

A Theory of Innovation Valuation

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Abstract

Aiming at an effective assessment of the intrinsic value of an innovative firm, the study is designed to explore the factoring of riskiness from innovation activities theoretically into the valuation of corporations. With the success of risk incorporated into corporate value, the market is going to allocate the capital optimally into innovative firm therefore beneficial to economic sustainability and wealth maximization. The study proposes a conceptual framework to quantify the risk effects into free cash flows that, in turn, determine the corporate value. It is rationally argued by the study that the key nature of innovation is the risk taken by firms. The riskiness taken by the firm will impact not only the operating cash flows but also the required rate of return. With innovation, riskiness is factored into the value of operating cash flows; the corporate intrinsic value integrates the innovation riskiness. Nevertheless, the market does not simultaneously discover the innovation value as part of the share value at the same time as the authentic intrinsic value does. The results establish the linkage between the riskiness of innovation and corporate valuation and recommend an effective methodology for further exploration of intrinsic value. In addition, the study proposes the gap between the recognition of innovation value by intrinsic and market value.

Keywords: Innovation risk, Innovation value, Intrinsic value, Free cash flows

Introduction

There are many studies that explored corporate governance and ownership structure do present significant and no significant impact on the firms' innovation activities. For instance, the concentrated ownership probably has different encouragement for innovation in comparison with diversified ownership. And institutional shareholders have different incentives for innovative activities relevant to non-institutional. Even the number of generations of family ownership demonstrates different styles of sense for innovation. Overall, it is inconclusive whether the impacts are from a corporate governance and ownership structure point of view. It is worth reminding that no matter what proposes made by corporate governance and

ownership, the key is the willingness and ability of risk taking. Corporate governance can influence the firms' decisions on the riskiness of new projects, and these influences can be measured by the degree and extent of risk-taking activities of the corporation. As long as the degree of riskiness taken by the firm can be measured, the result of those influences can be factored into the value of the operation.

If the corporate governance and ownership structure can't be explicitly measured in terms of impacts on the innovation activities of entrepreneurs, it is more efficient to lay the assessment on the resulting riskiness of business activities. As the disruptive innovation is the key determinant for sustainable business advantages and economic growth, the key attribute of innovation should be measured to reflect how productivity has been dramatically levelled therefore, economic sustainability has been guaranteed. First of all, that key attribute is definitely the nature of innovation – riskiness. Riskiness is accompanied by a high return of successful innovation. Secondly, riskiness of innovation not only represents the inherent nature of innovation activities but is also integrated with the ability to tolerate risk. Fortunately, the capacity for risk tolerance is explicitly reflected by free cash flows over time.

If the innovative nature can be incorporated into the value of the firm, then the intrinsic value of the firm, then the investment decision-making will definitely be guided or influenced by the innovation motivation. Eventually, the capital allocation in the financial market does signal in certain degree by the innovation activities of the firm.

The study aims at developing a theoretical structure and arguments to support the rationales of incorporating innovation value into the operational value that, in turn, determines the intrinsic value of the firm. For the initial proposal of theoretical development, it builds the fundamentals for further investigation.

Literature Review

The issues of risk-taking for innovation and corporate valuation have been widely discussed and investigated. Moreover, arguments involving the linkage between corporate innovation and corporate valuation are inconclusive.

Henrik, B (2007) explores the risk conceptions of innovators in two large corporations and identifies three themes that illuminate the relationship between risk and innovation in the corporate setting. The study relates risk to the issues of boundaries and control over parts of the innovation process and then shows how risk is primarily related to innovation as a process and not as output. In addition, the study shows how a flexible view of business models

can be used to manage risk in corporate innovation. Ottoo, R. E. (2018) shows how to value a Biopharmaceutical product, tracked from discovery to market launch in a step-by-step manner for improving over early real option models. The study explicitly captures competition, speed of innovation, risk, financing need, and the size of the market potential in valuing corporate innovation using a firm-specific measure of risk and the industry-wide value of growth operating cash flows.

Moreover, it is believed that financial risk demonstrates significant relevance to corporate innovation. Nemlioglu, I., and S-K Mallick (2020) revealed that when we classify all firms into high-tech and low-tech sectors, implying that firms in the high-tech sectors with debt dependence have benefited favorably in terms of higher valuation and lower uncertainty in the post-crisis period, not firms in the low-tech sectors, reflecting further the role of technological intensity in firm valuation. Dong, M., Hirshleifer, D., & Teoh, S. (2021). Estimated stock overvaluation is strongly associated with measures of innovative inventiveness (novelty, originality, and scope), as well as research and development (R&D) and innovative output (patent and citation counts). O'Brien, J. P. (2003) argues that consideration of firm strategy can help illuminate the choices managers make between debt and equity financing. Within an industry, the form of competition that each firm chooses will determine the strategic value to the firm of maintaining financial slack.

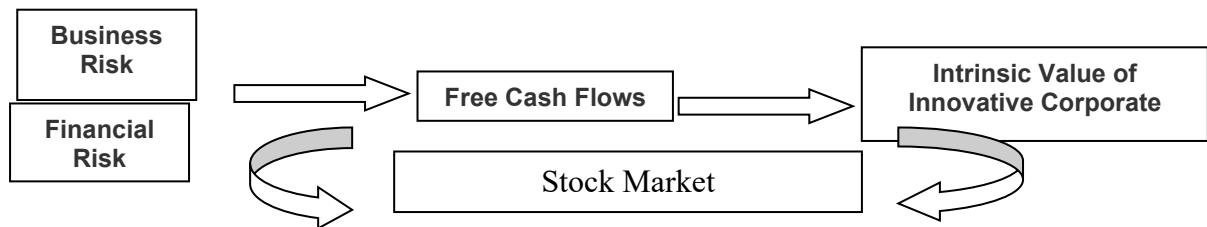
Fortunately, the measurements of corporate innovation are broadly explored. Cohen, L., Diether, K., & Christophe, M. (2013) demonstrated that a firm's ability to innovate is predictable and simple to compute. Reeb, D. M. (2017) provided the composite measures based on multiple signals of corporate innovation, which provide more reliable assessments of corporate innovation than any single indicator. Finally, I discuss the use of composite measures of innovation in empirical research on technological innovation and the implications for policymakers.

In addition, the valuation method of cash flows discounting has been contributed to by numerous studies. Steiger (2010) explores lessons from established financial theory for allowed rate of return calculations within the constant-growth dividend (DCF) framework. Ali and others (2010) look at the way in which uncertainty can be incorporated into the traditional DCF approach so that the latter, which is otherwise conceptually sound, becomes relevant. This is done by recognizing that the DCF input variables are uncertain and will have a probability distribution pertaining to each of them. Carter, T. D. Ejara, D. (2008). Managers

need to keep their focus on discounted cash flow and all those factors in the company and marketplace that reflect the firm's capabilities and opportunities.

A Theoretical Framework

Innovation and disruptive technology development are the vital, unquestionable requirements for industrial upgrading and sustainable economic growth in the long term. Only productivity and technological progress can foster competence and sustainability. For achieving the goal, enterprises need to keep exploring not only the applicable technologies but also incorporate innovative thinking into the operation and management. However, there are two types of innovations, one of which will not cause any harm or pitfall to the firm's operation, and another that more or less presents the detrimental impacts, therefore uncertainty to free cash flows in the future. As a consequence, it results in the jeopardized valuation of corporate. For the first type of technological innovation, it can be ignored due to insignificant impacts. For the second impact, it is worth exploring the extent of impact on the valuation of the firm. The fundamental transition between innovation and corporate valuation is bridged through risk-taking and cash flow generation. First of all, the disruptive innovation and change bring opportunities for magnificent earnings. Meanwhile, it is accompanied by enormous risk-taking. If the risk-taking does not cause bankruptcy and survives through a volatile period, the riskiness has to be incorporated into the valuation of the firm. The rationales to consider the riskiness in the valuation are due to the uncertainties that can alter the free cash flow generation, which is the fundamentals of the intrinsic part of the operating value. The corporate value consists of the value of operation and the non-operation value. If one can assess the risk quantities into the value of the operation, therefore corporate value, the mechanism of corporate valuation measurement can be dramatically improved, and therefore contribute to the proper valuation of innovation firms' share value.



It is worth to mention, although the risk impacts can be quantified into the part of intrinsic value of innovative corporate, the scale of reflection of risk in the market value of shares is questionable, partially probably due to the efficiency of the market or the factoring of risk into the intrinsic value is not being mastered in the market. Either way, the suggestion of factoring riskiness into the valuation is needed.

The benefit of factoring riskiness into the intrinsic value, therefore, applied by the institutions or retail traders is straightforwardly stated for the purpose of optimizing the capital allocation. Only the capital is optimally assigned to the most potentially innovative enterprises the economic sustainability and overall wealth growth can be assured.

The study aims to conduct an analysis that can channel the effects of risk ranking for innovation into the free cash flows, which is further followed by the measurement of the incremental change of corporate valuation due to the cash flows. No matter what the results are presented, the study is going to further investigate the market responses to the riskiness of innovation, from which the degree and extent of the reflection will be measured and concluded. Nevertheless, the study does consider the comparison of theoretical effects of innovative risk on the intrinsic and practical exploration of market response to the innovative risk taken by the corporations.

Theoretical Analysis

The risks confronted by innovative corporations consist of business risk and financial risk in a broad classification. The inherent degree of business risk derived from the specific combination of products or market segments directly impacts the capability of absorbing uncertainties, therefore reducing the possibilities of bankruptcy. Without the survival strength, the corporate invested heavily in innovation or technology may not get through the initial stage of innovation. Therefore, business-risk-bearing firms have to be assessed for assuring sustainable free cash flow generation before any valuation of corporate innovation is conducted. It is certain that both business risk and financial risk constrain the extent of innovation and jeopardize the possibilities of success. Therefore, how the riskiness of business operation and financial structure contributes to the value creation of innovation is worth exploring, whether such a contribution exists positively or negatively. As a result, the study is structured to explore the following research questions.

- Is risk-bearing of business operation and capital structure positively or negatively significantly relevant to corporate innovation?

- If it is partially relevant to the corporate innovation, by how much does such a contribution's significance play in the valuation of corporate innovation? What exactly is the quantified significance of riskiness assessed in the amount of intrinsic value of innovation?

- If it is not relevant to corporate innovation, what are the plausible explanations for such insignificance?

To answer the aforementioned research questions, the following research objectives are proposed to work on.

- 1) Measuring the part of corporate valuation that represents innovation contribution
- 2) Exploring the statistical significance of the riskiness of business operation in the relationship to corporate valuation of innovation.
- 3) Analysing the extent and structure of riskiness as part of the corporate valuation of innovation, and providing explanations.

Methodology for Theoretical Development

First of all, the measurements of business risk and financial risk should be processed separately. The variables of business uncertainties, such as ROIC and NOPAT, and the variables of financial risk that are derived from the difference between overall corporate risk and business risk, will be calculated, respectively. The FCFs as the measurement of performance and degree of innovation will be processed. Thereafter, the econometric model will be established, and the control variables will be added to the model for testing. To be simplified, the first econometric model includes the variables such as business risk, financial risk, industrial classification, capital size of firm, and others if further studies are explored. The first econometric model tries to find out the statistical relationship between the risk-bearing and innovation of corporate. With the high business risk represented, it is believed that the uncertainty of free cash flow from operations will be large, and the value of operations will be trimmed. Similarly, the larger the financial risk, the higher the cost of capital is, and the discount rate for calculating the value of the operating. It is worth addressing not only the business risk but also the financial risk measured and tested here, which are both caused by innovation activities of the corporation rather than the overall business activities.

Following the aforementioned econometric model, the model can be established to test the relationship between the price movement and the degree of risk-taking of corporations. Similarly, the same group of control variables will be added into the model to test the combined effects of independent variables on the dependent variable of the change

in the return of the firm's stock price. In addition, the measurements of business risk and financial risk are all only part of the innovation activities of the corporation.

Continuing from the second model proposed, the third model combines all variables into the equation to explore the multiple variables' effects on the firms' market price. All independent variables will be combined into the model, and the dependent variables will be represented by the market price movement of the innovative corporation.

Under the three levels of econometric tests, the different results of the models will be compared, and any worth noting differences and contradictions will be analysed.

All the variables, including dependent and independent variables, can be time series panel data. The source of data will be derived from the S&P 500 corporations. Through a certain filtering method, mostly only the firms exercising significant business innovations over time will be chosen for the test. The degree of risk related to the innovation activities will be carefully designed and defined for the measurements. The degree or extent will be quantified and excluded from the overall riskiness of corporate. The statistical significance of innovation risk relevant to intrinsic value and relevant to the market value will be compared for the rationalization.

Conclusion

Aiming at an effective assessment of the intrinsic value of an innovative firm, the study is designed to explore the factoring of riskiness from innovation activities into the valuation of corporations. With the success of risk incorporated into corporate value, the market is going to allocate the capital optimally into innovative firm therefore beneficial to economic sustainability and wealth maximization. The study proposes a conceptual framework to quantify the risk effects into free cash flows that, in turn, determine the corporate value. It is rationally argued by the study that the key nature of innovation is the risk taken by firms. The riskiness taken by the firm will impact not only the generation of operating cash flows but also the required rate of return. With innovation, riskiness is factored into the value of operating cash flows; the corporate intrinsic value integrates the innovation riskiness. Nevertheless, the market does not simultaneously discover the innovation value as part of the share value at the same time as the authentic intrinsic value does. The results establish the linkage between the riskiness of innovation and corporate valuation and recommend an effective methodology for further exploration of intrinsic value. In addition, the study proposes the gap between the recognition of innovation value by intrinsic and market value.

In summary, the riskiness of innovation can be measured and factored into the evaluations of free cash flow expected. With the free cash flow's components of innovation confirmed, the extent of innovation as part of the value of corporations can be assessed. Although the market value volatility does not exactly single meanly riskiness of innovation, a successful measurement of innovation as part of the intrinsic price does contribute greatly to optimal capital allocation in the market since the innovation firms' value will be reflected in the valuation context.

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