Valuation of Hong Kong REIT based on Risk Sensitive Value Measure Method  論文要旨  

Ban Lan

[Background and Motivation]

Project valuation is one of the most important problems in finance. One of the well-known methods to this problem is the net present value method (NPV). However, it has a limitation in that random complexities of cash flow caused by various future uncertainties are not sufficiently accounted for. To overcome this limitation, Miyahara (2006) has proposed the “utility indifference net present value (UNPV) method,” which is based on the utility indifference pricing theory and the NPV method. The UNPV method employs a utility function to valuate investor attitude toward risk. Miyauchi et al. (2007) have adopted the UNPV method to assess oil thermal electric power generation projects. Furthermore, Hirata et al. (2012) and Misawa (2010) have proposed some probit models to “random net present value” derived from a simplification of the UNPV method. These papers verify that the UNPV method is useful for practical project assessment.

The UNPV method can be used to deal with the valuation problem of random cash flows. From setting utility function as that of an exponential type, we can derive a special type of UNPV, called “risk sensitive value measure (RSVM).” Miyahara (2010) has shown that one can overcome the shortcomings of the ordinary NPV method by using RSVM as a valuation tool for investment. Furthermore, Miyahara (2013) has confirmed that the RSVM method also has a connection with scale risk as well as optimal scale of investment which influences the valuation.

The present dissertation has two aims: one is to observe the performance of the RSVM method through the application of RSVM to practical investment to asset, and the other is to determine the advantageous points of the RSVM method.

[Method and Outline]

For the first aim, we adopt the Hong Kong Real Estate Investment Trust (REITs) as the practical asset, because there are no articles regarding “financial investment problem” of the UNPV or the RSVM
method. The Hong Kong REIT is a collective investment scheme and its aim is to pass a source of recurrent income to investors through focused investment in a portfolio of income-generating properties such as shopping malls, offices, hotels and service apartments in Hong Kong and/or overseas. REIT originates from the USA, and nowadays has spread worldwide. REITs did not emerge in Hong Kong until 2005, although they had variants all over the world. Even today, there is no REIT in Mainland China. However, the intimate connection between Hong Kong and Mainland China prompts us to study more about the Hong Kong REIT. Furthermore, all the data about Hong Kong REITs can be easily collected from the Internet, making it more convenient for us to conduct data analysis.

For the second aim, we compare the results with those of the Mean-Variance (MV) approach, which is a valuation of risky prospects based on the expected value and variance of possible outcome; in so doing, we observe the advantage and effectiveness of the RSVM method. Then, we pay attention to “two parameters” which are defined by RSVM. The first one is risk-sensitivity parameter $\alpha$ which reflects the investor’s attitude towards risk. The investor’s preference of risk will lead to various results on his decision of an investment. Therefore, it is necessary to study the performance of the risk-sensitivity parameter $\alpha$ and to see how it influences the valuation of the project. In consideration of $\alpha$, a special risk-sensitivity parameter $\alpha_0$ is defined as a new index of risk valuation of investment, which is called “inner rate of risk aversion (IRRA).” It is shown that the index together with the following scale parameter is useful for rating and measuring the scale effect of the commodities to invest. The second parameter is the parameter $\lambda$ describing the scale effect of investment. The RSVM method helps us find the optimal scale $\lambda^*$ easily and also provides us with a new way to valuate scale risk. When the investor enlarges the scale of investment, the risk which used to be hidden might be displayed, and may even lead to bankruptcy in the worst case; this is called the “scale risk.” By changing the parameter $\lambda$, the scale risk of investment could be investigated, and hence it is important to study the parameter. We also observe the performance of these parameters in practical situations as mentioned above.

We focus on the annual profits of 8 REITs in the year 2011 and regard each profit as cash flow which occurs with equal probability. The 60 data are collected from August 24th to November 18th, 2011, and the histogram of each REIT is made to observe the feature of the cash flows. The data of REITs are classified according to their mean and variance as well as the feature of their distribution.
This dissertation is organized as follows:

In section 2, we review the background of the UNPV method and introduce our RSVM method. We refer to the properties of RSVM and explain the reason why RSVM is a suitable tool for project valuation. In order to show the effectiveness of the RSVM method, we also give a brief introduction of the Mean-Variance (MV) approach.

In section 3, we first interpret the concept of REIT and review the history of REITs. Second, we give a brief introduction to the Hong Kong REITs and comment on the present situation of Hong Kong REITs. Next, we explain the reason why we choose Hong Kong REITs as the practical asset. Finally, we show how to process the data.

In section 4, we observe the performance of the risk-sensitivity parameter $\alpha$ through an application of RSVM to valuation of Hong Kong REITs. The RSVM method and the MV approach are applied into Hong Kong REITs’ data, and through the comparison among them, we investigate how the parameter $\alpha$ influences the valuation. Finally, we define a new concept on risk valuation which is called “inner rate of risk aversion (IRRA) $\alpha_0$” as a preparation of the application to finding an optimal investment scale of each REIT and rating the REITs in the preceding sections.

In section 5, to indicate an advantageous property of the RSVM method, we investigate the scale effect in the Hong Kong REITs valuation by RSVM and the MV approach. By varying the value of scale effect parameter $\lambda$, we learn the difference between the valuation results of the RSVM method and those of MV, and therein we examine the property of the RSVM method for $\lambda$. Moreover, we also apply the “inner rate of risk aversion $\alpha_0$” defined in section 4 with scale effect parameter $\lambda$ to the issue mentioned above. To do so, we define an “IRRA judging table for all the REITs” on the basis of the values of $\alpha_0$ and $\lambda$, and thus, we may provide a suitable investment scale for an investor. To examine this, some examples on the scale effect in the investment to Hong Kong REITs are illustrated.

In the application of the RSVM method to practical investment issues, it should be natural to take into account the “default risk.” From this point of view, in section 6, we proceed to the rating valuation of Hong Kong REITs investment by the RVSM method taking into consideration the default risk. We explain how to process the data and then give some examples on rating valuation through
the RSVM method by making the “IRRA judging table for all the REITs with default risk.” The result will suggest to us that RSVM may become an effective rating tool in practical investment.

Finally, in section 7, we conclude our results and outlook for future issues related to this dissertation.

[Results and Conclusions]

It is the first time that the RSVM method has been applied to the valuation problems of financial investment. In order to examine the advantages of RSVM, we compared the results derived from the RSVM method with those from the MV approach for each theme in this dissertation, and we observed the following facts:

1) As to a risk sensitive parameter $\alpha$, the values of both RSVM and MV decrease with the increase of $\alpha$, and RSVM has a stronger concavity for the parameter than MV.

2) We take into account the scale parameter $\lambda$ in RSVM. As to $\lambda$, scale risk influences the valuation of the RSVM method and the MV approach in similar ways, especially in the case in which distribution of returns spreads in both negative and positive values. Yet for valuation in the case in which all the returns of REITs are positive, RSVM gives a higher valuation for the scale parameter $\lambda$ than MV. As in this dissertation, for Group 3, RSVM keeps increasing with the increase of $\lambda$, which means there may be no scale risk reflected by the RSVM method. This fact is consistent with the consideration of Miyahara’s numerical simulation (2013).

3) As to scale parameter $\lambda$, both the optimal and maximum scales obtained by the RSVM method are consistent with the value of $\alpha$.

4) A new index of risk valuation of investment is defined through RSVM, and is called “inner rate of risk aversion (IRRA).” The practical examples suggest that IRRA together with scale parameter is useful for decision-making of investment, and for choosing and rating of the commodities to invest.

5) We introduce default risk into our investment issue. This is the key point and an innovation of this
dissertation as well. In our dissertation, the default risk for each REIT is set as the same level. Then, we have found that the RSVM measure is more sensitive to the lower negative values of returns as well as default risk than the MV approach. This characteristic is especially clear if the value of scale parameter $\lambda$ is large. This fact is consistent with the consideration of Miyahara’s numerical simulation (2013).

As mentioned, in the consideration of default risk, RSVM could be an effective method in ratings and valuating the scale effect. Note that we assume the default risk to be the same value for the different REITs in this article. In general, it would be natural for the default risk for different REITs to be different from each other. Furthermore, it is necessary to investigate the characteristics of the two parameters ($\alpha$ and $\lambda$) in RSVM with default risk more deeply and compare them to those without the risk. We will treat such issues in a future work.

Here we use annual profit for daily closing price due to the limitation of data of Hong Kong REITs. With the development of Hong Kong REIT, such research should be analyzed with the daily/annual profit in the future.