Firm Effect' and Analysts

In this section the impact Analysts have over the information environment on 'New Firms' and the 'Old Firms' will be explored. In the Table 4j. the information environment of the 'New Firms' is explored in three time periods — 1990-2010, 1990-2001 and 2002-2010. Due to the lack to sufficient data only the dynamic auto-regressive panel model is estimated in the Table 4j.

In the Panel i. Analysts in models with relative spread ratio and average absolute bid-ask spread as dependent variables are found to be significant at the second lag level (SR. i. and S. ii.). The evidence in the Panel ii. gets better and the Analysts are able to explain the information environment formed by the liquidity measure of relative bid-ask spread (SR. iii.). However, the alternate model of average absolute bid-ask spread dilutes the evidence wherein Analysts are significantly explaining the information environment (S. iv.). In the panel iii. where the models are estimated after the regulatory reforms, the evidence of Analysts having an impact on the information gets inconsistent. One model with dependent variable as relative bid ask spread (SR. v.) shows that Analysts are able to explain the contemporary information information with all three time series variables. However, with average absolute bid-ask spread as dependent variable (S. vi.) Analysts do not show any effect whatsoever. At best the evidence is weak and unclear for the impact of Analysts on the information environment for New Firms both before and after the regulatory reforms.

In the Table 4k the GLS-RE estimates of Analysts impact on the information environment of the 'Old Firms' are tabulated. The results from Panel i. shows that from three out of four model estimates Analysts do not have any statistically significant impact on the liquidity measure of information environment (see SR. i. ii. and S. iii.). However, when the average absolute bid-ask spread is used as a dependent variable the Analysts and its first lag are significant (S. iv.).

The Panel ii. and Panel iii. of the same table shows even less evidence of the Analysts having any explanatory power when it comes to the older and mature firms in contributing to the information environment.

Overall, this set of two tables show that Analysts had some explanatory power for new firms especially before the regulatory reforms were enacted because of the discriminatory policy of allowing firms to provide private information to few analysts. Since the implementation of Reg FD, the effect of Analysts have significant gone down. This is an evidence in favor of the regulation that it is in fact democratizing the information environment rather than letting it to be monopolized by a few Analysts.

Insert Table 4j — Appendix A.2.11

Insert Table 4k — Appendix A.2.12

4.3.9 The Case for Causality

Lang and Lundholm [164] have argued in their study whilst presenting evidence that analysts have an incentive to follow firms with higher quality of disclosures, which allows for more number of analyst following for firms with robust disclosure policy. If one assumes there is a linear relationship between the disclosures of firms and News Articles it produces, there can there be a relationship between News and Analysts, causal or otherwise? In this section, this line of reasoning is explored further to test if there is a causal relationship between News and Analysts following.

The case for a causal relation[26] rests on two different studies. The first study by Lang and Lundholm [164] which argues "firms with more infor-

[26] At first, in order to find if there exists any co-integration between the variable News and Analysts an Engle-Granger Augmented Dickey-Fuller test for co-integration is performed [96]. The Augmented Dickey-Fuller test with a single lag of the residuals without

mative disclosure policies have a larger analyst following" (pp. 467). Since they study the disclosure policy of American firms using a database that no longer exists (FAF reports) and the methodology of scoring the disclosure by this report is unclear or unknown, there lies a heavy burden on the real causal relation between information and any subsequent analyst following because of the technological changes in information technology and overall ways in which news travel in stock markets. Moreover, the FAF reports are only used to score the published data from the firms such as quarterly reports, press releases and proxy statements [164] (pp. 468) which are under the managements discretion and therefore subject to manipulations in their benefit.

The second study is by Barth Kasznik and McNichols [21], they studied the incentives of the analysts to follow or un-follow firms and found that analysts follow firms that have higher investments in research and development which means that the decision to follow firms are based on the firm's intangible-intensiveness. This argument presents a contrarian perspective on the causality of the source of information and the decision of the Analysts to follow them. This study therefore explores the causal relation between the real information coming out of the firms through the News reports and Analyst's decision to follow the firms.

Granger causality test[27] has been quite a popular choice of methodology used to test the causal relationship between two panel data variables. Below mentioned is the basic econometric framework for the test;

$$lnNews_{i,t} = \alpha + lnNews_{i,t-1} + lnAF_{i,t-1} + \upsilon_i + \varepsilon_{i,t} ...(19)$$

$$lnAF_{i,t} = \alpha + lnNews_{i,t-1} + lnAF_{i,t-1} + \upsilon_i + \varepsilon_{i,t} ...(20)$$

In this Vector Auto-regressive Model (VAR), which is an extension of the Granger's unidirectional causality test, assumes to have two panel data variables — $lnNews_{i,t}$ and $lnAF_{i,t}$, where the potential causal relationship between the variables is in question. The following procedure is fundamental to the Granger causality test running from $LnNews$ to $lnAF$ [128]: if, while

trend [231] (pp. 695) shows that the residuals are stationary. This could only indicate that the variables are in fact co-integrated. Please note, additional tests such as Johansen [153] could not be performed for further evidence of co-integration as the test is not suitable for an unbalanced panel dataset as has been used in this study.

[27] For detailed information see Granger [121] and Sims [222].

controlling for other information contained in the past (lagged) values of $lnAF_{i,t-1}$, lagged values of $lnNews_{i,t-1}$ add significantly to the current explanation of $lnAF_{i,t}$, then $lnNews$ is said to be the Granger's cause for $lnAF$. Another test symmetric to the previous could be performed to test for causality running from $lnAF$ to $lnNews$. If the finding shows that any one of these relationship is true, it provides support for unilateral causation. However, if the causality from both sides is found to be true then it is a support for a bilateral relationship. If neither relationship is found then the evidence would suggests that there is no relationship between the variables.

For this section the assumption is that News Articles captures the essence of the information environment created by the firm through its mandatory and voluntary disclosures along with soft disclosures, which are characterized by 'cheap talk'[28]. Additionally, the causal relation is analyzed within the framework of the regulatory changes that happened with the implementation of Reg FD and SOX.

From the previous results in the chapter it is evident that there is a structural break in the information environment around the year 2002 therefore the time period is sub-divided for the comparison of before-and-after the implementation of regulatory reforms of Reg FD and SOX. That creates time periods of causal tests based on time period of 1990-2010, 1990-2001 and 2002-2010.

In the Table 4l the GLS-RE estimates of Granger causality test are tabulated. Estimates from the Panel i. shows the lagged News significantly effects the News in the current time period in all sub-periods. However, the coefficients of Analysts is only significantly different from zero in the time period after the regulatory reforms. From the Panel ii. when the dependent variable is the Analysts, the coefficients show that lagged value of Analysts and News are both significant in all the sub-periods of estimation. Therefore, overall the evidence shows a clear benefit of the regulatory reforms since 2002. To elaborate, when the disclosure regime was discriminatory before the implementation of the regulatory reforms especially Reg FD wherein selective disclosure is outlawed, as soon as information is available to the Analysts it reaches the News as well, which was absent before the implementation of the regulatory reforms.

Insert Table 4l — Appendix A.2.13

[28]See Gigler [114] for more information about 'Cheap Talk' models.

4.3.10 Robustness Check

The robustness of a models are checked with implementing alternative estimation procedures such GLS-Fixed Effect and 2SLS[29]. Obviously, the assumptions of the model changes with each of the estimation methodology. Nevertheless general conclusion from the additional estimates are found to be inline with the conclusions reached here in the analysis. Additionally all model assumptions such as a White test of heteroscedasticity [250] is performed on the models and the results are found to be robust.

4.4 Discussion

Change in any regulation or enactment of new laws with the same intention always causes concerns to the investors and uncertainties in the market. Regulatory framework of a country or a state is a macroeconomic intangible therefore any changes to it is a potential risk in terms of expertise and expenses. Reg FD and SOX were two significant regulation and legislation respectively that had an impact on the information environment of the US stock markets. In this study the liquidity measure of bid-ask spread is used to model the information environment. To explain the information environment two information intermediaries are used — (i.) the first is News Articles from the Factiva database and (ii.) the second is the number of Analysts following a firm calculated using the earnings forecast put out by the Analysts collected from the I/B/E/S database.

Looking at the content of the News Articles it is not surprising that there is a decreasing dependence on financial figures (See Appendix B.2.5.1 – Graph 1 and B.2.5.2 – Graph 2). From the investors point of view they cannot wait until the firms produce financial reports and then make decisions about their investments in firms. With the advancements of new technologies during the sample period and emergence of new platforms of News gathering it is quite evident that information in the News itself is becoming more focused on the intangible side of the firms. By modeling the liquidity measure of bid-ask spread using News as an explanatory variable the evidence shows negative and statistically significant coefficients, which means that News is able to reduce information asymmetry. Plainly put, it means that News Articles are

[29]The estimates are not reported in the interest of space. They are available from the author on request.

able to produce ‘new information’.

Many papers have studied the impact of Analysts on the information environment especially after the regulatory reforms [140]. Analysts use their research and networking skills to produce information that they sell for a fee to their clients in the form of Analyst reports, forecasts and stock recommendations. Based on that information certain investors make financial decisions which are informative to the smaller investors who don’t have access to these forecasts and recommendations. Using the liquidity measure of bid-ask spread this study finds that the analysts do have an impact on the information environment, although the evidence is stronger in the years before 2001, when Reg FD and SOX have not yet been implemented. Does this mean that analysts produced previously unknown ‘new information’ for the general benefit of the entire market? The evidence from this study under the assumptions inherent in the model, the estimation process and with due caution, yes.

However, the information environment have had a significant change since the implementation of Reg FD in 2000 and SOX in 2002. The information environment became bimodal, at least for pharmaceuticals, biotechnology and life science, and there is no reason not to expect the same for other sectors and industries because these regulatory and legislative changes are uniform throughout. Previous studies [3] have found that analysts forecast have become less reliable since the implementation of Reg FD. This study finds that the impact of Analysts following the firm’s have also declined since the regulatory reforms. It basically means that the ability of an analysts covering a new firm to uncover ‘new information’ have declined since the regulatory reforms.

Most studies in accounting and finance use the market equity ME as the indicator of size of the firm. For this study the US regulatory indicator of size — the number of employees has been used as a measure of firm size. The simple reason for this classification is that, market equity is volatile and dependent on current financial position and future strategic outlook of the firm, therefore a sustainable and plausible way of forming company’s disclosure policy is guided by regulatory requirements [88]. The results from the study show that News Articles have an impact on the information environment only when the firms are large, and most effectively after the implementation of Reg FD and SOX. For SMEs the evidence is weaker. However, for smaller firms, Analysts have a significant impact, especially before the implementation of Reg FD and SOX. For large firm analysts do not have an impact.

Furthermore, this study explored the information environment of firms based on their age. In this chapter it is called the 'New Firm Effect'. The age is determined by time a firm has spent listed in a stock market. For example, in the first five years of a public listing the firm is considered to be a 'New Firm'. In the Pharmaceuticals, Biotechnology and Life Sciences sectors most firms are under pressure to go public as soon as possible to raise capital so that the investors can hedge risks and diversify. The results indicate that News Articles produces 'new information' for the large firms and its evident that they are able to reduce information asymmetry. However, for SMEs the evidence is weak, i.e. News Articles do not produce enough 'new information'.

When it comes to the information environment of New Firms as modeled by the Analysts, for SMEs they are able to produce 'new information' for the market. However, the information impact of Analysts for the large firms are weak and uncertain. Also, after the implementation of Reg FD and SOX, the ability of analysts to produce new information has been visibly reduced, as noted in previous sections [3].

Finally, in a bi-variate analysis, this study finds that News Articles and Analysts following have a causal relationship. This analysis is made possible by using a Granger causality test [121]. The evidence shows that, as more and more analysts follow firms, the insiders are compelled to produce more information that is then consumed by the News Articles. Therefore, according to this study the causal direction of information is from Analysts to News. That raises some doubts about the findings of Lang and Lundholm [164] wherein they used an industry data on the quantification of qualitative data of firms and claimed that Analysts follow firms that produces superior quality disclosures. Evidence from this study shows that company insiders are producing more information because more analysts are following their firm and demanding additional data, and since there is a regulation against selective disclosure, the information becomes public leading to News Articles. This result therefore confirms and adds to the evidence from previous studies by Barth, Kasznik and McNichols's [21] and Walker and Tsalta's [247] study of UK based firms in a different setting.

Overall the benefits of implementing Reg FD and SOX are quite visible from this study. The information environment with the help of News and other types of new media platforms has become, post these regulatory and legislative reforms, more open and accessible to a large number of investors which is expected to disproportionately benefit the small investors.

4.5 Conclusion

The focus of this chapter is information regulatory regime which is a macroeconomic intangible. Any change in the regulatory regime is a potential risk to the investors. The main question this study tried to answer is: what did Reg FD and SOX do to the information environment of the firms operating in the Pharmaceuticals, Biotechnology and Life Sciences sectors in the United States? The firms in these sectors are known to invest heavily in structural intangibles such as RND. Using the liquidity measure of bid-ask spread as proxy for information asymmetry, this chapter studied the information environment using News and Analysts. Both these variables are exogenous information intermediaries. The evidence from this chapter shows that since the regulatory reforms of Reg FD and SOX there is a structural break in the information environment. It means the ability of Analysts and News to influence the information environment have changed forever. Comparatively, the impact of Analysts has diminished and News has increased, albeit marginally. Finally, the study finds an unidirectional causal relation between News and Analysts using Granger casualty test – where Analyst coverage Granger-cause News.

Chapter 5

Organizational Capital

5.1 Introduction

In this chapter[1] a new theory is presented in support of organizational capital. A firm needs two types of basic inputs – (i.) tangible capital[2] and (ii.) intangible capital[3]. This chapter focuses on a third type of input called (iii.) organizational capital. This term has been fluttering around in the academic literature, especially in management sciences without any clear direction or purpose [156]. Here in this chapter, an attempt has been made

[1]Previous version(s) of this chapter have been presented at the 11^{th} *International Accounting Conference* held in Kolkata, India on 5 - 6 January, 2013, 8^{th} *Interdisciplinary Workshop on Intangibles, Intellectual Capital & Extra-Financial Information* in Grenoble, France on September, 27 - 28, 2012, and *Giornata in Ricordo del Professor Antonio d'Atri, a dieci anni dalla sua scomparsa,* a workshop held in University of Ferrara, Italy on November, 30, 2012. The feedback and suggestions from the participants is gratefully acknowledged. Special thanks to the respective session chairs Prof. Ashok Banerjee, Dean, Academics, *Indian Institute of Management Calcutta*, Kolkata, India, Prof. Yosra Béjar, *Institut Mines Telecom*, Paris, France, Prof. Salvatore Madonna, *University of Ferrara* and Prof. Paolo Andrei, *University of Parma* for their valuable feedback.

[2]Widely known and commonly accepted tangibles capital is investments in property, plant and equipments.

[3]Numerous studies [119, 142, 185, 169] have highlighted that firms need intangible capital as inputs, which are in the form of human resources, trade secrets, trademarks, patents, and other forms of intellectual properties. Additionally, a distinction is made by using the term intangible and intangible capital.. Intangibles — is a super-set of all types of intangibles, intellectual capital and human resources, treated not only as an asset but also as risks. By using the term intangible capital the study refers to the asset inputs that are intangible by nature.

to renew the definition of 'organizational' capital primarily to address two problems: (a.) to provide suitable measurement variables as it is necessary in financial accounting and economics literature by taking a uniquely functionalist view, and (b) to provide an utilitarian framework to understand organizational capital which was previously known for the crude generalizations found commonly in the management sciences or strategic management literature [203, 230].

The main thesis of this chapter is this — if there is such a thing called 'organizational capital' then it must have an impact on the ability of an asset to generate cash streams, given there is a method to credibly measure it. Since organizational capital is a fluid concept in the management sciences[4], the measurement has been almost non-existent. However, in financial accounting attempts have been made to measure organizational capital, most prominently by the paper of Lev and Radhakrishnan [171].

The theory presented in this chapter argues that organizational capital is essentially an endogenous productive efficiency factor created within the boundaries of the firm and idiosyncratic because of its people, material and strategy. Stated another way, in a financial time period the productive efficiency with which a firm employs all its resources to produce an optimal output, if found to produce the same output in the next period, with some variations which constitutes its riskiness, is called the organizational capital. This makes the productive efficiency, a combined product of its tangibles resources, intangibles resources, the training and knowledge of its human resources and their combined effort in a competitive market to achieve the best possible productive outcome, an organizational capital. Therefore the most significant question this chapter will try to answer is if this productive efficiency can be used in explaining the cross-section of returns. This productive efficiency[5] that is calculated mainly from the output produced in one time period and if it serves as an input in the next time period, that can be explained as the assets organizational capital.

The empirical findings from this paper indicates that the organizational capital can be explained using a measure of its past productive efficiency.

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[4]Everything that cannot be separately identified and credibly measured are generally attributed to organizational capital [156].

[5]There are many ways to measure the productive efficiency. As explained later in this chapter, the productive efficiency models used in this chapter are Cash-Flow/Price, Sales Growth, Asset Productivity, Tobin's Q, Investment Growth and Profitability (Return on Assets).

The sales growth is found to be the best measure of this productive efficiency. The result is very intuitive because by growth in sales it normally means that the asset is acquiring new cash flow sources or efficiently using its existing one. In either case, it demonstrates that the firm's collective performance is improving with respective to the previous one.

In the following section (5.2), the background of the literature is presented, followed by the section (5.3) in which the model to capture organizational capital is developed. The next section (5.4) provides the details about the data and portfolio formation methodology. Additionally, that section (5.4 contd.) will summarize the various empirical models and estimates. The last section (5.5) will close with some conclusions remarks.

5.2 Background

5.2.1 Theoretical Framework

Assuming perfect foresight an investor buys into a stream of cash flow by "choosing the most desirable time shape" [107]. When the assumption of perfect foresight is dropped, the risk to the projected cash flow stream is in it's variation. This variation in the cash flow stream is dependent on the asset inputs, both tangible and intangible. This study models a third input factor that could have an effect on the cash flow variability — here it is called organizational capital.

At an asset level there could be many idiosyncrasies because of the tangible and intangible inputs that could be a reason for the risks associated with the projected cash flow streams. Many financial economists since Markowitz [182] have argued that with 'diversification' of portfolios all idiosyncratic risks can be eliminated and then the investor can just worry about the systematic risk. This view has been most forcefully argued using the Capital Asset Pricing Model (CAPM) by Sharpe [221], Lintner [179] and Mossin [192]. Ideally in this scenario the maximum risk to the investment portfolio of present value of expected returns $E(\tilde{R}_i)$ can be benchmarked to the risk-free US treasury bonds[6]. However, empirical literature does not support these theo-

[6]Early literature theorized that returns are stochastic and therefore unpredictable, which is an inference from the efficient market hypothesis and the theory of random walk [100]. Later on, some financial economists found that returns are partially predictable using publicly available data such as Market Value (size) [17, 101], Price/Equity ratio

retical predictions of absolute diversification, even at a portfolio level [111]. Therefore, it is critically important to understand all types of idiosyncratic risks associated with portfolio assets, one such risk is organizational capital.

Organizational capital has been a subject of interest in the management science literature[7] but sufficient attention has not been given to it in the financial accounting and economics literature. The key problem lies in the inability of researchers in measuring organizational capital. It is because the definition organizational capital, especially in the financial accounting and economics literature is vague to say the least. To address this problem Lev and Radhakrishnan [171] proposed publicly available selling, general and administrative (SGA) expenses as a measure of the "firm-specific organizational capital." This view hinges on the incentives of the insiders that are tied to their compensation. The main shortcoming of this view is that it argues organizational capital is wholly dependent on a firm's human capital.

This is clearly not a sufficient definition for a much wider concept of organizational capital because of a simple reason – human resource alone is not a measure of an assets organizational capital. This chapter argues that organizational capital lies in the ability of an asset to create a level of productive efficiency with its tangible, intangible, human and strategic performance. This efficiency of performance reflects in the ability of an asset to benefit from its tangible, intangible, human and strategic resources to endogenously create organizational capital and impact the variation of the cash flow streams.

5.2.2 Organizational Capital

The idea of "organization capital" — an intangible that describes the all encompassing unmeasured non-financial resource is a fairly recent one. Prior to this study many researchers have tried to visualize or measure the phenomena in very many ways.

[22], Leverage [29], etc. A critique on the entire debate on efficient market hypothesis is found in Malkiel [180].

[7]Pioneering work by Penrose [203] in the filed of Strategic Management laid down the founding principles of Resource-Based View of the firm. In her view, a firm should not only be viewed as "bundle of productive resources", but its economic performance depends on the "administrative framework". This Resource-Based View has been further developed by Barney [18] and Porter [204].

Prescott and Visscher [205] argued in favor of considering "information"[8] as the most significant organizational capital. Hall [133, 132] treats the productivity achieved by the college educated and non-college educated human resources as a form of organizational capital naming it "e-capital".

Black & Lynch [33] argued that a firm's human capital development programmes (training, work design and employee voice) could be the factors that produces organizational capital.

Organizational theorists such as Spender [230] argued for Organizational Capital to be treated as a "social good" available to firms in the form of a "soft" capital that is allocated by its managers". Similarly, Carlin et al. [53] argued that a firm's organizational capital can be explained by its intrafirm communications. They theoretically show that "richer internal language have lower employee turnover."

Atkeson & Kehoe [14] have argued that organizational capital is a "plant-specific capital good" and a result of its endogenous operations over the years that builds up plant specific "knowledge" that is measurable and transferable and from this the owners extracts rents in the future once an investment has been made in the past.

Other views on Organizational Capital are as a result of a firm's idiosyncratic human capital [117] and/or as a result of its intellectual capital [154]. van Rens [242] argued that the organizational capital is a simple matter of fluctuating labor cost management.

Last but not least, Lev and Radhakrishnan [171] have proposed that a firm's organizational capital can be measured by the accounting disclosure of Selling, General and Administrative expenses (SGA). This measure of organizational capital is further explored by Papanikolaou & Eisfeldt [201] arguing broadly that the organizational capital is "embodied in the firm's key employees." Needless to say, this chapter sees organizational capital differently.

The main thesis of this chapter is — organizational capital is not a "capital" in its traditional sense but it is a stochastic productivity efficiency shock to the future performance measurable using the fundamentals of the asset performance variables. This type of capital is a result of the management's investment strategy, marketing and selling capability and its employee's training, knowledge, efficiency and ingenuity in allocating tangible and intangible

[8] The paper modeled the information about its 'personnel' as a measure of organizational capital.

resources to produce the most efficient cash generating output.

5.2.3 Cross Section of Risk & Return

The main goal of the asset pricing literature is to explain the stochastic returns (R_t) of a security. In that endeavor, CAPM is one of the most important contribution by [221], Lintner [179], Mossin [192] and Black [31]. They postulate that the returns can be best explained by the covariance of assets (R_i) and the market (R_m) divided by the variance of the market[9] which measures the systematic risk to each individual asset assuming absolute diversification of idiosyncratic risks.

This model was found to be deficient in the face of mounting evidence [101, 102, 52] and there are other factors that could better explain asset returns. The idea that the stochastic returns can be explained by factors other than that by the systematic risk represented by the market beta found initial evidence as early as in 1968 through the paper of Fama & Babiak [97], although the findings were based on very weak theoretical foundations. Later Basu [22] found similar evidence using earnings-to-price ratio and then Banz [17] using size as one of the factors that can explain the risk-adjusted returns. Bhandari [29] showed that debt-to-equity ratio is also related to the returns, controlling for beta and asset size. Fama & French [101, 102] made a significant contribution to the financial accounting literature with their papers in which they explained the futility of using market beta and produced explanatory variables based on size and book-to-market equity that mimic the underlying risk-return relationship of the securities.

Gradually the focus shifted to additional factors that could explain the cross section of stock returns. Key among others was the interest in intangibles, as it's importance started growing in the market equity [169]. Interestingly, Chan, Lakonishok and Sougiannis [56] found in their empirical study that securities that invest in RND, and those who do not, have similar risk-adjusted returns. In fact, the market seemed to be skeptical of asset that invests heavily in RND. Some researchers have argued that this could be an indication of a systematic 'mispricing' [65] or that these assets are inherently risky because of the uncertainty associated with the investment[10].

[9] The $\beta$is given as: $\beta = \frac{cov(R_i,R_m)}{var(R_m)}$;where $R_{it} = \alpha + \beta R_m + \varepsilon_{it}$

[10] Evidence from United Kingdom [5] also show that RND explains the cross section of returns when RND is capitalized and amortized for the purpose of the study [56].

Some advances have also been made in the field of organizational capital in its role in explaining the cross-section of asset prices. Lev and Radhakrishnan [171] promoted the idea that SGA could be used as a measure for organizational capital[11]. Taking the analysis further Papanikolaou & Eisfeldt [201] modeled organizational capital using the SGA and argued that "key employees" of a firm are responsible. Their evidence shows that firms with higher investments in their "organizational capital" (SG&A) is more risky than the firms with more physical (tangible) capital.

This paper therefore attempts to join the two threads of literature, organizational capital and asset pricing [69], and hypothesizes using a new model, that this unique type of resource/asset could be employed to explain the cross-section of risk-adjusted returns.

5.3 Model

This chapter attempts to derive a new model to explain the organizational capital. From the onset it must be made clear that a firm's intangible capital or human capital is not the same as its organizational capital. Obviously there could be bidirectional synergies, but the same can be argued in favor of tangible capital[12].

[11] This study differs from the insight of Lev and Radhakrishnan [171] into SG&A, which arguably encapsulates an assets organizational capital. The main reason behind the disagreement is that — SGA is used to expense all human resource related costs of a firm. Obviously human resource expense alone cannot be a measure of organizational capital since human resource themselves are classified as a separate input for the firm. Therefore, one can argue that human resource can be treated either as an input on a stand alone basis and their contribution can be measured by the per-capita expense of SGA by the firm or be considered as a organizational capital. The argument on considering human resource is still weak because organizational capital can be achieved not only by human resources, but strategic placement of a factory in a cheaper cost country, a brand development, marketing and selling techniques or a unique distribution system, and many more such examples can be given that could go on to explain that none of these can be achieved by human resources expenses alone. Therefore an alternate definition is needed to visualize and subsequently measure organizational capital.

[12] A firm could benefit from its strategic placement of factories, shops, retailers, etc. which are all tangible investments but benefit from the intangible geographic closeness to their customers, suppliers, etc. These strategic decisions have impact on the cost of labor, capital, supply-chain and other organizational needs that could have an impact the firm's performance efficiency.

Take an example of a firm XYZ, Inc. in a two period setting (in discrete time). The firm sets-up its business at a time period t_0 produces first output at t_1 and second output at t_2. For the sake of simplicity assume that the firm is financed using only equity[13] and it is liquidated at t_2 and return funds to the equity holders.

At time t_0 the firm XYZ, Inc. invests in tangible assets in the form of property, plant and equipment and hires human capital (mangers and associates) to run the business on behalf of the stockholders which is expensed through SGA[14]. The expense of RND between the time period $t_0$and t_1 develops the structural intangibles, such as patents, trademarks, etc. SGA expenses is mostly in lieu of services provided to the firm by people, both internally and externally. The combination of the intangible capital and human capital creates tacit knowledge, know-how and other such 'soft' intangibles. An output is produced (y_t) at time t_1 with the productive efficiency ϱ. In the next time period the firm again invests in tangibles, or amortize previous investments. The firm then incurs expenses towards intangibles and also bring forward the productive efficiency from the previous time period in the form of organizational capital. Therefore, the organizational capital is argued to be the endogenous productive efficiency of the asset by using the tangible capital, intangible capital and the ability of its human resources to coordinate all the available inputs to produce an optimal output in the time period t_{21}. This performance efficiency when used as a model input in the next time period could be termed as organizational capital. This organizational capital can be measured using a number of performance indicators and statistically it is assumed to be stochastic, independent and identically distributed (i.i.d.). Another way to put it, the organizational capital is a result of the investments and sunk expenses of the previous time period, the productive efficiency benefits which are enjoyed by the firm in the present time period[15] if all the assets[16] are available from the previous time period

[13] Debts involves legal liens on the assets of the firms in the face of liquidation, unnecessarily increasing the complexity of the economic model.

[14] Managers and associate's compensation is included in the SGA expenses which are payable at time t_1.

[15] Note that in the next time period the expectations $[E(R_{t+2})]$ can readjust based on the current output, the availability of the managers (since they can leave the firm or let go based on their performance or the organizational needs) and the investments in intangibles and the resulting organizational efficiency produced by the firm.

[16] Its tangible assets could be sold off and intangible capital in the form of SGA and RND could be realized as inefficient or wasteful because of an exogenous technology shock (new

to the present time period t_2.

The economic model can be expressed mathematically using the below mentioned Cobb-Douglas production function. Here, the output (y_t) of a firm is the function (f) of labor (L_t) and capital (K_t). Some recent papers [178, 201, 80, 53, 14, 56] have argued that firms invest in intangible capital (K_t^I) along with tangible capital (K_t^T) that contributes to the output. This paper postulates that a firm's inputs are not only the result of tangible capital, intangible capital and labor but also a stochastic "organizational capital" (ϱ_t) that is produced by the performance efficiency shock measured using the accounting fundamentals from the previous time period. Therefore, the production function is given by;

$$f(\tilde{y}_t) = \vartheta_t \varrho_t (K_t^T)^\delta (K_t^I)^\gamma (L_t^{1-\delta-\gamma})$$

where,

θ is the exogenous technology shock with i.i.d distribution; $\theta \sim N(0, \sigma_\theta^2)$ (assumed constant because of the lack of data)

It is difficult to visualize, measure, transfer, store or sell when organizational capital is not in productive use[257]. However, in this study the organizational capital is measured as the function of its productive efficiency[17] measured by — Sales Growth, Profitability (ROA), Productivity (Sale/BE), Cash Flow (CF/P) and Tobin's Q. Therefore, the organizational capital, in theory is calculated as follows;

$$\varrho_t = \frac{y_t}{y_{t-1}}$$

5.4 Empiricism

5.4.1 Data

The data for this study is collected primarily from two sources, (i) Standard & Poor's Compustat database [73], and (ii) The Center for Research in Security Prices database (CRSP) [79], both available at Wharton Research Data

technology or management know-how) therefore not contributing to the firm's output.

[17]The same investing principles apply when the asset is a portfolio instead of an individual firm.

Services (WRDS)[18] website [254]. The firms are listed in the three main stock exchanges of United States, (a) New York Stock Exchange (NYSE), (b) American Stock Exchange (AMEX) and, (c) NASDAQ Stock Market (NASDAQ). Since the study deals with RND expenses the study period is restricted to 1975-2011[19].

To avoid survivor bias[20] all firms in the Compustat and CRSP databases are included in the dataset between 1975 and 2011 except for the following exclusionary criteria. (1) All duplicates observations are removed from the dataset. (2) All firms that were incorporated in countries other than the United States are deleted. (3) All Firms whose fiscal year doesn't end in December of each year is eliminated. (4) All firms in the financial and utilities sector are removed[21] from the dataset using the two digit SIC codes[22]. (5) All firms that do not have accounting or market data available in one of the databases, Compustat or CRSP, are also removed from the dataset. (6) Firms that have just one year of data are removed from the dataset. These selection criteria leaves the dataset with 7,799 firms and 100,929 annual Compustat observation years in an unbalanced panel[23].

5.4.2 Portfolio Selection Methodology

One of indirect benefits of the 1993 Fama and French paper [102] is, that it produced for academic researchers a benchmark set of portfolios at the intersection of Size ME and book-to-market ratio of the assets against which various asset pricing theories can be tested. With the motive of keeping the evidence comparable, 25 portfolios are created at the intersection of market

[18]The access to WRDS is provided by Manchester Business School, United Kingdom and it is gratefully acknowledged.

[19]The FASB *Statement 2* concerning financial accounting and reporting of RND expenses issued in 1974. According to this statement all financial costs related to RND should be expensed when incurred. [178]

[20]Delisted asset returns are included in the dataset for the time period available. The portfolios are rebalanced to the delisting at the end of the time period.

[21]Firms in the financial sector are removed because of high leverage concerns [101]. Firms in the utilities sector are removed since the structural and regulatory environment of such firms are 'different' [195].

[22]Deleted all firms that are in the SIC code range of 4900 - 4999 for utilities and 6000 - 6999 for financial firms.

[23]Stata/SE 11.2 [77] is used to estimate the parameters, which has the ability to handle large unbalanced panel dataset.

equity[24] (ME) and book-to-market (BE/ME) in a method similar to Fama and French paper [102] as explained below in greater detail.

5.4.2.1 Portfolio and Returns

The dependent variable or the regressand used in this study are the risk-adjusted value-weighted portfolio returns R_p otherwise known as excess portfolio returns[25]. The set of 25 portfolios are created at the beginning of July of year $t-1$, using the industry specific[26] deciles intersection of ME, which is calculated in the month of June of year t and BE/ME ratio, which is calculated using the book equity disclosed in the year $t-1$ divided by ME from December $t-1$. The portfolios are reformed annually at the end of June of each year to account for the change in size or book-to-market deciles.

Since the study deals with annual fundamentals the returns are calculated annually between July $t-1$ and June of t. The portfolios are based on the buy-and-hold strategy wherein the contribution of each asset to a portfolio is 100%, the monthly ME_i of each individual asset i is averaged between July of $t-1$ and June of t and an aggregate ME_p of the portfolio is calculated. Annual continuously compounded value-weighted returns[27] are calculated using the ME_p of the portfolio assets between $t-1$ and t. An investor worries only if the returns are unable to exceed the risk free rate, therefore, the portfolio returns are risk-adjusted by subtracting by annualized one month treasury interest rate to the value-weighted portfolio returns.

[24]Market Equity = share outstanding (#shrout) x stock price (#prc), corrected for stock splits and adjustments.

[25]The risk-free rate of return is the One Month Treasury interest rate available from the WRDS database [254].

[26]The industry classification is based on the Fama and French paper of 1997 [99].

[27]The value-weighted returns R_p, where the subscript p denotes the portfolio asset is in the form of natural log of market equity (ME) increment between two time periods $t-1$ and t. There are clear econometric benefits of using a logarithmic returns, for more information see Tsay [241], therefore;

$$R_p = \left[exp \left\{ ln \left(\frac{ME_{p,t}}{ME_{p,t-1}} \right) \right\} - 1 \right]$$

5.4.2.2 Fundamental Explanatory Variables

There are two types of model setups that are used in the asset pricing studies, (a.) that are based on portfolio returns of an asset in time series which are intended to highlight a specific type of hypothesis such as size, momentum, etc. [102, 52] and (b.) others are based on the economic fundamentals of the assets [161]. In this study a set of specific performance based economic factors are being tested in addition to other fundamental factors already established in the literature in a cross-sectional model. Return based factors as proposed by Fama and French [102] such as SBM and HML are not being used because of the various shortcomings and the perceived lack of clarity associated, as highlighted by its many critics including Lewellen, Nagel & Shanken [177]. Moreover, the accounting fundamentals have an established history in the asset pricing literature and any risk loading found in the models can be clearly associated with those fundamentals to assess its economic importance.

Once the set of 25 portfolios is created at the industry specific deciles of ME and BE/ME of the each individual assets, the following fundamentals are created for the same portfolios; (i.) dividend yield, (ii.) earnings-per-share, (iii.) size ME, (iv.) BE/ME ratio, and (v) RND/BE. Additionally, the risk-adjusted market return R_m is used as one of the explanatory variable.

The fundamental factors, with the exception of ME, are calculated for each of the Size-BE/ME portfolio in the year $t-1$ so that the variables can have a lagged effect on the expected returns. In this econometric setup models are expected to find out the best predictor of the cross-section of risk-adjusted stock returns. Size ME is the only variable that is calculated in the year t for each of the portfolios.

Dividends of an asset i is calculated by adding the dividend per share between July of year $t-1$ and June of year t. The dividend per share between July $t-1$ and June t is adjusted for its cash equivalent market value using the shares outstanding. The dividend yield DY of the portfolio is calculated by aggregating the assets i in a portfolio p with n assets then dividing the cash equivalent market value of dividend announced between July $t-1$ and June t by the market equity ME calculated in December $t-1$ of the portfolio sorted at the end of June $t-1$. The portfolios are reformed in June t and the process repeats itself.

$$DY_{p,t-1} = \frac{D_{p,t}}{ME_{p,t-1}}$$

Earnings-by-price ratio is another key variable that has been used in the models as an independent variable. To calculate the earnings-by-price ratio of a portfolio, the earnings calculated of an asset i in the year $t-1$ is aggregated in the portfolio in which the asset is allocated at the end of June $t-1$, it is divided by market equity of the portfolio from December in the year $t-1$. As usual the portfolios are reformed in June t and the process is repeated.

$$EP_{p,t-1} = \frac{E_{p,t-1}}{ME_{p,t-1}}$$

Size ME and BE/ME ratio are also used as independent variables. Size ME is the market equity of a portfolio calculated in June of year t by aggregating the market equity of individual assets i sorted in the portfolio p at the end of June $t-1$. Whereas BE/ME is calculated by dividing book equity calculated in the year $t-1$ by ME calculated in December $t-1$.

$$BE/ME_{p,t-1} = \frac{BE_{p,t-1}}{ME_{p,t-1}}$$

Last but not the least, RND is used as an independent variable normalized by BE. RND of the portfolio is created by adding all the individual RND i in the year $t-1$ to the portfolio p which are sorted on Size-BE/ME deciles. RND/BE ratio is calculated by dividing RND of the portfolio aggregated in the year $t-1$ by book equity of the portfolio aggregated in the same year.

$$RND/BE_{p,t-1} = \frac{RND_{p,t-1}}{BE_{p,t-1}}$$

5.4.2.3 The Market Portfolio

The value-weighted market portfolio is created using all the assets in the sample including the ones with negative book equity. The value-weighted monthly returns are annualized between January and December[28] of the year $t-1$, which is incidentally the fiscal year for all the assets in the sample. The value-weighted annualized returns is adjusted with the annualized one-month treasure returns, a measure of risk free asset. To check the robustness of the market return measure created using the sample assets, it is correlated with

[28] Note that only those equity assets are in the sample whose financial year end in December.

the annualized market return found in the Compustat database [29] using the Pearson's correlation. The Pearson correlation coefficient is found to be 93% with a Spearman's rho confirmation (p-value < 0.000).

5.4.2.4 Organizational Capital Variables

In addition to the fundamental factors several measures of the hypothesized organizational capital are used as explanatory variables. There are six main measures of productive efficiency factors that are used in this study which are — (a.) Cash Flow ratio[30], (b.) Investment Rate[31], (c) Productivity[32], (d.) Return on Assets (ROA)[33], (e.) Sales Growth[34] and (f.) Tobin's Q[35].

[29] The value-weighted market portfolio return in the Compustat database is under the header 'vwmretd' [73].

[30] The Cash Flow ratio is calculated by dividing Cash Flow (oibdp#13 - txt#16 - Δtxditc#35 - xint#15 - dvp#19 - dvc#21) calculated in the year $t-1$ by Market Equity (#shrout x #prc) from December of year $t-1$;

$$CF = \frac{C_{p,t-1}}{ME_{p,t-1}}$$

[31] Investment Rate (Physical) is calculated by dividing the Capital Expenditure (capx#128) by the Gross Property Plant and Equipment (ppegt#7) both in the year $t-1$;

$$Inv.R = \frac{capx_{p,t-1}}{ppegt_{p,t-1}}$$

[32] Productivity of the asset is calculated by dividing the Sale (sale#12) in the year $t-1$ by BE (ceq#60 + txditc#35 - pstk#130) of the same year;

$$Prod. = \frac{Sale_{p,t-1}}{BE_{p,t-1}}$$

[33] Profitability or Return on Assets (ROA) is calculated by dividing Income before Extraordinary Items (ib#18) by lagged Total Assets a (lse#6)

$$ROA = \frac{ib_{p,t-1}}{a_{p,t-1}}$$

[34] Sales Growth is the rate of growth in Sale (sale#12) between the year $t-2$ and $t-1$;$(Sale_{p,t-1} - Sale_{p,t-2})/Sale_{p,t-2}$

[35] Tobin's Q is calculated by adding Market Equity from Dec in the year $t-1$ to the Book Value of Total Debt (Long term debt dltt#9 + Current Liabilities dlc#34) plus book value of preferred stocks (pstk#130) minus the Inventories (invt#3) and divide it

The selection of these six variables as a measure of productive efficiency, which in turn are factors that represent the theorized organizational capital might appear random to some extent but all of them have an established economic rationale in the literature and researchers have devoted significant time and journal space to these measures[36]. Therefore, the basic structure of the econometric asset pricing test is structured as follows:

$$E(R_t) - R_f = \alpha + \beta \sum X_t + \gamma \varrho_{t-1} + \nu_t$$

where,

X is the fundamental factor, for e.g. size, etc.

ϱ is the productive efficiency factor, a measure of organizational capital, for e.g. cash flow ratio, etc. assumed to be i.i.d distribution; $\theta \sim N(0, \sigma_\theta^2)$

To start with, Cash Flow ratio represents how the free cash flow produced by the asset with respect to book equity. By using this variable as an explanatory factor, the hypothesis that study will test is weather the cash flow with respect to the book equity of an asset can explain the risk-adjusted variability of the portfolio returns in addition to other factors that are pre-established in the literature. Moreover, many papers have explored the role of free cash flow in issues related to disclosure and corporate governance which makes it an interesting measure of an assets performance [165, 83, 248].

Investment rate is an unusual measure of performance but quite an effective one. The theory behind this variable is that an asset will receive renewed capital investments only when the investors are satisfied with the previous returns or they expect better future returns, in both cases the investment itself makes it an indicator of asset performance [238, 178]. Additionally capital investments are generally considered to be a tangible investment in most of the cases, therefore this variable will go on to show, if significant at all, that organizational capital is not just in the domain of unexplained

by the Book Equity (ceq#60 + txditc#35 - pstk#130) from the year $t-1$

[36]It must be noted that there could be other performance measures that could be better suited to explain the cross-section of stock returns. The emphasis here is on finding evidence that can justify a theory in which a lagged efficiency measure can improve the explanation of expected stock returns, that could justify the existence of a much illusive organizational capital.

or unmeasurable intangibles as previously imagined in much of management sciences literature.

Productivity is a much more straight forward measure of productive efficiency which is measured using sales with respect to the book equity of an asset. Similarly profitability or ROA is a measure of how well the asset performs financially.

Sales growth is the rate of growth of sales between two points in time. Since a lagged variable measure is being used for organizational capital, the sales growth is calculated between $t-2$ and $t-1$, which is obtained at $t-1$. This variable is then used to explain the risk-adjusted cross-section of portfolio returns. Sales growth have been used in the literature, particularly in the asset pricing to explain the portfolio performance should the stock selection be based on a ranked sales growth [161] which is a substitute of momentum-strategy [52], except it is based on the asset fundamentals.

Last but not least, lagged Tobin's Q have been used as a measure of organizational capital. Here the Tobin's Q is calculated by adding the total debt to the market equity and preferred stock less the inventories, which is then divided by the book equity, a measure of replacement cost. Obviously Tobin's Q has been of interest to researchers with interest in intangibles [244] because of the unique setup that the ratio provides. The numerator of the Q ratio gives the market value, that includes a premium on intangibles, which is normally discounted in the book value because of measurement and reporting requirement[37] which is calculated for each asset with respect to its replacement value (book equity). Therefore researchers such as Villalonga [244] have argued that the ratio provides the performance of the "intangibility" of an asset, therefore in this study its lagged value is used as a measure of organizational capital to explain the risk-adjusted expected returns of the portfolio.

The method of calculating these organizational capital factors are similar in nature for each individual one. After stock are sorted in 25 industry specific Size ME and BE/ME deciles portfolios, the factors are then created by aggregating each fundamentals in its respective time structure for each portfolio. There are two main reasons of doing this, first is that it removes the heterogeneity of each single equity asset and focuses on the collective portfolio based on the Size and BE/ME deciles characteristics, second the

[37]Investments on structural intangibles and wages of human capital are expensed and therefore unaccounted for in the book equity.

investment in each equity asset is 00 per cent[38]. The efficiency factors are then calculated in year $t-1$ for each portfolio based on the aggregated values of the fundamentals as given in their respective formula.

5.4.3 Estimation Methodology

The asset pricing models are econometrically based on pricing error represented by the model α and the 'coefficient of determination' represented by R^2 in a hypothetical linear model. With a large amount of data there could therefore be suspicions of data dredging. To avoid this risk, the equity assets in the sample are divided into 25 portfolios at the intersection of deciles, sorted on industry median Size (ME) and BE/ME ratio[39].

The regression models are estimated using Fama-MacBeth estimation procedure [103] using Ordinary Least Square (OLS) with White-Huber standard errors (SE)[40]. Many researchers have questioned the validity of this estimation technique and called to implement alternate methods of estimation especially when portfolio returns are being used as an explanatory variable [210, 134, 177] so that the economic interpretations are not diluted mainly because of inefficient or ineffective econometric tests. Shanken [220] in his paper advocated for the use of maximum-likelihood estimation method for the beta-estimation with the correction of SE of Fama-MacBeth [103]. Jagannathan-Wang [151] derived the SE when the assumption of conditional heteroscedasticity is breached and therefore recommending the use of Generalized Least Square (GLS) estimation method. In addition of Fama-MacBeth R^2_{FM}, asset pricing error α_{FM} the Jagannathan-Wang R^2_{JW} estimates and asset pricing error α_{JW} are reported separately. In this chapter the factors are created by aggregating the market value of each individual assets i in a portfolio p sorted on industry-specific deciles Size ME and BE/ME which attempts to make the portfolios homogenous.

[38]The contribution of the equity asset in the portfolio is nevertheless based on its market equity with respect to the collective size of the aggregate portfolio.

[39]The assets are sorted into 25 portfolios at the intersection of Size and BE/ME deciles 20%, 40%, 60%, 80% and 100% creating a 5x5 matrix. The Size and BE/ME are based on the asset's industry median to accommodate for idiosyncratic effects of an industry on the Size and BE/ME ratio.

[40]White-Huber SE are calculated to account for the observable and unobservable heteroscedasticity. Under conditions of absolute homoscedastic the White-Huber SE is the same as under standard OLS estimation.

5.4.4 Portfolio Summary

In Table 5a the summary of the portfolios returns, that is the fundamental dependent variable, and other independent variables are presented. As stated earlier, 25 portfolios are created in a 5x5 matrix[41] along the incremental 20% industry-specific deciles intersection of Size ME and BE/ME ratio reformed each year at the end of June. The values reported here in the table are averaged across BE/ME deciles in the interest of space[42]. The annual returns on the portfolios varied across size, with the smallest set of five portfolios with an average annual size $35.4 million producing 14.7% risk-adjusted value-weighted returns. The largest set of portfolios with an average annual size of $9,179.0 million produced a risk-adjusted value-weighted return of 11.9% annually.

In the set of independent control variables, summary statistics are presented here for Size ME, BE per ME, dividend yield, RND per BE and earnings-to-price ratio. Even with the astronomical increase in the Size ME across small-to-large portfolios deciles the ratio of BE/ME does not show a very significant change. However, it must be noted that, as assets grow in Size ME the ratio of BE to ME reduces which can only mean that increasing portion of the value of the assets are becoming intangible or forward looking [169]. Except for the initial fall in the dividend yield, from the second deciles onwards the yield shows an increasing trend which is consistent with the view that large firms disburse more dividends. The average RND

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[41]The portfolio matrix is as follows;

$$\begin{bmatrix} Size_1 BEME_1 & . & . & . & Size_1 BEME_5. \\ . & . & . & . & . \\ . & . & . & . & . \\ . & . & . & . & . \\ Size_5 BEME_1 & . & . & . & Size_5 BEME_5. \end{bmatrix}$$

[42]The reported matrix is as follows;

$$\begin{bmatrix} \frac{1}{5}\sum\{Size_1 BEME_1 + ... + Size_1 BEME_5\} \\ . \\ . \\ . \\ \frac{1}{5}\sum\{Size_5 BEME_1 + ... + Size_5 BEME_5\} \end{bmatrix}$$

Tables with complete results are available with the author on request.

spending with respect to BE has a very distinct U-shaped Kuznets curve[43]. RND per BE is found to be increasing across size till the third deciles and then goes down to about 6% in the fifth deciles. E/P shows an increasing trend from small to large in conformity of the view that large firms are able to produce more earnings per share capital. The portfolio returns are not found to be significantly auto-correlated AR(1) except for portfolios in the second deciles of size. Natural log of ME and BE/ME ratio is found to be highly (first-order) auto-correlated. On the other hand dividend yield seems to be completely independent. RND per BE and E/P are somewhat (first-order) auto-correlated where some of the portfolios are showing evidence of significant auto-correlation.

That brings to the summary statistics of measures used to model organizational capital – cash flow per BE, investment rate, productivity, return-on-assets, sales growth and Tobin's Q. The mean CF per BE as expected grows with the size of the assets. Investment rate looks stationary in the below listed figures, but when explored deeply using the entire set of 25 portfolios, the general trend shows small assets attracting more capital investment per tangible capital. When the trend of observed horizontally, across the BE/ME ratio portfolios, the rate of investment decreases as the ratio of BE/ME increases. This goes on to show that as the intangibility[44] of assets decreases, the rate of investment decreases. The productivity of an asset is calculated by dividing the sales by BE. The trend on the evidence presented here shows that the productivity of an asset decreases with the increase in size, i.e. small assets are more productive when calculated with respect to its fixed assets. However, the return-on-assets is positively related to size. The rate of growth of sales is found to be highest in the smallest portfolios, i.e sales growth is inversely proportional to size. The trend across the horizontal BE/ME ratio portfolios shows that as the ratio increases the sales growth decreases. Tobin's Q which is a much used measure of an asset's intangiblity [244] is found to be growing with size and decreasing across the BE/ME portfolios. Most of the measures used as organizational capital does not show high (first-order) auto-correlation. However, investment rate and return-on-assets are found with substantial number of portfolios with (first-order) auto-correlation.

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[43]Kuznets curve hypothesized that the economy of a country grows in a U-shaped manner, where it grows, matures and then declines.

[44]The 'intangibility' of an asset decreases when the BE increases to match the ME in a BE/ME ratio.

Insert Table 5a — Appendix A.3.1

5.4.5 Dividend Yield Model

Dividends have been of interest to financial accountants and economists for some time in the asset pricing literature both theoretically and empirically [97, 22, 125]. One of the main reason of this interest is because of the ability of this variable to predict stock returns [98, 49]. Since dividends can be argued to be the long term returns on an assets, Campbell and Shiller [49] have argued that risk-loading or the equity premium on dividend yield[45] can be used as a discount rate, assuming absolute return foresight. This makes dividend an important measure to be used as a control in this study where a theory is being tested, where the performance indicators are used to find the best possible fit to explain endogenous organizational capital.

In the Table 5b Fama-MacBeth estimates the cross-sectional organizational capital asset pricing model with dividend yield as a common control variable. In the first model, however, the estimates are of a dividend yield model without any organizational capital variable. In the Fama and French study on dividend yield [98] they found by regressing the full sample dividend yield from the years 1941-1986 using real data on the CRSP value-weighted returns on NYSE that the yearly DY has a risk loading of 4.40% whose t-value is more than two standard deviation (2.29) from mean and the model fit is 9% (see Table 3 in Fama and French study [98], p. 12). The evidence in this study show that the portfolios in the second deciles showing similar evidence where the risk loading on dividend yield when regressed on value-weighted real returns as 5.20 although the t-value is not significantly away from mean. However, the model fit using the Fama-MacBeth estimation showing R^2_{FM} 7% and Jagannathan-Wang estimation showing R^2_{JW} 10% respectively. Portfolio assets in other deciles show a negative risk loading on dividend yield with larger model fit that ranges from R^2_{FM} 13% to 21% using the Fama-MacBeth estimation and R^2_{JW} 8% to 26% using the Jagannathan-Wang estimation.

[45] Dividend yield is generated as follows;

$$DY = \frac{D_t}{ME_{t-1}}$$

where, D_t is calculated by adding the CPI adjusted market value of dividends distributed between $t-1$ and t, and $P_{t-1}$is the CPI adjusted market value of the asset calculated in December of year $t-1$

However, the model fit is inversely related to the size of the portfolios, i.e. the smaller portfolio are producing better model fit estimates.

In the next model, cash flow normalized by book equity is used as a measure of performance efficiency. This ratio measures the ability of an asset to generate cash flow with respect to the book equity of the portfolio. Using the measure of cash flow performance the organizational capital asset pricing model with dividend yield shows the risk loading on neither of the factor are significant enough. The model fit estimated by the Fama-Macbeth estimator find the range of R^2_{FM} 4% to 10.3% and the Jagannathan-Wang model fit estimate ranges from R^2_{JW} 4.6% to 20. 5% where the portfolio assets in the second deciles are performing the best.

In the following model the rate of investment is used as a measure of hypothesized organizational capital. This ratio measures the investments in capital investments per tangible capital already available to the asset. An investor only makes an investment with the expectation of positive cash flow streams therefore investments rate serves as a unique measure of performance efficiency. The empirical evidence from using investment rate in the organizational capital asset pricing model with dividend yield as a control variable does not show any improvement from the previous model. Investment rate itself is not statistically significant and the model fits as estimated by the R^2 are almost same as the previous model.

Productivity of an asset is calculated by dividing sales by book equity. Using this as a measure of performance efficiency shows marginal improvements from the earlier models. Productivity is not found to be significant, however, the model fit estimated using Jagannathan-Wang estimator ranges from R^2_{JW} 24.5% for the assets in the third deciles to R^2_{JW} 5.7% in the fifth deciles.

Return on assets or profitability is calculated by dividing income before extraordinary items by total assets of the portfolio. When the organizational capital asset pricing model is estimated with ROA and DY as explanatory variables the evidence is mixed bag. Using the Fama-MacBeth estimator the model fit for the smallest to the largest assets does not show any significant improvement from the previous models. The risk loading on ROA is also not found to be statistically significant. However, when the assumption of homoscedasticity is dropped in the Jagannathan-Wang estimator the smallest portfolio model fit is found to be as high as R^2_{JW} 59.2%.

Sales growth is the next variable to be used as a measure of productive efficiency hypothesized as the organizational capital. In this model SG along with DY is used to model the organizational capital asset pricing model. Although dividend yield is not found to have a significant impact on the model, sales growth on each of the size deciles are found to be significant where the risk loading ranges from 0.63% to 0.95% per annum where t-value is more than six standard deviation away from the mean in the smallest size portfolios. The model fit has increased dramatically and pricing error is reduced. According to the Fama-MacBeth estimator the R^2_{FM} ranges from 51.9% for the smallest asset to as high as 86.8% for the largest asset portfolio.

In the last measure of performance efficiency Tobin's Q is used which is calculated by dividing the market value of equity and debt by its replacement value measured by book equity. The organizational capital asset pricing model is estimated with Tobin's Q and DY as explanatory variables and it is found to be statistically significant in the fourth deciles. The model fit is found to be best in the same deciles using both estimation techniques.

Insert Table 5b — Appendix A.3.2

5.4.6 Earnings Model

Basu [22] found that earnings-to-price ratio[46] was able to explain variation in the stock returns, it was met with considerable surprise because of the past work by Sharpe-Lintner-Mossin model in developing CAPM [221, 179, 192] that viewed only systematic risk as the sole explanatory variable[47]. Earnings have even been found to have information effect as studied by Chari, Jagannathan and Ofer [58]. In this section the organizational capital asset pricing model is estimated using EP as a control along with a measure of organizational capital. In the first attempt, the model is estimated without the organizational capital as a variable. The findings of the model show that risk loading on EP factor decreases with size except for the portfolios in the second deciles which showed an initial growth. However, none of the estimates

[46] Earnings to price ratio is calculated as follows;

$$\frac{E_{t-1}}{ME_{t-1}}$$

where, CPI adjusted earnings (ib#18 + txdi#50 - dvp#19) from the year $t-1$ is divided by CPI adjusted market equity (share outstanding #shrout x stock price #prc, corrected for stock splits and adjustments) from December $t-1$

[47] The evidence with respect to CAPM is however very weak [210, 101].

are statistically significant. The Fama-MacBeth model fit estimates ranges from 8.4% in the smallest size deciles to 0.8% in the largest size deciles portfolio assets. However, when the assumption of homoscedasticity is dropped the model fit of the smallest size deciles portfolio increase to as high as R^2_{JW} 40% using the Jagannathan-Wang estimates.

Table 5c tabulates the estimates of the organizational capital asset pricing model with earnings-by-price as a control variable. In the first model of organizational capital asset pricing model — cash flow by book equity ratio is used as a measure of organizational capital. In this model the t-value of risk loading estimates of the EP in the smallest size portfolio is found to be more than two standard deviation away from mean. However, the risk loading on the cash flow by book equity ratio is found to be statistically insignificant. The Fama-MacBeth estimates of the model fit is also found to have improved from 8.4% to 12.3%. However, the risk loading of the larger sized portfolios are found to be statistically insignificant even though there are some improvements in the model fit.

In the next model investment rate is used as a measure of performance efficiency hypothesized as organizational capital. The risk loading on the EP in the smallest size portfolios are again found to be more than two standard deviation away from mean. However, investment rate again fails to have any significant impact on the organizational capital asset pricing model. There are marginal fluctuations on the asset pricing model fit using both estimation techniques, but the evidence is still weak with investment rates.

The results are not an improvement with productivity as a measure of organizational capital. The risk loading on productivity, which measures the sales per book equity, is not statistically significant. The regression asset pricing model fit as estimated by the Fama-MacBeth estimates ranges from R^2_{FM} 16.9% for the smallest asset size portfolio to R^2_{FM} 6.1% for the largest asset size portfolio. The Jagannathan-Wang estimates of the model fit ranges from R^2_{JW} 20.7% to 5.2% respectively.

In the next model, return on assets (ROA) or profitability is used as a measure of performance efficiency. Both independent variables EP and ROA are found not to have a statistically significant impact on the cross-section of stock returns across the size deciles. However, the model fit as estimated by the Jagannathan-Wang estimator is found to be as high as R^2_{JW} 63.8% under the assumption of heteroscedasticity.

Sales growth is again found to be the best performer in explaining the cross-section of portfolio asset returns. Even though EP is not found to be significant in the model, the t-value on the risk loading on SG is found to be more than five standard deviation away from mean. The asset pricing model estimated using Fama-MacBeth estimator ranges from 56% to 86.8% from small to large sized portfolios.

In the last model of this section, Tobin's Q is used as a measure of organizational capital in the asset pricing model. The t-value of the risk loading is found to be more than two standard deviation away from mean only on Tobin's Q estimates in the fourth deciles portfolio assets. The R^2_{JW} is found to be 21.9%. On all other deciles EP and Tobin's Q are found to be ineffective.

Insert Table 5c — Appendix A.3.3

5.4.7 Dividend Yield and Earnings Model

In this section the analysis is further advanced by modeling the organizational capital asset pricing model using dividend yield and earnings-by-price as controls. In the Table 5d the estimates of organizational capital asset pricing model is constructed using dividend yield and earnings-by-price ratio of the portfolio as control variable in addition to various performance efficiency factors hypothesized as organizational capital. In the very first model the estimates are of dividend yield and earnings-by-price without the organizational capital variables. The risk loading on both dividend yield and earnings-by-price ratio on each of the size deciles portfolios are not statistically significant. However, the coefficient of determination or the Jagannathan-Wang R^2_{JW} is found in the range of 63.7% for the portfolio assets in the smallest size deciles to 4.9% for the assets in the largest size deciles.

Cash flow by book equity ratio is used as the first measure of performance efficiency which is hypothesized as organizational capital. The evidence from the model suggests that none of the variables are statistically significant in explaining the cross section of portfolio asset returns. However, except for the smallest size all other size deciles R^2_{FM} appear to have increased the model fit. Under the assumption of heteroscedasticity the performance of the regression is improved ranging from R^2_{JW} 34.4% for the smallest size deciles to 6% for the largest size deciles.

The evidence from investment rate model, productivity model and ROA models are not any significant improvement from cash flow model. None of these variables have any significant impact on the asset pricing model and the model fit is correlated inversely to the size ranging R^2_{FM} 17% and 6% with

Fama-MacBeth estimates and R^2_{JW} 30% and 7% with the Jagannathan-Wang estimates. However, there is one exception — Jagannathan-Wang estimate of the smallest portfolio in the first deciles has a R^2_{JW} of 85%.

Sales growth is still one of the best performing measure of organizational capital. In this model SG is found to be significant across size deciles with a risk loading ranging from 0.62% to 0.95% per annum with t-value over five standard deviation away from mean. The Fama-MacBeth R^2_{FM} ranges from 53.1% to 87% growing with size. The pricing error of the model is also found to be approaching zero especially in the third deciles of size portfolio.

In the last model of this segment, Tobin's Q is used to model the performance efficiency which is hypothesized as organizational capital. As in the previous segments on dividend yield, the fourth deciles on size appears to have a t-value greater than two standard deviation on the risk loading for Tobin's Q. The control variables dividend yield and earnings-per-share does not appear to have any significant effect on the asset pricing model.

Insert Table 5d — Appendix A.3.4

5.4.8 Size

Banz [17] in his seminal paper found initial evidence of size of the assets explaining the cross-section of stock returns. This finding was later confirmed by Fama and French [101, 102] using a portfolio selection methodology based on Size and BE/ME ratios and then using them to create returns based factors and naming then small-minus-big (SMB) and high-minus-low (HML) respectively which were able to explain about 90% of the stock variations. In the Table 5e the organizational capital asset pricing model is presented with size as a control variable.

In this study the portfolios are sorted on the Size ME and BE/ME deciles, however, unlike Fama and French [102] paper a return based asset pricing model is not being used. The log of ME calculated in the year t is used as a measure of size and as an independent variable in a organizational capital asset pricing model.

In the first model only size is used as an explanatory variable of asset pricing model. The risk loading on the size is found to be statistically significant from the second deciles onwards with t-value of the size equity premium found to be larger than two standard deviation away from the mean. The Fama-MacBeth estimates of the coefficient of determination is R^2_{FM} ranges from 10% to 12% from smallest size portfolio assets to the largest size portfolio assets. The Jagannathan-Wang estimates of the R^2_{JW} is found to be no different and they range from 9.6% to 12.2% respectively.

When cash flow by book equity is added to the model there is a marginal improvement in the model fit as demonstrated by the Fama-MacBeth R^2_{FM} which ranges from 13.3% to 18.3%. However, the Jagannathan-Wang estimates show a marked improvement from the previous model as the R^2_{JW} ranges from 25.1% to 18.6%. However, the risk loading on the cash flow is not statistically significant whereas size is still significant from second deciles onwards.

In the next three models investment rate, productivity and ROA are used as a measure of organizational capital in an asset pricing model. The risk loading on none of these variables are found to be statistically significant in any of the size deciles. The model fit in terms of Fama-MacBeth R^2_{FM} ranges for all of the model in the range of 12% and 23% across size and model deciles. When the estimates are calculated using Jagannathan-Wang estimator the R^2_{JW} ranges from 12% and 30% with the exception of ROA smallest portfolio. In the ROA portfolio the smallest size deciles model fit goes as high as 70% which stands out from the lot.

When sales growth is used as a measure of productive efficiency which is hypothesized as organizational capital the model evidenced to perform the best among the lot. Using size as a control SG explains in the range of R^2_{FM} 55% and 86.5% of cross-sectional variation of the risk adjusted portfolio value-weighted asset returns.

Last but not least, Tobin's Q is also used as a measure of organizational capital in the asset pricing model. The statistical significance of the variable is not found in the estimates. The model fit according to the Fama-Macbeth estimator found the model fit to range from 12.3% to 23.6%. The Jagannathan-Wang estimates of the model fit are of similar range.

Insert Table 5e — Appendix A.3.5

5.4.9 Size and BE/ME

The importance of Size and BE/ME ratio is in the spotlight since the Fama and French paper of 1993 [102]. Many papers have since focused on the Size and BE/ME ratio as explanatory variables of cross-section of asset returns [52]. The unifying factor in previous studies has been the use of returns based models to capture the risk loading on BE/ME ratio of the portfolio assets. In this study, however, returns based factors are not used to capture BE/ME risk. The BE/ME used in this study is the portfolio ratio of book equity in the year $t-1$ dividend by the market equity calculated in the December of year $t-1$.

In the Table 5f the estimates of the organizational capital asset pricing model is tabulated with size ME and BE/ME ratio as independent variables along with measure of organizational capital. In the first model size and BE/ME ratio is modeled without the organizational capital variables. The estimates from the Fama-MacBeth show that the t-values of the risk loading on size and BE/ME ratio are not sufficiently away form the mean therefore not statistically significant. The model fit estimates using both Fama-MacBeth and Jagannathan-Wang estimator are evidenced to be in the range of 12% to 19%.

Size models of performance efficiency are tested in the organizational capital asset pricing model in addition to Size and BE/ME ratio. Of the six models five (cash flow by book equity, investment rate, productivity, ROA and Tobin's Q) are found not to have any significant impact on the cross-section of value-weighted asset returns across size deciles. The Size and BE/ME ratios as a factor are also not found to have any significant impact on the asset pricing model. The coefficient of determination or the R^2 under both estimators Fama-MacBeth and Jagannathan-Wang ranges between 12% and 36% with a few exceptions.

The only model that is found to be of statistical significance is sales growth. With the Size and BE/ME in control the risk loading on sales growth ranges from 0.65% and 0.95% per annum with t-value more than six standard deviation away from the mean. The model fit ranges from 55% for the smallest size deciles portfolio to as high as 86.5% across both estimator.

Insert Table 5f — Appendix A.3.6

5.4.10 Size, BE/ME and RND

Many studies have focused on the RND as an explanatory variable of the cross-section of asset returns [175, 56]. Over the last few decades the investments in RND have increased exponentially and Lev [169] is among the first researchers to point out the trend. Increasing these investments are having an impact on the valuation of the asset. Therefore the key ingredient into a firm has given way from being predominantly tangible asset to increasingly intangible. Therefore, when organizational capital is being studied empirically one needs to accommodate RND in the model to understand its impact on the cross section of stock returns. In the Table 5g the estimates of the organizational capital asset pricing model is tabulated along with size, BE/ME ratio and RND/BE ratio as control variables.

The very first model is estimated without the organizational capital variables. From the estimates only the size of the portfolio assets appear to be statistically significant in explaining the cross-section of asset returns. The Fama-MacBeth and Jagannathan-Wang coefficient of determination R^2 ranges from 18% to 29% moving in a u-shaped manner across size deciles.

Five out of six variables used as a measure of organizational capital do not have any impact on the cross-section of stock returns. The organizational capital factors are cash flow by book equity, investment rate, productivity, ROA and Tobin's Q. The Fama-MacBeth and Jagannathan-Wang estimates of the coefficient of determination is found to range from 21% to 47%. One of the key reason why the factors are found to be statistically insignificant is because they are in ratios rather than in returns normally used in other models [102, 52, 56].

However, the last variable — sales growth is found to be statistically significant and the risk loading on the factor ranges from 0.65% to 0.94% per annum. The Fama-MacBeth coefficient of determination ranges from R^2_{FM} 58% to 87% and by using Jagannathan-Wang estimates the model fit ranges from 47.4% to as high as 89.8%.

Insert Table 5g — Appendix A.3.7

5.4.11 CAPM

No discussion is complete in asset pricing literature without sparing a thought for CAPM model and how any new evidence compares itself with its much famous cousin. Here in this section the various measures of productive efficiency which has been theorized as an assets organizational capital, is added to the CAPM model to compare if the risk-adjusted cross-section of stock returns are explained any better. In CAPM as proposed by Sharpe-Lintner-Mossin [221, 179, 192] they argued that in a fully diversified portfolio only the systematic risk can explain the cross-section of expected stock returns. In the models presented in the previous sections the systematic risk is not considered while discussing the effect of other fundamental factors such as Size and BE/ME ratios.

In the Table 5h, the estimates of the organizational capital asset pricing model is tabulated. In the first model the two-step Fama-MacBeth estimates of the Capital Asset Pricing Model (CAPM) is presented. Similar to the evidence from the Fama and French [101] the CAPM does not perform well and the model firm ranges from R^2_{FM} 13% to 16% fluctuating across size deciles. When the assumption of homoscedasticity is dropped according to the Jagannathan-Wang estimates the model fit deteriorates and ranges from R^2_{JW} 5% and 11% across size deciles.

With the inclusion of five out of six factors based on cash flow by book equity, investment rate, productivity, ROA and Tobin's Q it is evidenced that these factors do not have any significant impact on the cross-section of asset returns. The Fama-MacBeth and Jagannathan-Wang coefficient of determination ranges from 15% to 35%. However, the sixth factor which is based on the sales growth has a tremendous impact on the cross section of stock returns. In addition to the systematic risk factor measured by the index returns on market the model fit increases linearly with size starting from R^2_{FM} 62.4% to as high as 87.2%. This is testament that the relatively innocuous factor based on sales growth can be of importance in the asset pricing models. However, this also goes on to serve as a measure of organizational capital because sales growth is a performance indicator of an asset. The ability of an asset to generate new cash flow from new customers or getting repeat customers to buy more services and products is how the asset pricing model in this chapter is predicted.

Insert Table 5h — Appendix A.3.8

5.4.12 Robustness Check

The robustness of a model estimate hinges on many factors, some of which are – (a) the accuracy of the returns and ratio calculation, (b) validity of the assumptions made during the estimation procedure, and (c) significance of the statistical and economic factors[48]. In order to address the first concern,

[48] There are other factors effecting the model estimates that predates the estimation process in search of an economic meaning, such as accuracy in data gathering and storage in the various databases. All data that has been used in this study are from standard databases listed on the WRDS website [254] such as CRSP [79] and Compustat [73],

the value-weighted returns are calculated using the methodology given in the previous sections. However, to meet the stylized fact of January-effect [75] the changes in market equity in the month of January is eliminated to calculate the value-weighted returns and the same methodological asset pricing models are repeated. In terms of empiricism, no difference has been found using the Fama-MacBeth or Jagannathan-Wang estimation of the asset pricing models. In order to address the assumptions that the Fama-MacBeth estimation methodology makes during the estimation, White test [250] and Breusch-Pagan test [43, 128] for heteroscedasticity are performed. No heteroscedasticity found in the returns model, however, White-Huber SE are estimated for the Fama-MacBeth models to address unobserved heteroscedasticity. The reading of the results show that no matter what estimates are used the final conclusion reached on the model are robust. Finally, there is an obvious difference between statistical significance and economic significance, and the presence of one does not guarantee the other. In the inference and the conclusion economic significance have been accommodated.

5.5 Discussion

This chapter attempted to explain a fluid concept of organizational capital that is much talked about in the management science literature [203, 230]. However, in financial accounting literature the concept has received very scant interest because of lack of commonly agreed definition or measurement variable. Lev and Radhakrishnan [171] have argued that SG&A could be a measure of organizational capital since human capital is important to functioning of a firm, therefore the better the quality, better will be the organizational outcome. This analysis is insufficient because organizational capital and human capital are two separate concepts, there are obvious synergies, but they cannot be equated absolutely. Moreover, focusing on organizational capital and just measuring human capital is an insufficient way of understanding what can only be described as a much complex issue. It is argued here that a firm creates organizational capital not only because of its investments (reported as expenses in the financial reports) human capital, but also its investments in tangible and intangibles, which are both structural such as

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access provided by Manchester Business School, UK. Therefore, the accuracy of the final estimates are subject to the accuracy of storage and transmission of the financial data from these sources.

RND and sometimes unmeasurable, just like corporate culture. Therefore, it is proposed in this chapter that organizational capital can be measured using the productive efficiency of one time period as an input for the next time period, should the organizational structure remains almost same over time[49].

Asset pricing serves as a very effective empirical framework to test the voracity of the theory proposed in this chapter. Some of the key reasons to test this hypothesis using risk-adjusted returns is because of the econometric reliability of tests, the established precedence in the literature and easy comparability of available evidence. Moreover, returns are something that investors are most interested in as it serves as a suitable measure of growth of their investments. Here portfolio returns are used to reduce the heterogeneity of each individual assets and test how different measure of performance efficiency, theorized as a measure of an asset's organizational capital can explain the mean-variance of the cross-section of the expected stock returns. The null hypothesis of the entire study is that none of the measure of efficiency can predict the cross-section of stock returns. In order to test this hypothesis six separate measures of performance are used, which are randomly selected, albeit academic interest of the measures in other fields of study being one indicator of importance. The measures of performance efficiency that independently serves as a measure of organizational capital are, Cash Flow, Investment Rate, Productivity, Return on Assets, Sales Growth and Tobin's Q.

To test the theory the empirical framework is setup on previous theory and evidence in the field of asset pricing. Size and book-to-market ratio has emerged as a major explanatory variable of the cross-section of the stock returns, among the plethora of factors that have mushroomed subsequently [101, 102, 56]. Therefore, the factors developed in this study as a measure of organizational capital are tested to see if they are able to improve the explanation of the cross-section of risk-adjusted stock returns. In the first test the organizational capital measures are compared with the dividend yield of the portfolios. The findings show that on an average all the measures improve the model fit, especially sales growth which improves the model fit by 16 times as compared to dividend yield. Others are not as good, but

[49]It is acknowledged that an organization is a dynamic being and there is a constant change in it, however, often these changes are gradual and measured. Nevertheless, this change is accounted in the assumption of the independent and identical (i.i.d) distribution of the productive efficiency factors.

on average better than dividend yield being the explanatory variable. In the second model dividend yield is replaced by earnings-to-price ratio, a common explanatory variable to model returns [161]. Here as well the findings show that on average the measures of organizational capital have increased the cross-section explanation of the expected stock returns. The same pattern is repeated in all other models as well as listed and explained in the previous pages.

The bottom line of the exercise undertaken in this study shows that there are lagged performance efficiency factors that help explain the risk-adjusted returns. Is this just co-incidence or econometrically spurious? When checked with other estimation methodologies the evidence remains the same, and in some cases provides a better fit to the models. This can only then boil down to one conclusion that there are productive efficiency factors that are theorized as organizational capital that improves the returns explanation. Obviously not all model performs the same, but to various extent almost all of the factors are useful in improving the models fit.

5.6 Conclusion

Organizational capital is a special type of intangible that is discussed at length in management science literature, but its visualization and measurement in financial accounting was questionable at best. In this chapter a new theory is proposed along with some empirical evidence to support the theory of organizational capital. Most previous explanations of organizational capital used subjective interpretations such as “language” [53], know-how [133], social values [230] or human capital in its various forms [205, 33, 117, 171]. Organizational capital is much larger than just being a measure of a firm’s human capital. It is not only human capital but strategy, tangible and intangible investments, etc. and many other things collectively, and all that can be called a firm’s organizational capital. The final benefit from all these resources a firm or an asset can realize is it economic performance, and the efficiency with which it has performed is a measure of its organizational capital. This study used various measure of asset performance efficiency to model organizational capital, such as Cash Flow, Investment Rate Growth, Productivity, Return on Assets, Sales Growth and Tobin’s Q. Evidence is found that Sales Growth is one of the best measure of performance efficiency to explain the risk-adjusted value-weighted cross-section of stock returns, hence the optimal measure of organizational capital.

Chapter 6

A Comparative Study of Human, Structural & Intangible Capital

6.1 Introduction

Two of the main non-tradable[1] assets are human capital and structural capital[2], yet the risks associated with these factors are not sufficiently understood in asset pricing literature. Studies that focus on intangibles explore the risks on RND most exclusively [56, 174, 172], on the other hand, human capital risk is generally modeled at a macroeconomic-level [150, 48] or at most meso-economic level [95]. The objective of this chapter is to increase the scope of intangibles to include human capital and structural capital, individually and collectively, using the micro-economic financial data.

The view wherein intangibles constitute human capital and structural capital is not entirely unfamiliar. Lev [169] writes in his book that "*there are three major nexuses of intangibles, distinguished by their relation to the generator to the assets: discovery, organizational practices, and human resources.*" Most of the studies in the field of financial accounting and eco-

[1]This chapter is selected to be presented at the *Marie Curie ITN - Conference on Financial Risk Management & Risk Reporting* to be held in Konstanz, Germany in April, 11 - 12, 2013.

[2]In this study structural capital is the investment in research and development (RND). They are defined as structural capital because firms invest in RND with the explicit reason to create intangible assets (patents, chemical formula, etc.)

nomics, intangibles are limited to "*discovery*", denoted by RND [56, 174, 172][3]. Studies focusing on "*human resources*" or human capital are generally out of scope of intangibles discourse [104, 95][4]. Although human capital and structural capital are arguably divergent in their utility, value and risk, there are some unifying factors, (i.) the accounting treatment of SGA and RND are similar – expense when incur, and (ii.) both are intangible assets that are non-tradable[5].

Human capital has been used in many studies relating to empirical asset pricing with various degrees of success [104, 150, 139, 95]. Most studies that explored human capital used macro-economic or meso-economic income data[6] to model asset prices. A firm needs heterogeneous portfolio of human capital that is suited to its economic needs. The quality of the human capital depends on the compensation the firm is ready to offer. People can join and quit the services of the firm based on the employment contract enforceable in a legal jurisdiction. The main risks associated with human capital are (i.) ready availability , (ii.) perfect replaceability and, (iii.) costless 'firing' of excess labor. In this chapter the micro-economic financial data available from the Compustat database [73] with the variable name called SGA is used to model human capital returns[7]. Human capital is indeed a very important

[3]There are other ways of estimating returns based on intangibles. Daniel and Titman [80] have used the cross-sectional regression residual of book-to-market ratio and book value returns on stock market returns as the measure of returns on intangibles.

[4]Most papers study human capital using industry level labor income to measure returns [183, 150, 95].

[5]Mayers [183, 184] is credited with developing the equilibrium mean-variance capital asset pricing model under the condition of uncertainty where there are two sets of assets, one tradable and liquid and another non-tradable and illiquid, with and without the assumption of a risk-less asset.

[6]Fama and Schwert [104] used "*wage and salary disbursements plus the proprietors' income portion of seasonally adjusted personal income, as computed by US Department of Commerce and reported in the Survey of Current Business.*" Jagannathan and Wang [150] used the personal income and population data to calculate the returns on human capital using data from "*National Income and Product Account of the U.S.A. published by the Bureau of Economic Analysis, U.S. Department of Commerce.*" Heaton and Lucas [139] used the National Income and Product Account data to calculate the labor income growth. Last but not least, Eiling [95] used "*labor income*" to calculate the human capital returns.

[7]Lev and Radhakrishnan [171] have argued in their paper that "organizational capital" is "embedded in people" and therefore they used SGA as its measure. This view is very restrictive and does not encompass the much wide-ranging concept that is organizational capital. See Chapter 5. for more details on organizational capital.

idiosyncratic risk [139] that could be priced in an asset pricing model, if they are not theoretically diversified away in a portfolio. The existing evidences on the impact of human capital risks are scarce and unclear to say the least [104, 150, 48, 166, 95]. Additionally, the *intangible* nature of human capital and its accounting treatment has a unique feature that has not been explored under a wider context of intangibles. Therefore, in this chapter the analysis of human capital is two-dimensional, (i) as a human capital and, (ii.) in the wider context of intangible capital, that is an extension of structural capital.

It is no secret that in the past most studies dealing with intangibles have only focused on RND as a measure of intangible [174, 175, 56]. This study challenges this solitary view on intangibles and argues that a firm has two basic types of intangibles which are essential in producing superior returns, (i) structural intangibles — RND and, (ii) enabling intangibles — human capital. Structural intangibles are produced when a firm invests in a project solely for the purpose of creating intangible assets, for e.g. patents, chemical formulas, trademarks, etc. However, without a skilled bench of human capital the firm cannot produce anything. It makes human capital an enabling factor. In 1974 Financial Accounting Standards Board (FASB) issued the *Statement No. 2* [105] that standardized the RND recognition and mandated its expense when incurred[8]. Chan, Lakonishok and Sougiannis [56] produced one of the most significant study on the subject in which they empirically found that stocks that invested in RND did not produce any better returns than other brick-and-mortar firms. Researchers [172, 174] have criticized the accounting standards for its conservative and mandatory expensing regulation and claimed that there could be "mispricing" of the stocks that invest in RND[9]. Lev and Sougiannis [174, 175] capitalized and amortized RND expenses to study if that would increase the informativeness of RND. In this chapter a five year capitalization and amortization period is selected to model human capital, structural capital and intangible capital[10].

The empirical evidence from this chapter shows that the idiosyncratic risk associated with human capital is indeed priced in an asset pricing model. The pricing model shows the best result when micro-economic data is used instead of industry level data. Indeed there is room for improvement as the study did not take into account the heterogeneity of human capital in different indus-

[8]Before 1974 there was no mandated standard for RND and firms used to report on their discretion [175].

[9]Although this view has been challenged [202].

[10]Intangible capital is an amalgamation of human capital and structural capital.

tries which could indeed produce better results [95]. Structural capital still produces the best asset pricing estimates because of its sheer riskiness that are priced in the models. However, when human capital and structural capital are integrated to create a new variable called intangible capital, the asset pricing estimates suffered. One of the key reason for this result is that human capital and structural capital although show key synergies such as they are both non-tradable and are both expensed in the financial accounts, they are still two different types of risks and therefore discount differently. This heterogeneity in the different type of intangibles is ignored in the amalgamated intangible capital model and therefore the risks associated with these factors are underestimated.

In the following section (6.2), the background of the literature is presented, followed by the section (6.3) in which the model to capture human capital, structural capital and intangible capital is developed and explained. The next section (6.4) provides the details about the empiricism methodology and data. The following section (6.5) will present some discussion on the theory and empirical evidence found in the research setup. Finally (6.6), the chapter will close with some conclusions and directions on future research prospects.

6.2 Background

Studies on human capital and structural capital have been ongoing in parallel for many years without any convergence. This chapter theorizes that the cross-sectional variation of the asset prices can be modeled using human capital and structural capital. Finally, this study increases the scope of intangible capital by including structural intangibles (RND) along with human capital — and it is hypothesized to improve the cross-sectional explanation of asset prices.

6.2.1 Human Capital

Human capital is at the center of any production process, arguably, even in the contemporary mechanized production period. The key reason in favor of this view is the portfolio of human capital that a firm employes and trains determines the production process, quality and efficiency of the output. It should also be noted that the quality[11] of human capital a firm employs depends on the remuneration it is ready to shell out which is decided exogenously in a competitive job market [229]. This could only mean that human capital should have a significant effect on the asset prices. Many researchers in the past have modeled human capital, both theoretically and empirically [190, 215, 23, 104, 251]. Empirically, human capital have been of most interest to researchers in macroeconomic consumption based asset pricing. Fama & Schwert [104], Jagannathan & Wang [150] and Campbell [48] and most recently, Eiling [95] among others have empirically studied the effect of human capital in asset pricing models using macro-economic labor income [12]. Undoubtedly none of the studies have found a significant relationship between the hypothesized risk loading of human capital, as measured by the macro-economic data, on the asset pricing models and therefore the empirical evidence remains weak at best, even after correcting for industry level idiosyncrasies.

One of the glaring shortcoming of these studies is the dependence on macroeconomic data[13] or labor income to explain the cross-section of asset prices. In order to meet the challenge of data, a micro-economic alternative readily available is in the form of selling, general and administrative (SGA) expenses reported by firms on its annual report. Lev and Radhakrishnan [171] have used the variable to model organizational capital, however, the previous chapter (see Chapter 5.) has presented the shortcomings of this view. The SGA expenses[14] encapsulates the expenses of a firm in purchasing

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[11] The quality of a Human Capital on average would entail – education, previous employment, skill sets, etc.

[12] Also see [251, 139, 199, 200]

[13] Some of the problems associated with macroeconomic data, even at the industry level is that it ignores the heterogeneity association with firm level data. [123]

[14] As per S&P's Compustat User's Guide [228], SGA consists of the following expenses: Accounting, Advertising, Amortization of research and development costs, Bad debt expense, Commissions, Corporate expense, Delivery expenses, Directors' fees and remuneration, Engineering expense, Freight-out expense, Labor and related expenses (including salary, pension, retirement, profit sharing, provision for bonus and stock options, employee insurance, and other employee benefits when reported below a gross profit figure), Legal expense, Marketing expense, Strike expense, Stock-based compensation when reported below a gross profit figure. All of these expenses involve some form of Human Capital, weather they are in the firm internally or they are external service providers, providing knowledge based service such as accounting or marketing. There are also some expenses that do not directly relate to human capital, such as Parent company charges for administrative services, Recovery of allowance for losses, Restaurants' pre-opening and closing

a portfolio of labor and human expertise and the cost to train them, both directly or indirectly for a period of time. Given that this SGA expense is at the firm-level, it captures the heterogeneity associated with each individual firm. Therefore, one of the main hypothesis of this study is to find out if creating portfolios based on Size-BE/ME can diversify away the risk loading associated with human capital or it can be priced in model.

6.2.2 Structural Capital

This chapter defines structural capital as the capitalized and amortized RND. Academic interest in RND manifests because of the increasing contribution, perceived or real, they are having on the asset valuation over the past 30 - 40 years [169]. Firms invest in RND with a conscious decision to produce assets such as patents, chemical compound, trademarks, etc. The belief that intangible produces positive future benefits are based on empirical studies such as by Sood & Tellis [226] and Eberhart, et al.[93], which finds that the news about a new innovative project or investments in intangibles produces a significant abnormal returns for the assets, even in the long term. However, not everyone is so convinced by this evidence. Chan, Lakonishok & Sougiannis [56] found in their study that there are no significant difference in the returns on the assets that invest in RND versus the ones that do not. Some have argued that the returns do not capture the impact of RND investments because of the stifling financial disclosure regime that mandates the expensing of RND as soon as incurred thereby causing asset "mispricing" [55, 65]. However, the argument of mispricing hinges on 'information' and 'timing' of the information. Penman [202] has argued that the information on investments available to the stock market through the income statement, and therefore lobbying for more mandatory disclosure on the subject of structural intangibles such as RND, is misplaced or unnecessary.

In this study an attempt has been made to explore the cross-section of stock returns of portfolios based on Size and BE/ME. RND is capitalized and amortized using a similar methodology as proposed by Chan, Lakonishok & Sougiannis [56] so that the results are comparable. In an asset pricing model RND is considered to be an idiosyncratic risk because according to the Sharpe [221], Lintner [179] and Mossin [192] model of CAPM all risk are systematic

costs, Retail companies' pre-opening and closing costs and rent expense, but these are exceptions rather than the norm.

and can be explained by its measure, often returns on the index stock market. Therefore, the hypothesis in this chapter for this section is that structural capital does not have any explanatory power in an asset pricing model.

6.2.3 Intangible Capital

Studies on intangibles in the financial accounting and economics literature are oddly limited to exploring the structural intangibles measured by the RND expenses, at the firm or industry level. There are precious few studies wherein intangibles are explored in a wider context, thereby focusing on variables and assets other than RND. Advertising [119, 142], marketing [223] and science & technology [85][15] are some of the other fields .

Interest in intangibles is not limited to the field of asset pricing, but value-relevance, and financial accounting have researched the effect with equal enthusiasm. Studies have looked into RND [122, 142, 143, 131] from a valuation[16] perspective, earnings as a measure of performance [227] and even systematic risk [145] generally measured using the returns on the index stock market.

Finally, this chapter hypotheses that, with the amalgamation of human capital and structural capital into one variable called intangible capital, the new variable will be more informative than each of variables individually. The main reason behind this amalgamation is because of the non-tradable nature of both assets and accounting treatment of the variables are identical. Therefore, collectively they represent the super-set expense that a firm incurs to create intangible assets.

6.3 Model

In this simple Cobb-Douglas model the output $f(\tilde{y})$ of an asset is a function of three main inputs, tangibles capital K^T, intangibles capital $K^I$and human capital L.

$$f(\tilde{y}_t) = \vartheta_t \varrho_t (K_t^T)^\delta (K_t^I)^\gamma (L_t^{1-\delta-\gamma})$$

where,

[15] "Patents", "citation index", "technology cycle time", etc. being some of the factor taken into research consideration. [85]

[16] Also known as value-relevance studies.

θ is the exogenous technology shock with i.i.d distribution; $\theta \sim N(0, \sigma_\theta^2)$

ϱ is the endogenous productivity shock with i.i.d distribution; $\theta \sim N(0, \sigma_\varrho^2)$

Extending the model prescribed by Sharpe [221], Lintner [179] and Black [31], Mayers [183, 184] argued that portfolio assets are not only made up of tradeable assets but also non-tradeable ones. Human capital is one such non-tradeable asset. It is essential not only for the production process but also creates hedge for the investors. Since the study proposes to use the expenses on SGA as a measure of the human capital, the implicit assumption is that it is a measure of the portfolio human capital.

6.3.1 Human Capital

Fama and Schwert [104] demonstrated the model in which the return on tradeable and non-tradeable assets are to be calculated empirically in extension of Mayers [183]. Jagannathan and Wang [150] used a lagged labor income to calculate the return on the human capital which is also similar to Fama & Schwert [104] and Eiling [95]. In this study the non-tradeable return on human capital is calculated as follows[17];

$$R_{p,t-1}^{HC} = \left[exp \left\{ ln \left(\frac{HC_{t-1}}{HC_{t-2}} \right) \right\} - 1 \right]$$

where,

$R_{p,t-1}^{HC}$ is the return on human capital of asset i at time t

[17] Here the assumption is that the rate of growth r_{HC} of human capital is constant (rate of growth in SGA expense) and it follows the first order auto-regressive model;

$$SGA_t = (1+g)SGA_{t-1} + \varepsilon_t; \varepsilon \sim N(0, \sigma_\varepsilon^2)$$

The wealth invested in SGA is given by;

$$W_t^{HC} = \frac{SGA_t}{r_{HC} - g}$$

HC is the capitalized and amortized selling general and administrative expenses using the method recommended by Chan, Lakonishok & Sougiannis [56];

$$HC_t = SGA + 0.8 * SGA + 0.6 * SGA + 0.4 * SGA + 0.2 * SGA$$

6.3.2 Structural Capital

In this chapter RND is defined as structural intangible. The main reason behind treating RND expense as a measure of structural capital (SC) is because firms actively invest in activities which under the FASB *Statement No. 2 [105]* can be expensed. SI creates some of the main entities that can largely be described as intellectual assets, however, they are non-tradeable as modeled by Mayers [183]. Here, in this Cobb-Douglas model the output is a function of tangible capital and structural capital. Human capital is held constant here in this model.

$$f(\tilde{y}_t) = \vartheta_t \varrho_t (K_t^T)^\delta (K_t^{SC})^{1-\delta} (L_t)$$

The return on the structural capital is calculated as follows;

$$R_{p,t-1}^{SC} = \left[exp \left\{ ln \left(\frac{SC_{t-1}}{SC_{t-2}} \right) \right\} - 1 \right]$$

where,

$R_{p,t-1}^{SC}$ is the return on structural capital of asset i at time t

SC is the capitalized and amortized RND expenses calculated as follows;

$$SC = RND + 0.8 * RND + 0.6 * RND + 0.4 * RND + 0.2 * RND$$

6.3.3 Intangible Capital

To simplify the initial Cobb-Douglas model lets assume that human capital is just another intangible in the larger scheme of things. This can only mean that the output $f(\tilde{y})$ is a function of investments on tangible capital and intangible capital with the same exogenous θ and endogenous ϱ shocks.

$$f(\tilde{y}_t) = \vartheta_t \varrho_t (K_t^T)^{\delta} (K_t^I)^{1-\delta}$$

One of the main reason to model intangibles capital that includes expenses on human capital is because of the accounting treatment. According to the Financial Accounting Standard Board *Statement no. 2* [105] all investments related to RND are to be expensed when incurred. The treatment of expenditure incurred in hiring a portfolio of human capital at a time t is no different. In a dynamic real world the impact of human capital is not static. But the accounting treatment of cost incurred on hiring and training human capital makes it appear to be static. Therefore, the key unifying factors in both structural intangibles (RND) and human capital is their accounting technique at time t and that they are non-tradeable assets. Therefore, the returns on this non-tradeable asset class should be similar to Mayers [183] approximation of the risk loading. The returns are calculated as follows;

$$R^{IC}_{p,t-1} = \left[exp\left\{ ln\left(\frac{IC_{t-1}}{IC_{t-2}} \right) \right\} - 1 \right]$$

where,

$R^{IC}_{p,t-1}$ is the return on intangible capital of asset i at time t

IC is the intangible capital wherein the intangibles is made of RND and SGA as follows;

$$I = RND + SGA$$

I is capitalized to form IC as follows;

$$IC_t = I + 0.8 * I + 0.6 * I + 0.4 * I + 0.2 * I$$

6.4 Empiricism

6.4.1 Data

The data for this study is collected primarily from two sources, (i) Standard & Poor's Compustat database [73], and (ii) The Center for Research in Security Prices database (CRSP) [79], both available at Wharton Research Data

Services (WRDS)[18] website [254]. The firms are listed in the three main stock exchanges of United States, (a) New York Stock Exchange (NYSE), (b) American Stock Exchange (AMEX) and, (c) NASDAQ Stock Market (NASDAQ). The study period is restricted to 1975-2011[19].

To avoid survivor bias[20] all firms in the Compustat and CRSP databases are included in the dataset between 1975 and 2011 except for the following exclusionary criteria. (1) All duplicates observations are removed from the dataset. (2) All firms that were incorporated in countries other than the United States are deleted. (3) All Firms whose fiscal year doesn't end in December of each year is eliminated. (4) All firms in the financial and utilities sector are removed[21] from the dataset using the two digit SIC codes[22]. (5) All firms that do not have accounting or market data available in one of the databases, Compustat or CRSP, are also removed from the dataset. (6) Firms that have just one year of data are removed from the dataset. These selection criteria leaves the dataset with 7,799 firms and 100,929 annual Compustat observations in an unbalanced panel[23].

6.4.2 Econometric Estimation

The asset pricing models are econometrically based on pricing error represented by the model α and the 'coefficient of determination' represented by R^2 on a hypothetical linear model. Large amounts of data cause speculations of data dredging. To avoid this risk, the equity assets in the sample are divided into 25 portfolios at the intersection of deciles, sorted on industry

[18] The access to WRDS is provided by Manchester Business School, United Kingdom and it is gratefully acknowledged.

[19] The FASB *Statement 2* concerning financial accounting and reporting of RND expenses was issued in 1974. According to this statement all financial costs related to RND should be expensed when incurred. [178]

[20] Delisted asset returns are included in the dataset for the time period available. The portfolios are rebalanced to the delisting at the end of the time period.

[21] Firms in the financial sector are removed because of high leverage concerns [101]. Firms in the utilities sector are removed since the structural and regulatory environment of such firms is expected to be 'different'[195].

[22] Deleted all firms that are in the SIC code range of 4900 - 4999 for utilities and 6000 - 6999 for financial firms.

[23] Stata/SE 11.2 [77] is used to estimate the parameters, which has the ability to handle large unbalanced panel datasets.

median Size (ME) and BE/ME ratio[24].

The regression models are estimated using Fama-MacBeth estimation procedure [103] using Ordinary Least Square (OLS) with White-Huber standard errors (SE)[25]. Many researchers have questioned the validity of this estimation technique and called to implement alternate methods of estimation especially when portfolio returns are being used as an explanatory variable [210, 134, 177] so that the economic interpretations are not diluted mainly because of inefficient or ineffective econometric tests. Shanken [220] in his paper advocated for the use of maximum-likelihood estimation method for the beta-estimation with the correction of SE of Fama-MacBeth [103]. Jagannathan-Wang [151] derived the SE when the assumption of conditional heteroscedasticity is breached and therefore recommending the use of Generalized Least Square (GLS) estimation method. In addition of Fama-MacBeth R^2_{FM} and asset pricing error α_{FM} the Jagannathan-Wang R^2_{JW} estimates and asset pricing error α_{JW} are reported separately. In this chapter, the factors are created by aggregating the market value of each individual assets i in a portfolio p sorted on industry-specific deciles Size ME and BE/ME which attempts to make the portfolios homogenous.

6.4.3 Portfolios

Since the study deals with RND expenses the sample period is restricted to 1975-2011[26]. A set of 25 portfolio are created at the intersection of industry-specific deciles of Size ME and BE/ME. The regressand returns are created from the same Size-BE/ME portfolios which is explained in greater detail in the following section.

[24] The assets are sorted into 25 portfolios at the intersection of Size and BE/ME deciles 20%, 40%, 60%, 80% and 100% creating a 5x5 matrix. The Size and BE/ME are based on the asset's industry median to accommodate for idiosyncratic effects of an industry on the Size and BE/ME ratio.

[25] White-Huber SE is calculated to account for the observable and unobservable heteroscedasticity. Under conditions of absolute homoscedasticity the White-Huber SE is the same as under standard OLS estimation.

[26] FASB *Statement No. 2* [105] was released in 1974 when the expensing of RND was mandated and standardized.

6.4.3.1 Portfolios and Returns

The portfolio value-weighted returns R_p are calculated for each of the 25 portfolios created at the intersection of industry-specific deciles[27] of Size ME and BE/ME ratios. The portfolios are created at end of June in year $t-1$. The returns are calculated from July of year $t-1$ to June of year t. The returns, however, are not calculated monthly but annually. The portfolios are reformed in June of year t. Since the portfolios are based on the buy-and-hold strategy wherein the contribution of each asset to a portfolio is 100%, the monthly ME_i of each individual asset i is averaged between July of $t-1$ and June of t and an aggregate ME_p of the portfolio is created. Annual continuously compounded value-weighted returns[28] are calculated using the ME_p of the portfolio assets between $t-1$ and t. An investor worries only if the returns are unable to exceed the risk free rate, therefore, the portfolio returns are risk-adjusted by subtracting the annualized one-month treasury interest rate from the value-weighted portfolio returns.

6.4.3.2 Independent Variables

There are three primary independent variables as a result of the earlier discussion[29], (i.) human capital, (ii.) structural capital and (iii.) intangible capital. Of the 25 portfolios created at the industry-specific deciles intersection of Size-BE/ME portfolios that are created at the end of June of year $t-1$, three variables – SGA_i, RND_i and I_i of each individual asset are aggregated to calculate the gross size of the variable in a portfolio SGA_p, I_p and RND_p. These variables are capitalized and amortized at fixed rate of 20% per annum to create capitalized variables HC_p, SC_p and IC_p observable in the year $t-1$. The returns R^{HC}_{t-1}, R^{SC}_{t-1} and R^{IC}_{t-1}on the variables are calculated from $t-2$ to $t-1$ which are to be used in the year $t-1$ in the regression as an independent variable.

[27]The five deciles intersection points are 0.2, 0.4, 0.6, 0.8 and 1.

[28]The annual continuously computed returns are calculated as follows;

$$R_p = \left[exp\left\{ln\left(\frac{ME_{p,t}}{ME_{p,t-1}}\right)\right\} - 1\right]$$

[29]See Section 6.3. Model – of this chapter.

6.4.3.3 Other Independent Variables

Other independent variables that are used as controls in various model estimations are – dividend yield, earnings per share, risk-adjusted market portfolio returns. They are calculated annually with all the stocks in the sample, which includes the assets with negative BE.

Dividends of an asset i is calculated by adding the dividend per share between July of year $t-1$ and June of year t. The dividend per share between July $t-1$ and June t is adjusted for its cash equivalent market value using the shares outstanding. The dividend yield DY of the portfolio is calculated by aggregating the assets i in a portfolio p with n assets then dividing the cash equivalent market value of dividend announced between July $t-1$ and June t by the market equity ME calculated in December $t-1$ of the portfolio sorted at the end of June $t-1$. The portfolios are reformed in June t and the process repeats itself.

$$DY_{p,t-1} = \frac{D_{p,t}}{ME_{p,t-1}}$$

Earnings-by-price ratio is another key variable that has been used in the models as an independent variable. To calculate the earnings-by-price ratio of a portfolio, the earnings of an asset i in the year $t-1$ is aggregated in the portfolio in which the asset is allocated at the end of June $t-1$, it is divided by market equity of the portfolio from December in the year $t-1$. The portfolios are reformed in June t and the process is repeated.

$$EP_{p,t-1} = \frac{E_{p,t-1}}{ME_{p,t-1}}$$

Size ME and BE/ME ratio are also used as independent variables. Size ME is the market equity of a portfolio calculated in June of year t by aggregating the market equity of individual assets i sorted in the portfolio p at the end of June $t-1$. Whereas BE/ME is calculated by dividing book equity calculated in the year $t-1$ by ME calculated in December $t-1$.

$$BE/ME_{p,t-1} = \frac{BE_{p,t-1}}{ME_{p,t-1}}$$

6.4.3.4 Market Portfolio

The value-weighted market portfolio is created using all the assets in the sample including the ones with negative book equity. The value-weighted monthly returns are annualized between January and December of the year $t-1$, which is incidentally the fiscal year for all the assets in the sample. The value-weighted annualized return is adjusted with the annualized one-month treasure returns, a measure of risk free asset. To check the robustness of the market return measure is created using the sample assets, it is correlated with the annualized market return found in the Compustat database [30] using the Pearson's Correlation. The Pearson correlation coefficient is found to be 93% with a Spearman's rho confirmation (p-value < 0.000).

6.4.4 Summary Statistics

A set of 25 portfolios are created at the intersection of industry-specific deciles[31] of Size ME and BE/ME ratio in a 5x5 matrix[32]. In the Table 6a the summary statistics of the portfolios are presented in the two panels, however, in the interest of space the returns and other variables are averaged across BE/ME ratio portfolios[33]. In the panel i. the summary of the value-weighted returns are presented along with the standard deviation and Sharpe ratio. Additionally, the first-order AR(1), second-order AR(2) and third-order AR(3) auto-correlations of the returns are tabulated.

As expected the returns are inversely correlated with size, a stylized fact that small assets produce higher returns. The returns are not highly auto-

[30] The value-weighted market portfolio return in the Compustat database is under the header 'vwmretd' [73].

[31] The deciles are at an interval of 20%, 40%, 60%, 80% and 100%.

[32] The portfolio matrix is as follows;

$$\begin{bmatrix} Size_1 BEME_1 & . & . & . & Size_1 BEME_5. \\ . & . & . & . & . \\ . & . & . & . & . \\ . & . & . & . & . \\ Size_5 BEME_1 & . & . & . & Size_5 BEME_5. \end{bmatrix}$$

[33] The reported matrix is as follows;

$$\begin{bmatrix} \frac{1}{5}\sum\{Size_1 BEME_1 + ... + Size_1 BEME_5\} \\ . \\ . \\ . \\ \frac{1}{5}\sum\{Size_5 BEME_1 + ... + Size_5 BEME_5\} \end{bmatrix}$$

Tables with complete results are available with the author on request.

correlated with only a few portfolios displaying a significant auto-correlation with t-value two standard deviation away from the mean.

The returns on human capital HC measured using the 20% straight line capitalization of selling, general and administrative expenses show a decreasing trend across the size portfolios. This trend is reverse across the BE/ME ratio portfolios. The ratio of BE/ME increases, the returns on human capital HC decreases. It is usually understood that with increase in the BE/ME ratio the assets get distressed, with lower cash flow and earnings, following the same trend the return on human capital HC also shows a sign of distress for the asset. The returns on human capital HC show some signs on auto-correlation with the first-order AR process significant in the 3rd and 4th deciles.

The structural capital is measured using a 20% straight line depreciation of the RND expenses expressed in year $t-1$ and the returns are calculated on a capitalized SC. The returns on the structural capital are higher for the smaller portfolios and lower for larger portfolios with one key distinction – when compared to the returns on human capital, the returns are higher in each deciles points. In the smallest portfolio in the first deciles, the average annual return across five BE/ME deciles are 20.8% which is over 9% points higher than the return on human capital and about 16% points greater than a combined intangible capital. Structural capital does not show a significant first-order auto-correlation except for one deciles point. Higher order auto-correlation is non-existent.

Last but not least, the return on intangible capital IC is measured by aggregating SGA and RND, one expenses human capital and the other structural capital, and then capitalizes it over a period of five years in a straight line depreciation effective in year $t-1$. When the returns are calculated annually on this variable, they are found to range within half and one-third of human capital in each size deciles. Some degree of first-order auto-correlation is also found in the 3rd and 4th size deciles which are averaged across BE/ME portfolio.

Insert Table 6a — Appendix A.4.1

6.4.5 Human Capital

In Table 6b the Fama-MacBeth estimates [103] and the Jagannathan-Wang [151] R^2_{JW} and pricing error of the cross-sectional human capital asset pricing model is presented. In the cross-sectional model some of the established variables are used as controls, such as dividend yield, earnings-per-share, systematic risk peroxided by the stock market index returns measured using the assets in the sample, Size ME and BE/ME ratio. The theory presented in Section 6.3.1 can be expressed in a empirical model as follows[34]:

$$E(R_{p,t}) - R_f = \alpha + \beta HC_{t-1} + \gamma X_{t-1} + \phi Y_{t-1} + \varepsilon_t$$

The risk loading or risk premium on the human capital returns are found to be significant with the t-value being two standard deviation away from mean in the medium to large portfolios, represented here in the 3rd - 5th deciles size portfolios. According to the Fama-MacBeth estimates which assumes homoscedasticity the R^2_{FM} increases from 9% in the smallest set of portfolio to 47% for the largest set of portfolios. The cross-sectional Jagannathan-Wang estimate of the model fit is found to be increasing from 5.4% for the smallest set of portfolios to 31.8% in the largest set of portfolios.

When dividend yield is added to the model of human capital to explain the cross-sectional covariance of the returns, the extreme fit of portfolios on the extremes are not improved sufficiently. However, in the 2nd deciles Size portfolio there is a marked increase from 26% in the human capital model to 47.1% in the human capital and dividend yield model using the Jagannathan-Wang R^2_{JW} estimates. Although, there are only marginal increment found between the two models when the estimator is Fama-MacBeth.

In the third model along with dividend yield earnings-per-share is added to the human capital asset pricing model. In this cross-sectional model there is a increasing trend on the model fit with size of the portfolio. Adding another factor such as earnings-per-share does not make any significant improvement from the earlier model of dividend yield. However, marginal increase in model fit is found throughout the size deciles even with the change in estimator from Fama-MacBeth to Jagannathan-Wang.

In the next model dividend yield is eliminated and just earnings-per-share is retained in the human capital model. The result of the most is quite similar to the dividend yield and human capital model. There is an upward trend in the model fit that increases with size, starting from 17.9% for the smallest portfolio assets to 48.9% for the biggest using the Fama-MacBeth estimator. The result is almost identical when the Jagannathan-Wang estimator is used.

[34]The model is an extension of the conditional CAPM or C-CAPM model proposed by Jagannathan and Wang [150], Campbell [48] and most recently Eiling [95].

In the CAPM model, all stocks from the sample are used to replicate the market index returns. This model set-up was termed conditional CAPM by Jagannathan & Wang [150], Campbell [48] and most recently Eiling [95]. The Fama-MacBeth estimates show that the model explains 21.8% of the cross-sectional variations of pricing factors with respect to portfolio returns of the small assets. As the assets grow larger the cross-sectional model explanation increases to about 61.7% for the largest set of portfolio assets. The risk loading on the human capital factor is significant as the t-value is more than two standard deviation away from mean starting the portfolios in 3rd deciles. The Jagannathan-Wang estimator has the same set of results except the variation of the cross-sectional variation ranges from 12.4% to as high as 66%.

In the next model, size of the asset is used as an explanatory variable in addition of returns on human capital. The importance of size in asset pricing model was highlighted by Fama and French [101]. Here the natural logarithm of portfolio Size ME at t is used as an explanatory variable. The risk loading on size that ranges from 0.17% to 0.18% per annum is significant with t-values more than two standard deviation away from mean in the assets from the middle deciles. The risk loading varies from 0.26% to 0.59% per annum is also significant with t-values greater than two standard deviation from mean from the 2nd deciles onwards. The model fit extends from 9.5% in the Jagannathan-Wang estimates of R^2_{JW} in the smallest deciles asset to 46.9% for the highest deciles assets. The analysis is further extended by adding a BE/ME factor of the portfolio assets into the final model. Fama and French [102] were the ones who highlighted the importance of BE/ME factors. Therefore, using the BE/ME factor in addition to Size ME factor and human capital factor explains the range of 20.5% to 52% of the cross-sectional variations of the factors with respect to conditional distribution of the asset returns using the Fama-MacBeth estimators.

Insert Table 6b — Appendix A.4.2

6.4.6 Structural Capital

Many studies in the past have tried to model the RND expenses in an asset pricing model. The main aim of all these studies is to find out how much of the cross-sectional variations of the asset returns can be explained by RND

[174, 175, 56]. Obviously the idea that investments in RND produces idiosyncratic intangibles is not a novel one. Therefore, to model RND expenses in the form of structural capital has two main purposes in this study. First, the evidence on the impact of RND on the cross-section of stock return by Chan, Lakonishok and Sougiannis [56] is old and needs renewal. Second, the RND modeling in study serves as a control study with which the human capital asset pricing model and intangible capital asset pricing model can be compared. The theoretical model from the Section 6.3.2 is expressed empirically as follows;

$$E(R_{p,t}) - R_f = \alpha + \beta SC_{t-1} + \gamma X_{t-1} + \phi Y_{t-1} + \varepsilon_t$$

Structural capital is capitalized and amortized RND expenses over a period of five years in a straight line 20% depreciation. The mean-variance structural capital asset pricing model hypothesizes that the cross-section of stock returns cannot be explained by the return on structural model. As shown in the Table 6e the Fama-MacBeth estimates finds that the t-value on the risk loading of the structural capital asset pricing model is more than two standard deviation away from the mean but only for the assets with the largest size. The R^2_{FM} is found to the 44% and R^2_{JW} is 53.4% respectively.

In the next model dividend yield is added to the structural capital asset pricing model. The risk loading on dividend yield does not appear to have any significant impact through the estimates. However, the model fit does appear to improve when viewed through the prism of R^2_{FM} which is found to be as high as 45.3% and R^2_{JW} is 60.2% respectively for the largest assets. For the portfolios with smaller size the model fits are not quite as impressive.

When earnings-per-share is added to the structural capital asset pricing model not much improvement is observed in the significance of the estimates or the model fit. The pricing error remains almost at the same levels, and all these observations are throughout asset size deciles. However, when dividend yield is eliminated from the structural capital asset pricing model whilst retaining the earnings-per-share as an explanatory variable, the estimates, model fit and pricing error remains the same and this observation does not change with the change in the estimation methodology.

In the next model, the systematic risk is priced using the measure of index market returns calculated using the stocks in the sample including the ones with negative BE. In this model the capital asset pricing model is extended using the structural capital as a measure of idiosyncratic risks. The t-value of the risk-loading on the structural capital is found to be at least two standard deviations away from the mean, in the largest asset size portfolio. Since the estimates are regressed on the annualized value the t-value of the systematic risk is two standard deviation away from the mean barring portfolios in one deciles. The model fit according to the R^2_{FM} is found to be 56.2% and the Jagannathan-Wang R^2_{JW} is as high as 74.7% for the portfolios with the largest asset size.

As noted earlier, Fama and French pointed out in their papers [101, 102] that Size ME and BE/ME ratios play a significant role in the explanation of the cross-section of asset prices. Size ME is used as a measure of asset specific idiosyncratic risk in addition to structural capital in an asset pricing model. Under the assumption of homoscedasticity using the Fama-MacBeth estimation the model fit ranges from 14.8% to 50% in the increasing order of size deciles. The t-value of the risk loading on size is found to be two standard deviation away from the mean thereby showing significant effect on the model along with structural capital. However, in the structural capital only the largest size deciles assets are found to have any significant risk loading effect according to the t-values. When the risk loading is of significance for intangible capital in the largest size deciles it is found to be discounting at 0.40% per annum, whereas the size risk loading ranges from 0.19% to 0.22% per annum.

When BE/ME is added to the model in addition to size and intangible capital in an asset pricing model, the BE/ME is found not to have any significant impact. In this model even the significance of size seems to have diminished, however, structural capital shows a similar amount of risk loading when compared to other models and the t-value are found to be two standard deviation away from the mean for the assets belonging to the largest portfolios. However, significant improvement is found when BE/ME is used in the model R^2 especially in portfolios with smaller asset size.

Insert Table 6c — Appendix A.4.3

6.4.7 Intangible Capital

Intangible capital is calculated by capitalizing SGA and RND that are expensed by a firm as soon as they are incurred. Both these expenses contribute to the development of intangible capital of a firm, one in the form of human capital and the other contributes to innovation that produces structural intangibles. Many papers have studied intangibles just by concentrating on RND investment's [174, 56] role in asset pricing. This chapter attempts to model intangible capital using the capitalized expenses on human capital and structural capital represented by the aggregated SGA and RND to explain the cross-section of asset prices.

Many have argued in the past that intangible capital does have or should have an impact in explaining the cross-section of asset prices since they are an important part of the value creating process [50, 169]. The theoretical model presented in the Section 6.3.3 can be empirically expressed as follows:

$$E(R_{p,t}) - R_f = \alpha + \beta IC_{t-1} + \gamma X_{t-1} + \phi Y_{t-1} + \varepsilon_t$$

Table 6d presents the Fama-MacBeth [103] estimates of the intangible capital asset pricing model along with its model variations. Additionally as Lewellen, Nagel, and Shanken [177] recommended the Jagannathan-Wang [151] R^2_{JW} is also tabulated.

The returns on asset prices are regressed on the one time period lagged return on intangible capital and the t-value of the model beta or the risk loading on the factor is found to be greater than two standard deviation away from the mean in most of the size deciles across size ME portfolios. The R^2_{FM} is found to be increasing with size of the portfolios, whereas as the portfolios move across the increasing BE/ME ratio portfolios[35] the trend decreases. This goes on to show that as the distress level increases of the assets the investments in intangible capital becomes increasingly irrelevant for the asset prices. Overall the R^2_{FM} ranges from 10.5% for the smallest size deciles to 45.6% whereas if the model is estimated without the assumption of homogeneity the R^2_{JW} ranges from 4.6% to 35.4%.

When dividend yield is added to the intangible capital asset pricing model the fit ranges from 12% to 47% under the assumption of the homogeneity. It must be noted that the pricing error in both type of estimates α_{FM} and α_{JW} shows an increment with the addition of dividend yield to the asset pricing model.

In the next step earnings-per-price is added to the model. Both dividend yield and earnings-per-price do not seem to be significant according to the t-values. However, the model fit does seem to increase in the asset with smaller

[35]Values not reported but available from the author on request.

size. For example, in the smallest asset with dividend yield and earnings-per-price along with intangible capital return as an explanatory variable, rises from 10.5% (model with only intangible capital) to 18% under the assumption of homogeneity. However, as the asset size grows larger the model fit does increases but the joint distributional covariance between the returns and the independent variable does not appear to show a significant improvement. The R^2_{FM} model fit increases from 45.6% to just 47%. When in the next model earnings-per-share is used as a sole explanatory variable in addition to intangible capital the model fit does not diverge from the previous estimates in any significant way.

In the next model the intangible capital asset pricing model is estimated under the joint distributional assumption with the systematic risk measured by the market index returns. The Jagannathan-Wang estimates of this model for the large assets go up to 70% whereas the two-step Fama-MacBeth estimates of this model is 60% for the largest set of assets. The improvements in the model fit are observed for the smaller size assets.

In the last set of models, Size ME as independent variable and Size ME along with BE/ME ratio of the assets are used in addition to intangible capital in an asset pricing model. In both cases there is model fit observed an increasing trend in correlation with size of the asset. There are however significant asset pricing errors found in both models even with the increasing level of model fit.

Insert Table 6d — Appendix A.4.4

6.4.8 Robustness Check

The robustness of a model estimate hinges on many factors, some of which are – (a) the accuracy of the returns and ratio calculation, (b) validity of the assumptions made during the estimation procedure, and (c) significance of the statistical and economic factors[36]. In order to address the first concern,

[36]There are other factors effecting the model estimates that predates the estimation process in search of an economic meaning, such as accuracy in data gathering and storage in the various databases. All data that has been used in this study are from standard databases listed on the WRDS website [254] such as CRSP [79] and Compustat [73], access provided by Manchester Business School, UK. Therefore, the accuracy of the final estimates are subject to the accuracy of storage and transmission of the financial data from these sources.

the value-weighted returns are calculated using the methodology given in the previous sections. However, to meet the stylized fact of January-effect [75] the changes in market equity in the month of January is eliminated to calculate the value-weighted returns and the same methodological asset pricing models are repeated. No difference has been found using the Fama-MacBeth or Jagannathan-Wang estimation of the asset pricing models. In order to address the assumptions that the Fama-MacBeth estimation methodology makes during the estimation, White test and Breusch-Pagan test for heteroscedasticity are performed. No heteroscedasticity found in the returns model, however, White-Huber SE are estimated for the Fama-MacBeth models to address unobserved heteroscedasticity. The reading of the results shows that no matter what estimates are used the final conclusion reached on the model are robust. Finally, there is an obvious difference between statistical significance and economic significance, and the presence of one does not guarantee the other. In the inference and the conclusion economic significance has been accommodated.

6.5 Discussion

This chapter took a fresh look into the role of non-tradable assets such as human capital and structural capital in explaining asset prices. Empirical studies on intangibles focus solely on RND. This empirical definition of intangibles is however, insufficient to say the least and could be potentially risky. In a theoretical asset pricing model of a fully diversified portfolio the cross-sectional returns can only be explained by the systematic risk. The empirical findings from this chapter show that human capital, as modeled, has substantial explanatory power of the value-weighted cross-sectional stock returns of portfolios sorted at the intersection of industry-specific deciles of Size ME and BE/ME portfolios. Human capital or structural capital is an idiosyncratic risk, which is not completely diversified away and has substantial explanatory power using R^2_{JW} going as high as 97%[37] in one of the portfolios. This paper has argued and empirically demonstrated that SGA can be used as a measure of assets measure of human capital, in expenses, and therefore can be used in future research with sufficient caution.

[37] Portfolio number $P_{5,4}$, where P is the portfolio code in the 5x5 matrix as listed in footnote 26 of this chapter, where 5 is the code of the row and 4 is code for the column. Not reported separately, available from the author on request.

The structural capital is the capitalized and amortized RND expenses and there are two basic objectives to perform this test. One, to renew the evidence on the structural capital in the most recent years, and secondly, to create comparative controls for the evidence from human capital and intangible capital, when human capital is part of the latter. The evidence shows that it is in fact structural capital that produces the best model fit R^2 and it can explain the cross-section of stock returns. Therefore, structural capital is obviously not diversified away in the portfolios and is priced especially in the assets with largest size.

Last but not least, Expenses on human resources and RND spending is amalgamated to create a new variable called intangible capital. The prediction of the value-weighted cross-section of stock returns are hypothesized to significantly improve. However, the empirical results do not show any improvement in the explaining the returns. In fact the cross-sectional explanation is inferior as captured by the R^2 model fit of the variables when modeled separately. One explanation of this empirical results is that with the amalgamation a lot of the heterogeneity of each individual factor, human capital and structural capital, is lost. This loss of heterogeneity among human capital and structural capital undermines the risks associated with the factors and does not fully price them. This highlights the importance of the factors separately, even of they have similar attributes, such as non-tradability and similar accounting treatment.

6.6 Conclusion

This chapter focused on the human capital and compared it with structural capital in the form of capitalized RND expenses. Every firm invests in a portfolio of human capital that is optimal for its operations. They are a non-tradable asset similar to structural capital and the accounting requirements of both are very similar — expense when incurred. However, the risks of these variables are not fully understood especially for human capital. The main problem with human capital is credible data. Many have studied it using industry level macroeconomic data and found very weak evidence. Here in this study capitalized SGA is hypothesized as a measure of human capital since all the expenses a firm incurs in paying its human resources are reported under this publicly available variable. Additionally, due to the similarity between capitalized RND and SGA, a common variable on intangibles is created by adding them. The evidence found in this study confirms that human capital has a significant explanatory power which is found to go up to explain about 97% of the cross-section variances of returns. However, overall structural capital has a better explanatory power when compared to human capital. Surprisingly, the worst performer amongst all three was intangible capital which is an amalgamation of human and structural capital. One explanation for this poor show is the loss of heterogeneity of human and structural capitals whose discount rates are found to be different, therefore when these factors are added up, the resulting variable is a poor estimator of risk associated with human and structural capitals.

Chapter 7

Conclusion

Intangibles is a complex research agenda. There are many manifestations of intangibles — and in each of its form, management, investors and other stakeholders have to deal with the risks. This study has demonstrated that intangibles are available to firms at the microeconomic level (human capital, RND, etc.) and at macroeconomic level (regulatory framework, etc.). Therefore, as with any resource the risks associated with intangibles are sometimes systematic or idiosyncratic.

To understand the risks associated with intangibles there are many approaches. This study is a collection of four approaches, looking at intangibles in four different ways — they are, (i.) intangibles-intensive firms because of their investments in structural intangibles such as RND, (ii.) macroeconomic intangibles, (iii.) an intangible concept — organizational capital, and (iv.) search for the measure of human capital and structural intangibles. However, at its foundation lies the same problem — what are the known-knowns and the known-unknowns? These risks must be understood theoretically and empirically because as it has been highlighted in the text earlier, firms are investing rapidly in intangibles generating assets, resources and capabilities.

7.1 Problems

Investors demand compensation to hold risky assets. If intangibles and/or human capital is making assets riskier then these risks need to be understood. Management needs to raise capital and fund projects that could create potential intangibles. If intangibles or human capital are the source of information asymmetries between the insiders and the outsiders the cost of capital becomes expensive, projects unsustainable and sometimes unproductive and the firms riskier. Do managers understand these tradeoffs and how are they communicating with the investors in order to address concerns of information asymmetries and cost of capital?

The researches relating to intangibles, especially in the accounting and finance literature sometimes fail to acknowledge that there are assets and resources that are not only microeconomic at the firm or individual level but there are elements that are intangible and available to an entire industry or to the economy. Regulatory framework is one such macroeconomic intangible. Similar to any asset, there are known-unknowns and there are unknown-unknowns that are a source of risk. These risk are sometimes idiosyncratic and at times systematic in nature.

In the domain of intangibles there are many ideas and concepts that are especially prominent in the management science literature — one such concept is organizational capital. This concept is all encompassing and can sometimes explain everything without measuring anything. Is there any such things as organizational capital? Is it important to the portfolio holders? Are there idiosyncratic risks associated with it and if so, what is the compensation that investors receive on holding this risk? These are some of the question that has been explored in this study.

Lastly, one of the most important problems of intangibles — how to measure the factors such as human capital and structural intangibles? Many studies have tried to model risk-loading on human capital using industry level data. Most of these studies have not had encouraging findings. Therefore, this study tries to find out if there is a microeconomic variable that is a better explanation of human capital? If so, does that improve the results in any way? Additionally, do human capital and structural intangibles, both non-tradable assets, what are the risk-loading if these two are combined to create one common variable that represent total investments in intangibles?

7.2 Findings

Findings from the Chapter 3, which is a study that looked into the non-financial textual disclosures firms make in their annual report. The sample of firms selected for this study are all in the Pharmaceuticals industry who invest heavily into RND. Therefore the intangible character of the sample is tangential to the set-up of the study — which aims to find out if these voluntary disclosure have any impact on the expected returns of the assets in the sample portfolio. Here the expected returns are a measure of the cost of capital because investors seek compensation to cover the risk of holding an asset with private information. The intangible-intensive character of the sample where little clarity is there about the ongoing RND and the potential outcome, makes the obvious assumption that there are private information which the insiders know and outsiders don't. Non-financial textual information in the MD&A section of the annual reports is a forward looking disclosure which is used by the insiders to make private information public. The study found that, in aggregate the non-financial textual disclosures does not have any explanatory power when it comes to the expected returns. However, when the disclosures are broken down to groups of communication indicators, the results are encouraging. Factors such as Customer & Market and Innovation & IPR are found to explain the expected stock returns which means they have an impact on the firm's cost of capital.

In the next chapter (4), the macroeconomic intangible risk of a changing regulation is studied with respect to Reg FD and SOX. These set of regulatory reforms were implemented in the United States to reduce discriminatory disclosures and promote financial and non-financial disclosures after a spat of big accounting frauds that impacted the whole of the American economy amid a strong political and social backlash. The study tried to find out the following: (i.) did the regulatory reforms change the information environment in any significant way? (ii.) does regulatory size play any role in creating the information environment? (iii.) how does age of firms in the stock market effect its information environment? and (iv.) is there a causal relationship between analysts and news which are the key information intermediaries? The findings show that there was indeed a change in the information environment since 2002 as the regulatory reforms took effect in the stock market. Regulatory size of firms does impact the information environment as large firms attract more attention in the stock market. The study also found that the age of firms in the stock market has a distinct impact on the information environment and information intermediaries such as news produce new information that has the ability to reduce information asymmetry. Finally, the study found there is a causal relation between news and analysts where analysts Granger cause news. This result is quite intuitive as the number of analysts swell the competition to produce new information increase amongst the analysts themselves, who are concerned about their career and with the quality of reports. They know that only quality and accurate forecasts and recommendations will increase the business of their brokerage and by extension themselves. Therefore, this demand pull by the analysts is able to get firms to disclose more, and since discriminatory disclosure is outlawed by the regulatory reforms, information finds its way into news and thereby increases the number of news articles.

The chapter following that (5) studies the intangible called organizational capital. In management science literature many references are found that discuss organizational capital, however, there are no commonly agreed upon set of measurement variables for this "capital". In this study it is theorized that a firm's or a portfolio's past performance efficiency can be used as a measure of its organizational capital. The risk-loading associated with this capital can be estimated using a modified asset pricing model. To model the performance efficiency six performance measures are identified which are — (i.) cash flow by book equity ratio (ii.) investment ratio (iii.) productivity (iv.) return on assets (v.) sales growth, and (vi.) Tobin's Q. Each of these factors are chosen as they highlight a different estimation of performance efficiency and their established presence in the accounting and economics literature. The study finds that among all the variables sales growth has the best record in predicting future expected returns. Overall outcome of this study was to propose a new method using which organizational capital can be defined and modeled in the financial accounting literature.

In the last empirical study from the Chapter 6, the human capital and structural intangibles are examined separately and then jointly. Human capital and structural intangibles have some similarities — they are both non-tradable assets and the accounting treatment of both variables are similar. Therefore, a separate variable is created by merging these two factors to create a new one which measure most of the intangibles as expensed in the financial accounts. The findings from the chapter shows that human capital, as measured in this chapter using the microeconomic accounting variable called selling, general and administrative expenses, has substantial explanatory power when it comes to future expected stock returns which goes for a portfolio as high as 97%. Structural capital is created using the capitalized structural intangibles such as RND. It also does have explanatory power in terms of expected returns. However, when it comes to intangible capital which is an amalgamation of selling, general and administrative expenses and research and development expenses, the predictive power of this variable is found to be the lowest. This is a somewhat surprising result as the variable ideally should measure both human capital and structural intangible and its risk-loading on the expected stock returns but adding these variables the heterogeneity of the variables is lost and the economic meaning therefore diminished.

7.3 Summary

In summation, there are many ways to study the risks associated with intangibles and human capital as this topic is dynamic, young and growing rapidly. The term intangibles itself could mean many things therefore there is a necessity in the academic literature to keep the meaning of the word open and dynamic similar to the economic variables and measure its representation. Lastly, human capital is found to have a separate identity of itself and it should not be mixed with the multiple variables or measures of intangibles. All these go on to create assets for the firms and the portfolio stock holders. The known-uncertainties and the unknown-uncertainties associated with these variables are causes of risks. To further the literature — there is a need to go after the unknown-unknowns risks associated with these factor variables.

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Appendix

Appendix A

List of Tables

A.1 Non-Financial Disclosures and Cost of Capital

A.1.1 Information Indicators

Table i.: List of Indicators

1. ***Strategy***	2. ***Human Resources, cont.***	3. ***Customer and Market, cont.***
Strategies	Employee by religion	Active customers
Focus, vision and mission	Employee by type of contract	Customer divided into categories
Strategic agreements	Incentives by category	Market analysis
Objectives	Company benefit policy	Industry analysis
Social Responsibility	Employee policy	Orders backlog
Environmental Policy	Educational level	New customers
Risk Management	Average age	Number of sales outlets
Strategic Position	Seniority in company	Distribution network
Regulatory Environment	Training program	Contacts
Value Drivers	Number of male and female	Level of customer satisfaction
Targets	Employee target	Registered users
Security program	Number of apprentices	Active users
		Number of page visits on the site
2. ***Human Resources***	3. ***Customer and Market***	Market served
Number of employees	Total potential market	Market penetration index
Employee by category	Market position	Competitive Environment
Employee by division	Competitors	Description of brands etc.

Table i.: List of Indicators, continued

4. ***Innovation and IPR***	5. ***Organization***	6. ***Corporate Governance***
RND capabilities	Company Organization Chart	Board members
Projects developed internally	Legally protected IA	Board Activities
New product development	Company culture	Ethical code
Technology used	Info. system description	Committee members
RND laboratory	Desc. of organization change	Committee activities
RND objectives		Internal control
RND partnerships		Description of firm bodies
Number of researchers		Investor relations
		Relationship between board
		Combined code

Source: Zambon and Bergamini [256]

A.1.2 Disclosure Quality Weights

Table ii.: Weights

Information Quality	Score
No Information	0
1 - 4 sentences	1
5 - 10 sentences	2
¡ 10 sentences	3

Source: Adapted from Zambon and Bergamini [256]

A.1.3 Correlation Matrix

Table iii.: Correlation Matrix

	VW Ret.	$Rm - Rf$	$InfoEx$	Strat.	Cust.	HR	Org.	Inn.	Corp. G.	ME_t	BE/ME	RND/BE
						Information Exists						
VW Return	1											
$Rm - Rf$	0.09	1										
Total $InfoEx$	0.09	0.04	1									
Strategy	0.04	0.00	0.74*	1								
Cust. and Market	-0.07	-0.03	0.85*	0.57*	1							
HR	0.23*	0.04	0.32*	0.10	0.25*	1						
Organization	0.03	0.20	-0.33*	-0.29*	-0.40*	0.22	1					
Innov. & IPR	0.10	-0.09	0.66*	0.43*	0.50*	0.13	-0.38*	1				
Corp. Gov.	0.14	0.13	0.72*	0.47*	0.52*	0.20	-0.17	0.26*	1			
ME_t	-0.13	0.01	-0.01	0.08	-0.04	-0.10	-0.06	-0.06	0.04	1		
BE/ME	-0.38*	0.05	0.07	0.12	0.08	-0.03	-0.03	-0.03	-0.13	-0.09	1	
RND/BE	0.14	0.14	0.07	0.08	0.01	-0.02	0.07	0.16	0.08	-0.07	-0.20	1

Table iii.: Correlation Matrix, continues

	VW Ret.	$Rm - Rf$	$InfoQt$	Strat.	Cust.	HR	Org.	Inn.	Corp. G.	ME_t	BE/ME	RND/BE
						Information Quality						
VW Return	1											
$Rm - Rf$	0.09	1										
Total $InfoQt$	0.09	0.07	1									
Strategy	0.00	0.03	0.86*	1								
Cust. and Market	-0.02	0.03	0.87*	0.73*	1							
HR	0.18	0.01	0.27*	0.10	0.25*	1						
Organization	0.10	0.16	-0.22	-0.20	-0.24*	0.36*	1					
Innov. & IPR	0.12	-0.05	0.78*	0.67*	0.63*	0.09	-0.23*	1				
Corp. Gov.	0.11	0.14	0.79*	0.55*	0.59*	0.25*	-0.23*	0.44*	1			
ME_t	-0.13	0.01	0.00	0.07	-0.02	-0.09	-0.06	-0.04	0.09	1		
BE/ME	-0.38*	0.05	0.11	0.16	0.13	-0.08	-0.08	0.06	0.00	-0.09	1	
RND/BE	0.14	0.14	0.11	0.10	0.03	0.06	0.17	0.14	0.09	-0.07	-0.20	1

A.1.4 Description of Variables

Table 3a: Description of Variables

In this table the qualitative non-financial and textual data from the annual reports are numerated. From Panel i. Ind. are the types of comm. indicators. Obs. is the number of observations in the dataset. Tot. Ind. is the total number of sub-indicators per comm. indicator. “Information Existence” section tabulates the comm. indicators in binary (0 , 1). “Information Quality” section tabulates the quality of information on 4 pt. scale (0, 1, 2, 3). Abs. is the absolute number of comm. indicators found in the qualitative data. Ratio is the number of comm. indicator found per total number of indicator for that type of comm. From Panel ii. Fin. Ind. is the accounting and market variables.

Panel i.											Panel ii.		
Ind.	Obs.	Tot. Ind.	Information Existence				Information Quality (4 Levels.)				Fin. Ind.	Mean	Std. Dev.
			Mean		Std. Dev.		Mean		Std. Dev.				
			Abs.	Ratio	Abs.	Ratio	Abs.	Ratio	Abs.	Ratio	lnRet	0.17	0.43
Total	75	70	35.76	0.51	8.30	0.12	69.29	0.33	21.79	0.10	vola	10.66	22.34
Strategy	75	12	8.73	0.12	1.62	0.02	18.96	0.09	5.92	0.03	$Rm - Rf$	0.01	0.001
Cust. & Mkt	75	20	10.17	0.15	2.96	0.04	20.59	0.10	7.73	0.04	lnME	15.91	1.39
HR	75	15	4.45	0.06	2.63	0.04	7.21	0.03	5.57	0.03	BE	4.13	7.73
Org.	75	05	1.36	0.02	0.78	0.01	2.80	0.01	1.46	0.01	RND	0.70	1.47
Inv. & IPR	75	08	5.07	0.07	1.49	0.02	9.36	0.04	3.69	0.02	BE/ME	0.23	0.20
Corp. Gov.	75	10	5.97	0.09	1.61	0.02	10.37	0.05	3.62	0.02	RND/BE	0.32	0.78

A.1.5 Returns Model

Table 3b: Returns Model

In this table the GLS-RE estimates of the Returns model is tabulated with the dependent variable as lnRet (β) calculated between Dec($t-1$) and Dec(t). "Information Existence" section tabulates the comm. indicators in binary. "Information Quality" section tabulates the quality of information on 4 pt. scale. $Rm - Rf$ is the risk-adjusted market return from the year $t-1$. lnME, BE/ME, RND/BE, InfoEx, InfoQt are natural log of market equity, book-by-market ratio RND-by-book equity ratio, total information existence variable, total information quality variable respectively. Strategy, Cust. & Mkt, HR, Org., Inv. & IPR , Corp. Gov. are the comm. indicators as identified by Zambon-Bergamini model. α is the pricing error denoted by the slope of the regression line. R^2 is the coefficient of determination. (* is sig. at 5% p-value < 0.05)

	Information Existence Panel i.						Information Quality Panel ii.					
	Sub-Panel i.			Sub-Panel ii.			Sub-Panel iii.			Sub-Panel iv.		
	a.	b.	c.	d.	e.	f.	g.	h.	i.	j.	k.	l.
$Rm - Rf$	10.83	28.24	32.97	8.00	27.50	33.97	10.78	27.89	32.53	8.85	25.76	33.34
lnME		-0.01	-0.07		-0.02	-0.08		-0.01	-0.07		-0.02	-0.09
BE/ME			-1.33*			-1.22*			-1.34*			-1.24*
RND/BE			0.07			0.06			0.07			0.05
InfoEx	0.05	0.11	0.12									
InfoQt							0.02	0.07	0.09			
Strategy				-0.03	0.01	0.29				-0.22	-0.31	-0.13
Cust. & Mkt				-0.51*	-0.82*	-0.72*				-0.22	-0.42	-0.40
HR				0.13	0.20	0.20				0.05	0.08	0.09
Org.				-0.04	-0.10	-0.11				0.06	0.07	0.02
Inv. & IPR				0.21	0.36	0.21				0.25*	0.41*	0.31
Corp. Gov.				0.26	0.40	0.21				0.17	0.31	0.24
α	0.09	0.17	1.00	0.09	0.17	0.87	0.09	0.18	1.03	0.31	0.61	1.26
R^2	0.42%	1.8%	19.6%	11.7%	13.5%	27.2%	0.34%	1.7%	19.6%	7.9%	9.5%	24.0%

A.2 Regulatory Change: A Macroeconomic Intangible Risk

A.2.1 Summary Statistics

Table 4: Summary Statistics

Panel i. Pearson Pairwise Correlation Coefficients and Statistical Significance

	$lnSR$	lnS	$lnNews$	$lnAF$	$lnEPS$	$lnME$	$lnMM$	$lnPrc$	$lnRet$	$lnVol$	$lnVola$	$lnTURN$
$lnSR$	1.00											
lnS	0.64*	1.00										
$lnNews$	-0.44*	-0.40*	1.00									
$lnAF$	-0.20*	0.07*	0.19*	1.00								
$lnEPS$	-0.35*	-0.13*	0.38*	0.11	1.00							
$lnME$	-0.72*	-0.16*	0.44*	0.44*	0.41*	1.00						
$lnMM$	-0.70*	-0.74*	0.50*	0.20*	0.32*	0.55*	1.00					
$lnPrc$	-0.50*	0.25*	0.22*	0.39*	0.39*	0.81*	0.17*	1.00				
$lnRet$	0.07*	0.11*	-0.05	-0.01	-0.25*	-0.07*	-0.11*	0.04	1.00			
$lnVol$	-0.69*	-0.56*	0.49*	0.32*	0.30*	0.75*	0.77*	0.38*	0.00	1.00		
$lnVola$	-0.26*	0.16*	0.14*	0.29*	-0.07	0.50*	0.10*	0.56*	0.21*	0.30*	1.00	
$lnTURN$	-0.52*	-0.28*	0.32*	0.22*	0.09	0.48*	0.50*	0.43*	0.20*	0.79*	0.34*	1.00

Panel ii.

	Obs.	Mean	Std. Dev.		Obs.	Mean	Std. Dev.
SR	2196	0.11	0.14	MM	2198	27.04	16.09
S	2206	0.16	0.21	Prc	2282	14.43	16.69
$News$	3162	136.05	242.75	Ret	2047	0.29	3.37
AF	3162	0.98	2.03	$lnVol$	2206	10.54	1.46
EPS	2006	-1.61	7.82	$Vola$	2179	3.55	5.66
$lnME$	2206	19.21	1.55	$lnTURN$	2206	0.00	0.00

A.2.2 Chow Test

Table 4a: Structural Break: Chow Test

	1990-2010		1990-2001		2002-2010	
	Dependent Variable: $lnSR$					
	β	$t(\beta)$	β	$t(\beta)$	β	$t(\beta)$
$lnNews_t$	-0.24	(-5.57)	-0.16	(-3.27)	-0.22	(-2.94)
$lnNews_{t-1}$	-0.11	(-2.92)	-0.14	(-3.23)	-0.07	(-1.16)
SR_{t-1}	0.56	(17.97)	0.55	(8.20)	0.21	(3.91)
$lnAF_t$	-0.42	(-7.61)	-0.42	(-6.53)	-0.47	(-5.78)
α	-0.04	(-0.27)	-0.11	(-0.63)	-1.68	(-5.87)
$Adj.R^2$	49.3%		38.7%		17.8%	
N	939		441		498	
Df	934		436		493	
RSS	1015.10		326.45		588.65	

A.2.3 News Articles

Table 4b: News Articles

This Table is divided into three panels — i., ii., and iii. where the estimates are from the time period 1990-2010, 1990-2001 and 2002-2010, respectively. SR is the relative bid-ask spread ratio. S is the average absolute bid-ask spread. $News_t$, $News_{t-1}$, and $News_{t-2}$ are the contemporaneous, first lag and second lag of the natural log of News variable. $lnEPS$, $lnME$, $lnMM$, $lnPrc$, $lnRet$, $lnVol$, $lnVola$, and $lnTURN$ are the natural log of earnings-per share, market equity, market makers, stock price, annual asset returns, annual return, trading volume, volatility of the annual daily equal-weighted returns, and trading volume per shares outstanding, respectively. α is the pricing error denoted by the slope of the regression line. R^2 is the coefficient of determination. N is the number of obs. (* is sig. at 5% p-value < 0.05)

		$News_t$	$News_{t-1}$	$News_{t-2}$	$lnEPS$	$lnME$	$lnMM$	$lnPrc$	$lnRet$	$lnVol$	$lnVola$	$lnTURN$	α	R^2	N
Panel i. 1990-2010															
SR.	i.	-0.14*			-0.01	1.38	-1.31*	-1.88	-0.04	-1.48	0.03*	1.42	3.87*	72.0%	209
	ii.	-0.44*	-0.15*	-0.16*									0.17	23.3%	1677
S.	iii.	-0.11			0.01	2.12	-1.29	-1.56	-0.02	-2.24	0.02	2.11	1.50	62.7%	208
	iv.	-0.30	-0.09	-0.32									0.29	22.2%	1675
Panel ii. 1990-2001															
SR.	v.	-0.01			-0.01	1.18	-0.22	-1.49	-0.03	-1.64	-0.01	1.41	3.41*	84.1%	80
	vi.	-0.20*	-0.06	-0.22*									-2.13*	21.9%	717
S.	vii.	0.01			0.01	2.07	-0.19	-1.39	-0.04	-2.53	-0.02	2.28	3.14*	60.9%	80
	viii.	0.03	-0.04	-0.20*									-0.94*	9.6%	717
Panel iii. 2002-2010															
SR.	ix.	-0.06			0.08	1.76	-0.56*	-2.61*	-0.10	-2.00	0.07*	1.78	1.01	69.1%	129
	x.	-0.30*	-0.25*	0.15*									-3.53*	14.0%	728
S.	xi.	-0.02			0.08	2.85*	-0.45*	-2.59*	-0.03	-3.03*	0.04 *	2.71*	-1.47	44.7%	128
	xii.	0.02	-0.14*	-0.04									-2.92 *	2.7%	729

A.2.4 Analyst Following

Table 4c: Analyst Following

This Table is divided into three panels — i., ii., and iii. where the estimates are from the time period 1990-2010, 1990-2001 and 2002-2010, respectively. SR is the relative bid-ask spread ratio. S is the average absolute bid-ask spread. AF_t, AF_{t-1} and AF_{t-2} are the contemporaneous, first lag and second lag of the natural log of Analyst following variable. $lnEPS$, $lnME$, $lnMM$, $lnPrc$, $lnRet$, $lnVol$, $lnVola$, and $lnTURN$ are the natural log of earnings-per share, market equity, market makers, stock price, annual asset returns, annual return, trading volume, volatility of the annual daily equal-weighted returns, and trading volume per shares outstanding, respectively. α is the pricing error denoted by the slope of the regression line. R^2 is the coefficient of determination. N is the number of obs. (* is sig. at 5% p-value < 0.05)

		AF_t	AF_{t-1}	AF_{t-2}	$lnEPS$	$lnME$	$lnMM$	$lnPrc$	$lnRet$	$lnVol$	$lnVola$	$lnTURN$	α	R^2	N
								Panel i. 1990-2010							
SR.	i.	0.27*			-0.04	5.25	-1.41*	-5.91	-0.11	-5.52	0.02	5.70	8.15	71.0%	142
	ii.	-0.13	0.11	-0.20*									-3.30*	2.6%	552
S.	iii.	0.13			0.03	4.74	-1.53*	-4.38	-0.06	-4.96	0.02	5.09	5.70*	62.9	142
	iv.	0.21*	0.20*	-0.18*									-2.89*	2.9%	551
								Panel ii. 1990-2001							
SR.	v.	0.33*			0.01	4.31	-0.66*	-4.98	0.02	-4.64	0.00	4.69	5.01*	85.3%	59
	vi.	-0.16	0.02	-0.24*									-4.01*	11.9%	259
S.	vii.	0.35*			0.04	5.21	-0.67*	-4.86	0.02	-5.54	-0.01	5.60	5.16*	63.3%	59
	viii.	0.09	0.19*	-0.12									-1.76*	1.2%	259
								Panel iii. 2002-2010							
SR.	ix.	0.00			0.12	-0.23 *	-0.55	-0.65*	-0.12	0.00*	0.06*	-0.06	1.60	51.2%	83
	x.	-0.29*	-0.08	0.00									-5.95*	8.5%	222
S.	xi.	-0.12			0.15*	40.90	-0.44	-40.68	-0.06	-41.05	0.05*	40.96	-0.67	37.0%	83
	xii.	0.04	-0.04	0.03									-3.85*	0.4%	223

A.2.5 News Articles — Large Firms

Table 4d: News Articles — Large Firms

This Table is divided into three panels — i., ii., and iii. where the estimates are from the time period 1990-2010, 1990-2001 and 2002-2010, respectively. SR is the relative bid-ask spread ratio. S is the average absolute bid-ask spread. $News_t$, $News_{t-1}$, and $News_{t-2}$ are the contemporaneous, first lag and second lag of the natural log of News variable. $lnEPS$, $lnME$, $lnMM$, $lnPrc$, $lnRet$, $lnVol$, $lnVola$, and $lnTURN$ are the natural log of earnings-per share, market equity, market makers, stock price, annual asset returns, annual return, trading volume, volatility of the annual daily equal-weighted returns, and trading volume per shares outstanding, respectively. α is the pricing error denoted by the slope of the regression line. R^2 is the coefficient of determination. N is the number of obs. (* is sig. at 5% p-value < 0.05)

		$News_t$	$News_{t-1}$	$News_{t-2}$	$lnEPS$	$lnME$	$lnMM$	$lnPrc$	$lnRet$	$lnVol$	$lnVola$	$lnTURN$	α	R^2	N
Panel i. 1990-2010															
SR.	i.	-0.22*			0.03	3.00	-1.42*	-3.31	-0.05	-3.06	0.02	3.08	3.84*	65.1%	127
	ii.	-0.52*	-0.11	-0.33*									0.83*	29.8%	470
S.	iii.	-0.19*			0.08	3.67	-1.32*	-2.89	0.01	-3.78	0.01	3.77	2.17	61.8%	126
	iv.	-0.36*	-0.08	-0.31*									0.96*	17.5%	469
Panel ii. 1990-2001															
SR.	v.	0.00			0.06	0.82	-0.09	-0.89	-0.06	-1.49	-0.01	1.26	5.70*	83.2%	54
	vi.	-0.10	-0.14	-0.32*									-2.10*	25.2%	228
S.	vii.	0.02			0.09	1.69	-0.03	-0.74	-0.07	-2.41	-0.02	2.15	6.09*	66.4%	54
	viii.	0.10	-0.13	-0.26*									-0.30	19.0%	228
Panel iii. 2002-2010															
SR.	ix.	-0.25			0.35*	56.56	-0.69	-57.57	-0.13	-56.65	0.07*	56.55	1.02	39.4%	73
	x.	-0.24*	-0.16	0.06									-4.93*	15.8%	184
S.	xi.	-0.21*			0.36*	256.2	-0.56	-256.1	0.02	-256.2	0.05*	256.2	-0.79	40.2%	72
	xii.	-0.06	-0.01	0.07									-3.82*	0.1%	184

A.2.6 News Articles — Small Firms

Table 4e: News Articles — Small Firms

This Table is divided into three panels — i., ii., and iii. where the estimates are from the time period 1990-2010, 1990-2001 and 2002-2010, respectively. SR is the relative bid-ask spread ratio. S is the average absolute bid-ask spread. $News_t$, $News_{t-1}$, and $News_{t-2}$ are the contemporaneous, first lag and second lag of the natural log of News variable. $lnEPS$, $lnME$, $lnMM$, $lnPrc$, $lnRet$, $lnVol$, $lnVola$, and $lnTURN$ are the natural log of earnings-per share, market equity, market makers, stock price, annual asset returns, annual return, trading volume, volatility of the annual daily equal-weighted returns, and trading volume per shares outstanding, respectively. α is the pricing error denoted by the slope of the regression line. R^2 is the coefficient of determination. N is the number of obs. (* is sig. at 5% p-value < 0.05)

		$News_t$	$News_{t-1}$	$News_{t-2}$	$lnEPS$	$lnME$	$lnMM$	$lnPrc$	$lnRet$	$lnVol$	$lnVola$	$lnTURN$	α	R^2	N
Panel i. 1990-2010															
SR.	i.	-0.04			-0.05	-0.40	-1.01*	-0.40	-0.02	-0.01	0.09*	-0.05	8.09*	82.1%	82
	ii.	-0.32*	-0.14*	-0.10*									-0.49 *	15.8%	1207
S.	iii.	-0.02			-0.05	0.90	-0.99*	-0.62	-0.04	-1.29	0.08*	1.14	5.00	73.7%	82
	iv.	-0.29*	-0.09*	-0.32*									0.13	29.1%	1206
Panel ii. 1990-2001															
SR.	v.	-0.01			-0.12*	-63.69	-0.41	63.17	0.04	63.44	0.01	-63.74	0.34	91.7%	26
	vi.	-0.18*	-0.04	-0.18*									-2.32*	11.8%	489
S.	vii.	0.00			-0.10	41.57	-0.45	-41.10	0.04	-41.73	0.01	41.37	-1.19	79.0%	26
	viii.	0.02	-0.02	-0.19*									-1.07*	9.5%	489
Panel iii. 2002-2010															
SR.	ix.	0.08			-0.04	-0.54	-0.14	-0.48	0.00	-0.06	0.12*	-0.21	4.83	86.6%	56
	x.	-0.25*	-0.25*	0.18*									-3.62*	7.4%	544
S.	xi.	0.12			-0.03	1.14	-0.11	-1.03	-0.04	-1.69	0.08	1.32	2.84	70.6%	56
	xii.	0.01	-0.17*	-0.07*									-2.58*	7.2%	545

A.2.7 Analyst Following — Large Firms

Table 4f: Analyst Following — Large Firms

This Table is divided into three panels — i., ii., and iii. where the estimates are from the time period 1990-2010, 1990-2001 and 2002-2010, respectively. SR is the relative bid-ask spread ratio. S is the average absolute bid-ask spread. AF_t, AF_{t-1} and AF_{t-2} are the contemporaneous, first lag and second lag of the natural log of Analyst following variable. $lnEPS$, $lnME$, $lnMM$, $lnPrc$, $lnRet$, $lnVol$, $lnVola$, and $lnTURN$ are the natural log of earnings-per share, market equity, market makers, stock price, annual asset returns, annual return, trading volume, volatility of the annual daily equal-weighted returns, and trading volume per shares outstanding, respectively. α is the pricing error denoted by the slope of the regression line. R^2 is the coefficient of determination. N is the number of obs. (* is sig. at 5% p-value < 0.05)

		AF_t	AF_{t-1}	AF_{t-2}	$lnEPS$	$lnME$	$lnMM$	$lnPrc$	$lnRet$	$lnVol$	$lnVola$	$lnTURN$	α	R^2	N
Panel i. 1990-2010															
SR.	i.	0.33*			0.00	6.41	-1.47*	-7.21	-0.16	-6.67	0.02	7.00	9.57 *	62.8%	102
	ii.	0.02	0.20	-0.38*									-3.94*	2.3%	276
S.	iii.	0.18			0.11	6.53	-1.60*	-6.30	-0.06	-6.74	0.02	7.08	7.64*	57.9%	102
	iv.	0.24	0.13	-0.28*									-2.79 *	2.2%	276
Panel ii. 1990-2001															
SR.	v.	0.32*			0.09	4.25	-0.66	-4.99	-0.04	-4.67	0.00	4.85	7.63*	82.1%	40
	vi.	-0.12	0.08	-0.32*									-4.40*	13.1%	138
S.	vii.	0.35*			0.13	4.79	-0.64	-4.51	-0.04	-5.24	0.00	5.39	7.92*	68.7%	40
	viii.	0.07	0.07	0.00									-1.73*	0.1%	138
Panel iii. 2002-2010															
SR.	ix.	0.07			0.31*	-325.5	-0.55	324.2	-0.09	325.3	0.07*	-325.3	2.45	37.2%	62
	x.	-0.05	0.06	-0.06									-7.06*	0.7%	106
S.	xi.	-0.01			0.45*	173.9	-0.48	-174.1	0.02	-174.0	0.06*	174.23	1.18	40.6%	62
	xii.	0.06	-0.04	0.01									-3.90*	0.7%	107

A.2.8 Analyst Following — Small Firms

Table 4g: Analyst Following — Small Firms

This Table is divided into three panels — i., ii., and iii. where the estimates are from the time period 1990-2010, 1990-2001 and 2002-2010, respectively. SR is the relative bid-ask spread ratio. S is the average absolute bid-ask spread. AF_t, AF_{t-1} and AF_{t-2} are the contemporaneous, first lag and second lag of the natural log of Analyst following variable. $lnEPS$, $lnME$, $lnMM$, $lnPrc$, $lnRet$, $lnVol$, $lnVola$, and $lnTURN$ are the natural log of earnings-per share, market equity, market makers, stock price, annual asset returns, annual return, trading volume, volatility of the annual daily equal-weighted returns, and trading volume per shares outstanding, respectively. α is the pricing error denoted by the slope of the regression line. R^2 is the coefficient of determination. N is the number of obs. (* is sig. at 5% p-value < 0.05)

		AF_t	AF_{t-1}	AF_{t-2}	$lnEPS$	$lnME$	$lnMM$	$lnPrc$	$lnRet$	$lnVol$	$lnVola$	$lnTURN$	α	R^2	N
Panel i. 1990-2010															
SR.	i.	0.13			0.00	-39.13	-1.63*	38.35	0.02	38.82	0.02	-38.70	9.64*	81.6%	40
	ii.	-0.04	0.21	0.19									-3.20*	2.2%	276
S.	iii.	0.15			-0.04	-77.84	-1.29*	78.23	0.00	77.42	-0.01	-77.42	7.44	80.2%	40
	iv.	0.26*	0.33*	0.00									-3.04*	5.7%	275
Panel ii. 1990-2001															
SR	v.	-0.02	0.12	-0.07									-3.96*	0.02%	121
S.	vi.	0.16	0.36*	-0.19									-1.85*	8.3%	121
Panel iii. 2002-2010															
SR	vii.	-0.21	0.11	0.29*									-5.63*	1.9%	116
S.	viii.	0.06	0.00	0.07									-3.84*	0.24%	116

A.2.9 News Articles — New Firm

Table 4h: News Articles — New Firm

This Table is divided into three panels — i., ii., and iii. where the estimates are from the time period 1990-2010, 1990-2001 and 2002-2010, respectively. SR is the relative bid-ask spread ratio. S is the average absolute bid-ask spread. $News_t$, $News_{t-1}$, and $News_{t-2}$ are the contemporaneous, first lag and second lag of the natural log of News variable. $lnEPS$, $lnME$, $lnMM$, $lnPrc$, $lnRet$, $lnVol$, $lnVola$, and $lnTURN$ are the natural log of earnings-per share, market equity, market makers, stock price, annual asset returns, annual return, trading volume, volatility of the annual daily equal-weighted returns, and trading volume per shares outstanding, respectively. α is the pricing error denoted by the slope of the regression line. R^2 is the coefficient of determination. N is the number of obs. (* is sig. at 5% p-value < 0.05)

		$News_t$	$News_{t-1}$	$News_{t-2}$	$lnEPS$	$lnME$	$lnMM$	$lnPrc$	$lnRet$	$lnVol$	$lnVola$	$lnTURN$	α	R^2	N
							Panel i. 1990-2010								
SR.	i.	0.06			0.06	1.33	-0.36	-1.39	-0.18*	-1.96	-0.01	1.77	7.58	74.8%	28
	ii.	-0.18*	0.05	-0.07*									-1.42*	8.7%	389
S.	iii.	0.09			0.12	2.22	-0.30	-1.21	-0.17*	-2.89	-0.02	2.65	5.72	60.7%	28
	iv.	-0.07	-0.02	-0.17*									-0.85*	11.9%	389
							Panel ii. 1990-2001								
SR.	v.	0.08			0.11	0.52	-0.51	-0.92	-0.16*	-0.98	0.00	0.82	4.70	77.0%	25
	vi.	-0.18*	-0.05	-0.06									-2.52*	13.1%	300
S.	vii.	0.10			0.21	1.41	-0.59	-0.94	-0.18*	-1.81	0.01	1.60	3.79	28.2%	25
	viii.	0.05	-0.01	-0.13*									-1.09*	5.6%	300
							Panel iii. 2002-2010								
SR.	ix.	-0.28	0.05	-0.15*									-3.29*	1.4%	52
S.	x.	-0.09	-0.04	-0.16*									-1.87*	6.4%	52

A.2.10 News Articles — Old Firm

Table 4i: News Articles — Old Firm

This Table is divided into three panels — i., ii., and iii. where the estimates are from the time period 1990-2010, 1990-2001 and 2002-2010, respectively. SR is the relative bid-ask spread ratio. S is the average absolute bid-ask spread. $News_t$, $News_{t-1}$, and $News_{t-2}$ are the contemporaneous, first lag and second lag of the natural log of News variable. $lnEPS$, $lnME$, $lnMM$, $lnPrc$, $lnRet$, $lnVol$, $lnVola$, and $lnTURN$ are the natural log of earnings-per share, market equity, market makers, stock price, annual asset returns, annual return, trading volume, volatility of the annual daily equal-weighted returns, and trading volume per shares outstanding, respectively. α is the pricing error denoted by the slope of the regression line. R^2 is the coefficient of determination. N is the number of obs. (* is sig. at 5% p-value < 0.05)

		$News_t$	$News_{t-1}$	$News_{t-2}$	$lnEPS$	$lnME$	$lnMM$	$lnPrc$	$lnRet$	$lnVol$	$lnVola$	$lnTURN$	α	R^2	N
							Panel i. 1990-2010								
SR.	i.	-0.04			-0.05	-0.40	-1.01*	-0.40	-0.02	-0.01	0.09*	-0.05	8.09*	82.1%	82
	ii.	-0.32*	-0.14*	-0.10*									-0.49*	15.8%	1207
S.	iii.	-0.02			-0.05	0.90	-0.99*	-0.62	-0.04	-1.29	0.08*	1.14	5.00	73.7%	82
	iv.	-0.29*	-0.09*	-0.32*									0.13	29.1%	1206
							Panel ii. 1990-2001								
SR.	v.	-0.01			-0.12*	-63.69	-0.41	63.17	0.04	63.44	0.01	-63.74	0.34	91.7%	26
	vi.	-0.18*	-0.04	-0.18*									-2.32*	11.8%	489
S.	vii.	0.00			-0.10	41.57	-0.45	-41.10	0.04	-41.73	0.01	41.37	-1.19	79.0%	26
	viii.	0.02	-0.02	-0.19*									-1.07*	9.5%	489
							Panel iii. 2002-2010								
SR.	ix.	0.08			-0.04	-0.54	-0.14	-0.48	0.00	-0.06	0.12*	-0.21	4.83	86.6%	56
	x.	-0.25*	-0.25*	0.18*									-3.62*	7.4%	544
S.	xi.	0.12			-0.03	1.14	-0.11	-1.03	-0.04	-1.69	0.08	1.32	2.84	70.6%	56
	xii.	0.01	-0.17*	-0.07*									-2.58 *	7.2%	545

A.2.11 Analyst Following — New Firm

Table 4j: Analyst Following — New Firm

This Table is divided into three panels — i., ii., and iii. where the estimates are from the time period 1990-2010, 1990-2001 and 2002-2010, respectively. SR is the relative bid-ask spread ratio. S is the average absolute bid-ask spread. AF_t, AF_{t-1} and AF_{t-2} are the contemporaneous, first lag and second lag of the natural log of Analyst following variable. $lnEPS$, $lnME$, $lnMM$, $lnPrc$, $lnRet$, $lnVol$, $lnVola$, and $lnTURN$ are the natural log of earnings-per share, market equity, market makers, stock price, annual asset returns, annual return, trading volume, volatility of the annual daily equal-weighted returns, and trading volume per shares outstanding, respectively. α is the pricing error denoted by the slope of the regression line. R^2 is the coefficient of determination. N is the number of obs. (* is sig. at 5% p-value < 0.05)

		AF_t	AF_{t-1}	AF_{t-2}	$lnEPS$	$lnME$	$lnMM$	$lnPrc$	$lnRet$	$lnVol$	$lnVola$	$lnTURN$	α	R^2	N
Panel i. 1990-2010															
SR.	i.	-0.27	0.33	-0.33*									-2.01*	6.2%	108
S.	ii.	0.06	0.53*	-0.28*									-1.88*	16.4%	108
Panel ii. 1990-2001															
SR.	iii.	-0.35*	0.17	-0.30*									-3.34*	15.4%	91
S.	iv.	-0.07	0.28*	-0.07									-1.39*	4.4%	91
Panel iii. 2002-2010															
SR.	v.	-1.34*	2.21*	-0.54*									-5.34*	96%	7
S.	vi.	0.04	0.72	0.09									-3.66*	38.9%	7

A.2.12 Analyst Following — Old Firm

Table 4k: Analyst Following — Old Firm

This Table is divided into three panels — i., ii., and iii. where the estimates are from the time period 1990-2010, 1990-2001 and 2002-2010, respectively. SR is the relative bid-ask spread ratio. S is the average absolute bid-ask spread. AF_t, AF_{t-1} and AF_{t-2} are the contemporaneous, first lag and second lag of the natural log of Analyst following variable. $lnEPS$, $lnME$, $lnMM$, $lnPrc$, $lnRet$, $lnVol$, $lnVola$, and $lnTURN$ are the natural log of earnings-per share, market equity, market makers, stock price, annual asset returns, annual return, trading volume, volatility of the annual daily equal-weighted returns, and trading volume per shares outstanding, respectively. α is the pricing error denoted by the slope of the regression line. R^2 is the coefficient of determination. N is the number of obs. (* is sig. at 5% p-value < 0.05)

		AF_t	AF_{t-1}	AF_{t-2}	$lnEPS$	$lnME$	$lnMM$	$lnPrc$	$lnRet$	$lnVol$	$lnVola$	$lnTURN$	α	R^2	N
Panel i. 1990-2010															
SR.	i.	0.13			0.00	-39.13	-1.63*	38.35	0.02	38.82	0.02	-38.70	9.64*	81.6%	40
	ii.	-0.04	0.21	0.19									-3.20*	2.2%	276
S.	iii.	0.15			-0.04	-77.84	-1.29*	78.23	0.00	77.42	-0.01	-77.42	7.44*	80.2%	40
	iv.	0.26*	0.33*	0.00									-3.04*	5.7%	275
Panel ii. 1990-2001															
SR.	v.	-0.02	0.12	-0.07									-3.96*	0.02%	121
S.	vi.	0.16	0.36*	-0.19									-1.85*	8.3%	121
Panel iii. 2002-2010															
SR.	vii.	-0.21	0.11	0.29*									-5.63*	1.9%	116
S.	viii.	0.06	0.00	0.07									-3.84*	0.2%	116

A.2.13 Granger Causality Test

Table 4l: Granger Causality Test

	1990-2010		1990-2001		2002-2010	
Panel i. $lnNews_t$						
$lnNews_{t-1}$	0.73*	0.77*	0.66*	0.76*	0.77*	0.75*
$lnAF_{t-1}$		0.03		0.01		0.13*
α	1.20*	1.13*	1.40	1.05*	1.04*	1.33*
R^2	71.1%	75.2%	64.9%	71.8%	72.0%	70.8%
$F-Stat$	3859.3*	1931.7*	1169.1*	687.3*	1911.2*	873.5*
N	2597	1173	1076	514	1360	569
Panel ii. AF_t						
$lnNews_{t-1}$		0.04*		0.06*		0.05*
$lnAF_{t-1}$	0.54*	0.53*	0.59*	0.55*	0.31*	0.35*
α	0.31	0.11	0.30*	0.06	0.39*	0.11
R^2	29.8%	31.0%	34.7%	36.3%	24.2%	25.9%
$F-Stat$	358.2*	369.2*	215.9*	219.2*	43.0*	62.1*
N	865	826	408	387	409	394

A.3 Organizational Capital

A.3.1 Summary Statistics

Table 5a: Summary Statistics

	Mean (μ)						Std. Dev. (σ)					
	$R_p - R_f$	ME	BE/ME	DY	RND	E/P	$R_p - R_f$	ME	BE/ME	DY	RND	E/P
Small	14.7%	35.4	0.67	0.021	0.05	-0.14	0.34	22.9	0.30	0.041	0.10	0.18
2	13.6%	122.4	0.71	0.015	0.05	-0.02	0.36	85.9	0.28	0.013	0.29	0.09
3	10.6%	309.4	0.70	0.018	0.11	0.01	0.30	188.5	0.26	0.013	0.35	0.09
4	10.5%	906.8	0.68	0.022	0.06	0.05	0.32	505.5	0.21	0.020	0.06	0.06
Big	11.9%	9,179	0.61	0.029	0.06	0.06	0.44	5271	0.20	0.013	0.02	0.04
	CF	Inv. R	Prod.	ROA	SG	Tobin	CF	Inv. R	Prod.	ROA	SG	Tobin
Small	0.01	0.11	3.21	-0.06	11.4%	1.17	0.24	0.04	8.57	0.06	0.39	2.69
2	0.02	0.12	1.56	-0.01	11.2%	0.78	0.47	0.04	5.91	0.04	0.39	3.54
3	0.21	0.12	4.45	0.00	9.4%	3.54	0.60	0.04	14.64	0.05	0.33	16.03
4	0.22	0.12	3.93	0.03	9.3%	3.11	0.18	0.03	2.95	0.03	0.33	3.39
Big	0.18	0.11	2.27	0.05	10.7%	2.69	0.05	0.03	0.49	0.02	0.42	1.00
	AR(1)						AR(1)					
	$R_p - R_f$	lnME	BE/ME	DY	RND	E/P	CF	Inv. R	Prod.	ROA	SG	Tobin
Small	-0.22	0.80*	0.73*	0.18	0.63	0.36	0.20	0.31	0.39	0.40*	-0.28	0.27
2	-0.49*	0.85*	0.67*	0.23	0.49*	0.52*	0.10	0.29	0.38	0.41	-0.34	0.23
3	-0.37	0.86*	0.73*	0.49	0.55	0.59*	0.10	0.35*	0.27	0.51*	-0.35	0.21
4	-0.40*	0.84*	0.73*	0.23	0.29	0.64*	0.26	0.52*	0.34	0.50*	-0.31	0.30
Big	-0.23	0.77*	0.72*	0.53	0.46*	0.70*	0.44	0.69*	0.71*	0.55*	-0.14	0.77*

A.3.2 Dividend Yield Model

Table 5b: Dividend Yield Model

In this table Fama-MacBeth estimates with White-Huber SE are presented along with Jagannathan-Wang coefficient of determination R^2_{JW}. DY is the dividend yield of the portfolio where the dividend is calculated between year $t-1$ and t. Org. Capital is modeled using Cash Flow (CF_{t-1}), Investment Rate ($Inv.R_{t-1}$), Productivity ($Prod._{t-1}$), Return on Assets (ROA_{t-1}), Sales Growth (SG_{t-1}) and Tobin's Q ($Tobin_{t-1}$). 25 portfolios are created at the deciles intersection of ME and BE/ME starting July 1975 till 2011. The portfolios are reformed annually in June of each year. The risk-adjusted value-weighted portfolio returns is the dependent variable and it is calculated for each portfolio from July of $t-1$ till June of t. All variables are lagged one year. All values are calculated using the CPI adjusted fundamental of the portfolio assets.

	Dividend Yield β							Dividend Yield $\beta(t)$						
Small	-2.05	-2.96	-1.87	-1.95	-3.44	-1.43	-1.71	-0.62	-0.79	-0.48	-0.51	-0.98	-1.02	-0.50
2	5.20	4.16	5.41	5.86	4.06	1.31	4.82	0.42	0.28	0.46	0.59	0.35	0.35	0.41
3	-1.18	-1.48	-0.39	0.40	-3.60	-0.38	-1.17	-0.30	-0.55	-0.16	0.18	-0.69	-0.33	-0.29
4	-1.58	-1.77	-1.09	-1.17	-2.22	-0.72	0.87	-1.13	-1.12	-1.02	-0.93	-1.30	-1.07	-0.34
Big	-3.01	-3.28	-2.46	-0.42	-4.42	-2.39	0.51	-0.44	-0.40	-0.35	-0.02	-0.66	-1.09	0.19
		CF	Inv. R	Prod.	ROA	SG	Tobin		CF	Inv. R	Prod.	ROA	SG	Tobin
	Org. Capital γ							Org. Capital $\gamma(t)$						
Small		0.01	-1.37	-0.05	0.93	0.63	0.11		0.15	-0.89	-0.60	0.98	6.31	0.96
2		0.98	-2.30	-0.07	0.54	0.81	0.20		0.68	-1.40	-0.99	0.39	7.46	1.03
3		0.48	-1.64	-0.16	2.06	0.80	0.24		1.93	-1.03	-1.08	1.57	7.72	1.25
4		0.22	-1.03	-0.09	2.14	0.88	0.32		0.09	-0.71	-0.98	1.10	8.88	2.80
Big		-2.15	-0.62	-0.20	2.41	0.95	0.02		-0.77	-0.13	-0.78	0.79	13.95	0.63

Table 5b: Dividend Yield Model, continued

Please see notes from the previous page.

	DY	CF	Inv. R	Prod.	ROA	SG	Tobin	DY	CF	Inv. R	Prod.	ROA	SG	Tobin
				R^2_{FM}							α_{FM}			
Small	2.5%	7.5%	7.4%	7.7%	7.9%	51.9%	7.2%	0.21	0.23	0.37	0.35	0.29	0.11	0.04
2	5.7%	10.3%	10.9%	8.7%	10.4%	74.1%	13.5%	0.07	-0.02	0.35	0.26	0.09	0.03	-0.17
3	0.3%	4.0%	3.8%	11.1%	6.1%	72.4%	8.2%	0.13	0.08	0.31	0.50	0.14	0.04	-0.11
4	2.1%	4.5%	5.1%	5.4%	6.1%	76.9%	19.6%	0.14	0.15	0.27	0.36	0.10	0.04	-0.33
Big	1.2%	7.8%	5.5%	6.7%	4.7%	86.8%	6.6%	0.20	0.50	0.21	0.48	0.08	0.08	0.00
				R^2_{JW}							α_{JW}			
Small	7.6%	14.5%	9.4%	13.3%	59.2%	52.3%	16.1%	0.26	0.29	0.32	0.40	0.10	0.12	0.05
2	5.1%	20.5%	10.7%	24.2%	17.6%	64.5%	34.0%	0.10	-0.11	0.30	0.22	-0.06	0.08	-0.25
3	1.5%	17.5%	4.8%	24.5%	15.8%	57.8%	24.1%	0.08	0.15	0.31	0.52	0.30	0.03	-0.20
4	9.7%	4.6%	4.7%	6.0%	9.4%	57.9%	22.2%	0.14	0.14	0.24	0.37	0.17	0.14	-0.35
Big	0.4%	5.4%	6.7%	5.7%	6.5%	83.4%	7.0%	0.15	0.31	0.15	0.43	0.15	0.10	-0.06

A.3.3 Earnings-per-Price Model

Table 5c: Earnings-per-Price Model

In this table Fama-MacBeth estimates with White-Huber SE are presented along with Jagannathan-Wang coefficient of determination R^2_{JW}. EP is the earnings-per-price of the portfolio. Org. Capital is modeled using Cash Flow (CF_{t-1}), Investment Rate ($Inv.R_{t-1}$), Productivity ($Prod._{t-1}$), Return on Assets (ROA_{t-1}), Sales Growth (SG_{t-1}) and Tobin's Q ($Tobin_{t-1}$). 25 portfolios are created at the deciles intersection of ME and BE/ME starting July 1975 till 2011. The portfolios are reformed annually in June of each year. The risk-adjusted value-weighted portfolio returns is the dependent variable and it is calculated for each portfolio from July of $t-1$ till June of t. All variables are lagged one year. All values are calculated using the CPI adjusted fundamental of the portfolio assets.

	Earnings-by-Price β							Earnings-by-Price $\beta(t)$						
Small	0.48	0.66	0.56	0.57	0.12	0.05	0.58	1.84	2.01	2.15	2.33	0.98	0.46	2.01
2	0.62	0.29	1.03	0.76	0.17	0.12	0.91	0.72	0.36	1.09	0.94	0.74	0.41	1.15
3	0.43	0.42	0.70	0.61	-1.31	0.15	0.52	1.03	0.96	1.34	1.44	-0.52	0.74	1.38
4	0.41	0.42	1.10	0.85	-0.52	0.03	1.18	0.74	0.64	1.12	1.14	-0.34	0.18	1.42
Big	-0.79	-1.25	-1.43	-0.20	-3.15	-0.72	1.18	-0.36	-0.55	-0.05	0.10	-1.22	-0.97	0.47
		CF	Inv. R	Prod.	ROA	SG	Tobin		CF	Inv. R	Prod.	ROA	SG	Tobin
		Org. Capital γ							Org. Capital $\gamma(t)$					
Small		-0.44	-1.51	-0.07	-0.31	0.64	0.11		-0.98	-1.02	-1.29	-0.17	5.88	0.92
2		0.82	-2.81	-0.07	-0.98	0.82	0.20		0.50	-1.69	-1.00	-0.73	7.73	1.04
3		0.22	-1.81	-0.18	4.74	0.80	0.28		1.87	-1.07	-1.35	0.88	7.91	1.44
4		0.30	-1.75	-0.14	3.53	0.88	0.33		0.15	-0.86	-1.36	0.53	8.94	2.86
Big		-2.28	-0.06	-0.21	4.84	0.95	0.02		-0.80	-0.13	-0.89	1.32	13.76	0.84

Table 5c: Earnings-per-Price Model, continued

Please see notes from the previous page.

	DY	CF	Inv. R	Prod.	ROA	SG	Tobin	DY	CF	Inv. R	Prod.	ROA	SG	Tobin
				R^2_{FM}							α_{FM}			
Small	8.4%	12.3%	13.3%	16.9%	12.5%	56.0%	14.4%	0.22	0.24	0.39	0.45	0.21	0.09	0.03
2	4.4%	9.6%	12.4%	7.7%	9.2%	73.9%	14.2%	0.16	0.08	0.52	0.36	0.15	0.05	-0.10
3	3.4%	6.6%	7.4%	16.7%	6.4%	72.8%	13.2%	0.10	0.08	0.31	0.57	0.09	0.03	-0.17
4	1.8%	4.5%	6.1%	6.7%	4.5%	76.4%	19.4%	0.08	0.07	0.27	0.41	0.05	0.02	-0.41
Big	0.8%	7.9%	5.3%	6.1%	7.9%	86.8%	7.0%	0.17	0.51	0.18	0.53	0.02	0.06	-0.09
				R^2_{JW}							α_{JW}			
Small	40.6%	24.3%	16.2%	20.7%	63.8%	40.9%	21.2%	0.35	0.23	0.33	0.50	0.14	0.14	0.10
2	9.8%	23.1%	8.9%	16.9%	17.0%	63.1%	28.8%	-0.11	-0.01	0.45	0.30	-0.10	0.02	-0.18
3	6.7%	21.7%	8.1%	29.8%	19.5%	59.1%	28.5%	0.25	0.17	0.29	0.60	0.10	0.02	-0.25
4	4.5%	5.1%	4.6%	7.2%	8.7%	50.0%	21.9%	0.19	0.03	0.23	0.42	0.08	0.07	-0.40
Big	4.3%	5.0%	7.0%	5.2%	11.4%	85.6%	7.4%	0.25	0.30	0.11	0.47	0.09	0.09	-0.22

A.3.4 Dividend Yield and Earnings-per-Price Model

Table 5d, Dividend Yield and Earnings-per-Price Model

In this table Fama-MacBeth estimates with White-Huber SE are presented along with Jagannathan-Wang R^2_{JW}. DY is the dividend yield. EP is the earnings-per-price ratio. Org. Capital is modeled using Cash Flow (CF_{t-1}), Invest. Rate ($Inv.R_{t-1}$), Prod. ($Prod._{t-1}$), Return on Assets (ROA_{t-1}), Sales Growth (SG_{t-1}) and Tobin's Q ($Tobin_{t-1}$). 25 portfolios are created at the deciles intersection of ME and BE/ME starting July 1975 till 2011. The portfolios are reformed annually in June of each year. The dependent variable is the risk-adjusted value-weighted portfolio returns from July of $t-1$ till June of t. All variables are lagged one year. All values are CPI adj.

	Dividend Yield β							Dividend Yield $\beta(t)$						
Small	-2.87	-2.67	-2.84	-1.73	-2.17	-1.67	-2.64	-0.83	-0.80	-0.75	-0.54	-0.54	-1.17	-0.82
2	4.71	4.49	4.35	5.36	4.62	1.50	3.62	0.47	0.35	0.41	0.54	0.48	0.39	0.33
3	-3.34	-3.59	-2.92	-1.53	-2.80	-0.69	-3.58	-0.65	-0.78	-0.60	-0.19	-0.47	-0.49	-0.70
4	-2.08	-2.34	-1.81	-1.87	-1.86	-0.77	0.16	-1.41	-1.53	-1.32	-1.35	-1.28	-1.07	-0.34
Big	-2.93	-1.84	-1.74	-1.37	-1.70	-1.85	0.30	-0.35	-0.14	-0.20	-0.04	-0.22	-0.66	0.09
	Earnings-by-Price γ							Earnings-by-Price $\gamma(t)$						
Small	0.46	0.57	0.54	0.61	0.16	0.06	0.54	1.20	1.28	1.51	1.75	0.79	0.36	1.38
2	0.59	0.28	0.98	0.66	0.34	0.06	0.99	0.66	0.40	1.01	0.82	0.85	0.31	1.19
3	0.62	0.61	0.83	0.63	-1.16	0.25	0.73	1.33	1.24	1.60	1.54	-0.39	0.99	1.73
4	0.57	0.57	1.21	0.97	-0.44	0.11	1.07	1.04	0.91	1.32	1.29	-0.30	0.34	1.49
Big	-0.21	-0.89	-1.00	0.30	-2.64	-0.35	1.09	-0.07	-0.41	-0.20	0.21	-0.78	-0.28	0.28
		CF	Inv. R	Prod.	ROA	SG	Tobin		CF	Inv. R	Prod.	ROA	SG	Tobin
	Org. Capital φ							Org. Capital $\varphi(t)$						
Small		-0.35	-1.73	-0.07	-0.32	0.62	0.11		-0.83	-1.17	-1.16	-0.08	5.73	0.85
2		0.73	-2.71	-0.08	-1.14	0.80	0.20		0.53	-1.66	-0.98	-0.86	7.17	1.11
3		0.48	-1.77	-0.18	4.53	0.80	0.28		1.76	-1.04	-1.23	0.87	7.68	1.49
4		0.28	-1.65	-0.13	3.67	0.88	0.33		0.15	-0.81	-1.24	0.54	8.80	2.98
Big		-2.35	-0.23	-0.22	4.65	0.95	0.03		-0.78	-0.05	-0.78	1.10	13.72	0.72

Table 5d, Dividend Yield and Earnings-per-Price Model, continued

Please see notes from the previous page.

	DY/EP	CF	Inv. R	Prod.	ROA	SG	Tobin	DY/EP	CF	Inv. R	Prod.	ROA	SG	Tobin
				R^2_{FM}							α_{FM}			
Small	8.2%	12.0%	13.8%	16.6%	11.9%	53.1%	13.8%	0.27	0.28	0.47	0.46	0.26	0.13	0.09
2	10.7%	15.3%	18.0%	13.6%	15.8%	74.5%	20.4%	0.10	0.03	0.45	0.31	0.09	0.03	-0.16
3	4.9%	8.3%	8.6%	17.8%	7.5%	73.1%	14.7%	0.15	0.11	0.35	0.59	0.13	0.04	-0.12
4	4.3%	7.6%	8.7%	9.1%	7.1%	77.1%	22.4%	0.13	0.12	0.30	0.42	0.09	0.04	-0.40
Big	1.4%	8.3%	6.3%	7.2%	8.3%	87.0%	7.4%	0.21	0.55	0.21	0.52	0.04	0.08	-0.10
				R^2_{JW}							α_{JW}			
Small	63.7%	34.4%	16.3%	22.9%	85.0%	54.1%	21.4%	0.14	0.15	0.42	0.53	-0.43	0.18	0.13
2	15.8%	30.3%	15.6%	27.2%	29.6%	69.5%	38.6%	0.17	-0.04	0.37	0.24	-0.17	0.06	-0.26
3	21.8%	22.6%	9.5%	31.4%	26.4%	60.1%	30.1%	0.36	0.16	0.34	0.67	0.16	0.03	-0.16
4	8.2%	8.5%	7.1%	9.5%	12.0%	60.2%	24.3%	0.24	0.09	0.26	0.43	0.11	0.12	-0.40
Big	4.9%	6.0%	7.8%	6.2%	12.5%	86.2%	8.4%	0.23	0.33	0.14	0.46	0.02	0.13	-0.22

A.3.5 Size Model

Table 5e, Size Model

In this table Fama-MacBeth estimates with White-Huber SE are presented along with Jagannathan-Wang coefficient of determination R^2_{JW}. $lnME$ is the natural log of market equity (ME) for the portfolio. Org. Capital is modeled using Cash Flow (CF_{t-1}), Investment Rate ($Inv.R_{t-1}$), Productivity ($Prod._{t-1}$), Return on Assets (ROA_{t-1}), Sales Growth (SG_{t-1}) and Tobin's Q ($Tobin_{t-1}$). 25 portfolios are created at the deciles intersection of ME and BE/ME starting July 1975 till 2011. The portfolios are reformed annually in June of each year. The risk-adjusted value-weighted portfolio returns is the dependent variable and it is calculated for each portfolio from July of $t-1$ till June of t. All variables except $lnME$ are lagged one year. All values are calculated using the CPI adjusted fundamental of the portfolio assets.

	Size lnME β							Size lnME $\beta(t)$						
Small	0.18	0.18	0.17	0.16	0.19	0.02	0.16	1.86	1.75	1.65	1.50	1.93	0.42	1.49
2	0.23	0.23	0.21	0.24	0.24	0.01	0.21	2.22	2.09	1.96	1.96	2.16	0.31	2.08
3	0.22	0.24	0.21	0.19	0.25	0.04	0.21	2.71	2.83	2.35	2.03	2.84	0.79	2.60
4	0.25	0.27	0.25	0.27	0.28	0.04	0.18	2.47	2.69	2.26	2.34	2.52	0.55	1.80
Big	0.31	0.29	0.37	0.35	0.35	-0.01	0.30	2.02	1.96	2.25	2.26	2.28	0.03	1.80
		CF	Inv. R	Prod.	ROA	SG	Tobin		CF	Inv. R	Prod.	ROA	SG	Tobin
		Org. Capital γ							Org. Capital $\gamma(t)$					
Small		-0.02	-0.79	-0.04	1.26	0.65	0.10		0.14	-0.50	-0.27	1.52	6.10	0.92
2		0.79	-1.54	0.00	1.06	0.82	0.17		0.84	-1.02	-0.08	0.72	7.25	0.85
3		-0.20	-0.63	-0.07	2.40	0.77	0.18		0.83	-0.32	-0.26	1.79	6.52	1.03
4		-0.59	-0.12	0.01	2.75	0.86	0.26		-0.26	-0.05	0.00	1.45	8.11	1.88
Big		-2.48	2.73	0.04	1.74	0.95	-0.05		-1.04	0.76	0.24	0.88	11.74	-0.06

Table 5e, Size Model, continued

Please see notes from the previous page.

	Size	CF	Inv. R	Prod.	ROA	SG	Tobin	Size	CF	Inv. R	Prod.	ROA	SG	Tobin
				R^2_{FM}							α_{FM}			
Small	10.0%	13.3%	12.6%	14.2%	15.8%	55.0%	12.3%	-0.48	-0.46	-0.34	-0.28	-0.43	0.00	-0.53
2	13.5%	18.1%	15.9%	14.6%	18.8%	74.1%	19.9%	-0.94	-1.01	-0.64	-0.96	-0.98	-0.02	-1.05
3	14.7%	19.5%	15.3%	19.7%	22.6%	72.8%	20.5%	-1.13	-1.20	-0.97	-0.78	-1.30	-0.22	-1.24
4	14.2%	17.0%	14.3%	17.0%	19.5%	76.9%	23.6%	-1.60	-1.60	-1.56	-1.72	-1.82	-0.27	-1.44
Big	12.2%	18.3%	17.6%	15.3%	17.5%	86.5%	15.5%	-2.63	-2.13	-3.53	-3.10	-3.13	0.10	-2.52
				R^2_{JW}							α_{JW}			
Small	9.6%	25.1%	16.3%	21.9%	70.1%	42.1%	22.4%	-0.46	-0.78	-0.40	-0.36	-2.70	-0.27	-0.60
2	13.2%	21.6%	14.4%	22.1%	26.3%	61.3%	34.1%	-0.91	-0.82	-0.63	-1.15	-1.44	-0.09	-1.29
3	14.3%	31.8%	15.0%	31.2%	30.9%	63.7%	36.3%	-1.09	-1.16	-0.93	-0.60	-1.92	-0.83	-1.38
4	14.1%	17.2%	12.2%	18.0%	21.2%	51.9%	27.1%	-1.58	-1.73	-1.41	-1.77	-1.87	-0.79	-1.49
Big	12.2%	18.6%	18.4%	15.7%	19.0%	86.4%	18.2%	-2.66	-2.28	-3.66	-3.04	-2.91	-0.13	-2.56

A.3.6 Size and BE/ME Model

Table 5f, Size and BE/ME Model

In this table Fama-MacBeth estimates with White-Huber SE are presented along with Jagannathan-Wang R^2_{JW}. $lnME$ is the natural log of market equity (ME) for the portfolio. BE/ME is the book equity per market equity both calculated in year $t-1$. Org. Capital is modeled using Cash Flow (CF_{t-1}), Invest. Rate ($Inv.R_{t-1}$), Prod. ($Prod._{t-1}$), Return on Assets (ROA_{t-1}), Sales Growth (SG_{t-1}) and Tobin's Q ($Tobin_{t-1}$). 25 portfolios are created at the deciles intersection of ME and BE/ME starting July 1975 till 2011. The portfolios are reformed annually in June of each year. The risk-adjusted value-weighted portfolio returns is the dependent variable and it is calculated for each portfolio from July of $t-1$ till June of t. All variables except $lnME$ are lagged one year. All values are calculated using the CPI adj. fundamental of the portfolio assets.

	Size lnME β							Size lnME $\beta(t)$						
Small	0.15	0.13	0.13	0.13	0.14	-0.03	0.12	1.23	1.12	1.06	1.06	1.26	-0.28	1.03
2	0.21	0.21	0.20	0.22	0.21	-0.02	0.25	1.81	1.66	1.62	1.63	1.70	-0.35	2.14
3	0.19	0.21	0.18	0.17	0.22	0.01	0.20	1.89	2.10	1.65	1.57	2.20	0.18	1.72
4	0.26	0.27	0.25	0.31	0.27	0.00	0.26	1.95	2.03	1.80	2.14	2.04	-0.12	2.05
Big	0.28	0.22	0.33	0.33	0.31	-0.04	0.24	1.57	1.19	1.83	1.59	1.68	-0.57	1.27
	BE/ME γ							BE/ME $\gamma(t)$						
Small	-0.03	-0.04	-0.04	-0.03	-0.23	-0.23	0.01	-0.41	-0.43	-0.43	-0.37	-0.92	-1.04	-0.33
2	-0.05	-0.05	0.05	-0.05	-0.24	-0.14	0.34	-0.18	-0.18	0.12	-0.15	-0.55	-1.14	0.80
3	-0.06	-0.05	-0.07	-0.08	-0.10	-0.15	-0.03	-0.24	-0.24	-0.26	-0.36	-0.73	-1.28	-0.02
4	0.06	0.04	0.07	0.15	0.00	-0.20	0.54	0.00	-0.03	0.00	0.36	-0.13	-1.31	1.38
Big	-0.13	-0.37	-0.36	-0.12	-0.27	-0.20	-0.06	-0.28	-0.67	-0.47	-0.20	-0.49	-1.24	-0.02
	Org. Capital φ							Org. Capital $\varphi(t)$						
Small		0.05	-1.01	-0.02	1.37	0.66	0.05		0.30	-0.63	-0.17	1.54	5.97	0.54
2		0.81	-1.71	0.00	1.40	0.82	0.24		0.87	-1.00	-0.10	0.74	7.72	1.22
3		-0.08	-0.67	-0.05	2.31	0.78	0.16		0.71	-0.35	-0.15	1.59	6.68	0.87
4		-0.50	-0.09	0.03	2.54	0.87	0.34		-0.02	-0.07	0.42	1.13	8.46	2.60
Big		-2.96	3.43	0.04	2.08	0.95	-0.12		-1.17	0.87	0.23	0.95	12.15	-0.09

Table 5f, Size and BE/ME Model, continued

Please see notes from the previous page.

	Size	CF	Inv. R	Prod.	ROA	SG	Tobin	Size	CF	Inv. R	Prod.	ROA	SG	Tobin
				R^2_{FM}							α_{FM}			
Small	13.2%	17.4%	15.5%	16.3%	18.7%	57.7%	15.3%	-0.24	-0.18	-0.09	-0.13	-0.05	0.35	-0.29
2	13.9%	18.5%	16.7%	15.1%	20.5%	75.2%	22.8%	-0.80	-0.88	-0.52	-0.82	-0.70	0.24	-1.50
3	17.6%	22.4%	18.2%	22.5%	24.1%	74.2%	22.5%	-0.86	-0.96	-0.69	-0.57	-1.01	0.11	-1.10
4	15.6%	19.0%	15.7%	19.3%	20.1%	77.9%	27.9%	-1.63	-1.59	-1.55	-2.06	-1.75	0.17	-2.35
Big	12.7%	20.5%	19.7%	16.5%	18.7%	86.8%	22.0%	-2.31	-1.16	-3.10	-2.85	-2.65	0.50	-1.67
				R^2_{JW}							α_{JW}			
Small	17.7%	28.6%	18.3%	26.1%	75.1%	45.2%	25.9%	-0.55	-0.77	-0.24	-0.32	-1.28	0.05	-0.55
2	12.8%	22.2%	14.8%	23.2%	37.4%	64.1%	36.5%	-0.90	-0.75	-0.63	-0.89	-1.19	-0.08	-1.65
3	18.3%	35.3%	18.1%	33.5%	33.2%	66.4%	37.8%	-1.08	-0.92	-0.58	-0.37	-1.58	-0.23	-1.19
4	14.8%	20.7%	14.0%	21.4%	22.4%	62.7%	30.7%	-1.68	-1.53	-1.43	-2.19	-1.99	0.74	-2.29
Big	15.0%	19.4%	21.4%	16.2%	20.1%	86.7%	23.0%	-2.06	-1.77	-3.04	-3.06	-2.79	0.17	-2.66

A.3.7 Size, BE/ME and RND Model

Table 5g, Size, BE/ME and RND Model

In this table Fama-MacBeth estimates with White-Huber SE are presented along with Jagannathan-Wang coefficient of determination R^2_{JW}. $lnME$ is the natural log of market equity (ME) for the portfolio. BE/ME is the book equity per market equity both calculated in year $t-1$. RND/BE is the RND per BE in year $t-1$. Org. Capital is modeled using Cash Flow (CF_{t-1}), Investment Rate ($Inv.R_{t-1}$), Productivity ($Prod._{t-1}$), Return on Assets (ROA_{t-1}), Sales Growth (SG_{t-1}) and Tobin's Q ($Tobin_{t-1}$). 25 portfolios are created at the deciles intersection of ME and BE/ME starting July 1975 till 2011. The portfolios are reformed annually in June of each year. The risk-adjusted value-weighted portfolio returns is the dependent variable and it is calculated for each portfolio from July of $t-1$ till June of t. All variables except $lnME$ are lagged one year. All values are calculated using the CPI adjusted fundamental of the portfolio assets.

	Size	CF	Inv. R	Prod.	ROA	SG	Tobin	Size	CF	Inv. R	Prod.	ROA	SG	Tobin
	Size lnME β							Size lnME $\beta(t)$						
Small	0.18	0.18	0.17	0.15	0.17	-0.03	0.16	1.44	1.45	1.25	1.09	1.40	-0.21	1.28
2	0.23	0.23	0.22	0.24	0.21	-0.01	0.27	1.97	1.86	1.79	1.83	1.73	-0.21	2.15
3	0.26	0.29	0.24	0.24	0.28	0.03	0.26	2.29	2.49	2.14	2.01	2.38	0.46	2.20
4	0.30	0.31	0.29	0.35	0.30	0.02	0.30	2.14	2.14	1.92	2.28	2.13	0.09	2.19
Big	0.32	0.28	0.36	0.35	0.34	-0.04	0.28	1.70	1.44	2.02	1.65	1.90	-0.46	1.51
	BE/ME γ							BE/ME $\gamma(t)$						
Small	-0.28	-0.26	-0.31	-0.28	-0.33	-0.32	-0.21	-0.82	-0.79	-0.94	-0.72	-1.02	-1.04	-0.63
2	-0.28	-0.21	-0.18	-0.28	-0.32	-0.21	0.10	-0.70	-0.65	-0.42	-0.69	-0.87	-1.44	0.13
3	-0.27	-0.24	-0.27	-0.26	-0.26	-0.21	-0.29	-0.98	-0.93	-0.99	-1.00	-1.26	-1.45	-0.75
4	-0.01	-0.03	-0.01	0.07	-0.03	-0.22	0.44	-0.24	-0.23	-0.26	0.11	-0.25	-1.53	1.13
Big	-0.10	-0.22	-0.36	-0.10	-0.25	-0.24	0.00	-0.04	-0.20	-0.27	-0.11	-0.22	-1.27	0.05

Table 5g, Size, BE/ME and RND Model, continued

Please see notes from the previous page.

	RND/BE φ							RND						
Small	-1.57	-1.93	-1.84	-2.29	-1.02	-0.38	-1.26	-0.72	-0.60	-0.80	-1.06	-0.34	-0.37	-0.47
2	-3.66	-3.39	-3.43	-3.82	-3.65	-1.39	-3.32	-1.55	-1.01	-1.40	-1.59	-1.00	-0.70	-1.33
3	-7.30	-7.65	-7.35	-7.75	-6.89	-2.00	-6.80	-1.52	-2.00	-1.48	-1.85	-1.17	-0.84	-1.91
4	-2.82	-2.64	-2.85	-2.81	-2.02	-1.52	-1.60	-0.29	-0.38	-0.30	-0.58	-0.12	-0.72	-0.42
Big	1.10	3.93	0.67	1.03	1.37	-0.37	3.61	0.49	0.96	0.42	0.37	0.67	-0.30	0.68
		CF	Inv. R	Prod.	ROA	SG	Tobin		CF	Inv. R	Prod.	ROA	SG	Tobin
	Org. Capital ϕ							Org. Capital $\phi(t)$						
Small		-0.21	-1.18	-0.05	0.93	0.65	0.04		0.26	-0.75	-0.60	0.97	5.21	0.18
2		0.50	-1.50	-0.01	0.37	0.81	0.20		0.29	-0.91	0.02	0.03	7.28	1.34
3		-0.93	-0.74	-0.09	0.85	0.75	0.05		-0.56	-0.36	-0.68	0.61	5.89	0.33
4		-0.41	0.17	0.04	1.64	0.85	0.30		-0.13	0.04	0.34	0.68	7.60	2.07
Big		-2.71	3.73	0.06	2.85	0.94	-0.15		-1.21	0.95	0.11	1.21	11.59	-0.06
	R^2_{FM}							α_{FM}						
Small	18.2%	22.3%	21.4%	21.9%	21.4%	58.0%	20.5%	-0.13	-0.10	0.06	0.13	-0.07	0.40	-0.20
2	20.3%	23.8%	22.6%	21.5%	23.4%	75.8%	27.6%	-0.59	-0.66	-0.35	-0.59	-0.51	0.30	-1.23
3	29.0%	32.6%	29.9%	33.7%	31.9%	74.8%	30.7%	-0.83	-0.90	-0.65	-0.45	-0.95	0.09	-0.89
4	22.0%	23.8%	22.3%	24.3%	25.9%	79.0%	32.1%	-1.76	-1.70	-1.69	-2.25	-1.81	0.12	-2.45
Big	18.8%	24.1%	26.0%	22.1%	24.6%	87.1%	25.2%	-2.65	-1.98	-3.41	-3.10	-2.99	0.49	-2.19
	R^2_{JW}							α_{JW}						
Small	28.9%	35.7%	26.1%	33.9%	95.6%	47.4%	31.6%	-0.10	-0.73	-0.18	-0.84	-13.02	0.19	-1.21
2	28.5%	37.5%	20.6%	33.7%	49.1%	64.6%	40.4%	-0.42	-0.26	-0.47	-0.79	0.77	-0.18	-1.26
3	37.8%	46.0%	30.0%	46.9%	41.9%	68.8%	47.4%	-0.50	-0.84	-0.59	-0.32	-1.43	-0.37	-0.97
4	25.0%	26.4%	20.2%	27.3%	28.3%	68.3%	35.7%	-1.71	-1.66	-1.59	-2.33	-2.05	0.79	-2.33
Big	18.8%	23.5%	27.6%	21.7%	24.2%	89.8%	27.0%	-2.87	-2.61	-3.18	-3.18	-3.15	0.10	-3.25

A.3.8 CAPM Model

Table 5h, CAPM Model

In this table Fama-MacBeth estimates with White-Huber SE are presented along with Jagannathan-Wang coefficient of determination R^2_{JW}. $R_m - R_f$ is the excess return on the market portfolio constructed using the super-set of assets used in the study including the ones with negative book value. Org. Capital is modeled using Cash Flow (CF_{t-1}), Investment Rate ($Inv.R_{t-1}$), Productivity ($Prod._{t-1}$), Return on Assets (ROA_{t-1}), Sales Growth (SG_{t-1}) and Tobin's Q ($Tobin_{t-1}$). 25 portfolios are created at the deciles intersection of ME and BE/ME starting July 1975 till 2011. The portfolios are reformed annually in June of each year. The risk-adjusted value-weighted portfolio returns is the dependent variable and it is calculated for each portfolio from July of $t-1$ till June of t. All variables except $lnME$ are lagged one year. All values are calculated using the CPI adjusted fundamental of the portfolio assets.

	$\beta(R_m - R_f)$							$\beta(t)(R_m - R_f)$						
Small	8.78	8.56	9.33	8.11	9.05	6.59	8.54	2.51	2.44	2.66	2.30	2.64	2.65	2.30
2	9.30	9.11	8.92	9.23	9.18	4.71	7.83	1.89	1.94	1.87	1.94	1.85	1.92	1.65
3	8.54	8.43	8.64	7.73	7.87	4.53	7.80	2.61	2.65	2.80	2.43	2.35	2.58	2.21
4	8.40	8.77	8.39	8.17	8.33	3.24	6.53	2.45	2.38	2.36	2.16	2.40	2.26	1.77
Big	12.47	11.72	12.47	12.62	12.84	2.73	12.35	2.52	2.57	2.44	2.56	2.40	1.71	2.27
		CF	Inv. R	Prod.	ROA	SG	Tobin		CF	Inv. R	Prod.	ROA	SG	Tobin
	Org. Capital γ							Org. Capital $\gamma(t)$						
Small		0.11	-1.21	-0.04	0.96	0.64	0.10		0.05	-0.82	-0.59	1.11	6.70	1.12
2		1.07	-1.99	-0.07	0.29	0.79	0.15		0.72	-1.31	-1.02	0.29	7.46	0.76
3		0.62	-1.63	-0.13	1.30	0.75	0.18		1.37	-1.28	-1.16	1.01	7.32	0.76
4		0.54	-0.59	-0.07	1.25	0.85	0.23		0.25	-0.55	-0.80	0.53	8.59	1.71
Big		-1.67	0.28	-0.20	0.66	0.92	-0.06		-0.60	-0.16	-1.06	0.35	12.30	-0.04

Table 5h, CAPM Model, continued

Please see notes from the previous page.

	$R_m - R_f$	CF	Inv. R	Prod.	ROA	SG	Tobin	$R_m - R_f$	CF	Inv. R	Prod.	ROA	SG	Tobin
	R^2_{FM}							α_{FM}						
Small	13.8%	15.8%	19.0%	17.8%	18.6%	62.4%	17.3%	0.05	0.06	0.18	0.20	0.12	0.00	-0.11
2	11.5%	16.4%	15.8%	14.3%	16.1%	76.5%	16.8%	0.03	-0.07	0.28	0.23	0.04	0.00	-0.13
3	16.2%	18.8%	19.9%	22.2%	18.8%	76.8%	22.0%	0.01	-0.06	0.21	0.35	0.01	-0.01	-0.14
4	13.0%	15.8%	15.6%	14.8%	15.9%	78.1%	23.3%	0.01	-0.04	0.10	0.20	-0.02	-0.01	-0.28
Big	16.0%	21.3%	18.3%	20.9%	18.3%	87.2%	19.1%	-0.02	0.21	-0.06	0.38	-0.10	-0.01	0.04
	R^2_{JW}							α_{JW}						
Small	8.7%	17.2%	17.6%	22.3%	44.5%	55.9%	23.8%	-0.03	0.11	0.16	0.29	0.06	-0.05	-0.05
2	7.9%	27.8%	12.3%	12.1%	27.5%	62.5%	18.4%	-0.09	-0.15	0.28	0.28	-0.03	0.03	-0.14
3	7.3%	30.4%	21.2%	32.1%	20.9%	67.7%	35.1%	-0.02	0.02	0.19	0.41	0.09	-0.07	-0.21
4	5.6%	19.8%	14.1%	16.4%	15.5%	54.1%	28.2%	-0.03	-0.08	0.07	0.21	-0.09	-0.01	-0.31
Big	10.5%	18.2%	19.8%	19.3%	18.0%	84.8%	17.2%	-0.14	0.09	-0.13	0.36	-0.12	-0.10	0.01

A.4 A Comparative Study of Human, Structural & Intangible Capitals

A.4.1 Summary Statistics

Table 6a: Summary Statistics

Panel i.

5x	$R_p - R_f$	SD(σ)	SR	AR(1)	AR(2)	AR(3)
Small	14.7%	0.34	0.42	-0.22	-0.12	-0.06
2	13.6%	0.36	0.37	-0.49*	-0.17	-0.07
3	10.6%	0.30	0.34	-0.37	-0.22	-0.01
4	10.5%	0.32	0.32	-0.40*	-0.21	-0.06
Big	11.9%	0.44	0.27	-0.23	-0.10	-0.25

Panel ii.

	Mean (μ)			Std. Dev. (σ)			Sharpe Ratio (μ/σ)		
5x	(HC)	(IC)	(SC)	(HC)	(IC)	(SC)	(HC)	(IC)	(SC)
Small	11.5%	4.9%	20.8%	0.39	0.33	0.55	29.6%	14.9%	37.7%
2	9.8%	4.7%	22.0%	0.36	0.29	0.68	27.3%	16.1%	32.5%
3	9.9%	4.5%	14.7%	0.35	0.31	0.43	28.2%	14.4%	34.4%
4	9.5%	4.4%	21.7%	0.34	0.32	0.70	27.7%	13.8%	31.1%
Big	12.7%	4.0%	19.8%	0.48	0.39	0.67	26.5%	10.2%	29.3%

	AR(1)			AR(2)			AR(3)		
5x	HC	IC	SC	HC	IC	SC	HC	IC	SC
Small	-0.37	-0.36	-0.38	-0.21	-0.23	-0.26	0.05	0.06	-0.13
2	-0.32	-0.34	-0.41*	-0.06	-0.08	-0.24	-0.09	-0.08	-0.09
3	-0.46*	-0.49*	-0.35	-0.20	-0.22	-0.21	-0.16	-0.17	-0.01
4	-0.49*	-0.50*	-0.35	-0.30	-0.29	-0.25	-0.11	-0.12	-0.07
Big	-0.38	-0.41	-0.36	-0.12	-0.09	-0.07	-0.22	-0.20	-0.19

* significant when p-value ¡ 0.05

A.4.2 Human Capital Model

Table 6b: Human Capital Model

In this table the human capital asset pricing model estimates are tabulated. Each model is estimated for 25 Size-BE/ME portfolios in a 5x5 matrix increasing at 20% deciles. In the interest of space only Size variation is presented below with each factor estimates being averaged across BE/ME portfolios in each size deciles. β is the risk loading or risk premium on human capital with $\beta(t)$ showing the t-values. γ is the risk premium on DY, $R_m - Rf$ and ME with $\gamma(t)$ being the t-values. ϕ is the risk premium on EP and BE/ME factors with $\phi(t)$ being the t-value. R^2_{FM} and α_{FM} is the model coefficient of determination and pricing error of Fama-MacBeth estimator. R^2_{JW} and α_{JW} is the model coefficient of determination and pricing error of Jagannathan-Wang estimator.

	HC Return							HC Return						
	β							$\beta(t)$						
Small	0.21	0.20	0.22	0.23	0.20	0.19	0.19	1.71	1.57	1.65	1.83	1.65	1.53	1.47
2	0.24	0.26	0.25	0.24	0.30	0.26	0.28	1.62	1.72	1.70	1.56	2.03	1.84	1.94
3	0.32	0.33	0.33	0.31	0.36	0.29	0.29	2.06	2.05	2.08	2.02	2.55	1.92	2.14
4	0.50	0.50	0.50	0.50	0.55	0.46	0.47	3.42	3.42	3.37	3.35	4.11	3.49	3.51
Big	0.61	0.62	0.63	0.62	0.62	0.57	0.59	5.11	5.20	5.25	5.32	5.35	4.90	5.06
		DY	DY		$R_m - Rf$	ME	ME			DY		$R_m - Rf$	ME	ME
	γ							$\gamma(t)$						
Small		-2.55	-3.25		8.81	0.17	0.12		-0.83	-1.03		2.32	1.70	1.06
2		4.27	3.75		10.17	0.23	0.19		0.31	0.38		2.36	2.32	1.70
3		-1.15	-4.59		9.52	0.20	0.17		-0.43	-0.87		2.63	2.60	1.75
4		-2.38	-2.75		9.92	0.20	0.18		-1.38	-1.72		3.17	2.26	1.52
Big		-4.40	-3.78		11.97	0.18	0.12		-0.94	-0.59		3.64	1.80	0.87

Table 6b: Human Capital Model, continued

Please see table notes from the previous page.

			EP	EP			BE/ME			EP	EP			BE/ME
			ϕ							$\phi(t)$				
Small			0.46	0.46			-0.11			1.28	1.87			-0.57
2			0.62	0.57			-0.13			0.70	0.72			-0.51
3			0.87	0.43			-0.08			1.17	0.87			-0.14
4			0.53	0.29			-0.09			0.87	0.55			-0.60
Big			-0.64	-1.40			-0.33			-0.37	-0.99			-1.01
			R^2_{FM}							α_{FM}				
Small	9.0%	10.7%	16.9%	17.9%	21.8%	17.1%	20.5%	0.12	0.19	0.25	0.19	0.02	-0.45	-0.13
2	12.4%	17.2%	21.6%	16.2%	26.1%	25.8%	27.0%	0.12	0.06	0.09	0.13	0.00	-0.94	-0.67
3	14.0%	14.6%	19.1%	16.5%	31.8%	25.7%	29.2%	0.08	0.10	0.13	0.07	-0.03	-1.03	-0.72
4	29.0%	31.0%	32.2%	29.8%	46.4%	38.0%	39.5%	0.06	0.11	0.10	0.05	-0.06	-1.28	-1.04
Big	47.2%	48.9%	49.7%	48.9%	61.7%	51.6%	53.3%	0.04	0.16	0.18	0.13	-0.09	-1.59	-0.81
			R^2_{JW}							α_{JW}				
Small	5.4%	10.3%	25.1%	17.5%	12.4%	9.5%	18.5%	0.22	0.26	0.33	0.28	0.15	-0.12	0.23
2	26.0%	47.1%	53.8%	30.8%	37.8%	39.2%	47.2%	0.21	0.09	0.12	0.24	0.09	-0.56	0.04
3	11.6%	19.8%	37.0%	29.0%	40.3%	22.3%	33.4%	0.06	0.06	0.06	0.03	-0.10	-0.68	-0.07
4	15.1%	18.4%	25.0%	18.3%	40.8%	25.7%	30.8%	0.12	0.21	0.19	0.11	-0.09	-1.53	-1.10
Big	31.8%	55.3%	58.3%	48.5%	66.0%	46.9%	55.2%	0.13	0.80	0.81	0.48	-0.18	-3.54	-0.64

A.4.3 Structural Capital Model

Table 6c: Structural Capital Model

In this table the structural capital asset pricing model estimates are tabulated. Each model is estimated for 25 Size-BE/ME portfolios in a 5x5 matrix increasing at 20% deciles. In the interest of space only Size variation is presented below with each factor estimates being averaged across BE/ME portfolios in each size deciles. β is the risk loading or risk premium on human capital with $\beta(t)$ showing the t-values. γ is the risk premium on DY, $R_m - Rf$ and ME with $\gamma(t)$ being the t-values. ϕ is the risk premium on EP and BE/ME factors with $\phi(t)$ being the t-value. R^2_{FM} and α_{FM} is the model coefficient of determination and pricing error of Fama-MacBeth estimator. R^2_{JW} and α_{JW} is the model coefficient of determination and pricing error of Jagannathan-Wang estimator.

	SC Returns						
	β						
Small	0.07	0.05	0.07	0.09	0.06	0.09	0.08
2	-0.02	-0.02	0.00	0.00	0.00	0.01	0.01
3	0.14	0.14	0.11	0.12	0.13	0.15	0.14
4	0.13	0.14	0.14	0.13	0.16	0.13	0.13
Big	0.43	0.43	0.44	0.43	0.41	0.40	0.41
		DY	DY		$R_m - R_f$	ME	ME
	γ						
Small		-1.84	-2.68		8.16	0.19	0.15
2		4.76	4.41		9.12	0.23	0.21
3		-0.98	-3.50		8.39	0.22	0.19
4		-2.50	-2.96		9.01	0.25	0.24
Big		-3.10	-3.54		11.16	0.22	0.18

	SC Returns						
	$\beta(t)$						
Small	0.81	0.66	0.84	1.03	0.69	1.17	1.14
2	-0.29	-0.24	-0.13	-0.28	0.18	-0.04	-0.02
3	1.09	1.05	0.95	1.01	1.08	1.13	1.13
4	1.68	1.85	1.71	1.59	2.63	1.93	2.09
Big	4.92	4.89	4.80	4.79	4.73	4.72	4.75
		DY	DY		$R_m - R_f$	ME	ME
	$\gamma(t)$						
Small		-0.56	-0.64		2.44	1.99	1.25
2		0.39	0.44		1.89	2.16	1.77
3		-0.24	-0.66		2.70	2.73	1.89
4		-1.35	-1.52		2.80	2.42	1.83
Big		-0.58	-0.49		2.90	1.94	1.23

Table 6c: Structural Capital Model, continued

Please see table notes from the previous page.

			E/P	E/P			BE/ME			E/P	E/P			BE/ME
				ϕ							$\phi(t)$			
Small			0.56	0.60			-0.03			1.37	1.98			-0.45
2			0.55	0.56			-0.08			0.64	0.70			-0.22
3			0.73	0.47			-0.08			1.44	1.17			-0.25
4			0.50	0.26			-0.02			0.76	0.54			-0.43
Big			-0.05	-0.84			-0.22			0.02	-0.53			-0.62
				R^2_{FM}							α_{FM}			
Small	4.2%	6.1%	12.4%	13.5%	16.8%	14.8%	18.5%	0.13	0.19	0.25	0.21	0.04	-0.53	-0.27
2	3.6%	8.5%	13.3%	7.6%	14.5%	16.5%	17.1%	0.14	0.08	0.10	0.16	0.04	-0.92	-0.76
3	5.5%	5.7%	9.7%	8.5%	20.8%	20.4%	23.1%	0.09	0.10	0.13	0.08	0.00	-1.15	-0.86
4	10.2%	13.2%	14.9%	11.3%	25.1%	23.9%	25.6%	0.08	0.13	0.12	0.07	-0.03	-1.59	-1.46
Big	44.1%	45.3%	46.0%	44.8%	56.2%	50.0%	50.7%	0.04	0.12	0.13	0.09	-0.08	-1.88	-1.39
				R^2_{JW}							α_{JW}			
Small	10.3%	21.3%	28.8%	23.2%	27.5%	19.1%	30.1%	0.14	0.19	0.23	0.18	0.11	-0.45	0.12
2	20.2%	23.6%	36.4%	30.5%	31.9%	31.0%	38.9%	0.08	0.11	0.06	0.04	0.02	-0.74	-0.63
3	16.3%	22.3%	27.4%	17.8%	27.7%	29.5%	33.8%	0.01	0.03	0.06	0.02	-0.02	-1.13	-1.07
4	10.6%	28.5%	31.3%	18.6%	27.5%	30.4%	38.9%	0.18	0.20	0.21	0.20	0.08	-1.73	-1.78
Big	53.4%	60.2%	62.4%	61.0%	74.7%	61.5%	64.0%	-0.09	0.24	0.20	0.17	-0.25	-6.59	-2.81

A.4.4 Intangible Capital Model

Table 6d: Intangible Capital Model

In this table the intangible capital asset pricing model estimates are tabulated. Each model is estimated for 25 Size-BE/ME portfolios in a 5x5 matrix increasing at 20% deciles. In the interest of space only Size variation is presented below with each factor estimates being averaged across BE/ME portfolios in each size deciles. β is the risk loading or risk premium on human capital with $\beta(t)$ showing the t-values. γ is the risk premium on DY, $R_m - Rf$ and ME with $\gamma(t)$ being the t-values. ϕ is the risk premium on EP and BE/ME factors with $\phi(t)$ being the t-value. R^2_{FM} and α_{FM} is the model coefficient of determination and pricing error of Fama-MacBeth estimator. R^2_{JW} and α_{JW} is the model coefficient of determination and pricing error of Jagannathan-Wang estimator.

	IC Returns							IC Returns						
	β							$\beta(t)$						
Small	0.28	0.28	0.30	0.31	0.26	0.26	0.27	2.02	1.77	1.83	2.15	1.88	1.95	1.87
2	0.29	0.31	0.32	0.30	0.36	0.31	0.32	1.69	1.76	1.82	1.69	2.08	1.89	1.95
3	0.40	0.41	0.41	0.39	0.42	0.36	0.37	2.47	2.47	2.42	2.44	2.70	2.26	2.64
4	0.55	0.56	0.55	0.54	0.61	0.50	0.51	3.63	3.60	3.53	3.53	4.15	3.63	3.66
Big	0.72	0.73	0.74	0.74	0.73	0.67	0.68	4.44	4.42	4.35	4.37	4.98	4.21	4.21
		DY	DY		$R_m - R_f$	ME	ME		DY	DY		$R_m - R_f$	ME	ME
	γ							$\gamma(t)$						
Small		-2.29	-3.07		8.53	0.16	0.11		-0.79	-0.99		2.24	1.84	1.11
2		4.56	4.09		10.37	0.22	0.19		0.34	0.41		2.37	2.28	1.68
3		-0.70	-3.87		9.24	0.20	0.16		-0.36	-0.83		2.58	2.55	1.73
4		-2.72	-3.10		9.76	0.20	0.17		-1.51	-1.79		3.26	2.24	1.49
Big		-3.84	-2.93		12.12	0.17	0.11		-0.79	-0.38		3.60	1.57	0.77

Table 6d, Intangible Capital Model, continued

Please see table notes from the previous page.

			E/P	E/P			BE/ME
			ϕ				
Small			0.46	0.47			-0.12
2			0.62	0.59			-0.12
3			0.83	0.44			-0.09
4			0.51	0.24			-0.11
Big			-0.62	-1.30			-0.31
			R^2_{FM}				
Small	10.5%	12.0%	18.5%	19.7%	22.8%	19.0%	22.5%
2	12.2%	17.0%	21.7%	16.1%	26.2%	25.2%	26.2%
3	15.5%	16.2%	20.1%	18.0%	32.7%	27.1%	30.7%
4	29.5%	32.1%	33.1%	30.1%	46.3%	38.2%	39.8%
Big	45.6%	47.0%	47.7%	47.1%	60.7%	49.5%	50.9%
			R^2_{JW}				
Small	4.6%	9.0%	24.1%	17.3%	12.5%	9.9%	21.3%
2	25.2%	42.8%	49.6%	29.8%	37.1%	36.9%	44.2%
3	11.6%	20.5%	33.4%	25.4%	35.8%	22.2%	33.7%
4	11.6%	16.2%	20.5%	13.4%	34.9%	25.2%	29.6%
Big	35.4%	55.5%	58.4%	49.4%	70.4%	48.9%	55.0%

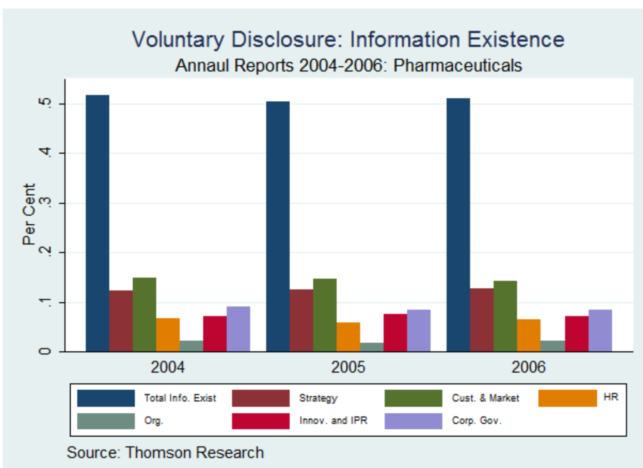
			E/P	E/P			BE/ME
			$\phi(t)$				
Small			1.28	1.87			-0.56
2			0.69	0.72			-0.45
3			1.16	0.89			-0.16
4			0.77	0.43			-0.70
Big			-0.43	-0.94			-0.80
			α_{FM}				
Small	0.13	0.20	0.26	0.20	0.04	-0.43	-0.11
2	0.12	0.07	0.09	0.14	0.01	-0.91	-0.67
3	0.09	0.11	0.13	0.08	-0.01	-1.01	-0.69
4	0.08	0.14	0.13	0.07	-0.03	-1.25	-0.95
Big	0.09	0.19	0.20	0.17	-0.04	-1.43	-0.71
			α_{JW}				
Small	0.20	0.28	0.34	0.25	0.13	-0.20	0.19
2	0.19	0.08	0.10	0.21	0.07	-0.42	0.10
3	0.05	0.04	0.03	0.03	-0.11	-0.88	-0.40
4	0.12	0.21	0.19	0.11	-0.10	-1.66	-1.33
Big	-0.10	0.55	0.58	0.22	-0.34	-4.66	-2.30

Appendix B

List of Figures

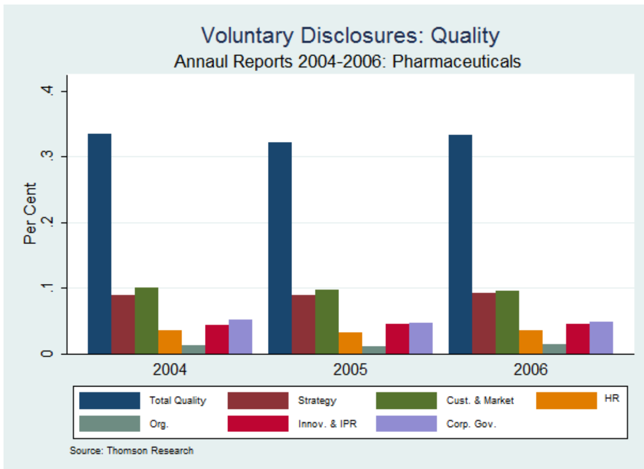
B.1 Non-Financial Disclosures and Cost of Capital

B.1.1 Information Existence



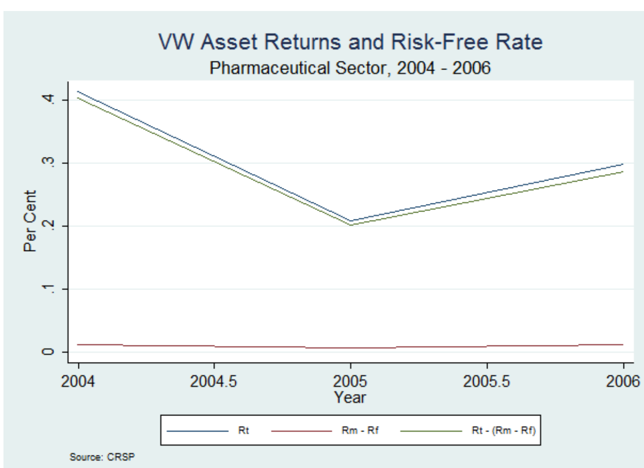
In this graph the average percentage change in the disclosure scores are shown over the years. The percentages are calculated on the basis of "Existence" of a communication indicator in the annual reports. The values are normalized using the total number of predefined indicators in each communication category.

B.1.2 Information Quality



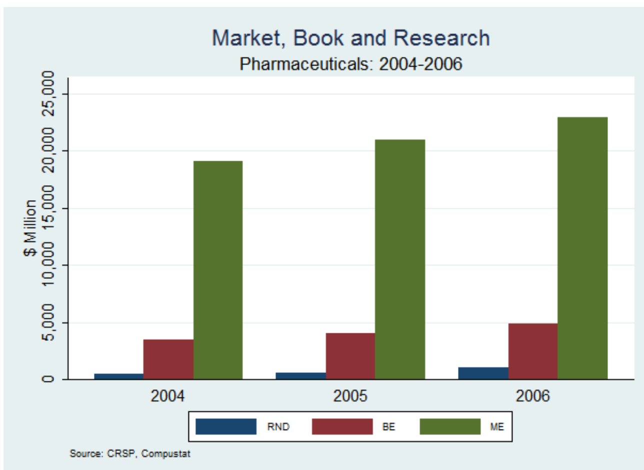
In this graph the average percentage change in the disclosure scores are shown over the years. The percentages are calculated on the basis of "Quality" of a communication indicator in the annual reports. The quality is assessed over a four point scale (0, 1, 2, 3). The values are normalized using the total number of predefined indicators in each communication category.

B.1.3 Summary of Returns



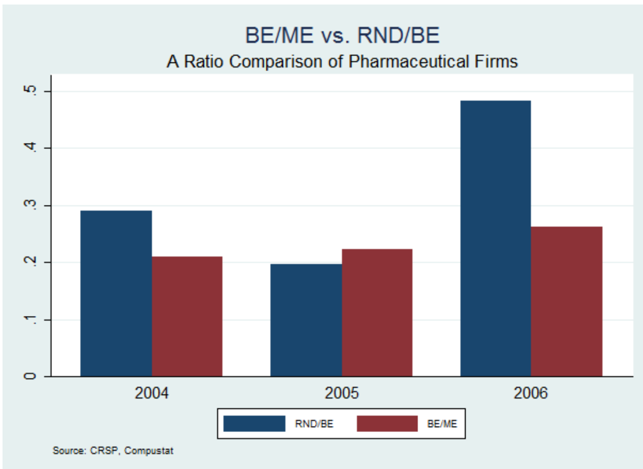
In this graph the blue line represents the annual value-weighted returns of the firms in the Pharmaceuticals sector calculated between the last working days of December $t-1$ and year t. The green line is the risk-adjusted value-weighted returns on the firms in the Pharmaceuticals sector from the year t. The red line represents the annualized one-month treasury bills from the year $t-1$.

B.1.4 BE and RND



This graphs shows the investments some of the largest firms in the Pharmaceuticals are making in the research and development (RND) activity (year: $t-1$) as compared to the book and market equity .

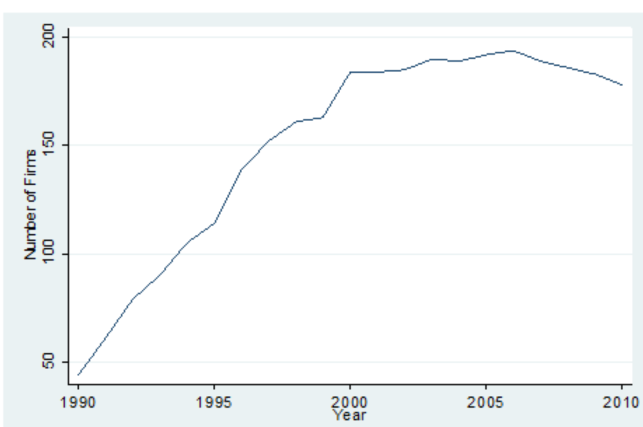
B.1.5 Ratio Comparison of RND/BE vs. BE/ME



This graph shows change in the ratio of RND/BE and BE/ME over a period of three years across a sample of 25 largest Pharmaceutical firms.

B.2 Regulatory Change: A Macroeconomic Intangible Risk

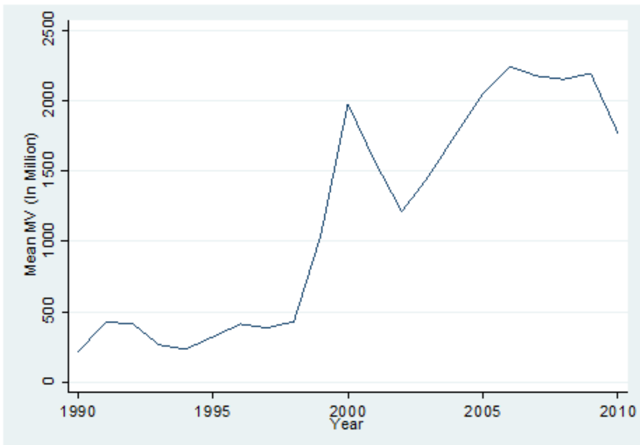
B.2.1 Total Number of Firms



Source: CRSP

This graph shows the increasing number of firms in the Pharmaceuticals, Biotechnology and Life Sciences sectors over the past two decades that are sampled in this study.

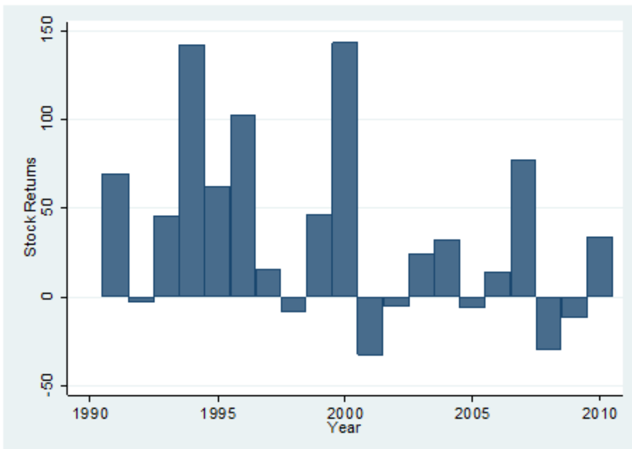
B.2.2 Market Value of the Firms



Source: CRSP

This graphs shows the increasing nature of the market capital of the firms in the Pharmaceuticals, Biotechnology and Life Sciences sectors, which is a function of the increasing number and additional investments in the industry.

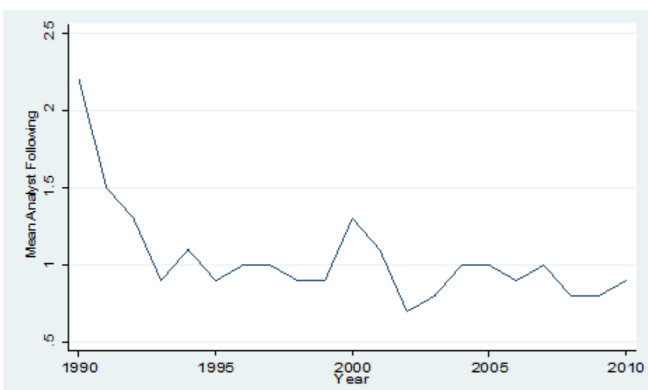
B.2.3 Stock Returns



Source: CRSP

This graph shows the percentage change at the industry level value-weighted returns based on the selected sample of the firms used for the study.

B.2.4 Analyst Following the Sector

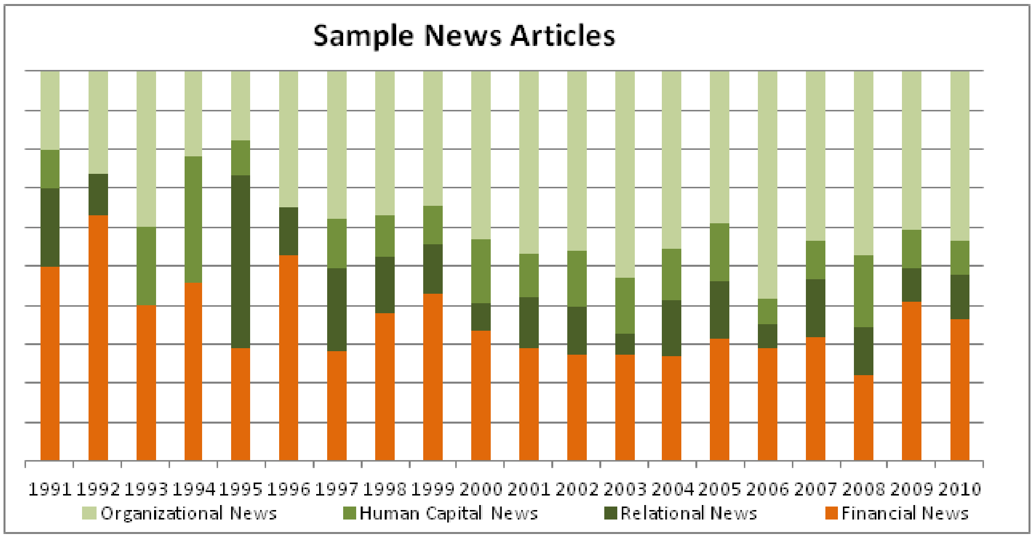


Source: I/B/E/S

This graph shows the average Analyst following of firms in the Pharmaceuticals, Biotechnology and Life Sciences sectors from the sample. The graph clearly shows that over the past 21 years, the number of Analyst following the firms have seen a decline.

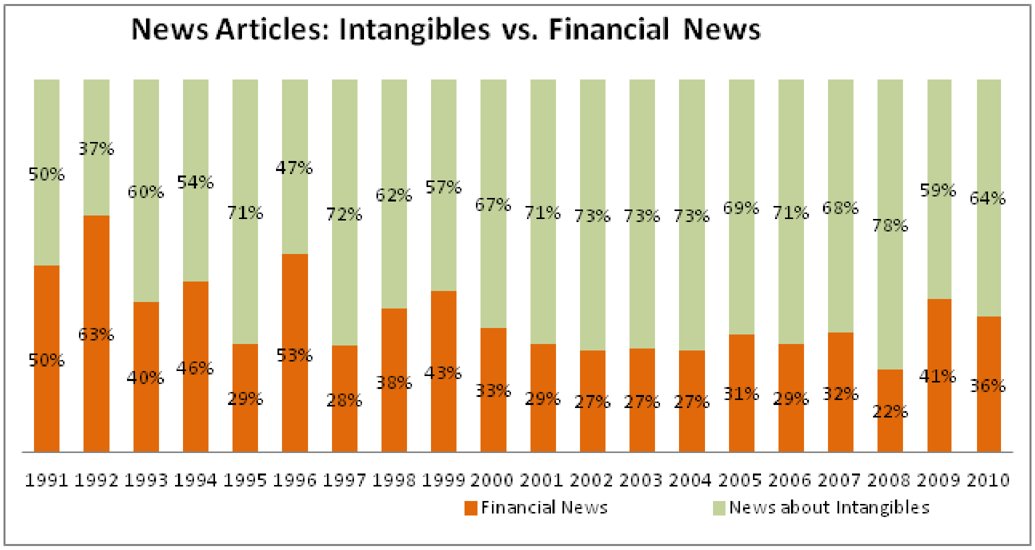
B.2.5 News Articles

B.2.5.1 Graph i.



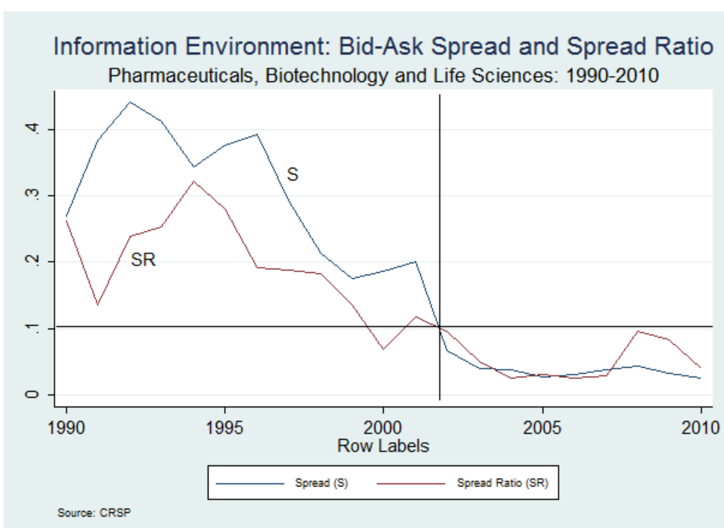
Source: Factiva — 10 firms are randomly selected for this graphical study which is approximately 5% of the firms in the database of 219. The news media reports are classified into four types, which are (i) Organizational News, (Human Capital News, (iii) Relational News and, (iv) Financial News. Some firms had a large number of news media reports in a particular year, therefore only 10% of news items have been reviewed from each year for each firm in that 5% sample size to report the findings. The individual indicators are reached by taking the mean of each type of news item found for each firm in each year.

B.2.5.2 Graph ii.



Source: Factiva — For this graphical study Organizational News, Human Capital News and Relational News have been added to arrive at the News Articles on Intangibles.

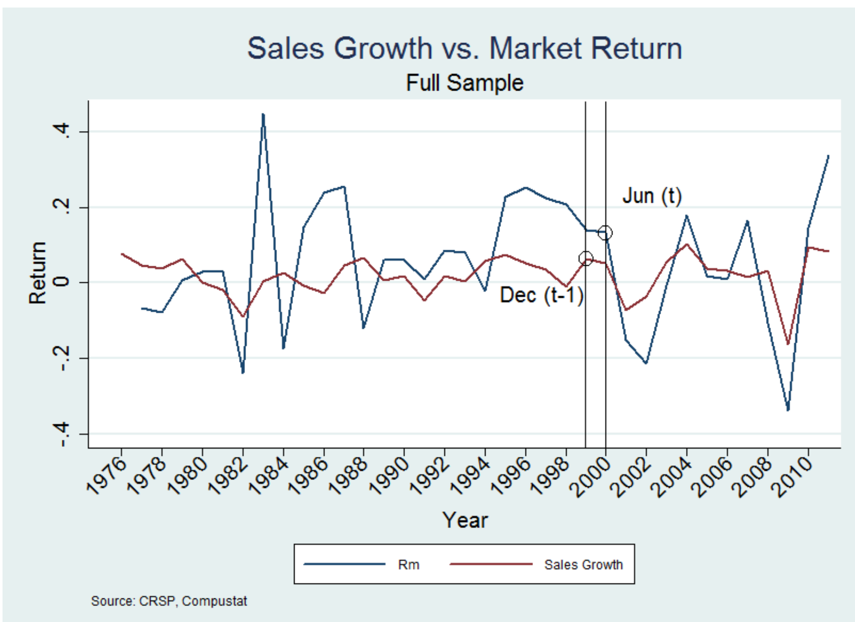
B.2.6 Information Environment Break



This graph presents that relative bid-ask spread SR and the absolute average bid-ask spread S for firms in the sample. The graph shows that there is indeed a fall in the bid-ask spread since the regulatory reforms of Reg FD and SOX somewhere in the middle of 2002-03 (hypothesized as 2002 in this study; but also tested for 2001 and 2003 showing same results, but not reported), which means that the liquidity of the stocks have increased and the information asymmetry reduced.

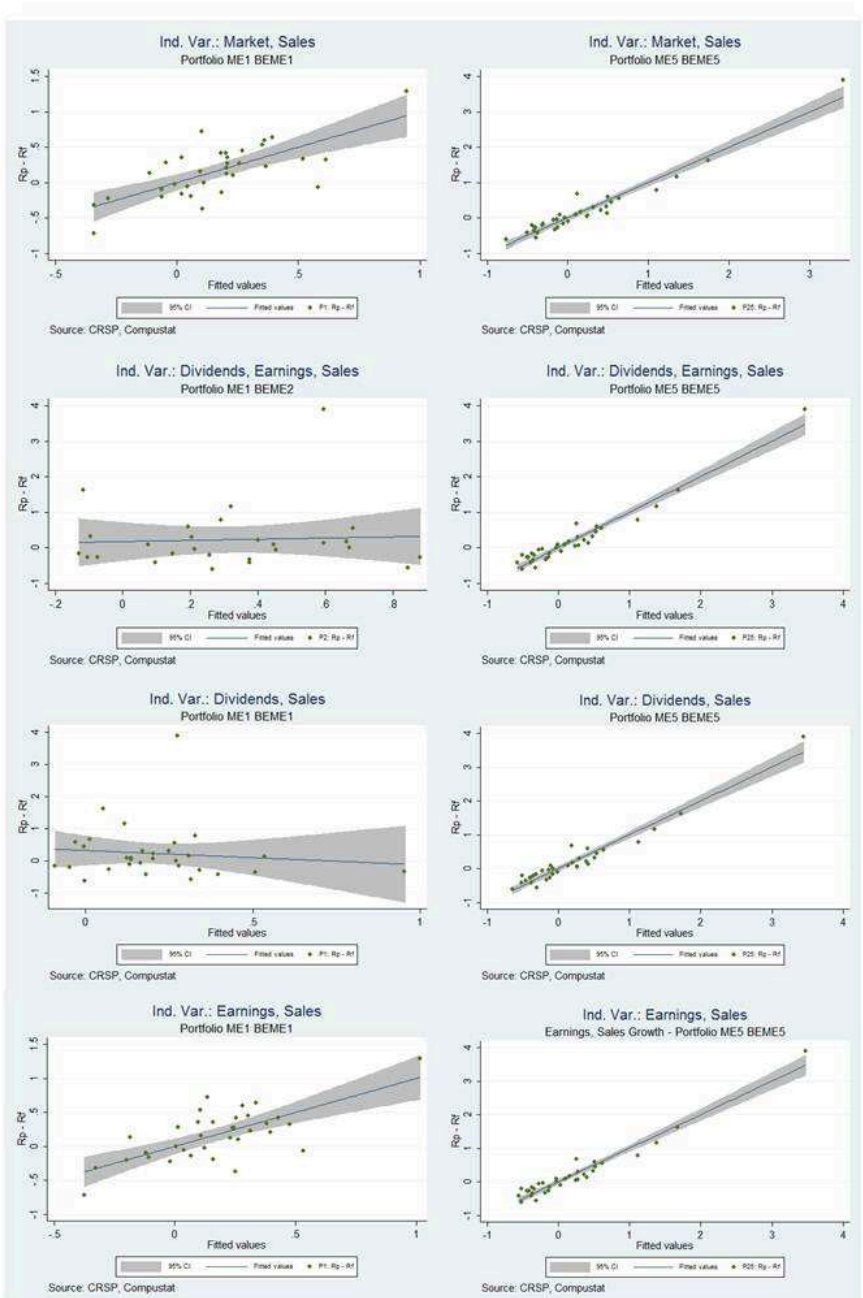
B.3 Organizational Capital

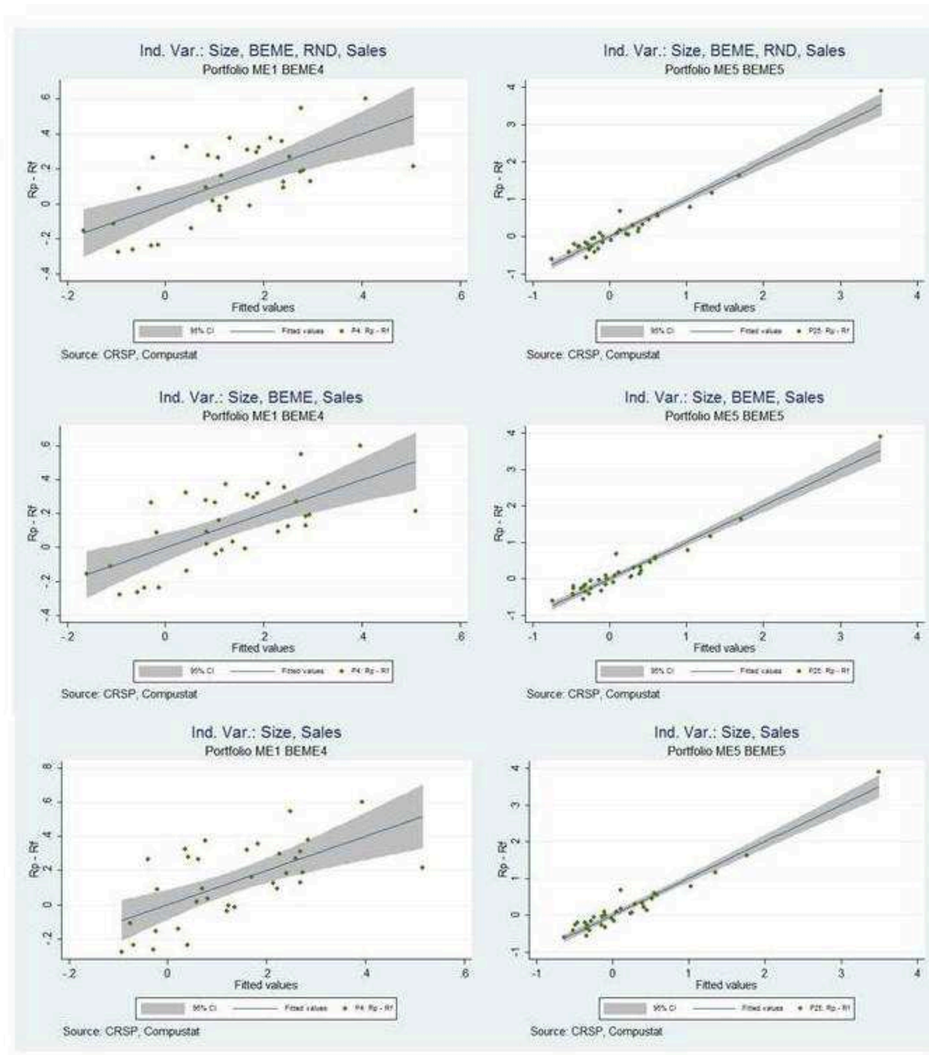
B.3.1 Sales Growth vs. Market Return



Here in this graph the total rate of sales growth of all assets in the sample is measured in contrast with the value-weighted returns on the index market created from all assets in the sample, including the ones with negative book equity. The sales growth is calculated in Dec of year $t-1$ and the index market return is calculated in June of year t.

B.3.2 Org Capital Asset Pricing Model — Sales Growth

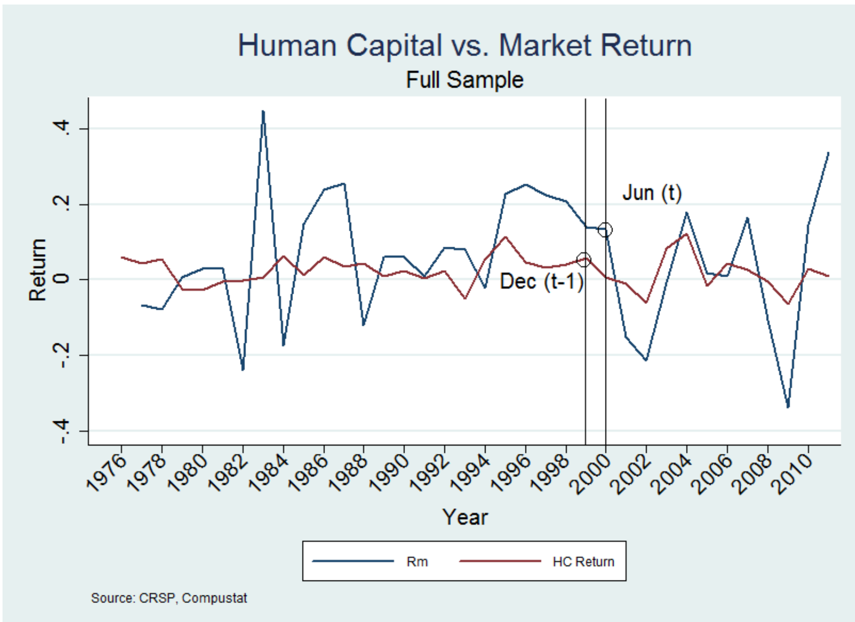




In the above set of figures the regression line fitted values are presented against the dependent variable which in this case is the value-weighted portfolio returns. Although there are 25 portfolios created for the study, here the fitted line plot is presented only for the "best" and the "worst" model fit. Here, best being the regression with the highest coefficient of determination R^2 and the worst being the lowest score of R^2. In the study, sales growth is found to represent the best measure of performance efficiency which is hypothesized as organizational capital. All the plots have it as an independent variable along with others as mentioned in the plot figures.

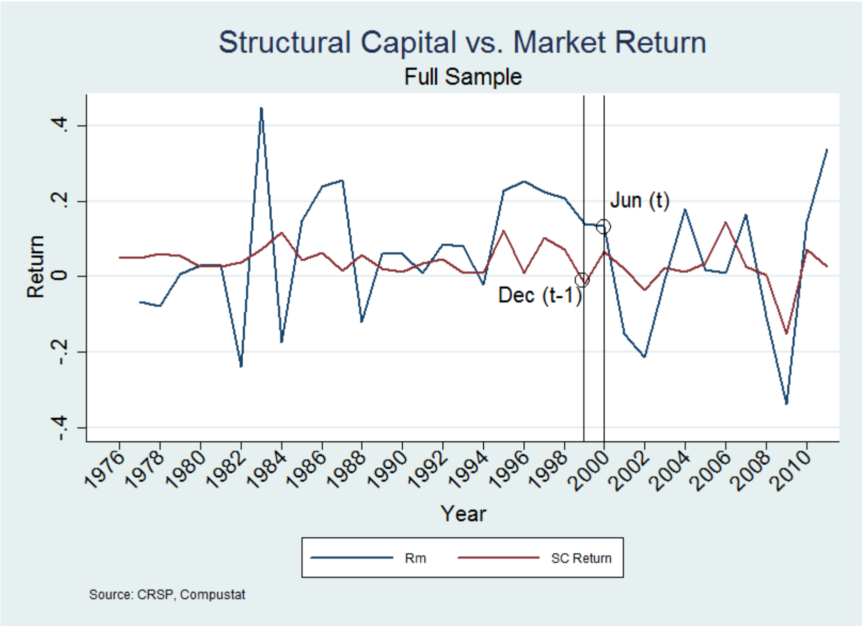
B.4 A Comparative Study of Human, Structural & Intangible Capitals

B.4.1 Human Capital Returns vs. Market



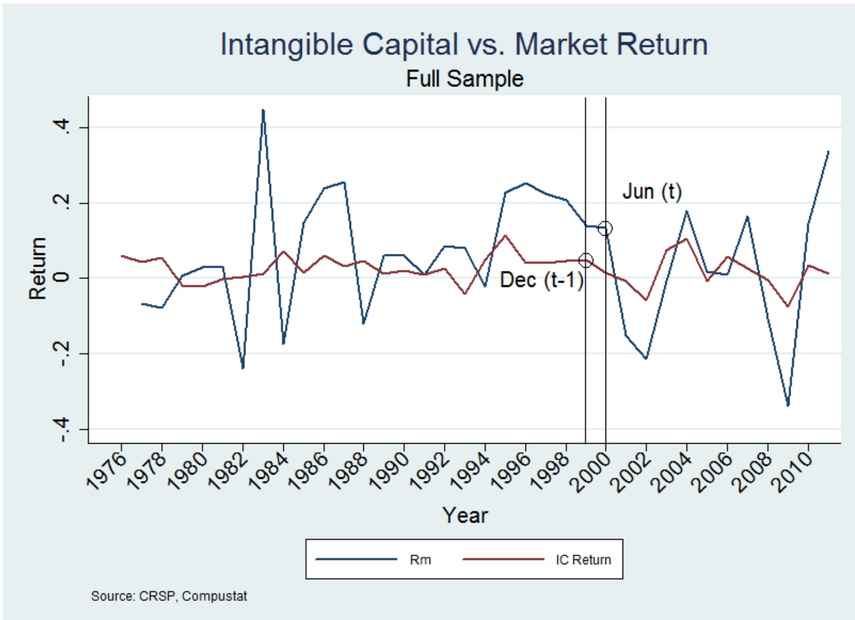
This graph shows the predictive ability of returns on human capital in contrast with the value-weighted returns on the index market calculated from the sample firms. The human capital return is calculated in Dec of year $t-1$ and the index market return is calculated in June of year t.

B.4.2 Structural Capital Returns vs. Market



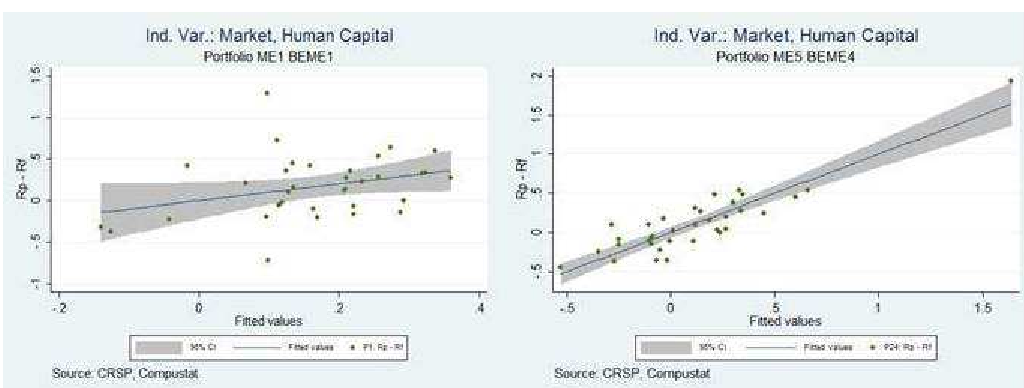
This graph shows the predictive ability of returns on structural capital in contrast to the value-weighted returns on the index market calculated from the sample firms. The structural capital return is calculated in Dec of year $t-1$ and the index market return is calculated in June of year t.

B.4.3 Intangible Capital Returns vs. Market



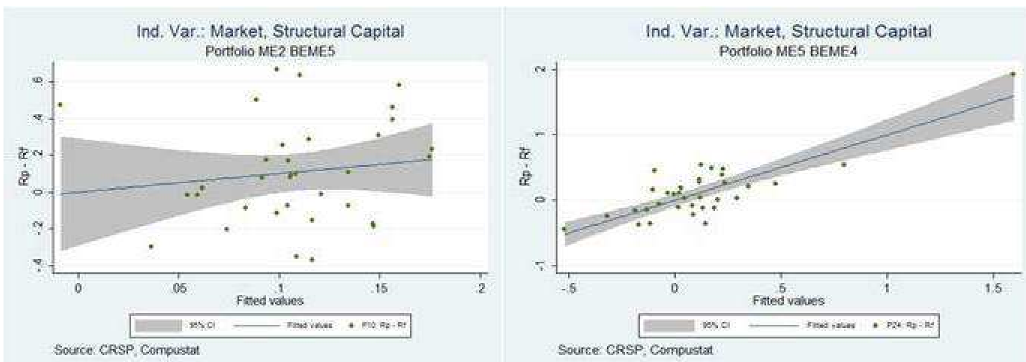
This graph shows the predictive ability of returns on intangible capital in contrast to the value-weighted returns on the index market calculated from the sample firms. The intangible capital return is calculated in Dec of year $t-1$ and the index market return is calculated in June of year t.

B.4.4 Human Capital Asset Pricing Model



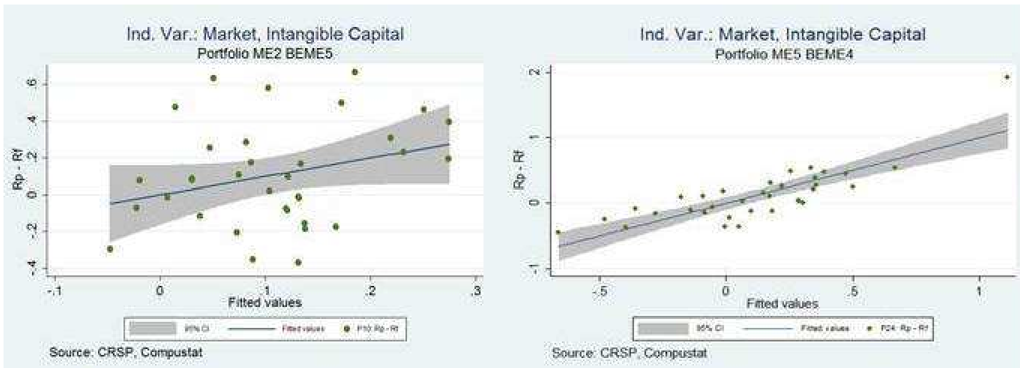
This graph shows the regression fitted values against the expected stock returns on the portfolio for which the estimates are calculated. From the 25 portfolios only best and worst model fit are shown in the above figure. Here the independent variables are human capital (capitalized selling, general and administrative expenses) and the index market calculated, from all stocks in the sample including the ones with negative book equity.

B.4.5 Structural Capital Asset Pricing Model



This graph shows the regression fitted values against the expected stock returns on the portfolio for which the estimates are calculated. From the 25 portfolios only best and worst model fit are shown in the above figure. Here, the independent variables are structural capital (capitalized research and development expenses) and the index market.

B.4.6 Intangible Capital Asset Pricing Model



This graph shows the the regression fitted values against the expected stock returns on the portfolio for which the estimates are calculated. From the 25 portfolios only best and worst model fit are shown in the above figure. Here, the independent variables are intangible capital (capitalized selling, general & administrative expenses plus research & development expenses) and the index market.

Appendix C

List of Variables

- *Market Equity* (ME): It is the size of an asset calculated using CRSP market data in the month of June of each year t (share outstanding #shrout[1] x stock price #prc, corrected for stock splits and adjustments)
- *Book Equity* (BE): It is created by adding Book value of common equity (ceq#60) to Deferred taxes and Investment Tax Credit[2] (txditc#35) minus the carrying value of Preferred Stock (pstk#130)
- Earnings (E): It is created by adding Income before Extraordinary Items (ib#18) to the Deferred taxes from the Income Account (txdi#50) minus the book value of Preferred Dividends
- Intangibles Capital (IC): Is created by adding RND (xrd#46) to SG&A (xsga#189)
- Tangible Capital (TC): The Gross Property, Plant and Equipment is used as Tangible Capital (ppegt#7)
- *Cash Flow* (CF)[3]: Operating Income before Depreciation (oibdp#13) minus Total Income Taxes (txt#16) minus Change in Deferred Taxes and Investment Tax Credit from the previous year to the current year

[1]The naming convention: Text name of the variable in CRSP or Compustat is followed by numerical code with a hash-tag (#) in the middle. If one or the other is unavailable then only the available code is used with a leading hash-tag.

[2]whenever available

[3]See Lehn and Poulsen [165].

(Δtxditc#35) minus Gross Interest Expense (xint#15) minus Preferred Dividends (dvp#19) minus Common Dividends (dvc#21)

- *Book to Market ratio* (BE/ME): The is calculated using Book Equity (ceq#60 + txditc#35 - pstk#130) in the year *t-1* divided by the Market Equity calculated (share outstanding #shrout x stock price #prc, corrected for stock splits and adjustments) in the month of Dec of year *t-1*

- Debt by Equity (DE): It is calculated by book value of Total Assets (6#at) minus book value of common equity (ceq#60) in the year *t-1* and then dividing it by ME of t-1

- Dividend Yield (D/P): The dividend is calculated by adding all the dividends per shares (#divamt) announced by a firm between July of year t-1 and June of year t. This dividend per share is transformed into the cash equivalent by multiplying the per share dividends to the shares outstanding in the year t (#divamt x #shrout). Dividend yield is calculated by dividing the cash equivalent of the dividends between year July t-1 and June t by Market Equity calculated in Dec of year t-1 (#divamt x #shrout) / (#shrout x #prc)

- *RND to Book ratio* (RND/BE): Is created by dividing RND (xrd#46) by BE (ceq#60 + txditc#35 - pstk#130) both in the year *t-1*

- *Cash Flow by Price* (CF/ME): The Cash Flow (oibdp#13 - txt#16 - Δtxditc#35 - xint#15 - dvp#19 - dvc#21) calculated in the year *t-1* is divided by Market Equity (#shrout x #prc) calculated at Dec of year *t-1*

- *Sales Growth* $(Sale_{t-1} - Sale_{t-2})/Sale_{t-2}$: Is the rate of growth in Sale (sale#12) from the year *t-2* to *t-1*

- *Asset Productivity* (Sale/BE): It is calculated by dividing the Sale (sale#12) in the year *t-1* by BE (ceq#60 + txditc#35 - pstk#130) of the same year

- *Tobin's Q*: Is calculated by adding Market Equity from Dec in the year *t-1* to the Book Value of Total Debt (Long term debt dltt#9 + Current

Liabilities dlc#34) plus book value of preferred stocks (pstk#130) minus the Inventories (invt#3) and divide it by the Book Equity (ceq#60 + txditc#35 - pstk#130) from the year *t-1*

- *Investment Growth* (Physical): It is calculated by dividing the Capital Expenditure (capx#128) by the Gross Property Plant and Equipment (ppegt#7) both in the year *t-1*

- *Profitability* or *Return on Assets* (ROA): It is calculated by dividing the Income before Extraordinary Items (ib#18) by lagged Total Assets (lse#6)

- Debt by Equity (DE): It is calculated by dividing Total Debt (Long term debt dltt#9 + Current Liabilities dlc#34) of year *t-1* by ME of *t-1*

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Public Dissemination of the Thesis Chapters

Refereed Journal Publication(s)

S. Mukherjee. and S. Zambon. The Relevance of Intangibles Disclosure for Market Risk: An Exploratory Study of US Healthcare and Pharmaceutical Industry. *Indian Accounting Review*, 15(1):24-41, 2011.

Other Publication(s)

S. Mukherjee. What Did We Learn from the Financial Crisis of 2008? *Systemic Risk, Financial Reform, and Moving Forward from the Financial Crisis, Society of Actuaries*, Casualty Actuarial Society and Canadian Institute of Actuaries, 1st Ed., Part 2, pp. 16 - 18, 2011.

S. Mukherjee. Accounting, Organizations, & Institutions: Essays in Honour of Anthony Hopwood - Ed. by Christopher S. Chapman, David J. Cooper and Peter B. Miller, *Financial Reporting*, No. 3, pp. 147 - 153, 2011.

Peer Reviewed Conference(s)

- *Marie Curie ITN - Conference on Financial Risk Management & Risk Reporting*, Konstanz, Germany, April, 11 - 12, 2013.
- 11^{th} *International Accounting Conference*, Kolkata, India, January, 5 - 6, 2013.

- *American Accounting Association 2012*, Washington DC, USA, August, 4 - 8, 2012.
- *European Accounting Association* 35^{th} *Annual Congress*, Ljubljana, Slovenia, May, 9 - 11, 2012.
- *Accounting Renaissance - Lessons from the Crisis and Looking into the Future. Learning from Histories and Institutions*, Venice, Italy, November, 4 - 5, 2011.
- 10^{th} *International Accounting Conference*, Kolkata, India, January, 8 - 9, 2011.

Workshop(s)

- *Giornata in Ricordo del Professor Antonio d'Atri, a dieci anni dalla sua scomparsa*, Aula Magna del Dipartimento di Economia e Management, Università di Ferrara, Ferrara, Italy, November, 30, 2012.
- 8^{th} *Interdisciplinary Workshop on Intangibles, Intellectual Capital & Extra-Financial Information*, Grenoble, France, September, 27 - 28, 2012.
- *Financial Reporting - Third Workshop*, Naples, Italy, June, 14 - 15, 2012.
- 7^{th} *Interdisciplinary Workshop On Intangibles, Intellectual Capital & Extra-Financial Information*, Warsaw, Poland, September, 29 - 30, 2011.
- *Mid-Term Conference of Marie Curie Initial Training Network on Risk Management and Risk Reporting*, Deutsche Bundesbank, Berlin, Germany, May, 5 - 6, 2011.
- *British Accounting and Finance Association Doctoral Colloquium.* Aston Business School, Birmingham, UK, April, 12 - 14, 2011.
- *Marie Curie Conference* (ESOF), Torino, Italy, July, 01, 2010.