Searching Proxies of Investment Opportunity Sets and Identifying Information Content

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ABSTRACT

The concept of the investment opportunity set (IOS), which was first noted by Myers (1977), plays an important role in the capital market because it implies future growth, which is relevant in predicting the shareholder's expected wealth. Unfortunately, IOS cannot be observed directly. Because IOS is an unobservable construct, the researcher must find appropriate proxies for IOS to capture Myers' idea. A number of studies have been done to obtain appropriate proxies of IOS. One major finding is presented by Kallapur and Trombley (1999), that suggests appropriate proxies of IOS and attempting to identify whether the IOS of the firms are credible for representing the future (realized) growth.

This paper attempts to review IOS literature, especially Kallapur and Trombley's study. Some limitations of their study are noted here. This paper proposes a method to confirm the constructs of IOS and develops a new model in searching appropriate proxies for IOS. The present model also allows researchers not only to determine appropriate proxies for IOS but also to identify which proxies of IOS have good or bad information content.

Keywords : investment opportunity set, realized growth, information content.

ABSTRAK

Konsep investment opportunity set (IOS), yang pertama diungkapkan oleh Myers (1977), memiliki peranan penting dalam pasar modal karena berimplikasi adanya pertumbuhan di masa depan, yang relevan untuk meramalkan ekspektasi kekayaan pemegang saham. Namun, kelemahannya adalah IOS tidak dapat diamati langsung. Oleh karena itu, para peneliti harus mencari data yang tetap yang dapat mewakili variabel IOS agar sesuai dengan gagasan Myers. Beberapa penelitian telah dilakukan untuk itu termasuk penemuan dari Kallapur dan Trombley (1999) yang mengusulkan beberapa variabel yang tepat untuk mewakili IOS dan juga mencoba menentukan apakah IOS dari perusahaan-perusahaan cocok untuk menggambarkan pertumbuhan masa depan yang actual.

Penelitian ini bertujuan mengkaji literature IOS, terutama penelitian Kallapur dan Trombley. Beberapa kendala dari analisa mereka ditemukan. Penelitian ini juga mengajukan metode baru untuk menentukan pengembangan IOS dan juga mengembangkan model baru untuk mencari variabel yang tepat yang dapat mewakili IOS. Model tersebut memampukan para peneliti untuk menentukan variabel yang tepat untuk mewakili IOS dan juga membedakan variabel-variabel tersebut berdasarkan informasi yang diberikan.

Kata kunci: investment opportunity set, pertumbuhan actual, isi informasi.

INTRODUCTION

The Fisherian Theorem argues that managers make investment decision first and make financing decision second, but the decisions are made in separate manner and independent of each other (Copeland and Weston, 1988:12). However, when one considers the asymmetry of information, the separation can no longer hold. Outside investors do not have inside information about investment decisions that involve the prospects of the firm. In other words, managers have more information about the prospects of the firm than outside investors.

Asymmetry of information leads to a gap between managers' perspective and outside investors' perspective. In an imperfect market, managers have more information about future growth of the firm than outside investors (Taggart, 1980). Outsiders cannot observe directly the managerial behavior in making investment decisions. Hence, they attempt to investigate the managerial behavior in another way to assess the investment decision.

Because investment decisions cannot directly observed, Myers (1977) introduced the term investment opportunity set (IOS) to refer to the extent to which firm value depends on future discretionary expenditures by the firm. Several proxies have been used in the accounting and finance literature to capture Myers' idea of the IOS, such as Smith and Watts (1992); Gaver and Gaver (1993); and Kallapur and Trombley (1999).

Kallapur and Trombley identified two related types of investment decisions based on time horizon. First, realized growth, represent by investment made in the previous or current periods. Second, investment opportunity, represented by a number alternative investment chosen by managers in order to get an economic advantage in the future. They argued that realized (current) growth is an implication of previous IOS. They identified three proxies of IOS: price-based proxies, investment-based proxies, and variance measures.

Kallapur and Trombley's idea to find the best proxies of IOS has implications for further research, first for investor attempts to predict the future performance (investment opportunity set) based on current performance (realized growth). The first implication shows that although IOS is more relevant in explaining expected value of the firm, IOS depends on realized growth. The time lag between IOS and realized growth might reduce the power of IOS to predict future performance.

Second, if Kallapur and Trombley's idea is true, researchers might focus on IOS rather than realized growth. Some cost in the past and present investment might represent sunk cost. Investors have a choice of changing or shifting their investment decision to buy or sell the stock. Thus, the IOS is also related to financing decisions. The second implication also has an impact on methodology. Further research might focus on how to measure the best proxies of IOS that represent the unobserved investment decision.

However, Kallapur and Trombley's study has some limitations in both methodology and conceptual framework. Their study ignores the appropriate statistical tools and other factors that might distort the relationship between IOS and realized growth. Because the concept of IOS is relevant to explain the expected value of the firm rather than realized growth, other methods and approaches in searching for the best proxies of IOS are still needed to improve Kallapur and Trombley's idea.

The purpose of this paper is two-fold. First, this paper proposes another method to test the reliability of IOS proxies. Second, this paper attempts to develop a new approach in finding appropriate proxies for IOS. The different approaches and proxies in assessing IOS might lead to different results. Finding appropriate proxies of IOS has become important in recent accounting and finance research. Investors need appropriate proxies of IOS because IOS determines future growth of the firm.

LITERATURE REVIEW

The assumption of the Fisher separation theorem that there are perfect markets cannot be met frequently in the real world. At least, this assumption cannot be implemented universally. Moreover, in general, managers have more inside information than outside investors, leading to a wide asymmetry of information. Outside investors cannot observe directly managerial behavior in making investment decisions.

Because the investment decision cannot be directly observed, Myers (1977) introduced the term investment opportunity set (IOS) to refer to the extent to which firm value depends on future discretionary expenditures by the firm. Several proxies have been used in the accounting and finance literature to capture Myers' idea of the IOS, including Smith and Watts (1992); and Gaver and Gaver (1993). Kallapur and Trombley (1999) classified these proxies into three types: (1) price-based proxies; (2) investment-based proxies; and (3) variance measures. They found that price-based proxies are better than other proxies of IOS to be related to realized growth as a benchmark.

Kallapur and Trombley argued that future growth is an implication of IOS, and they evaluate various proxies of IOS on the basis of the association between IOS and realized growth. Based on their argument, this paper attempts to describe their conceptual framework in Figure 1. This figure shows the association between realized growth and IOS proxies.



Figure 1. Relationship between IOS and Growth

Kallapur and Trombley's model has a number limitation. First, in their perspective, future growth is merely an implication of current IOS. In other words, current growth is an implication of previous IOS. The model merely focuses on association between IOS and actual investment or realized growth. During the transformation process from IOS to actual investment, there are controllable and uncontrollable events that might disturb the

association between the two. This model ignores other factors, which lead to a wider gap between the previous investment opportunity compared to actual investment, such as merger and acquisition, earnings management, agency problems, and the succession or change of executives. External factors also might lead to a wider gap, such as the change in level of competition in forward and/or backward markets, a turbulent environment, or monetary disturbances (Romer, 1996:187), and irregular innovation, caused by research and development (R&D). Although, the proxies of IOS cover R&D, it is usually difficult to identify specific innovation (Romer, 1996:186).

Second, the model does not explicitly consider learning effects and the business cycle. Mature firms might not plan more investment in the future. In contrast, declining firms might divest their assets. These factors disturb the prediction power of the model. Third, Kallapur and Trombley's study employs inappropriate tools to investigate the proxies of IOS. The IOS is an unobservable construct; hence, the indicators or proxies of IOS should not be treated as individual items, but rather as a group of indicators to form the composite index of IOS (Gaver and Gaver, 1993).

CONFIRMATORY MODEL OF INVESTMENT OPPORTUNITY SET

In this section, this paper proposes a confirmatory model of the factor structures of IOS. The present model is not same as the two previous studies, neither Gaver and Gaver (1993) nor Kallapur and Trombley's study in 1999. This paper argues that factor structures of IOS are known or hypothesized *a priori*. The above discussion noted that Kallapur and Trombley (1999) cite factor structures of IOS which can be classified into three types: priced-based proxies, investment-based proxies, and variance measures based proxies.¹ Confirmatory factor analysis is a more appropriate tool to confirm or verify the factor structure(s) (Sharma, 1996:128) rather than Spearman Rank correlation used by Kallapur and Trombley (1999).

Figure 2 shows the confirmatory model of IOS. The model provides a rough guide to verify or confirm the factor model. The model consists of a three-factor model with correlated constructs that suggests examining interdependency between the three constructs. The method is quite different from Kallapur and Trombley who ignore the structure of each construct and the possibility of existing interdependency between the three three constructs.

^{\perp} This paper deals with a high level of abstraction. Hence, the operational identification of each indicator of each (type) structure is beyond the scope of this study.



Figure 2. Confirmatory Model of Investment Opportunity Set

DEVELOPING A MODEL OF INVESTMENT OPPORTUNITY SET: A SIMULTANEOUS MODEL

In the previous section, the discussion is more concerned with how to design the constructs of IOS. Whether the constructs of IOS are appropriate with a particular benchmark, is not discussed explicitly. Kallapur and Trombley argue that in order to choose the appropriate proxies for IOS, it can be associated with realized growths as benchmarks. Based on Kallapur and Trombley's idea, this section attempts to develop a new model as a rough guide in choosing appropriate proxies for IOS. The model developed in this section allows researchers not only to classify the proxies of IOS based

on each construct, but also to find appropriate proxies for IOS.

Referring to Kallapur and Trombley's model, better proxies of IOS can be met when there is higher correlation between the proxies and realized growths as benchmarks. The model is only concerned with each proxy of IOS and realized growth individually. However, the above discussion suggests that finding appropriate proxies of IOS is an importance task because asymmetry of information means that managerial behavior in cannot be directly observed by outside investors in making investment decision. Hence, the IOS is an unobservable construct. Furthermore, some proxies of IOS might show interdependence within each construct of IOS. The association between each proxy of IOS and realized growth also allows interdependence not only within the construct but also between the constructs. These properties indicate that a simultaneous model can explain the relationship in equation (1) better than other model. Thus, the initial equations of the two can be expressed as follows:

$$\mathbf{RG}_{t} = \mathbf{f}_{2}(\mathbf{A}_{t}, \mathbf{S}_{t}, \mathbf{I}_{t}, \mathbf{B}_{t})$$
(1)

$$IOS_{t-k} = f_1(P_{t-k}, I_{t-k}, V_{t-k})$$
(2)

From Kallapur and Trombley's study, equations (1) and (2) can be expressed simultaneously as:

$$\mathbf{RG}_{t} = f_{1}(\mathbf{P}_{t-k}, \mathbf{I}_{t-k}, \mathbf{V}_{t-k})$$
(3)

where:

 IOS_{t-k} = Investment opportunity set at t-k period

 RG_t = Realized growth at t period

 P_{t-k} = Price-based proxies of IOS

 I_{t-k} = Investment-based proxies of IOS

- V_{t-k} = Variance measure-based proxies of IOS
- A_t = Asset growth
- S_t = Sales growth
- I_t = Investment growth
- \mathbf{B}_{t} = Book value growth

IOS's that are expressed in equation (1) are unobservable. Hence, Gaver and Gaver (1993) use exploratory factor analysis to identify composite index based on six proxies of IOS.² Exploratory factor analysis tools are more appropriate to assess unobservable construct(s) than Spearman rank correlation tool used by Kallapur and Trombley. However, Gaver and Gaver's model just provides composite indexes of IOS. Whether the indices are appropriate for representing the proxies of IOS is not explicitly discussed in their study. The present study provides another model to combine the two concepts using a simultaneous equation model (SEM) of IOS. Equation (3) presented in this study simplifies and resolves the problem of the two concepts.

 $^{^2}$ If large number of IOS proxies considered, exploratory factor analysis usually produce more than one construct of IOS. Thus, the equation (1) also can be expressed as more than one construct of IOS.

VARIABLE CONTROL, INTERACTION EFFECT, AND IDENTIFYING INFORMATION CONTENTS

The explanation power in equation (3) cannot be hold in the long-run, because there are many events that might exist during time lags from investment opportunity set (IOS_{-k}) through realized growth (RG_t). The growth (actual investment) attained or realized by the firms is dependent not only on the previous unobservable investment choices that they make but also on events which are beyond their control. These uncontrollable and controllable factors distort the association between IOS_{t-k} and RG_t . Thus, during the transformation process, controllable and uncontrollable factors might increase the gap between the two. Based on this argument, equation (3) should be expanded as follow:

 $RG_{t} = f_{1}(P_{t-k}, I_{t-k}, V_{t-k}, CF_{t-r}, UF_{t-r}); \quad k \ge r$ (4)

Controllable factors (CF_{t-r}) are defined as a number of internal changes during the transformation process from IOS_{t-k} through RG_t , including the merger and acquisition, earnings management, agency problems, internal ability, and the succession or change of executives. Uncontrollable factors (UF_{t-r}) are defined as a number of external changes during the transformation process from IOS_{t-k} through RG_t , such as a change level of competition in forward and/or backward markets, the environmental turbulence, monetary disturbances, industry concentration, business life cycle, and shifting critical resource dependencies.

Figure 3 shows how uncontrollable and controllable factors disturb the association between IOS_{t-k} and RG_t . The conceptual framework proposed in this present study shows that realized growth is a manifestation of the accumulation of investment and divestment policies.



Figure 3. Distortion of The Association between IOS and Realized Growth

This paper argues that there are interactions between controllable and uncontrollable factors. First, during the transformation process, internal changes might be made to respond to external change. In an imperfect market, especially in an oligopoly market, the internal changesor the action of individual firms might affect the aggregate market, and lead to reaction of other firms. The action and reaction of the firms in industry increases the competitive uncertainty. The uncertain conditions lead to revised investment or divestment during transformation process. The revised decision caused by interaction of the two factors will increase the gap between IOS_{t-k} and RG_t .

Second, in making investment decisions, managers will evaluate the feasibility of any projects that are based on internal ability and external possibilities. The evaluations are not only done in order to accept or reject the proposal of project, but also during the transformation process. Internal abilities are important factors in the success of selected investment projects.³ However, external possibilities⁴ might disturb the power of internal ability to conduct the IOS_{t-k} to RG_t. Thus, equation (3) can be modified as follows:

$$\mathbf{RG}_{t} = f_{1}(\mathbf{P}_{t-k}, \mathbf{I}_{t-k}, \mathbf{V}_{t-k}, \mathbf{CF}_{t-r}, \mathbf{UF}_{t-r}, \mathbf{CF}_{t-r}\mathbf{UF}_{t-r}); \quad k \ge r$$
(5)

Equation (4) is clearly different with equation (5). The former treats CF and UF as control variables, while the last treats CF and UF as both controlling variables and interaction between control variables.

Figure 2 also explicitly shows that realized growth could be manifested by investment and divestment decisions. By substituting RG_t with actual net investment (I_{an}) and actual net divestment (D_{an}) in equations (3), (4), and (5), one can identify clearly which proxies of IOS are more relevant to explain actual investment decisions and which proxies of IOS are more relevant to explain the divestment decisions. This model allows researchers not only to determine the appropriate proxies of IOS but also to identify which proxies of IOS have good or bad information content.

This concept is quite different with signaling theory. Signaling theory assumes that high-quality firm managers have an incentive to somehow convince investors that their firm should be assigned a higher valuation based on what the managers know to be a superior prospect for the company (Megginson, 1997:19). Managers might prefer to use the money to fund a particular investment rather than expense costly information signals to outside shareholders. In other words, managers might prefer to maximize the current shareholders' wealth rather than expected wealth of outside or potential shareholders (Myers and Majluf, 1984). If this argument holds, managers have no incentive to act as signaling theory suggests. Thus, one cannot discriminate the high-quality and low-quality firms. Hence, this study attempts to provide information content identification by ignoring the signaling theory's assumption.

Two necessary conditions should be met to identify whether the proxies of IOS convey bad or good information content. First, if the proxies of IOS positively influence the actual investment decision, it indicates good information content, and bad information content brings the opposite result. Second, if the proxies of IOS negatively influence the actual divestment decision, it indicates increasing value of proxies' good information content, while bad information content gives the opposite results.

³The success of previous investment projects can be used as proxies for internal abilities. In operational terms, previous or current realized growth can be used as proxies the internal abilities.

⁴External possibilities are defined as super-system. It is wider than competitiveness of the industry, including macroeconomic, labor market, and non-economic factors.

However, the two necessary conditions are not enough to identify clearly whether the proxies of IOS are credible to interpret as good or bad information content. Thus, this present study also proposes two sufficient conditions. First, the proxies of IOS that influence the investment decision should have opposite effects on divestment decisions. Second, if magnitude of the two opposite effects is relatively equal, there is no good and bad information content, because the effects of the two are offset one another.

CONCLUSIONS

Future growth is relevant to predict expected return, because future growth is an implication of the investment opportunity set. While the investment opportunity set cannot directly observed, finding appropriate proxies of investment opportunity set play an important role in accounting and finance studies. This paper proposes a method to confirm or verify the construct of investment opportunity sets. This paper also develops a new model for finding the appropriate proxies of investment opportunity sets. The model is concerned with whether the IOS of the firms are credible in representing future realized growth. The model shows that maintaining the firm's credibility is not simple as Kallapur and Trombley described. During the transformation process, they address several complex problems in relating the IOS_{t-k} (investment opportunity set) to RG_t (realized growth).

Some implications for further research are noted in this study. First, the model provided in this study is an abstraction. Further study requires translation of the operational definition of each indicator to develop propositions. Second, the conceptual model needs empirical studies to examine the validity of the model. Third, the model is more concerned with the association between investment opportunity and actual investment (realized growth), whether the actual of future growth is valuable is beyond the scope of the model. This study suggests to the theoretically inclined might do better to not only work on association between the investment opportunity set and realized growth, but also examine whether the association is valuable and relevant to explain the expected shareholders' wealth in imperfect markets.

Fourth, if one of four conditions proposed in this study does not hold, it suggests other complex implications for further research. This indicates that managers have less ability to realize the actual investment or divestment decisions. Another implication is the possibility of agency conflict. Contrary findings in examining the four conditions (both necessary and sufficient conditions proposed in the present study) indicate the trade-off between investment and divestment decisions. Because managers can choose future discretional expenditure, this phenomenon leads to higher conflict of interest between agent and principal. Thus, the fourth implication is also useful to identify the agency problem suggested by Jensen and Meckling (1976).

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