

1. Introduction

1.1 Research Motive and Background

As the business world becomes more global and increases the international competition pressure, managers will find themselves facing more complex strategic decisions (Brouthers, 1995). Managers should combine their perception of the control variables including of experience, cultural differences, and industry concentration into a control risk evaluation. After a firm decides (Erramilli et al., 1993) to enter a certain foreign market, it must choose a mode of entry, for example, select an institutional arrangement for organizing and conducting international business transactions, such as contractual transfers, joint ventures, and wholly owned operations. They also indicated that the most efficient mode is the one with highest benefit-to-cost ratio. Therefore, firms (Brouthers, 1995) will then select their entry mode strategies based on their perception of control risks in the target market. It is obvious that highly significant relationship exists between total perceived risk and strategic choice.

The Taiwan banking market started to liberalize in 1992 when the banking laws allowed for private banks and financial institutions. The Ministry of Finance established laws to allow foreign banks to set up offshore business units (Chen, 1992), rescinded the provincial banking rules and county banking laws, stipulated that the banking market allow new products and services, and allowed for all banks to exchange foreign currency. The current state of the banking market, with Taiwan as a member of the World Trade Organization, has created greater competition but offers greater opportunities for local banks. According to Johanson and Vahlne (1977), understanding the marketplace, or having market knowledge, is essential for making new market commitments or redirecting business activities to exploit the opportunities. As the electronics industry in Asia shifts labor intensive manufacturing facilities to industrial parks in China, banks are aggressively seeking opportunities to provide capital. Given the state of cross-straits relations between Taiwan and China, and due to China's own non-performing loan crisis, there is increasing risk and complexity in providing capital and other banking services to the emerging manufacturing sector. Taiwan manufacturers operate in China using a variety of methods to finance operations. A common method of transferring funds is through offshore accounts established in the Cayman or British Virgin Islands. Businesses by nature seek the path of least resistance and greatest profitability. If a Taiwan manufacturer operating in China can avoid the costs associated with offshore banks without incurring greater risks, then opening an account in China via a local

bank, a Taiwan branch bank, or an international bank becomes viable alternative. The issues for the internationalization of the Taiwan banking market are twofold. First, will China under WTO liberalize its bank market and allow Taiwan international banks to operate on an equal basis with other international banks? Second, can Taiwan resolve its internal financial regulatory and reform issues to enable greater foreign market commitment? Taiwan's traditional manufacturing firms are shifting their base of operations to China at a rapid pace and as the shift occurs, a significant portion of the bank market is transferred. Strategically, what action should Taiwan banks take to maintain the domestic market and increase their market share internationally? These are critical questions for Taiwan banks which can be explored using Johanson and Vahlne's internationalization process model. The model is based on the analysis of the firm's market knowledge, market commitment, commitment decision, and current activities.

Therefore, this dissertation choose Johanson and Vahlne's (1977) internationalization process model as the theoretical base. Model transformation, model correction and case study are performed to provide the revised international investment decision model, and firm decision making regarding international market entry is discussed.

1.2 Research Purpose

This research discusses topics which include industrial analysis, model transformation, sensitivity analysis, optimal solution, and case study for the Taiwan banking market. The theoretical basis is Johanson and Vahlne's (1977) internationalization process model. The internationalization process model developed by Johanson and Vahlne (1977, 1990) is based on an analysis of the firm's market knowledge, market commitment, commitment decision and current activities.

Decision-making is difficult and important for firms. This study tries to combine decision-making theory to the practical example of the Taiwan banking industry to provide suggestions for firms' decision-making on international market entry.

1.3 Research Process and Research Structure

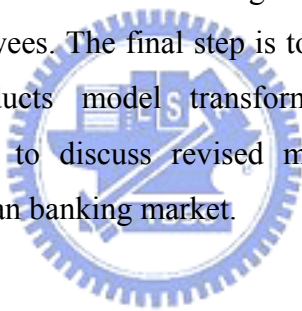
The content of this dissertation is summarizes as follows.

1. Introduction: this section demonstrates the research motive and background, research purpose, research process, research structure, and data analysis methodology of the dissertation.
2. Literature review: this section outlines the literature review of internationalization process

model and international investment decision model.

3. Methodology: this section performs model transformation, model building, industrial analysis and sensitivity analysis in the dissertation.
4. Research result: this section demonstrates the research result of industrial analysis, sensitivity analysis and case study.
5. Research limitation and future research: this section presents the research limitation of the study and offer future research topics regarding the issues.

The research process adopted in this dissertation is as follows. The first step is to collect the data and review the literature. The second step is to determine the research structure (see figure 1-1) and the research scope (Taiwan banking market). The third step is to define the structure of the research theory. The fourth step is to build a model used for banking industry analysis. The fifth step is to perform a sensitivity analysis of the revised model. The sixth step is to design a questionnaire. The seventh step is to execute the case study, conduct expert interviews, and confirm the revised model. The eighth step is to correct the model based on the suggestions of the interviewees. The final step is to offer conclusions and suggestions. In conclusion, this study conducts model transformation, sensitivity analysis, integer programming and case study to discuss revised models, and provide conclusions and suggestions regarding the Taiwan banking market.



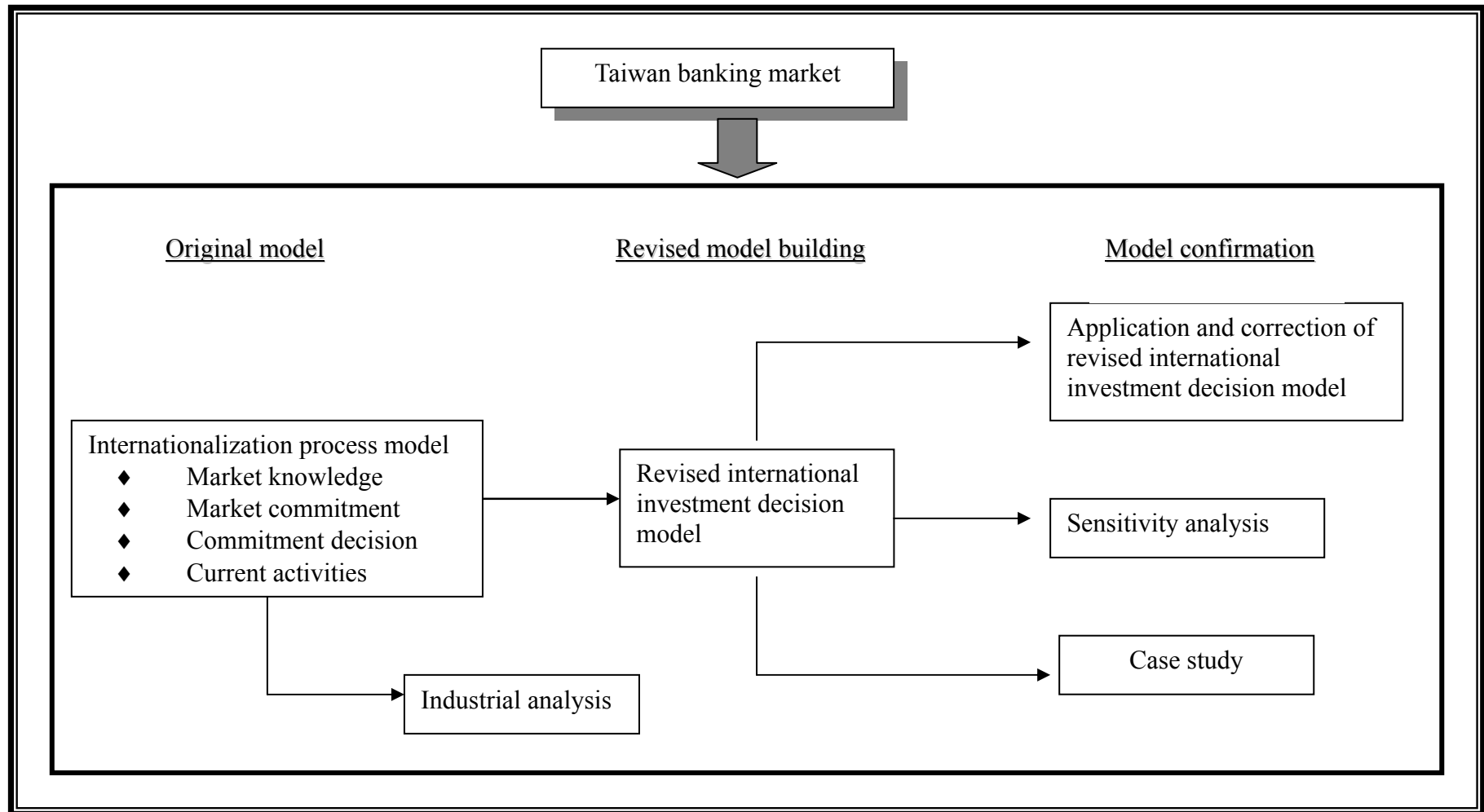


Figure 1-1. Research structure

1.4 Data Analysis Methodology

The data analysis methodology of the research is as follows (See figure 1-3). The application software is LINGO 7.0 and Excel 2000.

1. Industrial analysis: this methodology performs the industrial analysis for Taiwan banking market through the internationalization process model.
2. Integer programming method: this methodology creates the revised model and finds the optimal solution. A general integer variable is required to be a whole number. A binary integer variable is further required to be either zero or one. Any model containing one or more integer variables is referred to as an integer programming model.
3. Sensitivity analysis: this methodology discusses how the variables to influence the model's optimal solution. A procedure to determine the sensitivity of the outcomes of an alternative to changes in its parameters. If a small change in a parameter results in relatively large changes in the outcomes, the outcomes are said to be sensitive to that parameter. This may mean that the parameter has to be determined very accurately or that the alternative has to be redesigned for low sensitivity.
4. Case study: Two managers of two financial holdings companies were visited to evaluate the revised international investment decision model and to provide useful suggestions for the revised model. Further, model confirmation, two costumed-models and banks' introduction were performed.

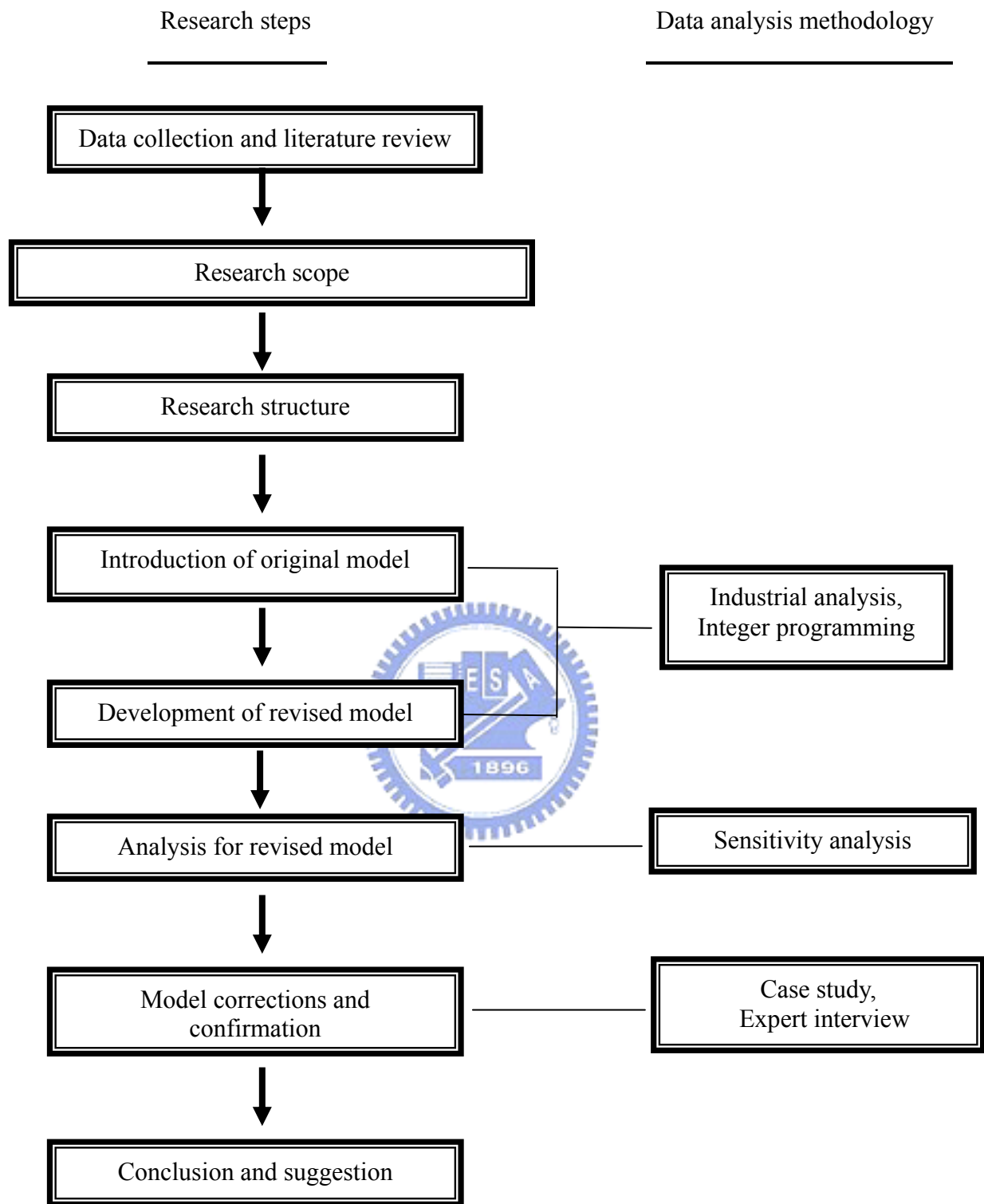


Figure 1-2. Data analysis methodology

2. Literature Review

2.1 Introduction

Firms continuously search for opportunities and formulate strategies for profit development. Operational strategies such as product diversification, vertical or horizontal integration, and internationalization are commonly used. Numerous researchers have provided conceptual frameworks and models of the internationalization process that have been adopted by multinational investment firms. Johanson and Vahlne (1977) are among the first to model the internationalization process and state that understanding the marketplace or having market knowledge is essential for making new market commitments or redirecting business activities to exploit international opportunities. Strategic choices that continuously become available provide companies' with specific competitive advantages and directly affect their international performance. Further, risk and uncertainty are key factors impacting internationalization strategies. The accurate evaluation of multiple factors is required to enter and succeed in difficult markets. Mulvey and Shetty (2004) indicated that the globalization of financial markets and the complexity of financial products have increased investment uncertainty and risks. Financial optimization models are frequently employed to weigh factors and are integrated with financial planning systems that use computer based mathematical models. This research provides two revised international investment models that expand the practical application of Johanson and Vahlne early model to financial holding companies. The revised models consider the investment decision methods of financial managers and apply integer programming to incorporate the financial perspectives of experts. In order to demonstrate the practical applications of the model, interviews of investment advisors are conducted to provide case data and to create two investment decision models.

2.2 The Internationalization Process Model

Following the introduction of the internationalization process model offered by Johanson and Vahlne in 1977, numerous papers were published to discuss, revise, or challenge the model. This section discusses the early contributions of authors and the research that has stimulated others to study internationalization process models.

2.2.1 Johanson and Vahlne's Internationalization Viewpoint

The internationalization process model developed by Johanson and Vahlne is based on an analysis of the firm's market knowledge, market commitment, commitment decision and current activities. The model emphasizes that a lack of knowledge about a foreign market of interest is a major obstacle to international investment operations. The accuracy of market knowledge leads to greater investment success whereas poor market knowledge increases the likelihood of a failed investment. Even though market knowledge can be purchased in the form of research reports or referenced from experience (Helliari et al., 2002), the quality of knowledge underlies the success of firms entering international markets.

Market commitment (Helliari et al., 2002) relates to activities of the firm that can restrict freedom of action. Commitment (Johanson and Vahlne, 1977) has often been studied in terms of the resources applied by the firm to specific events or actions. The difficulty of transferring resources affects the degree of market commitment, and the more specialized the resource to the specific market, the greater the degree of commitment required (Johanson and Vahlne, 1977). According to Chetty and Eriksson (2002), experiential knowledge and market commitment dependent on the structure of the business network surrounding the parties and cannot be transferred between countries or between units in a firm. Commitment decisions depend on the decision alternatives chosen and carried out (Johanson and Vahlne, 1977). For example, vertical integration means a higher market commitment degree than a miscellaneous foreign investment. Thus, as the commitment decisions become more serious, the investment costs increase. From the opposite view, if the commitment decisions are weakly supported, then the expected revenues from the decisions should be lower.

Finally, regarding the operational activities of firms, the internationalization behavior is often decided by a combination of learning through the experience and incorporation of members that have international knowledge (Ekboir, 1997). Based on Johanson and Vahlne's viewpoint, the more differentiated the product, the larger the total commitment to current activities (Johanson and Vahlne, 1977). Further, the firms' commitment to current activities becomes greater when the product base is differentiated. Firms that are production oriented

tend to invest in personnel to manage current activities. For customer-oriented products or services, the country features and cultures become more important for the firm to base their internationalization strategy. Finally, various operational activities, which come from different levels of market knowledge, market commitment, and commitment decisions, yield different investment costs and profits.

2.2.2 The Application and Challenge of Johanson and Vahlne's Model

Numerous researchers have extended or modified the internationalization process model to include market selection, entry mode, Foreign Direct Investment (FDI), location patterns, and internationalization process factors (Dunning, 2000). For example, Sullivan and Bauerschmidt (1990) conducted an empirical test of European forest product firms based on Johanson and Vahlne's model. However, the internationalization model did not hold for this case and the authors found that international involvement is influenced by competitive rivalry, government policies, and exogenous conditions. On the other hand, Erramilli, Srivastava and Kim (1999) applied the internationalization model to Asian multinationals and found significant support. Lamb and Liesch (2002) re-framed the relationships between market knowledge, market commitment and market involvement. They proposed an iterative model of internationalization for small firms where market knowledge and market commitment were reciprocally caused. For instance, abundant market knowledge influenced the degree of the market commitment and the degree of market commitment influenced the abundance and accuracy of market knowledge. Furthermore, Forsgren (2002) indicated that experiential learning positively influenced tacit knowledge. Abundant tacit knowledge tended to decrease perceived uncertainty and then increase the drive to internationalize. The research challenged firms to invest abroad even with low market knowledge if the perceived risk of investment was lower than the perceived risk of not investing. Thus, if the risks were well evaluated, then firms would tend to favor internationalization.

The eclectic paradigm provided by Dunning (1988) challenged conventional internationalization models. Dunning (1988) points out that ownership-specific advantages, transfer advantages, and location advantages play important roles in the internationalization process. Johanson (1990) compared the eclectic paradigm to the internationalization model and offered a different viewpoint. That is, the eclectic paradigm is production oriented and assumes that perfect information for the optimization decision. On the other hand, the internationalization model assumes market knowledge and experience is imperfect before entering a market and then uses a feedback loop to correct the market knowledge as

experience is gained in the marketplace. Thus, Johanson views the eclectic paradigm as a static model but the internationalization model as dynamic. Dunning (2000) concluded that a dynamic component would make the eclectic paradigm a more useful analytical framework for examining internationalization. This study agrees with the importance of feedback and derives a revised international investment decision model based on Johanson and Vahlne's early research.

2.3 International Investment Decision Model

Market uncertainty and risk require that firms utilize decision models to help analyze and evaluate international investment strategies. The risk attitude of the decision-maker influences the international investment decision model differently. Accuracy, efficiency and flexibility of the decision model are common requirements for firms.

2.3.1 The Literature Review of International Investment and Decision Models

Successful internationalization of firms often depends on well-designed international investment strategies. Optimal investment and timing are achieved by managing the differences between the actual and expected rewards (Ekboir, 1997). These differences vary depending on company characteristics which include capital, wealth, scale, and human resources.

Investment decision-making under uncertainty is the method whereby investors forecast several different criteria values for each investment alternative without knowing which alternative will be selected. Jovanovic (1999) demonstrated investment projects under uncertainty and risk using break-even analysis, sensitivity analysis, and game theory. Generally speaking, firms execute investment strategies based on various considerations. For example, if a firm wants to invest, three criteria are evaluated. The criteria are financial capabilities, management talent, and development strengths. Each company will have its own preferences and values placed on the criteria. Bacon (1992) derived investment decision techniques using Net Present Value (NPV) and Internal Rate of Return (IRR). For the IRR method, if the discount rate equals the present value of cash inflows and the present value of cash outflows are better than the required return rate, then the investment is accepted.

Investment models are widely used for determining international investment strategies. Choi (8) indicated that there are two key factors which influence international diversification including barriers from the international capital market and the exchange rate on international investment. Therefore, for a typical decision formulation under uncertainty, the decision makers choose the action which maximizes their expected utility under the various

evaluations (Hederstierna, 1981). For international investments, knowing how to define the countries' risk level is important. Fernandez, Zanakis and Walczak (2002) used 27 factors and classified countries into five risk categories. The risk factors included economic indicators, liquidity, performance, value, regulation, and efficiency. The five risk groups were listed as safe markets (e.g., USA, Canada, Sweden), developed markets (Austria, Hong Kong, Japan), mature emerging markets (Brazil, Philippines, Thailand), new emerging markets (China, India, Taiwan), and frontier markets (Egypt, Jordan). Doumpos and Zopounidis (2001) applied multi-criteria decision models and used multi-group hierarchical discrimination to classify countries into four groups and obtained similar classification results. The risk factors focused on 12 economic indicators sourced from the World Bank. The countries were classified into four groups depending on income level -- high-income economies (e.g., USA, Canada), upper middle economies (Europe), lower-middle income economies (Eastern Europe), and low-income economies (mostly Africa). These research results demonstrate that different techniques and risk evaluation models yield different clarifications and different decision results. Thus, the modeling approach selected by decision makers will have a strong impact on the outcome. The validity and reliability of the model will be best when the accepted business decision processes of the firm are considered when formulating the models.

2.3.2 The Impact of Risk and Risk Attitude on Decision-Making

In classical theory, risk is reflecting variation in the distribution of achievable outcomes, their likelihoods, and their subjective values (March and Shapira, 1987). Pratt (1964) indicated that risk is measured either by nonlinear utility for money or by the variance of the probability distribution of possible gains and losses associated with a particular alternative. Expected value is supposed to be positively associated, and risk is assumed to be negatively associated, with the attractiveness of an alternative (March and Shapira, 1987). From a managerial perspective, managers see risk in ways that are both less precise and different from risk as it appears in decision theory. A risky choice is one with a wide range of possible outcomes or is one that contains a threat of a very poor outcome (March and Shapira, 1987).

A number of risk measurement models have been proposed (Luce and Weber, 1986; Sarin, 1987; Keller, Sarin and Weber, 1986; Weber, 1990). Jianmin and Dyer (1996) indicated that these risk models have two major problems. First, the validity of these risk models as measures of perceived risk has been called into question by empirical studies. Second, it is not clear how to incorporate risk measures into decision models because they were developed separately from the preference models. Dyer (1989) proposed two general frameworks for

risk-value models; an additive one and a multiplicative one, and showed that many decision models can be explained by the intuitive idea of risk and value tradeoffs. Bell (1988) derived a utility-compatible measure of risk for the purpose of trading off risks against returns and explored risk-return structures for typical utility models (Bell, 1995). Sarin and Weber (1993) provided a synthesis of the research on risk measurement and decision models based on expected utility and non-expected utility. In their research, risk is measured by the variance and value by expected returns. From another aspect, risk has become increasingly a term referring not only to the unpredictability of outcomes but to their costs (Fischhoff, et al., 1984). Market knowledge, information and experience cause different levels of market commitment and commitment decisions. And the market commitment and commitment decision decides the investment costs for firms entering the international market.

Early research assumed that most decision makers are risk wary. Decision makers study the variability of possible outcomes and the greater the return on investment then the greater the variance (Pratt, 1964; Ross, 1981). March and Shapira (1987) indicated that variation in the ways individuals perceive risk results from incentives and experience. They showed the necessity and the excitement of risk taking in management, but noted that risk taking in organizations is sustained more by personal than by organizational incentives. The attitude toward risk is important to consider in the corporate internationalization process. Although risk can be defined as an exposure to uncertainty, people judge uncertainty differently (Holton, 1997). Aloysius (1999) expressed that the impact of risk attitudes on the optimal allocation of members' restricted budgets on funding for profitable projects is important.

There are several methods developed to measure risk attitudes. For example, Wakker (39) showed that under the methodology of expected utility, risk attitudes can be modeled using utility and outcome sensitivity. In a rank dependent model, risk attitudes consist of two independent components including a measure of sensitivity towards outcomes. Studying managerial attitudes to risk, March and Shapira (1987) indicated that the definition of risk employed by executives who were responsible for organizational decisions differed radically from the variance measure used in the financial management field. Risk attitude varies according to individual's age and seniority in the firm, the division's performance in relation to the company budget, and whether the company possesses expert knowledge of the decision context (Helliard, et al., 2002).

Wu and Gonzalez (1996) indicated that previous studies of weighting functions for risk attitude have suggested an inverse S-shaped function, first concave and then convex. However, these studies faced a methodological shortcoming since estimation procedures have

required assumptions about the functional form of the weighting functions. Thus, they use prospect theory to confirm their studies and found three results. First, the data-fitting exercise indicates that a weighting function that is strictly nonlinear within the boundaries generally outperforms a linear weighting function with discontinuities at 0 and 1. Second, these common-consequence (concavity and convexity) conditions permit nonparametric tests of the curvature properties of the weighting function. Third, a more refined set of probabilities, namely concavity for small probabilities and convexity for large probabilities should be used.

In conclusion, because of the different tolerances of risk and the different risk attitudes, various industries or companies will set different risk coefficients or use different evaluation models. In the banking industry, for example, the variability of bank stock returns reflects the risks associated with all aspects of bank holding company activities (Neuberger, 1991). These risks include asset risk, default risk, and charter value risks. Financial institutions face five generic risks, namely systematic, credit, counter party, operational, and legal risk (Oldfield and Santomero, 1997). Nickel and Rodriguez (2002) indicated that helping managers understand the evolution of the risk relationship over time is important, and it's also important to examine whether the risk-return relationship depends on the managers' attitude towards risk or the operation differences among companies. Johanson and Vahlne's model incorporates perceived risk and tolerable risk. Based on their model and other author's international investment viewpoints, this study develops a decision model considering risk attitude, expected revenue, and cost variables for financial holding companies.

3. Methodology

3.1 Industry Analysis through Internationalization Process Model

The model of Johanson and Vahlne emphasizes the gradual acquisition, integration and use of knowledge about foreign markets and operations, and then incrementally increasing commitments to foreign markets. Andersen and Buvik (2002) study the firms' internationalization and alternative approaches to the international customer/market selection. Their approach adopts the decision-making process in relation to the international market selection. The decision-making process steps include problem definition, identifying choice criteria, weighting the criteria, generating alternatives, rating alternatives on the criterion, and finally computing the optimal decision.

Another approach is non-systematic and describes a company's actions when choosing a foreign market. This method has been noted by some scholars as applicable to small companies and to companies at an early stage in their internationalization process (Johanson

& Vahlne, 1990; Papadopolous & Denis, 1988). Dwyer, Schurr, and Oh (1987) show that relationships evolve through five general phases of awareness, exploration, expansion, commitment, and dissolution.

There are four key items underlying Johanson and Vahlne's model (1977) – market knowledge, market commitment, commitment decision, and current activities. The factors for market commitment include two state factors, the amount of resources committed and the degree of commitment. The higher the degree of commitment, the more the resources in question are integrated with other parts of the firm and their value is derived from these integrated activities. The amount of resources committed is indirectly related to the size of the investment in the market. For example, the investment includes investment in marketing, building the organization, and personnel. There are also direct relations between market commitment and market knowledge. Market knowledge can be considered a resource and the better the market knowledge, the more valuable are the resources and the stronger is the commitment to the market.

Second, the change factors need to be considered and these cover the current activities and decision to commit resources to foreign operations. Generally speaking, the more complicated the market situation and the greater the product differentiation, the larger the total commitment. In order to clarify the roles of integrating the experience of the firm into the internationalization process, the authors distinguish between firm experience and market experience. Because of the performance of current activities, both experiences are necessary. The authors distinguish between an economic effect and an uncertainty effect of each additional commitment. They note that economic effect is associated primarily with increases in the scale of operations on the market. Further, market uncertainty is reduced through increased interaction and integration with the market environment.

In conclusion, the steps for analyzing the market are described as follows:

1. Decide the tolerable market risk of the company.
2. Collect market information to build market knowledge and understand the market environment.
3. According to the information from step 1 and step 2, evaluate the degree of market commitment. If the market risk is less than the tolerable market risk of the company then the strategy suggests raising investment or expanding scale. On the contrary, if the market risk is more than the tolerable market risk of the company, then the strategy suggests reducing the market uncertainty or withdrawing from the market.
4. Make the commitment decision.

5. Determine the current activities.
6. Re-evaluate the previous steps.

Hence, this dissertation develops an industrial analysis for the Taiwan banking market through the use of the Johanson and Vahlne model. Based on four key items in the internationalization process model, this research performs a complete industrial analysis of the Taiwan banking industry.

3.2. Johanson and Vahlne's Commitment Decision Strategy

Johanson and Vahlne's model emphasizes the gradual acquisition, integration and use of knowledge about foreign markets and operations, and then recommends incrementally increasing commitments to foreign markets as confidence in the market increases. The following equation describes the systems of relationships underlying Johanson and Vahlne's commitment decision strategy.

R_i^* = Maximum tolerable market (market i) risk = f (firm's resource position, firm's risk approach)

R_i = Market i risk situation

= $C_i * U_i$

where C_i = Market i commitment

U_i = Market i uncertainty



According to the above equations, companies should increase their investment scale when $R_i \leq R_i^*$ and implement an uncertainty-reducing strategy to seek for the opportunities to invest the market but withdraw from the market when $R_i > R_i^*$. Table 3-1 provides an example application of Johanson and Vahlne's model.

Table 3-1 An example application of Johanson and Vahlne's model

Firm no.	Risk attitude	R_i^*	C_i	U_i	$R_i = C_i * U_i$	Decision
Firm 1	Risk wary	0.3	0.8	0.8	0.64	Withdraw
				0.4	0.32	Withdraw
			0.4	0.8	0.32	Withdraw
Firm 2	Risk neutral	0.5	0.8	0.4	0.32	Invest
				0.4	0.8	0.32
			0.4	0.4	0.16	Invest
Firm 3	Risk lover	0.7	0.8	0.8	0.64	Invest
				0.4	0.32	Invest
			0.4	0.8	0.32	Invest
				0.4	0.16	Invest

Note. the values of R_i^* , C_i , and U_i are assumed values describing various risk attitudes of firms

3.3 Revised International Investment Decision Model

Andersen and Buvik (2002) adopted the decision-making process in relation to international market selection. The steps include problem definition, identifying choice criteria, criteria weighing, generation of alternatives, rating alternatives based on the criterion, and finally calculating the optimal decision. Chen, Fine and Huberman (2003) indicated that rational expectation theory shows that markets have the capacity not only to aggregate information held by individuals, but also to convey it via the price and volume of assets associated with that information. March and Shapira (1987) expressed that in conventional decision theory formulations, choice involves a trade-off between risk and expected return. Risk wary decision makers prefer relatively low risks and are willing to sacrifice some expected return in order to reduce the variation in possible outcomes. Risk seeking decision makers prefer relatively high risks and are willing to sacrifice some expected returns in order to increase the variation of outcomes. Wu and Gonzalez (1996) also indicated that risk aversion for most gains and low probability losses are asymmetrical and that individuals treat losses and gains differently.

According to the discussion about risk wary and risks seeking behavior and the relationship between risk and expected returns, this research formulates an example to describe the revised Johanson and Vahlne investment decision model. Basically, the revised international investment model adopts $ER_j (P_{ij} * Outcome_{ij})$, $Cost_j$ and PR_j as the model parameters to replace market risk (market uncertainty U_i and market commitment C_i) and firm's risk tolerance degree (R_i^*) from Johanson's model. The replacements are justified as follows. In practice, the sources of market information are varied, which causes difficulties for firms to precisely quantify the market risk. Further, the risk tolerance depends on the firm's investment decision experience, capital scale, and manager's subjective judgment. Therefore, the comparison between market risk (R_i) and risk tolerance (R_i^*) is difficult to quantify in practice. However, it is fairly easy to estimate the expect revenue of projects under market uncertainty (U_i). ER_j is defined as the expected revenue under the j^{th} market. When a firm can define or estimate the market knowledge needed for market entry decisions, then the task is to compute the expected revenue (ER_j) to be derived from the estimated sales volume given the product price in the target market. The firm further evaluates the possibilities PR_j of achieving the revenue in terms of the company's risk attitude (which replaces the measure of the firm's risk tolerance degree R_i^*). The risk attitude is used to weigh the risk factors after evaluating the market uncertainty using market knowledge and the firm's experience. In the

revised investment decision example, the authors model and compare two firms with different risk attitudes (risk wary and risk lover).

Market commitment defines the firm's involvement level and willingness to invest in a market and is quantified by evaluating $Cost_j$, the investment cost of the j^{th} market. The higher the market commitment degree (C_i), the higher the investment cost ($Cost_j$) to enter a market. Investment cost may include factors such as transaction cost, management cost, operating cost, production cost, labour cost, coordination cost (Chen and Chen 1998; Zekos, 2003), and other costs. Therefore, the cost variables can be numerous various and may be expressed by a linear or non-linear function on the basis of firm's demands. Hence, when the expected revenue, multiplied by the probability of achieving the revenue is greater than the investment cost, then the firm should invest in the market. The rule for deciding when to invest in a market is $PR_j * ER_j \geq Cost_j$.

Thus, this study proposes a revised integer-programming model based on Johanson and Vahlne's early research. The revised investment decision model is derived as follows. In Table 3-2, the examples of two firms' investment profiles (with distinct attitudes toward market risks) are listed.

$$\text{Maximize } \pi = \sum_{j=1}^n \left[PR_j * \left(\sum_{i=1}^m (Outcome_{ij} * P_{ij}) \right) - Cost_j \right] * Iv_j$$

Subject to

$$\sum_{j=1}^n (Cost_j * Iv_j) \leq Cost_F$$

$$Iv_j = (0, 1)$$

$$\sum_{i=1}^m P_i = 1$$

$$0 \leq P_{ij} \leq 1$$

$$0 \leq PR_j \leq 1$$

$$i = 1, 2, 3, \dots, m$$

$$j = 1, 2, 3, \dots, n$$

Where:

$Cost_j$ = the investment costs for a given market

$Cost_F$ = the total restricted investment cost for all the markets considered by firm.

Iv_j = the decision to invest ($Iv_j = 1$) or withdraw ($Iv_j = 0$) from a market.

$Outcome_{ij}$ = the possible outcome under condition i and j market.

P_i = the sum of probabilities under the $Outcome_{ij}$ condition when market j is fixed.

P_{ij} = the prior probabilities of Outcome_{ij} vary with market information and market knowledge.

PR_j = the achievable probabilities of ER_j vary with the investors' risk attitudes.

i = the number of different types of risk in a given market.

j = the number of different markets.

m = the total number of different types of risks in a given market.

n = the total number of different markets.

The integer-programming problem is solved using Lingo and Excel software. The example sets all variables except for Iv_j . The value of Iv_j determines whether or not to invest in the project. After confirming Iv_j , the company derives the maximum values π and the total cost. Table 3-2 shows two firms with two different risk profiles. In order to simplify the example, the authors fixed Outcome_{ij}, Cost_j, and P_{ij} . Figure 3-1 shows that the firms derive two Outcome_{ij} values and the two prior probabilities from the market. The firms then compute the expected return and variance (the variance value represents the degree of risk). The sum of prior probabilities under one market must be 1. Furthermore, in order to simplify the model comparing two firms facing the same market, the P_{ij} are assumed to be equal (Table 3-2).

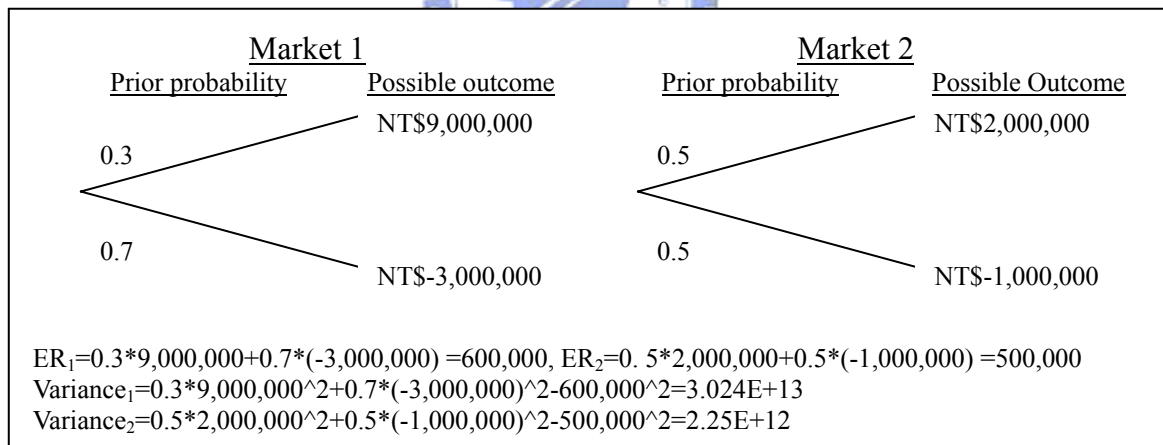
Risk wary investors prefer low risks and are willing to sacrifice some expected return in order to reduce the variation in possible outcomes. Therefore, in this model, the values of PR_j vary depending on the firms' risk attitudes. The risk wary investor, when facing a high risk market, sets a lower value for PR_1 to evaluate the market 1 investment decision and expects stable investment returns. On the contrary, the risk lover sets a higher PR_1 and expects a higher investment return. Even though the prior probability and the possible outcomes are equal for the same market situation, the investment decisions vary based on the firm's risk attitudes. Furthermore, if the firms assign more Cost_f to their investment project, their investment decisions change accordingly.

Table 3-2 An example of revised investment decision model.

Unit: NT\$ dollars

Firm no.	Market no. $j = 3$	P_{ij} $i=2$	Outcome _{ij}	ER_j	Variance	PR_j	Cost _j	Profit _j = $PR_j * ER_j - Cost_j$
Firm 1 (Risk wary)	Market 1 (High risk)	0.3	9,000,000	600,000	3.02E+13	0.5	250,000	$0.5 * 600,000 - 250,000 = 50,000$
		0.7	-3,000,000					
	Market 2 (Mid risk)	0.5	2,000,000					
		0.5	-1,000,000	500,000	2.25E+12	0.7	250,000	$0.7 * 500,000 - 250,000 = 100,000$
	Market 3 (Low risk)	0.7	600,000	435,000	6.35E+10	0.9	250,000	$0.9 * 435,000 - 250,000 = 141,500$
		0.3	50,000					
Firm 2 (Risk lover)	Market 1 (High risk)	0.3	9,000,000	600,000	3.02E+13	0.9	250,000	$0.9 * 600,000 - 250,000 = 290,000$
		0.7	-3,000,000					
	Market 2 (Mid risk)	0.5	2,000,000					
		0.5	-1,000,000	500,000	2.25E+12	0.8	250,000	$0.8 * 500,000 - 250,000 = 150,000$
	Market 3 (Low risk)	0.7	600,000	435,000	6.35E+10	0.7	250,000	$0.7 * 435,000 - 250,000 = 54,500$
		0.3	50,000					

Note. data show the relationship between risk tolerance and the degree of market commitment. The higher the Variance_j, the higher the market risk. P_{ij} means the prior possibility of the Outcome_{ij} depends on the market information and market knowledge. In order to simplify the model, the study assumed that the market information, market knowledge, and market commitment between the two firms are the same. PR_j is assumed based on the firms' risk attitude. The risk wary firm prefers a low risk market with a lower variance of outcomes and the risk seeking firm prefers a higher risk market with a higher variance of outcomes.



Note. data show the possible outcomes and prior probability under market 1 and market 2.

Figure 3-1. The computation of ER_j and $Variance_j$ for Market 1 and Market 2 in Table 3-2.

Table 3-3 Optimal solutions derived for Firm 1 and Firm 2 using Lingo and Excel software.

Unit: NT\$ dollars

		Cost _{F1} = 600,000			Cost _{F2} = 800,000				
		Market no.	Iv _j	Max π	Total cost	Market no.	Iv _j	Max π	Total cost
Firm 1 (Risk wary)	Market 1 (High risk)		0			Market 1 (High risk)	1		
	Market 2 (Mid risk)	1	241,500	500,000	Market 2 (Mid risk)	1	291,500	750,000	
	Market 3 (Low risk)	1			Market 3 (Low risk)	1			
Firm 2 (Risk lover)	Market 1 (High risk)	1			Market 1 (High risk)	1			
	Market 2 (Mid risk)	1	440,000	500,000	Market 2 (Mid risk)	1	494,500	750,000	
	Market 3 (Low risk)	0			Market 3 (Low risk)	1			

Note. investment in a market when $Iv_j = 1$ or withdraw from a market when $Iv_j = 0$. The Max π and total costs are computed using values for Iv_j , $Cost_j$, and $profit_j$.

Table 3-3 shows the optimal solutions of the two firms using Lingo and Excel software (See Appendix B). The resulting matrix enables the firm to execute its strategic plan quantitatively and objectively. From Table 3-3, the risk wary firm invests in market 2 (mid risk) and market 3 (low risk) under the $Cost_{F1}$ restriction. The same firm will choose all markets to invest in under the $Cost_{F2}$ restriction. The risk lover firm chooses market 1 (high risk) and market 2 (mid risk) to invest in under the $Cost_{F1}$ restriction and all markets under the $Cost_{F2}$ restriction. That is, if budget has no restriction, investors could invest in all markets. Comparing the two firms' investment decisions, firm 2 receives a higher estimated investment profit.

3.4 Theoretical Basis of the Sensitivity Analysis Method

Risk depends on uncertainty. Three dominant causes of risk exist, namely: measurement error, unclear specifications and an uncertain future (Eschenbach, 1996). Eschenbach (1989) also indicated that approaches for dealing with uncertain data include: deterministic approximations, expected value analysis, simulation, and sensitivity analysis. All of these techniques can be used to improve decision-making, determine which data estimates should be refined, or focus managerial attention on the key elements during implementation.

Sensitivity analysis is a general description that lacks a rigorous definition. Some writers focus on the functional form of a relationship, for example, elastic or inelastic demand. Others have focused on the ranges of change of variables and the likelihoods of these changes

(Eschenbach, 1989). Therefore, researchers can determine factors to perform the sensitivity analysis in decision-making and implementation process. Sensitivity analysis provides useful information to planners through simple application and through testing of more complex decision models (Alexander, 1989). This method can help planners understand differences in decision-making under changeable variables. Therefore, besides transforming the internationalization process model into the revised international investment decision model, the authors conduct sensitivity analysis on the revised model to clarify the influence of decision-making result through various risk attitudes and costs.

4. Research result

4.1 The Industry Analysis of Taiwan Banking Market

The industry analysis of Taiwan banking market based on Johanson and Vahlne's internationalization process model is as follows.

4.1.1 Market Knowledge

Indirect investment in China by banking and insurance companies is growing with the overall amount of investment reaching a peak during the year 2002 (Ministry of Economic Affairs, R. O. C., 2002). The data further show that for the year 2001, investments to China via Taiwan almost exceeded NT\$ 974 billion dollars (Ministry of Economic Affairs, R. O. C., 2002). Given that the local investment in Taiwan during the same year was NT\$ 10,921 billion dollars (Ministry of Economic Affairs, R. O. C., 2002) and that Taiwan firm's net income before tax was NT\$ 766 billion dollars (Bureau Monetary Affairs, 2003), it can be estimated that Taiwan's China investments led to a local lost banking profit ratio of about 9%. This figure demonstrates that the higher the investment in China by Taiwan firms, the higher the lost profit ratio for local banks. Table 4-1 reflects the phenomenon and the potential impact to the local banking industry.

The Financial Minister Yung-San Lee (Xu, 2002) revised the laws to allow China's banks to establish branches in Taiwan. These laws govern the financial transactions between Taiwan banks and banks in China and allow Taiwan banks in China to directly transfer funds to corresponding banks in China. However, no China banks are allowed to transfer funds to the Taiwan bank branches in China and this critical issue is still under review.

Table 4-1 Investment rate comparison table for Taiwan, China, Japan, and Korea

Year	Taiwan		China	Japan	Korea
	Domestic investment rate by year (%)	Investment rate (%)	Investment rate (%)	Investment rate (%)	Investment rate (%)
1997	18.6	24.0	38.0	28.3	36.2
1998	11.8	24.7	37.4	26.5	25.4
1999	-0.7	23.2	37.1	25.7	29.5
2000	15.7	22.6	36.4	25.9	31.1
2001	-29.2	17.4	38.5	25.3	29.4
2002	2.5	16.3	-	23.6	29.0
2003	16.1	16.1	-	23.5	29.4
2004	20	19.9	38.5	23.5	29.4

Note. From <http://win.dgbas.gov.tw/dgbas03/bs8/world/invest.htm>, compiled by the authors.

Table 4-2. Bank ranking by different net income before tax (2005/3)

(NT\$ dollars)	Banks (number)	Domestic Banks (49)	Trust investment company (3)	The local branches of foreign banks (36)	Bills Finance Companies (15)	Total (103)
Net income before tax						
> 2000 million dollars		18%(9)	0%(0)	3%(1)	0%(0)	10%
1000 ~ 2000 million dollars		14%(7)	0%(0)	0%(0)	13%(2)	9%
0 ~ 1000 million dollars		56%(27)	33%(1)	64%(23)	80%(12)	61%
< 0 million dollars		12%(6)	67%(2)	33%(12)	7%(1)	20%

Note. From Financial Institution Income Statement, <http://www.boma.gov.tw/public/data/boma/stat/bas/3080.xls>, compiled by the authors.

Taiwan's banking market experienced fast liberalization during the 1990's partly due to the low capital barriers to entry. There were only 16 local banks in 1990, but within 13 years there are 52 local banks and numerous small financial institutions in 2001 (Chen, Zeng, & Guo, 2001). Current statistics show that more than 30 banks among the existing pool of 49 banks have a market share of less than 1% in 2005. Table 4-2 lists the percentage shares of pre-tax income for different types of banks. Only 10% of Taiwan banks' have profit greater than NT\$ 2 billion dollars. The top four most profitable banks are the Chinatrust Commercial Bank, Cathay United Bank, Hun Nan Commercial Bank, and First Bank which have a net income before tax greater than NT\$ 3 billion dollars. In conclusion, 81% of all banks' net income before tax in Taiwan is less than NT\$ 1 billion dollars, indicating that the marketplace has too many low profit banks.

The total Non-Performing Loans (NPLs) in Taiwan is conservatively rated at about 8% in 2001 (Figure 4-1). However, international standards indicate that banking problems can occur even when the level of NPL's ratio is at the level of 2% to 3% (Mouat, 2002). Figure 4-1 shows the increasing rate and decreasing rate of Taiwan's financial institutions' NPL ratio

from 1995 to 2004.

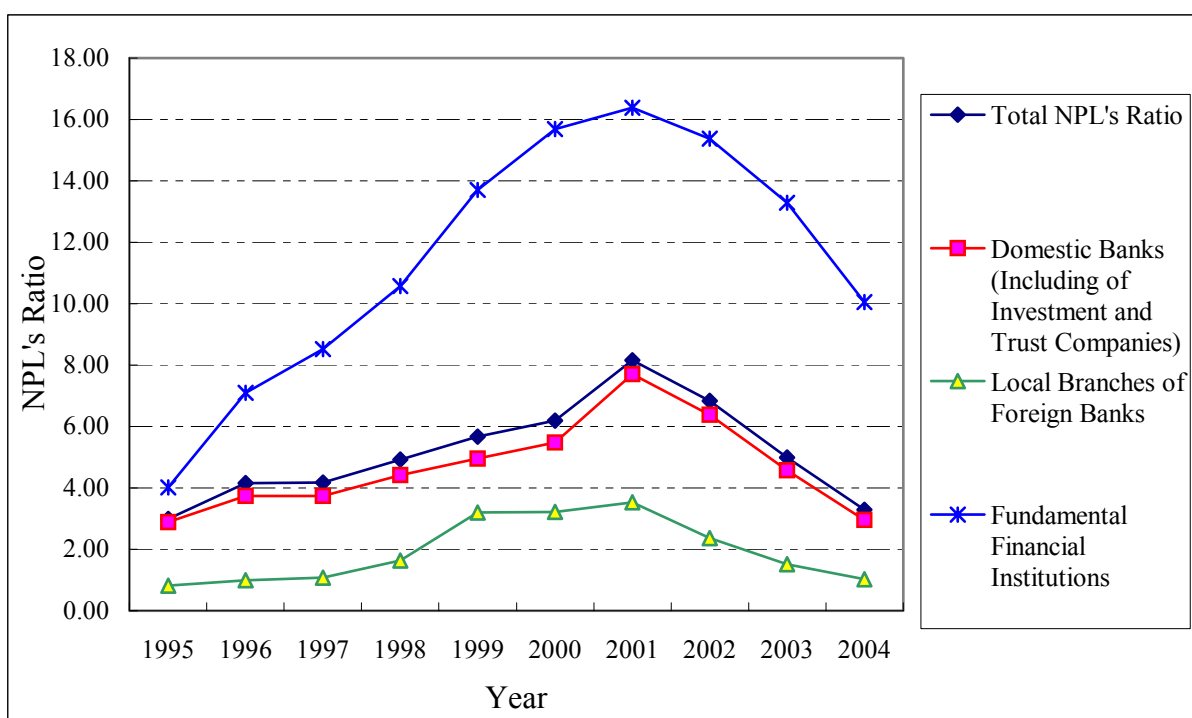


Figure 4-1 The ratio of Non-performing loans for Taiwan financial institutions
Note. From <http://www.boma.gov.tw/public/data/boma/stat/index/index-10.xls>, compiled by the authors.

4.1.2 Market Commitment

The level and degree of commitment expresses not only the resources allocated by the individual firm, but must also considers the collective resources committed to exchange relationships (Bonaccorsi 1992). The factors that will influence the degree of difficulty of resource transfers and the degree of market commitment for Taiwan banks include the government, trade organizations, competitors and the customers. Before 1992, the government was the most important factor to affect the operation of the Taiwan's banks. After 2002, trade organizations (particularly the WTO) continue to determine the path taken by banking firms.

Taiwan's government maintains active involvement in the banking system yet there remains problems with the current accounting rules and the inability of local banks to readily comply with international accounting rules and financial laws. Given that many banks will be required to adapt to international law, there is pressing burden on local management and government talent. In addition to inexperienced management, the judicial system has problems as well since there are few judges that have financial training and can fairly litigate international banking laws and issues of receivership.

When any market is crowded with competitors, the best strategic approach to apply is that

of differentiation, to establish a niche that builds a competitive advantage against a few in the short term and in the long term can be leveraged against the major players. But in all cases, even entering into the niche market game is difficult and many small firms are often overtaken and consolidated. A common source of failure for Taiwan's small banks is the belief that they can act like a large banks and achieve sufficient economies of scale to provide consumers with full service banking. Affiliation with global credit card companies such as Master Card and American Express requires the payment of high fees and the delivery of services which many of Taiwan's small local banks cannot cover. Further, city banks have plentiful branches and more professional sales clerks. The end result is that there will be an inevitable hollowing out business with fewer and larger banks.

Another trend underway in Taiwan is the herd behavior to seek opportunities in China without resolving existing marketplace inadequacies and deficiencies. Several banks with nonconforming loans have sought to boost investor confidence by promising bigger returns and faster growth via the China market. Obviously, when a bank is ready to fail, creating excitement by moving to a difficult market with even less regulatory oversight poses a threat to the public confidence in banks.

4.1.3 Commitment Decisions

Commitment decisions (Johanson & Vahlne, 1977) depend on the decision alternatives chosen and carried out. There are different opportunities and threats in different markets. Companies must analyze market knowledge, market uncertainty, market commitment and investment risk in advance and then the companies can evaluate alternatives. Given Taiwan's history of government control of banks, investors that wanted to invest in or own a bank needed agreement from the Taiwan government. When banks were totally under government control, the banks were few and their profits were high. After 1992, the Taiwan government allowed new banks to be established by private and foreign institutions.

The cooperation with international banks can help to resolve the problem of NPLs. However, the problem with resolution of loans requires placing companies in receivership, a situation that creates a tense relationship between the judiciary, politicians, and investors. The steps that Taiwan has adopted to settle non-performing loans include the set up of an asset management corporation with a settlement fund of about NT\$ 1500 billion dollars (Lin, 2002). The asset management corporation will intervene if the banks' NPL ratio exceeds 5%. The government will then purchase the bank, resell the assets held as collateral, and work to raise the banks' capital ratio to over 8% in two years. This plan is called the "258 Financial

Improvement Plan." However, the government has been very slow to target banks with huge losses. Perhaps this is due to the falling prices of real estate and the falling capital reserves from businesses borrowing money to invest to China but leaving their debts Taiwan. The end result has been that the prosecution of companies that have defaulted on loans remains slow and difficult and ultimately leaves the risk and burden of faulty financial policy enforcement on the taxpayers.

Banks are taking action to resolve the NPL issue, even in light of the above mentioned problems. For instance, the First Commercial bank (Huang, 2002) held an auction to sell its non-performing commercial loans at a discount, most of which are real estate related. Another case concerns Citibank which auctioned off 20 real-estate properties with a market value of NT\$ 68 million, liquidated collateral from its non-performing loans, and realized a return of NT\$50 million (Huang, 2002).

Banks are also starting to consolidate since the global trend is toward fewer and bigger banks that offer professional services with international vision. Mergers are encouraged under the Financial Institution Merger Law promulgated on December 13, 2000. The first companies that announced plans to collaborate were the Farmers Cooperative Bank, and Chinfon Commercial Bank. Other mergers involve First bank, Pan Asia Bank and Dah An Bank.

4.1.4 Current Activities

A review of Taiwan bank web-sites (Appendix A) shows that most bank products and services target the consumer business, corporate business, trust accounts and investment. For instance, the China Development Financial Holding Corporation focuses on industrial and international business services. CitiBank offers consumer business services as well as international corporate business services. These banks have sufficient resources to be international banks. In contrast, low market share banks are attempting to define their market and are searching for target customers. For instance, the Taiwan Land Bank focuses on government employees and teachers' retirement funds and the Tai Shin Bank concentrates on the consumer market.

In conclusion the web sites show the following trends:

1. Most domestic banks focus on the local consumer and business market.
2. Few banks have an international orientation.
3. Most domestic banks such as Chinatrust Commercial Bank offer e-bank services.
4. Few web sites introduce the products and services offered by the banks.

5. The large banks have an international vision whereas the small banks target specific consumers.

The market trend is that more banks are cooperating with insurance companies and stock brokerage companies. There is also a trend where there are more financial holding companies being created such as the Chinatrust Financial Holding Company and the Chiao Tung Financial Holding Company. The objective of these companies is to offer various services and products to the consumer market.

Bank advertisements on TV, in magazines, and in newspapers are needed to build consumer confidence and loyalty. An example is Chinatrust Commercial Bank's emphasis on service and friendship with the slogan "We are family." E. Sun Commercial bank also emphasizes service and friendship and employs a smile symbol in their advertisements. Other banks focus on the offer of credit cards and others promote the "e-generation." Examples are the George & Mary Card of Cosmos bank and the Ube Card of Tai-shin International Bank. Specialty credit cards, such as the platinum credit card, are being used as a social status symbol. FuBon Bank began issuing the platinum card without charging a fee and many banks followed their lead. However, consumers that utilize the card do so more for travel related activities than for domestic transactions.

Few banks in Taiwan offer investment plans for retirement. Since most of the banks' advertisements focus on credit card and loan service, the impression given to the customer is somewhat negative. The best strategy for banks targeting the local market would be to position services which help the consumer save and increase their wealth instead of increase their debt or increase the foreign exchange debt.

4.1.5 Summary

The history of Taiwan's banking market can divide into three stages. Before 1992, most banks were public banks and controlled by the government. The C_i (market i commitment) and U_i (market i uncertainty) were low and R_i (Market i risk situation) $\leq R_i^*$ (Maximum tolerable market i risk). Furthermore, Taiwan banking market showed high profits. Many private companies wanted to establish banks not only for profit but to help their related business. As the new banking law was passed by the Legislature Yuan, many new banks were established after 1992. Because the C_i and U_i were midrange (market uncertainty low, commitment not total), R_i was almost equal to R_i^* . Thus, most of the new banks were established by large conglomerates or by foreign banks. For instance, the FuBon conglomerate established the FuBon bank to complement its insurance company and stock

broker company.

Furthermore, Taiwan became the WTO's member in 2002 and several financial holding companies were established since 2002. Therefore, the author chose 2002 to be the start year of the third analysis stage. After Taiwan became a member of WTO, the number of foreign banks in the Taiwan market began to increase. Likewise, Taiwan banks recognized the opportunities to set up operations in China. This situation changed the market drastically, where competition in the local market not only came from local banks but also from international banks. Since many banks have financial problems such as high non-performing loans and low profit, the C_i and U_i are now very high and $R_i > R_i^*$. Table 4-3 provides an analysis of the Taiwan banking market during the three stages.

Table 4-3. The analysis for Taiwan banking market according to Johanson's model.

Factors Years	Market Knowledge	Market Commitment	Commitment Decisions	Activity
Before 1992	Low	Low	Restrained by government	Restrained by government
1992-2002	Medium	Medium	Directed by government or conglomerate	Direct investment
After 2002	High	High	Decreasing NPL ratios	Public auction Bank mergers Establishment of financial holding companies

Note. Compiled by the authors.

There are new opportunities for Taiwan banks now that Taiwan has become a member of the WTO. However, there are numerous competitors, an economic slow down, high non-performing loans, and other risks for local companies. Considering these prevailing market factors, the market strategies for Taiwan banks are derived as follow:

1. Encourage mergers among complementary banks to increase market share and economic scale.
2. The larger fiscally sound banks should begin to internationalize operations after considering the market, their commitment, and risk tolerance.
3. All banks should pay attention to service processes, and increase business process quality and efficiency to increase competitiveness.
4. Smaller banks must adopt a differentiation and positioning strategy (product differentiation, services differentiation, personnel differentiation, channel differentiation, and image differentiation).
5. Banks in Taiwan must re-position advertisements to consumers and spread the message that banks are working to increase their investor's wealth.
6. All banks must decrease non-performing loans to an international level.

7. Increase service offerings and contact points for customers including call centers.
8. Invest in research to create innovate new product and services to attract consumers.
9. Hire managers and employees with an international vision and commitment to service.
10. Invest in business process automation.

According to the Johanson's model, the current internationalization process of Taiwan banking industry is summarized as Figure 4-2. Because the model is dynamic, the firms must continue to correct and adapt their activities. The key point is that the consumer and corporate market can become saturated quickly when there are opportunities. However, a local bank can change their market scope and vision from a local provincial view to a worldwide international view by hiring the right people to change the business culture. Since the international financial knowledge and experience are very important, local banks will have to hire international managers and employees or cooperate with foreign banks to make their companies internationalization quickly.

Therefore, the current market knowledge of Taiwan banks includes knowledge of a high NPL ratio, government involvement, numerous competitors, few banks with economic scale, a lack of international managers, a lack of international business experience, consumer market and corporate market saturation, a lack of advanced computer devices such as ATM and on-line financial services. The financial ministry institution must pass laws to create a healthy and fair financial environment Therefore, the current market commitments of Taiwan banks is to increase understanding of the local market and to hire international financial employees or cooperate with foreign banks. The China market commitments of Taiwan banks are to hire local financial employees to understand China's financial laws and government regulations, and hire international financial employees or cooperate with foreign banks. The commitment degree of Taiwan banks to the Taiwan market is high but to the market in China is low.

Based on the results of a market knowledge analysis and market commitment, the commitment decisions of Taiwan banks appear to include bank mergers, cooperation with foreign banks, acquisition of other banks, hiring international managers or employees, increasing economic effect and decreasing uncertainty effect, public auctions, international marketing strategy development, and creating a bank's international brand. Therefore, the current activities of Taiwan banks include two aspects: the bank's experience and the market experience. The experience of Taiwan banks includes hiring managers or employees with international financial experience, adopting an internationalization marketing strategy, public auction for non-performing loans, expanding market share, and paying attention to economic scale. The market experience of Taiwan banks includes understanding the demand of the

consumers, offering new financial products, offering international products and services, choosing the target market, and deciding market strategy.

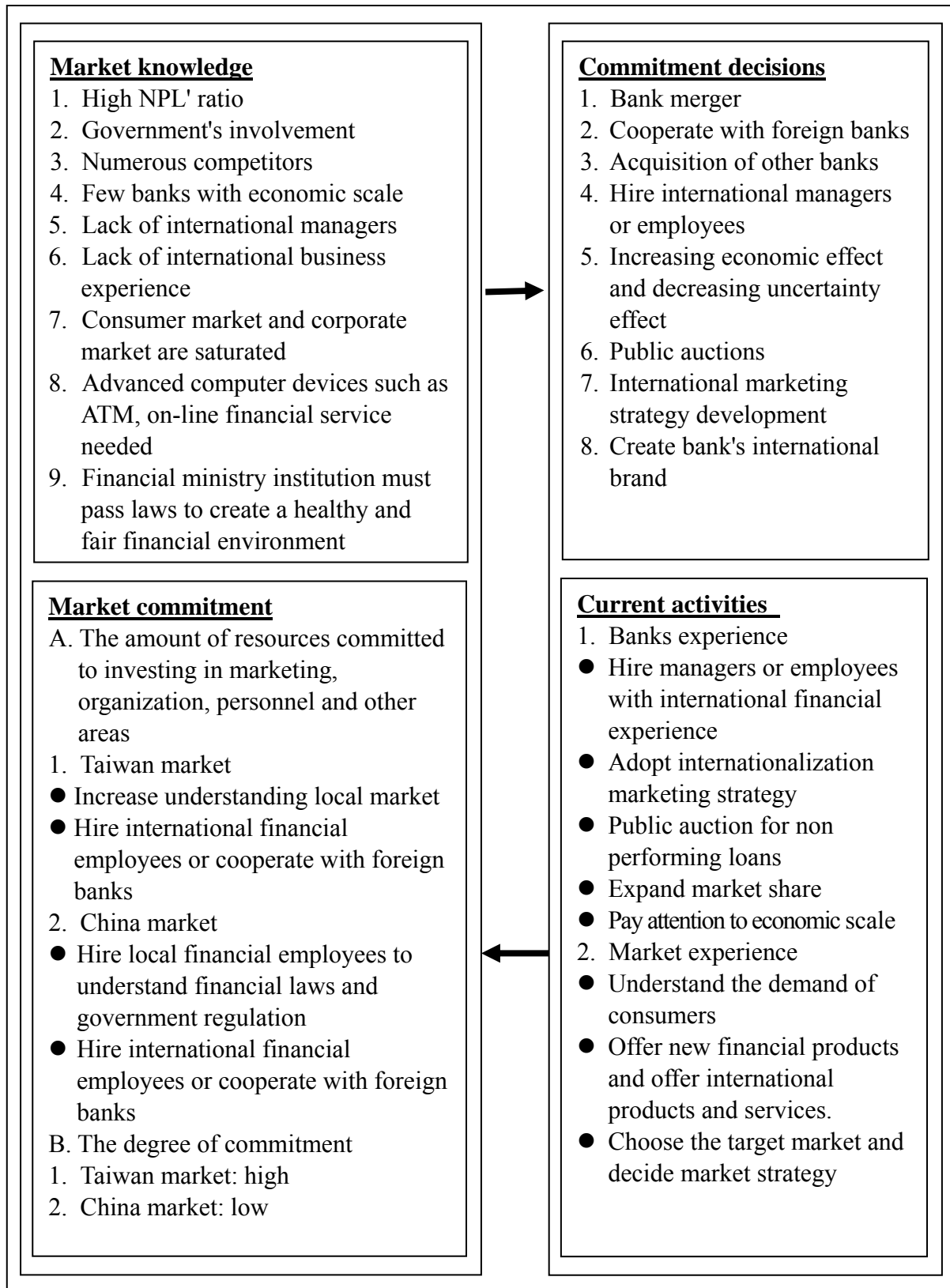


Figure 4-2 Internationalization of the Taiwan banking market

4.2 Sensitivity Analysis for Revised International Investment Model

In the revised international investment model, the PR_j values differ according to risk attitude. Risk wary investors would assign lower PR_j values to assess the market investment decisions and increase their chances of obtaining stable profits in high-risk markets. Meanwhile, investors with a high risk tolerance would assign higher PR_j values and expect higher investment profits in high-risk markets. Notably, although the P_{ij} and $Outome_{ij}$ values are similar within single markets, investment decisions vary owing to differences in risk attitude among firms. Furthermore, facing the same market, the investment decision would be changed accordingly if firms possess the different $Cost_j$ value or investment scale. Hence, based on the subjective risk attitude, the research lists two examples to demonstrate the sensitivity analysis of P_{ij} and $Cost_j$ variables, and various investment decisions based on the revised international investment decision model.

4.2.1 Performing the Sensitivity Analysis of PR_j values given fixed P_{ij} , $Outome_{ij}$, and $Cost_j$ values.

According to the discussion in the literature review, the degree of market risk could be measured using the variation in expected outcomes. The market investment risk increased with variation of $Outome_{ij}$. The following example assumes that firms invest in two markets. The values of P_{ij} , $Outome_{ij}$, and $Cost_j$ of market 1 (high risk market) and market 2 (low risk market) are listed and calculated as follows.

Market 1: The two different values of P_{ij} and $Outome_{ij}$ for market 1 are (0.3, NT\$ 800,000) and (0.7, NT \$ -250,000). $Cost_j$ is NT \$ 25,000. These data can be used to calculate ER_j as NT\$65,000. Meanwhile, $Variance_j$ is 2.315E+11.

Market 2: The two different values of P_{ij} and $Outome_{ij}$ of market 2 are (0.7, NT\$ 80,000) and (0.3, NT\$ -10,000). $Cost_j$ is NT\$ 25,000. These data can be used to calculate ER_j as \$53,000. $Variance_j$ is 1.70E+09.

Under restrictions of cost, this study performs risk assessment and decision making for two markets. Based on the above assumptions, the values of ER_j and $Variance_j$ for market 1 exceed those for market 2. Thus, based on risk theory, market 1 has a higher risk than market 2. In example 1, the two firms individually assess markets 1 and 2 using various subjective identities. Namely, when the values of PR_j range from 0.1 to 0.9, firms could analyze the sensitivity of the revised investment decision model. From Tables 4-4 and 4-5, for the same market, the lower the given PR_j values, the higher the firm's risk wary degree. Meanwhile, firm's risk favorite degree and expected profit ratio increase with increasing PR_j value.

Furthermore, Figure 4-3 shows that the market has no investment values when profit ratio is below zero (see the dotted line in Figure 4-3. Namely, when the PR_j value exceeds 0.384 (profit ratio equals zero), market 1 possesses the investment value. Similarly, when the PR_j value exceeds 0.471, market 2 possesses investment value. Under the same hypothetical investment costs as in example 1, market 1 has higher risk than market 2. To obtain higher investment profit ratio for firms, the investment value of market 1 exceeds that of market 2 based on the same risk attitude.

Table 4-4 Market 1's sensitivity analysis between PR_j and Profit Ratio.

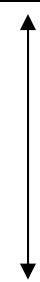
Market 1	PR_j	Profit Ratio _i = $(PR_j * ER_j - Cost_i) / Cost_i$	Firm's risk attitude
	0.1	$(0.1 * 65,000 - 25,000) / 25,000 = -0.74$	 Risk wary
	0.2	-0.48	
	0.3	-0.22	
	0.4	0.04	
	0.5	0.30	
	0.6	0.56	
	0.7	0.82	
	0.8	1.08	
	0.9	1.34	

Table 4-5 Market 2's sensitivity analysis between PR_j and Profit Ratio.

Market 2	PR_j	Profit Ratio _i = $(PR_j * ER_j - Cost_i) / Cost_i$	Firm's risk attitude
	0.1	$(0.1 * 53,000 - 25,000) / 25,000 = -0.79$	 Risk wary
	0.2	-0.58	
	0.3	-0.36	
	0.4	-0.15	
	0.5	0.06	
	0.6	0.27	
	0.7	0.48	
	0.8	0.70	
	0.9	0.91	

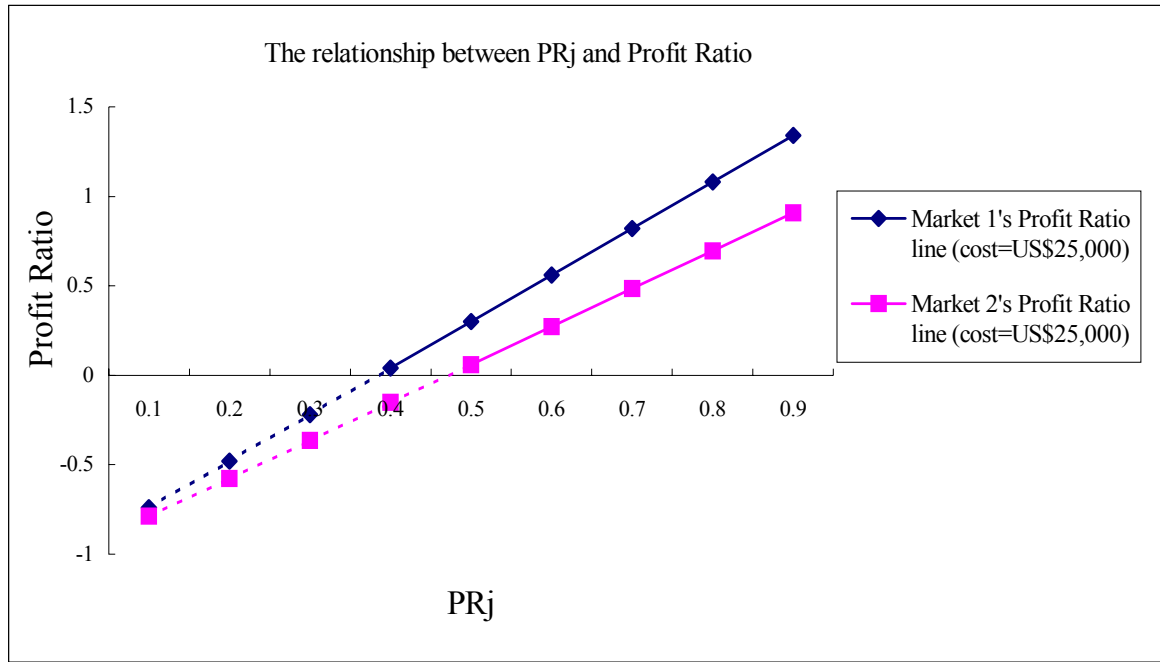


Figure 4-3 The relationship between PR_j and Profit Ratio

4.2.2 Performing the Sensitivity Analysis of $Cost_j$ Values given Fixed P_{ij} , $Outcome_{ij}$, and PR_j Values.

Market 1: The two different values of P_{ij} and $Outcome_{ij}$ in market 1 are (0.3, NT\$ 800,000) and (0.7, NT\$ -250,000).

Market 2: The two different values of P_{ij} and $Outcome_{ij}$ in market 2 are (0.7, NT\$ 80,000) and (0.3, NT\$ -10,000).

From example 1, market 1 has higher investment value than market 2 under restricted values of PR_j and $Cost_j$. However, given variation in the cost variable, the final decision may differ even if the values of P_{ij} , $Outcome_{ij}$ and PR_j are the same. The following example assumed that the value of the investment cost variable ranges from NT\$25,000 to NT\$50,000. The interval value is NT\$5000. There are six situations in which profit ratios are calculated accordingly. Tables 4-6 and 4-7 indicate that the profit ratio decreases with increasing investment cost. Given high investment cost, the degree of firm tolerance for risk must be sufficiently high to let them choose to invest in a low profit ratio market.

Comparing the results of the profit ratio lines of market 1 based on six cost values. The profit ratio line of Market 2 is set when the restricted cost is NT\$25,000. Investor risk attitudes are assumed to be the same in all scenarios. If the investment cost of market 1 is below NT\$30,000, then the investors would invest in market 1, otherwise the investors would invest in market 2 (investment cost is NT\$25,000).

Table 4-6 Market 1's sensitivity analysis of Cost_j and Profit Ratio given various PR_j and Cost_j values.

		Cost _j unit : NT\$ dollars						
Market 1 Profit Ratio	PR _j	25,000	30,000	35,000	40,000	45,000	50,000	Firm's risk attitude
	0.1	-0.74	-0.78	-0.81	-0.84	-0.86	-0.87	↑ Risk wary ↓ Risk lover
	0.2	-0.48	-0.57	-0.63	-0.68	-0.71	-0.74	
	0.3	-0.22	-0.35	-0.44	-0.51	-0.57	-0.61	
	0.4	0.04	-0.13	-0.26	-0.35	-0.42	-0.48	
	0.5	0.3	0.08	-0.07	-0.19	-0.28	-0.35	
	0.6	0.56	0.30	0.11	-0.03	-0.13	-0.22	
	0.7	0.82	0.52	0.30	0.14	0.01	-0.09	
	0.8	1.08	0.73	0.49	0.30	0.16	0.04	
	0.9	1.34	0.95	0.67	0.46	0.30	0.17	

Note: The color parts express the spread range about the value of PR_j and Cost_j that firm's could invest.

Table 4-7 Market 2's sensitivity analysis of Cost_j and Profit Ratio given various PR_j and Cost_j values.

		Cost _j unit : NT\$ dollars						
Market 2 Profit Ratio	PR _j	25,000	30,000	35,000	40,000	45,000	50,000	Firm's risk attitude
	0.1	-0.79	-0.82	-0.85	-0.87	-0.88	-0.89	↑ Risk wary ↓ Risk lover
	0.2	-0.58	-0.65	-0.70	-0.74	-0.76	-0.79	
	0.3	-0.36	-0.47	-0.55	-0.60	-0.65	-0.68	
	0.4	-0.15	-0.29	-0.39	-0.47	-0.53	-0.58	
	0.5	0.06	-0.12	-0.24	-0.34	-0.41	-0.47	
	0.6	0.27	0.06	-0.09	-0.21	-0.29	-0.36	
	0.7	0.48	0.24	0.06	-0.07	-0.18	-0.26	
	0.8	0.70	0.41	0.21	0.06	-0.06	-0.15	
	0.9	0.91	0.59	0.36	0.19	0.06	-0.05	

Note: The color parts express the spread range about the value of PR_j and Cost_j that firm's could invest.

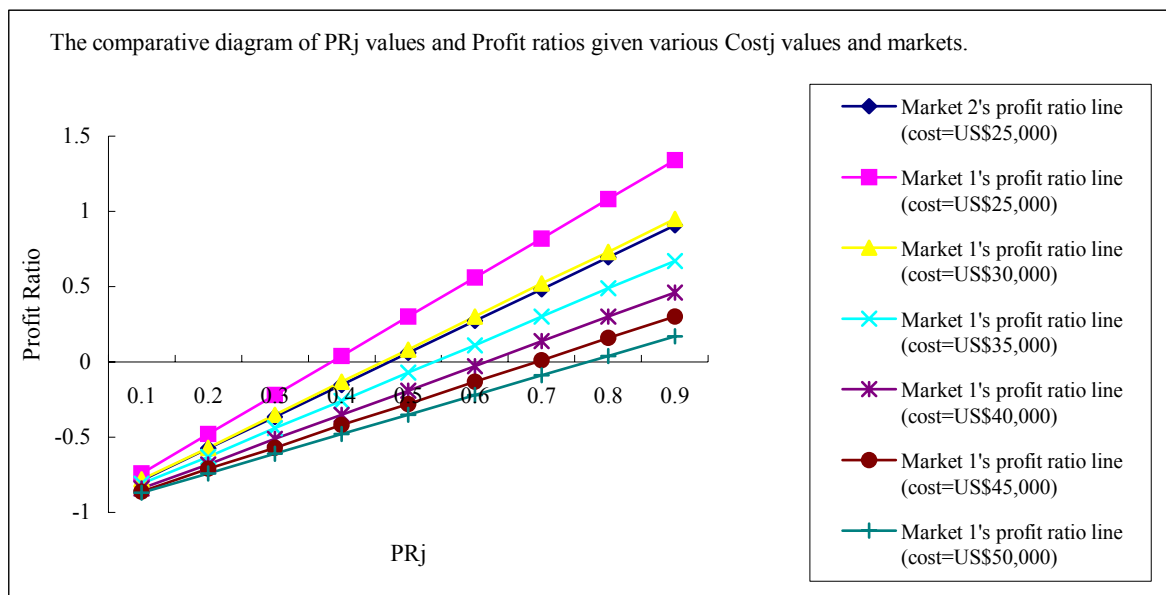


Figure 4-4 The comparative diagram of PR_j values and Profit Ratio given various Cost_j values and markets.

Therefore, in example 1, the sensitivity analysis results of the PR_j value could exhibit the following phenomena. First, when the PR_j value is reduced to 0.1, the reduced profit ratio of market 1 is 0.26 and the reduced profit ratio of market 2 is 0.212 (see the comparative results in Tables 4-6 and 4-7). Furthermore, when $Cost_j$ value is increased by NT\$5,000 each time, the decrease range of the profit ratio of market 1 rises with the PR_j value. For example, when the PR_j value of market 1 is 0.1, the range of the profit ratio reduces from 0.04 (the $Cost_j$ value is from NT\$25,000 to NT\$30,000) to 0.01 (the $Cost_j$ value is from NT\$45,000 to NT\$50,000). Moreover, when the PR_j value of the market 1 is 0.9, the range of reduction of the profit ratio is from 0.39 (with an increase in $Cost_j$ value from NT\$25,000 to NT\$30,000) to 0.13 (the $Cost_j$ increase from NT\$45,000 to NT\$50,000). The data distribution of market 2 is the same as that of market 1 (See table 4-7). Namely, The influence degree of $Cost_j$ on the profit ratio increases with the PR_j value.

Consequently, the analytical result can demonstrate that the PR_j and $Cost_j$ both influence the optimal solution of the revised international investment decision model. Moreover, the sensitivity degree of PR_j exceeds that of $Cost_j$. The conclusion shows that increased investment cost influences the optimal international investment decision. However, the influence degree of investor's risk attitudes on the optimal solution exceeds the increase in the investment cost. Furthermore, the examples also demonstrate that the influence degree of the $Cost_j$ variable on the optimal investment decision decreases with increasing market risk. For instance, owing to the ER_j value of market 1 is higher than that of market 2, market 1 has a higher profit ratio than market 2. Along with the increase in $Cost_j$, if the PR_j value is high enough to allow the calculated profit ratio to exceed zero, it is still worthwhile to invest in market 1. The ER_j value of market 2 is lower than that of market 1. Therefore, the increased investment cost of market 2 is easily exceeds firm tolerance degree and the computed profit ratio is allowed to be below zero. At that time, despite the PR_j value being 0.9, the firm still will not invest in market 2.

In the internationalization process model, Johanson and Vahlne indicated that reducing market uncertainty or market commitment would help firms reduce investment costs and increase international investment aspirations. However, sensitivity analysis of the revised international investment decision model indicated that firm risk attitude exerted the most significant influence on investment decision. That is, if the risk tolerance degree R_i^* is sufficiently high to let $R_i \leq R_i^*$, then the probability of firms making a positive international investment was increased.

In conclusion, regarding examples 1 and 2, the PR_j and $Cost_j$ both significantly influence

the investment decisions. Moreover, PR_j is more influential than $Cost_j$. The analytical results could demonstrate that most decision-making depends on the risk attitude of firms. However, besides risk attitude, differences in market information, market risk or market uncertainty deriving from various markets also handles the estimates of prior probabilities, expected revenue and investment costs of firms. Therefore, if firms cannot accurately forecast market variations, and make investment decisions depending simply on their own risk attitude, then forecast error and profit loss will constantly occur. That is, facing changeable international markets, accurately forecasting market information, market uncertainty and market risk, making realistic revenue and expenditure forecasts, and the risk attitude and international experiences of firms are all important influences on the final investment result.

4.2.3 Summary

Firms with large scale and scope will establish risk management and investment decision departments to help in making decisions. However, these two departments are generally overseen by different administration directors. These two departments thus generally report the evaluation results separately. Whether the final decision maker considers the two evaluation reports together or not is unknown. Moreover, the result of the sensitivity analysis of the revised international investment decision model indicated that the risk attitude of firms has a higher degree of influence than the investment cost. Consequently, the risk attitude of the final decision maker would actually handle the international investment decision. It is important for firms to avoid the influence of subjective risk attitude and adopt objective risk evaluation and market information for making perfect international investment decision. Firms can establish their own risk management systems based on their risk considerations, weighing factors and international experiences, and may combine these systems with decision support systems based on information from various markets, enabling them to establish their own accurate international investment decision system.

4.3 Case Study

To confirm the revised international investment decision model, interviews were conducted with two international financial holding company managers. The interviews are used to confirm the revised international investment decision model and to derive actual values for the investment decision tables.

Furthermore, Basel II Accord will be implemented in Taiwan at the end of 2006. In order to help banks adopt the new rules of Basel II and boost their risk management capability, the Financial Supervisory Commission and the Bankers Association set up joint research

taskforce to study the rules and propose action plans for promoting compliance. Taiwan's government hopes that in the process of promotion, banks will face fewer obstacles in implementing the Accord through experience sharing while supervisor-bank collaboration mechanism is established (Bureau of Monetary Affairs, 2004).

The current objective of Taiwan government is to build worldwide financial institutions for investment and develop large scale and internationally recognized firms across all economic sectors (Trappey and Shih, 2003). The investment decision-making processes of Taiwan's financial institutions are frequently managed by the risk management department, the investment decision department, and then approved by the chiefs of financial holding companies. Therefore, even though the market information and market knowledge comes from the internal sources, the different risk attitudes and market experiences of the chiefs heavily influence final decisions. To confirm the revised international investment decision model, interviews were conducted with two international financial holding company managers. The interviews are used to confirm the revised international investment decision model and to derive actual values for the investment decision tables.

4.3.1. Financial Holding Company A

Financial Holding Company A promotes the business philosophy of "Trustworthiness, Sincerity, Professionalism and Innovativeness," and continuously upgrades its services with new products. Financial Holding Company A (FHC A) is a conglomerate that includes insurance, commercial banking, securities, asset management, venture capital, land and property management, construction, leisure and entertainment services, charitable foundations, art foundations, futures, bills finance, and investment services.

To confirm the revised model, the authors interviewed the vice president and director of the group risk management office at FHC A. The authors summarized his views regarding the Taiwan banking market and revised the model according to his suggestions. First, the products and services of Taiwan banks differ depending on the operating objectives. For example, the products and services of commercial banks include deposits and credit. Investment banks are currently seeking opportunities to invest in industry or business and this strategy entails a high probability of losses. Moreover, industrial banks target industrial customers but are suffering from a declining number of customers and are exploring alternative methods of raising capital. FHC A was originally an insurance company and maintains a risk wary investment attitude. Market knowledge and market information used for risk analysis is often purchased from professional research and consulting organizations. The company ranks the investment

risk of various countries from high degree to low degree as follows: Indonesia, Malaysia, Chinese, Vietnam and Hong Kong, Thailand, Singapore, Taiwan and America. FHC A has established a risk management department to help the company evaluate investment projects. Although there are numerous risk factors that can be considered, this research focuses on the critical risk factors chose by experienced investment bankers (Wang, 2003). The head of FHC A's risk management department indicated that the risk factors considered for their investment projects include country risk, industry risk, product life cycle risk, and operation risk. Concerning Basel II, the vice president is a member of the joint research taskforce in Taiwan. He believes that Basel II will strengthen Taiwan's financial operating environment by enabling financial institutions to perform more prudent risk evaluations and simultaneously reduce the risk of financial crisis. FHC A has incorporated Basel II process into their risk management system. FHC A has built an electronic risk management system to help evaluate market risk and investment risk. However, the final investment decision depends on the chief of FHC A. Whether to investment in a project or not depends on the estimated loss rate. Therefore, regarding the PR_j in the revised model, the manager suggested that the value be changed to $1 - Loss_j$. The other variables stay the same as proposed in Section 4.2. According to the vice president's opinions, the revised model should be stated as:

$$\text{Maximize} \quad \pi = \sum_{j=1}^n [ER_j * (1 - Loss_j) - Cost_j] * Iv_j$$

Subject to

$$\sum_{j=1}^n (Cost_j * Iv_j) \leq Cost_F$$

$$Iv_j = (0, 1)$$

$$ER_j \geq 0$$

$$0 \leq Loss_j \leq 1$$

$$j = 1, 2, 3, \dots, n$$

Where:

ER_j = the expected value of total revenue under j market condition.

$Loss_j$ = the probability of ER_j loss under j market.

$Loss_j = W_1 * \text{Country risk} + W_2 * \text{Industry risk} + W_3 * \text{Product life cycle risk} + W_4 * \text{Operation risk}$; where W_v = Weight value on various risk variables. $0 \leq W_v \leq 1$,

$$\sum_v W_v = 1$$

Next, the authors listed five countries and invited the department head to estimate the different values of $1-\text{Loss}_j$, ER_j , and Cost_j . Therefore, the authors completed Table 4-8 based on FHC A's investment plans and the recommendations from the vice president. In Table 4-9, the results generated using Lingo and Excel software are shown. Given the risk wary attitude of FHC A, there is a higher loss rate for various markets. In this example, owing to the established business operation guidelines, international competitive pressure, and lack of American market experience, FHC A assigns a lower loss rate for the USA and has not invested in this market. Although FHC A reports a higher potential loss rate for China and Hong Kong, given the cultural advantages, language advantages, and higher ER_j makes these two markets good targets for investment. Finally, the department head indicated a growing willingness to hire foreign employees to strengthen the international operating experience or to cooperate with foreign financial institutions. This strategy will assist FHC A to invest money in foreign markets with different cultural countries.

Table 4-8 Financial Holdings Company A's application of the revised investment decision model
Unit: NT\$ Thousand dollars

The Investment Plans	Market No. $j=5$	$1-\text{Loss}_j$	ER_j	Cost_j	$\text{Profit}_j = ER_j * (1-\text{Loss}_j) - \text{Cost}_j$
1	Indonesia	0.3	500,000	250,000	$500,000 * 0.3 - 250,000 = -100,000$
2	China	0.4	850,000	330,000	$850,000 * 0.4 - 330,000 = 10,000$
3	Hong Kong	0.5	1,000,000	448,226	$1,000,000 * 0.5 - 448,226 = 51,774$
4	USA	0.7	450,000	320,000	$450,000 * 0.7 - 320,000 = -5,000$
5	Taiwan	0.9	400,000	300,444	$400,000 * 0.9 - 300,444 = 59,556$

Note. data collected from Financial Holding Company A's 2002 year book and interviews with the vice president of risk management.

Table 4-9 Optimal solutions for FHC A's example using Lingo and Excel software
Unit: NT\$ Thousand dollars

The Investment Plans	$\text{Cost}_{F1} = 800,000$				$\text{Cost}_{F2} = 1,200,000$			
	Market No. $j=5$	Iv_j	Max π	Total cost	Market no. $j=5$	Iv_j	Max π	Total cost
1	Indonesia	0			Indonesia	0		
2	China	0			China	1		
3	Hong Kong	1	111,330	748,670	Hong Kong	1	121,330	1,078,670
4	USA	0			USA	0		
5	Taiwan	1			Taiwan	1		

Note. investment in a market when $Iv_j=1$ or withdraw from a market when $Iv_j=0$. The Max π and total costs were computed using the value of Iv_j , Cost_j , and profit_j .

4.3.2. Financial Holding Company B

With the goal to become a leading financial holding company for overseas Chinese communities, Financial Holding Company B (FHC B) strives to be an upright and trust worthy financial institution and to provide one stop financial services for customers. The company is approved by the Ministry of Finance for investment banking, bills financing, credit cards, trusts, insurance, securities, futures, venture capital, and investments in overseas financial institutions. An interview was conducted with the administrative and financial manager of FHC B's venture capital corporation. In addition to providing the risk attitude and investment decision model of FHC B, the manager described the investment strategy of the venture capital industry. FHC B maintains a neutral attitude towards risk and consults with the risk management department for most investment decisions. The venture capital company focuses on the future profit potential of the target investment as well as the changes in its stock prices. Regarding Basel II, the manager expressed that the banking subsidiary of FHC B has become a member of the joint research taskforce, and as such has incorporated the Basel II system to enhance their risk management system and strengthen their operating constitution. Although the venture capital corporation is not directly involved in the Basel II's implementation process, the guidelines underline their decisions. On the whole, the chief of FHC B's venture capital corporation authorizes project managers to make investment decisions. Therefore, the risk attitudes and professional experience of project managers greatly influences the final investment results. The variables considered for international investment decisions by FHC B's venture capital corporation include country risk, industry risk, technology risk, company leader risk and financial risk. Based on these variables, weights are assigned and the risk value is calculated. Finally, according to the risk evaluation result and the return rate of project, the manager decides whether or not to invest in the project. Therefore, based on the suggestion of the manager (Kuo, 2003), FHC B's investment decision model was corrected as follows:

$$\text{Maximize Return Rate} = \sum_{j=1}^n (\text{Return Rate}_j * \text{Discount}_j) * Iv_j$$

Subject to

$$\sum_{j=1}^n (\text{Cost}_j * Iv_j) \leq \text{Cost}_F$$

$$Iv_j = (0, 1)$$

$$\text{Return Rate}_j = \frac{(\text{ER}_j - \text{Cost}_j)}{\text{Cost}_j}$$

$$\text{Return Rate}_j > 0\%$$

$$0 \leq \text{Discount}_j \leq 1$$

$$j = 1, 2, 3, \dots, n$$

Where:

return rate = the expected return rate of total investment.

return rate_j = the expected return rate of investment under j market condition.

Discount_j = the different discount of return rate under return rate_j condition.

Discount_j = W₁ * Country risk + W₂ * Industry risk + W₃ * Technology risk + W₄ * Company leader risk + W₅ * Financial risk; where W_v = Weight value on various risk variables. $0 \leq W_v \leq 1, \sum_v w_v = 1$

For FHC B's model, the Discount variable is similar to the 1-Loss_j variable used by FHC A. For example, if Loss_j equals to 0.3, then the Discount_j is 0.7. Therefore, the higher the value of Discount_j, the higher the estimated return rate. The authors listed the same five countries used for FHC A's interview and invited the financial manager to estimate the values for Discount_j, ER_j, and Cost_j. Given to the value of ER_j and Cost_j, the return rate_j is calculated. Therefore, given the revised model and investment data from FHC B's manager and annual yearbook, Table 4-10 was constructed. Following a risk neutral investment strategy and assuming sufficient market knowledge, FHC B adopts a higher discount rate (lower loss rate) than FHC A to evaluate their investment projects. Table 4-11 shows the investment decision of FHC B using two different Cost_F restrictions.

In this interview, FHC B gives the China market a lower Discount_j and has not invested in the market. The reason given is that the Taiwan government hasn't completed the investment law to let native financial institutions enter the China market. Therefore, FHC B would follow the law and want to invest in the China market. However, they have a high willingness to enter the China market after the investment laws are revised. Possessing extensive

international experience and operating many foreign branches, FHC B holds a positive attitude toward international investment. However, FHC B's guidelines are restricted operations as a global Chinese financial institution. Since most of their foreign branches currently target overseas Taiwanese and Chinese, expanding the market base to include new cultures will help FHC B become a global financial institution.

Table 4-10 Financial Holdings Company B's application of the revised investment decision model

Unit: NT\$ Thousand dollars

The Investment Plans	Market No. $j=5$	Discount $_j$	ER $_j$	Cost $_j$	return rate $_j = [(ER_j - Cost_j)/Cost_j]*Discount_j$
1	Indonesia	0.7	2,200,000	1,691,023	$[(3,000,000-1691023)/1691023]*0.6 \doteq 0.21$
2	China	0.5	200,000	150,000	$[(350,000-150,000)/150,000]*0.5 \doteq 0.17$
3	Hong Kong	0.7	260,000	200,000	$[(360,000-200,000)/200,000]*0.7 \doteq 0.21$
4	USA	0.8	1,100,000	889,020	$[(1,500,000-889,020)/889,020]*0.8 \doteq 0.19$
5	Taiwan	0.9	155,000	120,000	$[(180,000-120,000)/120,000]*0.9 \doteq 0.26$

Note. data are from the Financial Holding Company B's 2002 year book and interviews with the manager of the venture capital corporation.

Table 4-11 Optimal solutions for FHC B's example using Lingo and Excel software

Unit: NT\$ Thousand dollars

The Investment Plans	Cost $_F 1 = 3,000,000$				Cost $_F 2 = 4,000,000$			
	Market No. $j = 5$	Iv $_j$	Max Return Rate	Total cost	Market No. $j = 5$	Iv $_j$	Max Return Rate	Total Cost
1	Indonesia	1			Indonesia	1		
2	China	0			China	1		
3	Hong Kong	1	0.873	2,900,043	Hong Kong	1	1.0397	3,050,043
4	USA	1			USA	1		
5	Taiwan	1			Taiwan	1		

Note. invest in a market when Iv $_j = 1$ and withdraw from a market when Iv $_j = 0$. The maximum return rate and total cost were computed using values for Iv $_j$, Cost $_j$, and the projected return rate $_j$.

5. Discussion and Conclusion

The banking industry belongs to service industry and services have four characteristics that affect the design of marketing programs: intangibility, inseparability, variability, and perish ability (Kolter, 2001). Following a service marketing strategy, service providers should focus on people, physical evidence, and process (Booms and Bitner 1981). Most of China's banks that have high NPLs also lack service quality. In order to expand the market share in China, Taiwan's banks need to pattern their business processes according to international standards, offer customer centric service quality, and provide technology based services such as ATMs, Internet services, and phone services. In addition to cultural similarities, China's market offers Taiwan's banks very unique opportunities due to the large flow of investment and business development underway.

Taiwan banks cannot avoid the transformation from being local to acting global. However, becoming an international firm is not easy, especially when the firm decides to enter a foreign market. This requires collecting the right information to support decisions and strategies. Furthermore, in order to compete with worldwide banks, the government will have to solve local issues, so that Taiwan banks will have international status and credibility. Taiwan should immediately build a worldwide bank like the HSBC bank in Hong Kong. HSBC offers personal services, business services, corporate services and institutional services. The bank became a worldwide bank after many mergers and cooperation with foreign financial institutions. The end result of Taiwan producing worldwide banks will be a greater flow of capital for investment and development of large scale and internationally recognized Taiwan firms across all economic sectors.

Furthermore, the internationalization process model is dynamic. Firms must continuously to correct their decision and strategy under market risk variation. The revised international investment decision model is also dynamic, and considers the risk factors and quantifies investment targets to help the firms to execute their international strategy and adjustment based on the market variation. For simplify the model, the research abbreviate the time analysis and restrict the variables' values by performing the sensitivity analysis of revised international decision model and got some findings. The risk attitude factor and investment cost factor both with influence degree to decision-making.

Internationalization involves many challenges and most companies have difficulties deciding how to execute their internationalization strategies. Numerous models have been designed for managers to efficiently and accurately assess their investments or projects.

However, owing to shortcomings such as operating complexity or the demand for instant response, most managers simply select the method they are accustomed to for quicker decision-making. Some managers expressed dissatisfaction with traditional net present value (NPV) or discounted cash flow (DCF) techniques (Moyen, Slade, and Uppal, 1996). For example, the cash flow must be forecast over the expected time of the future profits, taxation policy, exchange rates, and political climate. The appropriate risk-adjusted discount factor must be obtained and most firms seldom change the discount rate to match the increased risk. In spite of these shortcomings, using a firm's characteristics to establish a specific risk evaluation system is important for building a profitable investment strategy. In our research, the authors transform the risk viewpoint to the probability of profit which decreases with increasing risk values. The revised international investment decision model helps companies develop and adjust their international strategy based on risk attitudes and financial variables commonly used by financial holding companies.

Table 5-1 compares Johanson and Vahlne's model with the revised international investment decision model. The management implications and future directions of the revised international investment decision model follow. First, the authors choose PR_j , $Cost_j$, ER_j ($Outcome_{ij}$, P_{ij}), $Cost_F$, Iv_j , $1-Loss_j$, $Discount_j$ to be the parameters used in the models. By transforming the international process model (Johanson and Vahlne, 1977; 1990) into an integer programming model, the spirit of risk related models (March and Shapira, 1987; Sarin and Weber, 1993) and respondents' opinions were included. For example, the risk attitude of investors can be changed to model investment experiences. Although the meaning of PR_j , $1-Loss_j$ and $Discount_j$ are similar, these parameters are decided by investors under different risk considerations. The case study showed that the estimated values of $1-Loss_j$ and $Discount_j$ for the same markets from two different firms were quite different. Owing to market uncertainty, the accidental enlarging of investment costs or the misestimate of sales volumes and product prices often occur, hence, the values of $Cost_j$ and ER_j are not certain and better estimation procedures are needed. In conclusion, the revised investment decision model is dynamic, supports Johanson and Vahlne's viewpoint, and provides a new quantitative approach for firms. Based on custom-made models, the firms are involved in formulation of models for their investment decisions.

Second, risk factors are numerous and accurate evaluation challenges the best managers. Most risk factors are related to market uncertainty, lack of market knowledge and lack of investment experience. With the rise of the Internet, information gathering methods have changed. Investors are better enabled to collect the market information, to become familiar

with the market and evaluate market risk. Kurtzman, Yago and Phumiwasana (2004) indicate that without transparency in a countries' legal, economic, regulatory and governance, global investment and commerce is hindered. Hence, the transparency of information and trustworthiness in a country or market influences the risk evaluation of investors. Emerging markets welcome investors to boost the development of their countries. The prerequisite for attracting investors to a market is to increase the transparency of the market information. By building better market information databases, providing market databases over the Internet, and decreasing political risk, will facilitate international investment decision-making for investors.

Finally, the authors invited the respondents to express their opinions and operating guidelines. Therefore, the model parameters reflect the respondents' opinions. Future research directions should enlarge the model and build in functions for risk attitude, risk factors, and cost parameters. Future research should verify the model for other industries to aid their international investment decision process.

Table 5-1 Comparison of Johanson and Vahlne's model to the revised international investment decision model.

	Mathematic equation	Strategies	Decision
Johanson and Vahle model	$R_i \leq R_i^*$	None	Invest
	$R_i > R_i^*$	Fixed U_i , if C_i could be decreased, let $R_i \leq R_i^*$	Invest
		Fixed C_i , if U_i could be decreased, let $R_i \leq R_i^*$	Invest
		If both U_i and C_i could be decreased, let $R_i \leq R_i^*$	Invest
	None	Withdraw	
The international investment decision model	$PR_j * ER_j \geq Cost_j$	None	Invest
	$PR_j * ER_j < Cost_j$	Fixed ER_j , if PR_j could be increased, let $PR_j * ER_j \geq Cost_j$	Invest
		Fixed P_j , if ER_j could be increased, let $PR_j * ER_j \geq Cost_j$	Invest
		If both P_j and ER_j could be increased, let $PR_j * ER_j \geq Cost_j$	Invest
		If $Cost_j$ could be decreased, let $PR_j * ER_j \geq Cost_j$	Invest
		None	Withdraw
The sum of $Cost_j$ must be restricted to less than $Cost_F$			

6. Research Limitation and Future Research

This study develops an international investment decision model. However, numerous internationalization variables are considered in this model. For instance, general environmental uncertainty refers to those variables that are consistent across all industries within a given country (Brouthers, 1995). This factor includes such variables as political risk, government policy uncertainty, economic uncertainty, social uncertainty, and natural uncertainty. Additionally, Adam (2001) also pointed out that the list of basic factor categories for selecting market entry mode is the same as for market selection, including internal factors (such as experience, management risk attitudes, market share targets, calculation methods applied, profit targets etc.), external factors (such as market barriers, natural barriers, market growth rate, image support requirements, etc.) and mixed factors. Critical success factors and firm core capabilities must be examined for optimizing the organizational structure and strategy.

Furthermore, some key considerations (Watters, 1995) exist in relation to international business development, including identifying markets, market structure and opportunities, customer segmentation, socio-demographic issues, competitive advantage, distribution channels, financial considerations, economic issues, political environment, legislation/regulation, technology, language, taxation, marketing mix, management control, previous experience, entry method (acquisition, joint ventures and strategic alliances, start up etc.), and standardization/adaptation. Accurate market information and industry analysis provide a good basis for decision-making by investors. Therefore, creative thinking is required (George, 1995) in decision-making processes, and global marketing opportunities can be substantially enhanced through considering the following perspectives: technical perspective; organizational perspective; personal perspective; international perspective; and cultural perspective.

Consequently, when firms attempt to make decision regarding international market entry or marketing strategy development, managers should consider proposed decisions from a general perspective. Risk attitudes are important considerations in international market entry research, but other factors must also be considered. Keeping the customer's wishes and preferences in mind (George, 1995). Furthermore, when firms try to develop marketing strategy, managers should consider relationships with suppliers as well as customers. Such a focus can help firms to achieve good profits and a solid operating system.

The research limitations of this study are described as follows. First, most parameters in the model simulation process are given fixed values, and then the author develop and discuss the revised model. Hence, the model solutions are generated on the fixed values of the partial parameters. In practice, all parameters for decision-making are varied and uncertain. Second, the risk factors vary on the decision maker's opinion. Therefore, the two confirmed models' risk factors in the study are different. The expert interview results of this dissertation only present two kinds of managers' considerations. The confirmed models could not express the overall investors' thought. Third, the study choose the Taiwan banking market to be the target research industry and only selected two financial holding companies to perform the model confirmation. Therefore, the two confirmed models only express partial opinions of the Taiwan financial holding companies. Fourth, the sensitivity analysis of the revised model focused on two variables: PR_j and $Cost_j$. The author discussed the variables' influence on the revised model. After the sensitivity analysis, the author concludes that the degree of influence of PR_j is more than of $Cost_j$. However, the PR_j variable is generated on the investor's experience and market knowledge. The investment experiences are accumulated by the numerous successes or failures of investment results. Hence, the study could not give the absolute answer of which factor possesses the most important influence on the revised model. The study only proposes that PR_j possesses more influence than $Cost_j$ given other fixed parameters of the revised model.

The contribution of the study is to provide an operational analysis model based on Johanson and Vahlne's internationalization process model. The revised international investment decision model could help investors to make decisions through model simulation by computer. Although the revised model is a simple model in the study, the variables of the model possess generality. The two confirmed models prove the generality concept of the revised model. Future research could enlarge the revised model on variables choice and on application of various industries. It will be helpful to develop a complete computer simulation model for investor decision-making on international market entry.

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Appendix A: Taiwan Banks Web-Sites

Table A-1 Taiwan banks web-sites

Name	Web-Site
ABN-AMRO Bank	Http://www.abnamro.com/
Bank of Taiwan	Http://www.bot.com.tw/
China Development Financial Holding Corporation	Http://www.cdibh.com/
Chintrust Commercial Bank	Http://www.chinatrust.com.tw/
Citibank, Taiwan	Http://www.citibank.com.tw/
Cosmos Bank, Taiwan	Http://www.cosmosbank.com.tw/
E.SUN Bank	Http://www.esunbank.com.tw/
Fubon Bank	Http://www.fubonbank.com.tw/
Land Bank	Http://www.landbank.com.tw/
Makoto Bank	Http://www.makotobank.com.tw/
Tai shin International Bank	Http://www.taishinbank.com.tw/

Note. Compiled by the authors.



Appendix B: The Example of Lingo Integer Programming and Excel Data for Firm 1

```

MODEL:
SETS:
ERR /1..2/ : ERQ;
CostT /1..3/ : Cost,Iv,PR;
TR(Costt,ERR):Outcome,p;
ENDSETS
DATA:
Outcome=@ole('c:\1232.xls');
Cost=@ole('c:\1232.xls');
CostF=@ole('c:\1232.xls');
P=@ole('c:\1232.xls');
PR=@ole('c:\1232.xls');
@ole('c:\1232.xls')=Iv;
ENDDATA
Max=@SUM(Costt(i):
((@SUM(ERR(j):Outcome(i,j)*p(i,j))*PR(i) - Cost(i))*Iv(i));
@SUM(CostT(i):Cost(i)*Iv(i))<=CostF;
@FOR(CostT(i):@BIN(Iv(i)));
END
    
```

Figure B-1. The Lingo integer programming example for firm 1 in Table 3-2.

Firm no.	Market no.	$P_{i,j}$	$Outcome_{i,j}$	Varjance _j	PR_j	ER_j	$Cost_j$	Iv_j
Firm 1	Market 1	0.3	9,000,000	3.024E+13	0.5	600,000	Cost1= 250,000	Iv1= 0
	High risk	0.7	-3,000,000	2.25E+12	0.7	500,000	Cost2= 250,000	Iv2= 1
	Market 2	0.5	2,000,000	6.35E+10	0.9	435,000	Cost3= 250,000	Iv3= 1
	Risk wary	Mid risk	0.5	-1,000,000				
	Market 3	0.7	600,000					
	Low risk	0.3	50,000					
			CostF= 600,000				CostT= 500,000	Max P= 241,500

Figure B-2. The example Excel data input for firm 1 in Table 3-2.

Appendix C: Questionnaire Design

Questionnaire design is as follows.

XXXXX 金融控股公司，您好：

貴公司在財經界享譽盛名，企業經營蒸蒸日上，在目前競爭激烈的金融界中，佔有重要地位。本人在交通大學以國際行銷策略、電子商務及軟體應用為主要研究方向，研究論文主要投稿國際期刊如 SCI、SSCI 等。目前在多項研究中有一個題目以台灣銀行業為主要探討的方向，此篇論文日前已投稿國際性研討會並已接受，此研討會由國立中山大學主辦，全程以英文為會議官方語言。在那篇論文中介紹了兩種投資決策模式並提供銀行國際化的觀點。為了增加論文本身之深度與廣度，我們計畫邀請幾家金控公司接受訪談並提供資料，進階發展論文內容的個案探討與實例比較。

本人瞭解企業中之營運策略均屬機密，其間的運籌帷幄更是外人不易瞭解及觸碰，因此，我們只期盼貴公司能請一位投資策略企劃單位的人員，提供貴公司過去的投資經驗及一至二份已公告執行之企劃檔案供做參考，如此，既不會對貴公司未來的決策產生影響，對於本研究又給予了極大協助。

在訪談的過程中，我們將關注幾個核心主題：

1. 貴公司面對風險的態度。
2. 貴公司估算投資報酬率、回收年限的方法。
3. 貴公司選擇投資方案的方法。
4. 貴公司面對新市場的資料蒐集與分析方法。
5. 請貴公司提供大陸或其他國家的已投資方案做為具體案例。

以上的請求，可能會對貴公司帶來困擾，但仍煩請貴公司在不影響公司機密及營運之下給予我們一點幫助，我們將根據貴公司的想法決定資料披露程度，並視貴公司的意願在論文中列入貴公司名號及給予莫大感謝，而在論文完成後，我們也會致贈論文研究結果供貴公司參考。

期待能收到您的回覆，告訴我們對您較方便的受訪形式。

敬祝

鴻圖大展 財源廣進

交通大學管理科學系

交通大學管理科學系博士生

張力元教授敬上

trappey@cc.nctu.edu.tw

施翠倚敬上

trace@ms16.hinet.net

核心主題：

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Table C-1 An example application of Johanson and Vahlne's model

Firm no.	Risk attitude	R_i^*	C_i	U_i	$R_i = C_i * U_i$	Decision
Firm 1	Risk wary					
Firm 2	Risk neutral					
Firm 3	Risk lover					

Note. the values of R_i^* , C_i , and U_i are assumed values describing various risk attitudes of firms

$$\text{Maximize } \pi = \sum_{j=1}^n \left[PR_j * \left(\sum_{i=1}^m (Outcome_{ij} * P_{ij}) \right) - Cost_j \right] * Iv_j$$

Subject to

$$\sum_{j=1}^n (Cost_j * Iv_j) \leq Cost_F$$

$$Iv_j = (0, 1)$$

$$\sum_{i=1}^m P_i = 1$$

$$0 \leq P_{ij} \leq 1$$

$$0 \leq PR_j \leq 1$$

$$i = 1, 2, 3, \dots, m$$

$$j = 1, 2, 3, \dots, n$$

Table C-2 An example of revised investment decision model

Unit: NT\$ dollars

Bank no.	Market no. $j=3$	P_{ij} $i=2$	Outcome $_{ij}$	PR_j	Cost $_j$	Profit $_j$	Cost $_{F1} =$			Cost $_{F2} =$		
							Iv_j	Max π	Total cost	Iv_j	Max π	Total cost
Bank 1 (Risk wary)	Market 1 (High risk)											
	Market 2 (Mid risk)											
	Market 3 (Low risk)											
Bank 2 (Risk lover)	Market 1 (High risk)											
	Market 2 (Mid risk)											
	Market 3 (Low risk)											

Note. Data are assumed to show the relationship between risk tolerance and the degree of market commitment.



Autobiography

1. Resume

- (1) Yu Da Senior High School, instructor (1997-now)
- (2) De Lin Institute Technology, instructor (2002-2003)
- (3) National Chen-Kung University, Professor Wu, Wann Yih's assistant (1996-1997)
- (4) Private Chen-Kung Senior Industrial and Commercial Vocational School, instructor (1993-1995)
- (5) Project Technology Company, sales engineer (1992)

2. Academic background

- (1) National Chiao Tung University, Ph. D. (2001/09-2005/06)
- (2) National Chen Kung University, MBA (1995/09-1997/06)
- (3) Chung Yuan Christian University, MIS (1988/09-1992/06)
- (4) Taipei Municipal Zhongshan Girls' High School (1985/09-1988/06)

3. Research achievements

(1) Journal papers

Trappey, C. V., Shih, T. Y., Hoang, T. (2005) Marketing Intellectual Property Using Electronic Libraries: A Survey of System-on-Chip Engineers and Managers in Sweden and Taiwan. *International Journal of Technology Management (SCI)*.

Trappey, C. V., Shih, T. Y. and Trappey, Amy J. C. (2005). Modeling International Investment Decisions For Financial Holding Companies. *European Journal of Operational Research (SSCI)*.

(2) Conference papers

Trappey, C. V. and Shih, T. Y. (2003). Internationalization of the Taiwan Banking Market. The 13th International Conference on Comparative Management (ICCM 2003), Kaoshiung, Taiwan.

(3) Books

Shih, T. Y. (2002). Data Processing. 廣興書局

Shih, T. Y. (1996). Collaboration and Globalization Strategies for the Domestic Staple Industry to Cope With the Development of Asia Pacific Operating Center. The Non-published Master Thesis of National Chen-Kung University, Department of Business Administration.

(4) Technology report and others

吳萬益, 施翠倚 . (1996). 型鋼市場普查計畫

E-mail: trace@ms16.hinet.net