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Risk Management in Outsourcing Service Industry

- Suggestions from a portfolio analysis of India's case

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1. Introduction

1.1 Background

India, famous for its software outsourcing service, has achieved high growth rates in software exports for many years. It seems not so interesting to summarize that India's outsourcing services are mainly US-oriented developments, since it has been a common sense. Table 1 shows that the US has been the dominant destination for India for more than a decade.

Table 1 India's software export destination constitution : (%)

Year	USA	Europe	Japan	Other Countries	Total
97/98	**65.0**	20.0	5.0	10.0	100
98/99	**57.0**	26.0	7.6	9.4	100
99/00	**65.0**	23.0	3.5	8.5	100
00/01	**62.0**	24.0	4.0	10.0	100
01/02	**63.0**	26.0	4.0	7.0	100
02/03	**68.0**	18.0	2.0	12.0	100
03/04	**67.7**	21.3	2.8	8.2	100
04/05	**64.0**	23.0	4.0	9.0	100
05/06	**62.1**	27.8	3.0	7.1	100

The US is overall India's largest partner in this sense. In other words, Indian software export is heavily dependent on the US market. In fact, In the US, outsourcing to India has been a controversial issue for a long time. When they discuss outsourcing to India is on earth good or bad, profits from the US market will change simultaneously. Risk is inherent to almost any business decision, in particular when it involves different geographical and political boundaries.

Outsourcing decisions and contractual arrangements of the type required by an IT outsourcing deal, are factually an example of a risky business endeavor. While outsourcing can lead to lower costs, economies of scale, access to specialized resources, it can have unwanted outcomes such as geographical risks, escalating costs, diminishing service levels and loss of expertise. As in other risky business, risk assessment and risk management are important contributors to the success of an outsourcing venture. It seemed that many researches were done from the outsourcers' stances; the part for the vendors has been neglected. While we should be aware that risks exist in outsourcing market not only for outsourcers but also for outsourcing service vendors, since outsourcing service industry has been a crucial economic contributor in some developing countries like India.

1.2 Objectives

This paper attempted to analyze the risks from the vendors' stance. Considering India's case, with two main export markets for India's selections, the risks, the expected return and the optimal export ratio are calculated. Implications and suggestions from the analysis are also given.

2. Analytical Framework

2.1 Portfolio theory

Portfolio Theory (PT) was firstly introduced by

Harry Markowitz in his paper "Portfolio Selection" in 1952. After 38 years, he shared a Nobel Prize with two other scholars for this theory, since it has been an important theory in finance. PT proposes how rational investors will use diversification to optimize their portfolios. PT models an asset's return as a random variable and models a portfolio as a weighted combination of assets; the return of a portfolio is thus the weighted combination of the asset's returns. Moreover, a portfolio return is a random variable, and consequently has an expected value and a variance. Risk, in this model, is the standard deviation of the portfolio's return. Every possible asset combination can be plotted in X_risk-Y_return space and the collection of all such possible portfolios defines a region. The line along the upper edge of this region is called efficient frontier as illustrated in Fig. 1. Mathematically the efficient frontier is the intersection of the set of portfolios with minimum variance and the set of portfolios with maximum return.

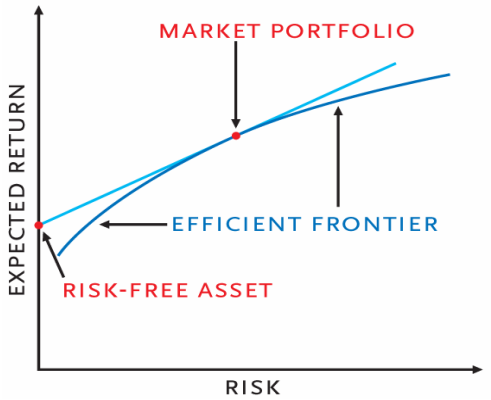

Fig. 1. Basic concept of portfolio theory.

2.2 The simplest portfolio model

In case two markets, $\{x_1, x_2\}$

At first, risk is measured as standard deviation of portfolio as follows:

$$\sum = \sqrt{Var} = \sqrt{x_1^2\sigma_1^2 + x_2^2\sigma_2^2 + 2x_1x_2\rho_{12}\sigma_1\sigma_2} \quad (1)$$

σ_1^2, σ_2^2 - variance of investment into the two markets

σ_1, σ_2 - standard deviation of σ_1^2, σ_2^2

ρ_{12} - correlation coefficient between investments into two markets as $-1 \le \rho_{12} \le 1$

Secondly, expected return is measured as follows:

r - expected return of portfolio $\{x_1, x_2\}$

r_1, r_2 - expected return of the two markets

Then, $r = r_1x_1 + r_2x_2$ (2)

Since the analyzed objects are two markets here, $x_1 + x_2 = 1 = 100\%$, and $x_2 = 1 - x_1$, $0 \le x \le 1$

The function of expected return of portfolio (2) and standard deviation of portfolio (1) can be induced further as follows:

$$r = r_1x + r_2(1-x) = (r_1 - r_2)x + r_2 \quad (3)$$

$$\sum = \sqrt{x^2\sigma_1^2 + (1-x)^2\sigma_2^2 + 2x\ (1-x)\rho_{12}\sigma_1\sigma_2} \quad (4)$$

A parametric curve of expected return versus standard deviation was depicted as Fig. 2.

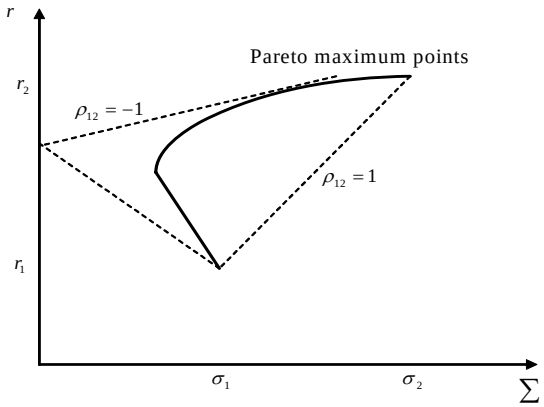

Fig. 2. Parametric curve of expected return and risk.

From Fig. 2, we can see that it is important to figure out the 5 parameters as $r_1, r_2, \sigma_1, \sigma_2$ and ρ_{12} for further analysis.

Thirdly, portfolio with minimal risk is also formulated with minimum conditions.

$$\frac{d\sum}{dx} = \frac{\sigma_1^2x - \sigma_2^2(1-x) + \sigma_1\sigma_2\rho_{12}(1-2x)}{\sqrt{\sigma_1^2x^2 + \sigma_2^2(1-x)^2 + 2\sigma_1\sigma_2x(1-x)}} = 0$$

$x(\sigma_1^2 + \sigma_2^2 - 2\sigma_1\sigma_2\rho_{12}) = \sigma_2^2 - \sigma_1\sigma_2\rho_{12}$ Then,

$$x = \frac{\sigma_2^2 - \sigma_1\sigma_2\rho_{12}}{\sigma_1^2 + \sigma_2^2 - 2\sigma_1\sigma_2\rho_{12}} = \frac{\sigma_2(\sigma_2 - \sigma_1\rho_{12})}{\sigma_1^2 + \sigma_2^2 - 2\sigma_1\sigma_2\rho_{12}}$$

$$1 - x = 1 - \frac{\sigma_2^2 - \sigma_1\sigma_2\rho_{12}}{\sigma_1^2 + \sigma_2^2 - 2\sigma_1\sigma_2\rho_{12}} = \frac{\sigma_1(\sigma_1 - \sigma_2\rho_{12})}{\sigma_1^2 + \sigma_2^2 - 2\sigma_1\sigma_2\rho_{12}}$$

If,

$$\sigma_2 - \sigma_1\rho_{12} > 0$$
$$\sigma_1 - \sigma_2\rho_{12} > 0$$
$$\rho_{12} < \min(\frac{\sigma_1}{\sigma_2}, \frac{\sigma_2}{\sigma_1})$$

In this case,

$$r = r_1 x + r_2(1-x) = \frac{r_1\sigma_2(\sigma_2 - \sigma_1\rho_{12}) + r_2\sigma_1(\sigma_1 - \sigma_2\rho_{12})}{\sigma_1^2 + \sigma_2^2 - 2\sigma_1\sigma_2\rho_{12}}$$

At last, maximization of x was conducted from the viewpoint of utility. In the analysis of this paper, utility is considered to be a simple one related to two easy-to-get data as software export revenues and the above mentioned risks.

The function is as follows:

Utility = revenues – risk (5)

It can be expressed as the following formula,

$$Utility = r_1 x + r_2(1-x) - (\sigma_1^2 x^2 + \sigma_2^2(1-x)^2 + 2\sigma_1\sigma_2\rho_{12}x(1-x))$$

Considering minimum conditions:

$$\frac{\partial U}{\partial x} = r_1 - r_2 - 2(\sigma_1^2 + \sigma_2^2 - 2\sigma_1\sigma_2\rho_{12})x + 2\sigma_2^2 - 2\sigma_1\sigma_2\rho_{12} = 0$$

then, $x = \frac{r_1 - r_2 + 2\sigma_2^2 - 2\sigma_1\sigma_2\rho_{12}}{2(\sigma_2^2 + \sigma_1^2 - 2\sigma_1\sigma_2\rho_{12})}$.

2.3 Data construction

$\{x_1, x_2\}$ were referred to the US and the European markets for India's outsourcing service. The analysis is to find out the optimal portfolio constitution between the two markets. India's software export ratios to the US and the European markets from 1997 to 2006 were utilized. In terms of expected return, mean values of real data as export revenues were used here. Market ratio of x is produced by random number between 0 and 1.

3. Empirical Analysis

3.1 Results

The five important parameters were firstly figured out and the parametric curve was depicted (See Fig. 3.).

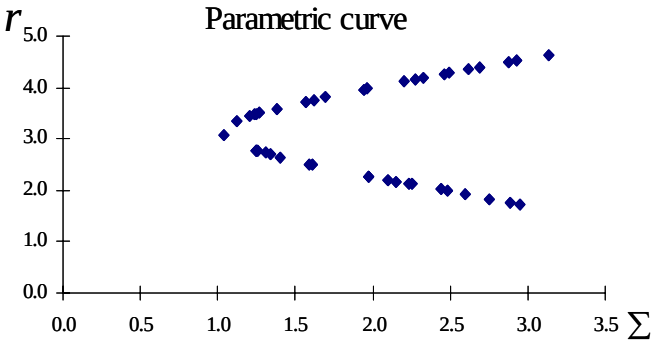

Fig. 3. Parametric curve of risks and expected returns.

Here, $\sigma_1 = 3.14, \sigma_2 = 2.95, \rho_{12} = -0.77$
$r_1 = 4.638, r_2 = 1.729$.

With the calculation based on minimum risk and maximum expected return, the optimal portfolio of x as 0.527 with risk as 1.053 and return as 3.239 are also clear now. It can be concluded that 52.7% is the optimal export ratio to the US.

The region under the pot line should be neglected with the higher risks but lower returns. Other important points can also be found out in the parametric curve. For example, the highest risk point is 3.140 with the highest return 4.638; the smallest risk point is 1.033 with the return 3.101; the middle risk point is 2.123 with the return 4.075. Then, different decisions can be made according to different considerations.

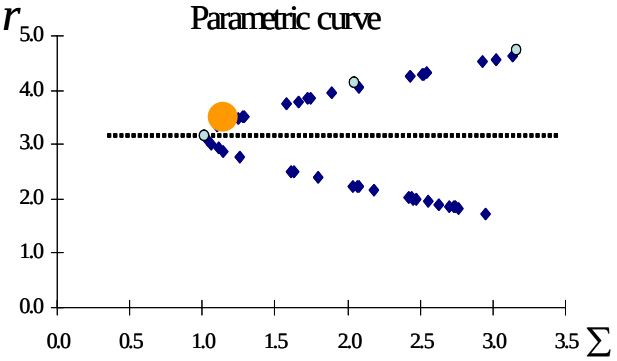

Fig. 4. Parametric curve with optional points.

3.2 Discussions

This is a two-market objective analysis with the simplest portfolio model. The purpose is certainly not to do the analysis itself, but to imply and suggest that risk should not be neglected by vendors and risk management is a good contributor to the success of outsourcing. Since the relationship between risks and revenues can also be illustrated, decision makings can be easily done by different options according to different principals from the viewpoint of risk.

4. Conclusion and Future Works

Risk and risk management have been studied in many domains; especially such as capital market, finance, insurance and management. Recently, it has been a hot topic in IT fields, like project management, software development and outsourcing service. In many cases, customers' profits and risk loss are focused. For vendors, risks' impacts are certainly huge. This paper tried to give some analyses of risk from vendors' stances. Before conducting the analysis, it is essential that the conceptualization of risk and of risk management adopted in the paper be consistent.

Risk awareness, avoidance and management are very crucial for outsourcing service industry's sustainable and healthy growth. The paper attempts to give some suggestions for risk management in outsourcing service industry by the portfolio analysis of India's case. Utilizing the simplest portfolio analysis model, the optimal point between markets was figured out. For India, the best export ratio to the US is about 52.7%. However, we can see from Table 1 that except the 98-99 fiscal year, export ratios to the US were all over 60%. India's software industry has been more dependent on the US market for years, which incorporates unavoidable risks. In other words, India should reconsider this kind of relationship with the US. In one hand, it is certainly important to go on keeping the partnership with the US, because of its main customer's position for India. In the other hand, to tap new markets and improve the market shares positively is also very crucial. In fact, India is now exploring and trying to occupy Asian markets, like Japanese market. It might be a rival for China in this sense; however, it can make more success in cooperation with China. Though it is true that India owns a great number of good-English speakers, India should do the best to educate other language speakers and adapt to other markets by some institutional changes.

The analysis objectives in this paper are two markets as the US and Europe, and one vendor as India. It can be applied to more outsourcing markets in the future research to find out the optimal point, and then confirm the optimal export ratio constitution. At the same time, to apply the analysis into China's case seems very interesting.

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