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Using TOPSIS & CA Evaluating Intentions of Consumers' Cross-Buying Bancassurance

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ABSTRACT

The purpose of this study is to develop and assess an objective research model to weigh the factors that affect intention of cross-buying insurance in banks. The Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) was conduct firstly for the shortlist selection of factors of cross-buying intention. Then, the factors' weights of cross-buying intention is also used as the evaluation criteria, and these are calculated effectively by employing Conjoint analysis (CA). This study finding: The TOPSIS is an effective method to help decision makers for the shortlist selection of idea factors of cross-buying intention. In order to collect data to identify and shortlist selection the intentions of cross-buying insurance in banks by Delphi & TOPSIS, and develop an evaluation structure to weigh the intentions of cross-buying insurance in banks, an interview protocol was designed.

*Keywords***:** *Cross-Buying Intention, TOPSIS, CA*

1. Introduction

The banking industry in Taiwan has experienced tremendous change and an increased growth in earnings from selling insurance products. Banking networks represent the major distribution channel for life insurance products. According to the statistics reported by the Financial Supervisory Commission of the Republic of China, as of the third quarter of 2010, bancassurance accounted for over 67% of the total first-year life insurance premium income in Taiwan. Moreover, the number of insurance sales representatives employed by agencies and brokerages has tripled to approximately 142,000 people. The increased number of agencies and brokerages affiliated with banks account for 70% of all new entries, whereas the growth rate of insurance premiums from these banking agents now exceeds those from traditional direct writers of insurers. In this context, competition in the bancassurance industry is at an all-time high, which challenges providers to retain existing customers while attracting new ones. Most banks are looking for the same things—better ways to retain customers and to increase income. Similarly, most insurers are looking for the same things—more efficient distribution channels to sell policies and to expand premium incomes.

Therefore, financial firms try to stimulate the relationship length and depth, and they are particularly focusing their efforts on cross-selling, which increases the breadth of the relationship with each customer (that is, the average number of services sold to each individual) [1]. In spite of cross-selling being associated with increased lifetime duration and value [2], prior studies have implied that it is not easy to motivate customers to cross-buy services or products from the same provider. Day [3] has also found that cross-selling is unlikely to occur if customers are not willing to buy the services or products that they already have. In fact, not all customers are disposed to engage in expanding their relationships with firms [4]. Customers in some service categories intrinsically tend to develop a multibrand loyalty [5].

Unfortunately, the question of why customers decide to cross-buy and to enhance their relationships with a bank has received scant attention in the literature and has not been appropriately investigated in prior studies [5]. Furthermore, the major contributions of previous research have only implied the relationships between the factors of cross-buying intentions, and the weight of those factors that impact crossing-buying intentions in the decision-making process has not been confirmed by research

data. Most importantly, no satisfaction assessment method, such as factors shortlisting and factors weighting, has been conducted sufficiently to understand the factors that motive cross-buying intention.

The purpose of this study is to address this research gap by developing and assessing an objective research model to shortlist and weigh those factors that affect intention of cross-buying insurance in banks that have been suggested in previous studies.

2. Literature Review

Verhoef [7] were the first to introduce the term "cross-buying" and defined it as the purchase of a number of different services from the same provider. In other words, cross-buying is the behavior expressed in buying various products from the same provider [6-7]. In fact, cross-selling and its benefits can only be achieved if consumers are willing to cross-buy [8]. Therefore, cross-buying is complementary to cross-selling, which pertains to the supplier's efforts to increase the number of products or services that a customer uses within a firm [9].

A number of factors that may impact bank customers' cross-buying intentions have been proposed in previous research studies. The findings of these prior studies are presented in **Table 1**.

3. Methodology

The purpose of this study is to address this research gap by developing and assessing an objective research model to weigh those factors that affect intention of cross-buying insurance in banks that have been suggested in previous studies by conjoint analysis, especially the full-profile conjoint analysis. But it's impossible to select all factors of cross-buying intentions, Hair *et al.*[19] and Siddiqui & Awan [20] figure out the conjoint analysis is useful for measuring up to about six attributes.

In the first phrase adopts the TOPSIS for the shortlist selection of factors of cross-buying intention, then the CA approach is employed to compute factors' weights of cross-buying intention in the second phrase.

This study selected 23 financial advisers who were employed by different model banks and have many years of experience working with bancassurance. The interviews explored more fully the perceptions of experts about these factors that affect every customer to cross-buy insurance products in a bank.

The major methods include two parts. The first part is TOPSIS and the second is CA, stated below:

3.1. The TOPSIS Methodology

Developed by Hwang & Yoon [21], TOPSIS attempts to define the ideal solution and the negative ideal solution. The ideal solution maximizes the benefit criteria and minimizes the cost criteria, whereas the negative ideal solution maximizes the cost criteria and minimizes the benefit criteria. The optimal alternative is the closest to the ideal solution and the farthest from the negative ideal solution. Alternatives in TOPSIS are ranked based on "the relative similarity to the ideal solution", which avoids having the same similarity for both ideal and negative ideal solutions. The method is calculated as follows:

3.1.1. Establishing the Performance Matrix

$$D = \begin{array}{c} A_1 \\ A_2 \\ \vdots \\ A_i \\ \vdots \\ A_m \end{array} \begin{bmatrix} X_{11} & X_{12} & \cdots & \cdots & X_{1j} & X_{1n} \\ X_{21} & X_{22} & \cdots & \cdots & X_{2j} & X_{2n} \\ \vdots & \vdots & \cdots & \vdots & \vdots & \vdots \\ X_{i1} & X_{i2} & \vdots & \vdots & X_{ij} & X_{in} \\ \vdots & \vdots & \cdots & \vdots & \vdots & \vdots \\ X_{m1} & X_{m2} & \cdots & \cdots & X_{mj} & X_{mn} \end{bmatrix}, \quad (1)$$

where X_{ij} is the performance of attribute X_j for alternative A_i, for $i = 1, 2, \cdots m \quad j = 1, 2, \cdots n$.

3.1.2. Normalize the Performance Matrix
Normalizing the performance matrix is an attempt to unify the unit of matrix entries.

$$\text{X} = \left(X_{ij} \right) \forall i, j \quad , \quad (2)$$

where X_{ij} is the performance of attribute i to criterion j.

3.1.3. Create the Weighted Normalized Performance Matrix
TOPSIS defines the weighted normalized performance matrix as

$$\begin{aligned} \text{V} &= \left(V_{ij} \right) \forall i, j \quad , \\ V_{ij} &= w_j \times r_{ij} \ \forall i, j \end{aligned} \quad (3)$$

where w_j is the weight of criterion j.

Table 1. The factors impact cross-buying intention for bancassurance.

Factors Impact Cross-Buying Intention	References	Factors Impact Cross-Buying Intention	References
Image	[5,6]	Payment Equity	[7,17]
Service Convenience	[5,10,11]	Experience	[5,7]
Interpersonal Relationships	[12,13]	Pricing	[7,13]
Trust	[6,11,14-16]	Product Variety	[13,18]

3.1.4. Determine the Ideal Solution and Negative Ideal Solution

The ideal solution is computed based on the following equations:

$$V^+ = \left\{ \left(max\ V_{ij} \mid j \in J \right),\ \left(max\ V_{ij} \mid j \in J' \right),\ i = 1, 2, \cdots, m \right\} \tag{4}$$

$$V^- = \left\{ \left(min\ V_{ij} \mid j \in J \right),\ \left(min\ V_{ij} \mid j \in J' \right),\ i = 1, 2, \cdots, m \right\} \tag{5}$$

where

$$j = \left\{ j = 1, 2, \cdots, n \mid j \text{ belongs to benefit criteria} \right\},$$

$$j' = \left\{ j = 1, 2, \cdots, n \mid j \text{ belongs to cost criteria} \right\}.$$

3.1.5. Calculate the Distance between Idea Solution and Negative Ideal Solution for Each Alternative, Using the N-Dimensional Euclidean Distance

$$S_i^* = \sum_{j=1}^{n} \left(V_{ij} - V_j^* \right)^2 \qquad i = 1, 2, \cdots, m, \tag{6}$$

$$S_i^- = \sum_{j=1}^{n} \left(V_{ij} - V_j^- \right)^2 \qquad i = 1, 2, \cdots, m, \tag{7}$$

3.1.6. Calculate the Relative Closeness to the Ideal Solution of Each Alternative

$$C_i^* = \frac{S_i^-}{S_i^* + S_i^-} \qquad i = 1, 2, \cdots, m. \tag{8}$$

where $0 \leq C_i^* \leq 1$. That is, an alternative i is closer to A^* as C_i^* approaches to 1.

3.1.7. Rank the Preference Order

A set of alternatives can be preferentially ranked according to the descending order of C_i^*.

3.2. The Conjoint Analysis Methodology

The concept of conjoint analysis is introduced in this section, as well as the determined formula of the utility with the conjoint analysis. The final part in this section discusses the process of data analysis with conjoint analysis.

CA has been employed in research for many years. Panda & Panda [22] have described CA as a "what if" experiment in which buyers are presented with different possibilities and asked which product they would buy. In other words, CA is a multivariate technique used specifically to understand how respondents develop preferences for products or services [19]. Sudman & Blair [23] emphasized that CA is not a data analysis process, such as cluster analysis or factor analysis; it can be regarded as

a type of "thought experiment," designed to display how various elements, such as price, brand, and style, can be used to predict customer preferences for a product or service.

The basic CA model was computed with the ordinary least squares (OLS) regression parametric mathematic algorithm [24] using dummy variable regression. This basic model can be represented as follows [25-26].

$$U(X) = \sum_{i=1}^{m} \sum_{j=1}^{k_i} \alpha_{ij} \cdot \chi_{ij}$$

where

$U(X)$ = Overall utility (importance) of an attribute; α_{ij} = Overall utility of the j level of the i attribute.

$$i = 1, 2, \cdots m \quad j = 1, 2, \cdots k_i$$

$X_{ij} = 1$, if the jth level of the ith attribute is present, or $X_{ij} = 0$, otherwise.

According to the CA basic model, Churchill & Iacobucci [27] presented a six-stage model that is based on the more critical decision points in a conjoint experiment.

3.2.1. Select Attributes

The attributes are those that the company can do something about and which are important to consumers. In other words, the company has the technology to make changes that might be indicated by consumer preferences.

3.2.2. Determine Attribute Levels

The number of levels for each attribute has a direct bearing on the number of stimuli that the respondents will be asked to judge.

3.2.3. Determine Attribute Combinations

This will determine what the full set of stimuli will look like.

3.2.4. Select Form of Presentation of Stimuli and Nature of Judgments

Typically, three approaches can be used: a verbal description, a paragraph description, and a pictorial representation. One method for characterizing judgments is to ask respondents to rank the alternatives according to preference or intention to buy. Another method that is gaining popularity among researchers is to use rating scales.

3.2.5. Decide on Aggregation of Judgments

This step basically involves the decision as to whether the responses from consumers or groups of consumers will be aggregated.

3.2.6. Select Analysis Technique

The final step is to select the technique that will be used to analyze the data. The choice depends largely on the method that was used to secure the input judgments from the respondents.

4. Results

Based on the TOPSIS, a general consensus among experts can be reached to rate their level of agreement toward factors of cross buying intention for CA. Those results are in **Table 2**.

The numerical illustration follows the procedure previously discussed.

1). Sample 23 attitude tendency toward cross-buying intentions are graded based upon 23 Delphi panelists' opinions (see **Table 3**).

2). Calculate the normalized performance matrix and calculate the weighted normalized performance matrix, using formulae (1) and (2). **Table 4** summarizes those results.

3). Determine the distance of the ith alternative from the ideal and negative-ideal solutions, using formulae (6) and (7). **Table 5** displays those results.

4). Calculate the relative closeness to the ideal solution and rank the preference order.

5). Calculate the relative closeness to the ideal solution of each alternative, C_i^*, using formulae (8) and rank the preference order (**Table 6**).

Table 2. Descriptive statistics of expert attitude toward factors of cross-buying intention.

Factors of Cross-Buying Intention	SA	A	UD	D	SD	N	Mean	Std. Deviation
Image	21	2	0	0	0	23	4.91	0.29
Service Convenience	15	6	2	0	0	23	4.57	0.66
Interpersonal Relationships	12	11	0	0	0	23	4.52	0.51
Trust	8	8	7	0	0	23	4.04	0.82
Payment Equity	4	9	10	0	0	23	3.74	0.75
Experience	0	6	17	0	0	23	3.26	0.45
Pricing	0	0	0	3	20	23	1.13	0.34
Product Variety	0	0	0	16	7	23	1.70	0.47

Note: strongly agree = 5, agree = 4, undecided = 3, disagree = 2, and strongly disagree = 1.

Table 3. 23 Attitude tendency toward cross-buying intentions.

Experts										Attitude Tendency													
Cross-Buying Intentions	EPT 01	EPT 02	EPT 03	EPT 04	EPT 05	EPT 06	EPT 07	EPT 08	EPT 09	EPT 10	EPT 11	EPT 12	EPT 13	EPT 14	EPT 15	EPT 16	EPT 17	EPT 18	EPT 19	EPT 20	EPT 21	EPT 22	EPT 23
Image	5	5	5	5	5	5	5	5	5	5	5	4	4	5	5	5	5	5	5	5	5	5	5
Service Convenience	5	5	5	4	5	5	4	4	5	4	5	3	5	5	5	5	5	4	5	3	4	5	5
Interpersonal Relationship	4	5	5	4	4	4	5	4	5	4	5	4	5	5	4	5	5	4	5	4	4	5	5
Trust	3	4	5	3	5	3	4	3	4	3	4	5	5	5	4	4	5	4	3	5	4	3	5
Payment Equity	3	4	4	3	5	3	5	3	5	3	3	4	3	4	4	4	4	3	3	5	4	3	4
Experience	3	3	4	3	4	3	3	3	4	3	3	3	3	3	4	4	3	3	3	3	3	3	4
Pricing	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	2	1	1	1	1
Product Variety	2	2	1	2	1	1	2	2	2	2	2	2	1	2	2	2	2	2	1	2	2	1	1

Note: EPT = Expert.

Table 4. Summary of data normalization.

	EPT 01	EPT 02	EPT 03	EPT 04	EPT 05	EPT 06	EPT 07	EPT 08	EPT 09	EPT 10	EPT 11	EPT 12	EPT 13	EPT 14	EPT 15	EPT 16	EPT 17	EPT 18	EPT 19	EPT 20	EPT 21	EPT 22	EPT 23
Image	0.56	0.51	0.50	0.59	0.52	0.57	0.54	0.58	0.51	0.59	0.51	0.46	0.41	0.49	0.54	0.51	0.49	0.57	0.53	0.56	0.57	0.54	0.50
Service Convenience	0.56	0.51	0.50	0.47	0.52	0.57	0.43	0.46	0.51	0.47	0.51	0.35	0.52	0.49	0.54	0.51	0.49	0.45	0.53	0.34	0.45	0.54	0.50
Interpersonal Relationship	0.45	0.51	0.50	0.47	0.41	0.46	0.54	0.46	0.51	0.47	0.51	0.46	0.52	0.49	0.43	0.51	0.49	0.45	0.53	0.45	0.45	0.54	0.50
Trust	0.34	0.41	0.50	0.36	0.52	0.34	0.43	0.35	0.41	0.36	0.41	0.58	0.52	0.49	0.43	0.41	0.49	0.45	0.32	0.56	0.45	0.32	0.50
Payment Equity	0.34	0.41	0.40	0.36	0.52	0.34	0.54	0.35	0.51	0.36	0.31	0.46	0.31	0.39	0.43	0.41	0.39	0.34	0.32	0.56	0.45	0.32	0.40
Experience	0.34	0.31	0.40	0.36	0.41	0.34	0.32	0.35	0.41	0.36	0.31	0.35	0.31	0.29	0.43	0.41	0.29	0.34	0.32	0.34	0.34	0.32	0.40
Pricing	0.11	0.10	0.10	0.12	0.10	0.11	0.11	0.23	0.10	0.12	0.10	0.23	0.10	0.10	0.11	0.10	0.10	0.11	0.21	0.11	0.11	0.11	0.10
Product Variety	0.22	0.20	0.10	0.24	0.10	0.11	0.21	0.23	0.20	0.24	0.20	0.23	0.10	0.20	0.21	0.20	0.20	0.23	0.11	0.22	0.23	0.11	0.10

Note: EPT = Expert.

Table 5. Resultant of S_i^* and S_i^-.

	Image	Service Convenience	Interpersonal Relationship	Trust	Payment Equity	Experience	Pricing	Product Variety
S_i^*	0.007	0.019	0.016	0.029	0.033	0.041	0.087	0.075
S_i^-	0.086	0.079	0.077	0.068	0.061	0.050	0.005	0.018

Note: EPT = Expert.

Table 6. Summary of the TOPSIS C_i^*.

Cross-Buying Intentions	Image	Service Convenience	Interpersonal Relationship	Trust	Payment Equity	Experience	Pricing	Product Variety
C_i^*	0.927	0.809	0.825	0.698	0.647	0.549	0.050	0.190
Rank	1	2	3	4	5	6	8	7

Note: EPT = Expert.

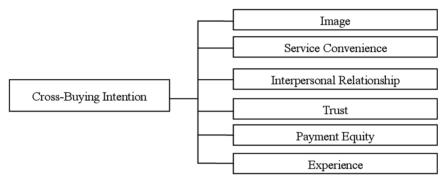**Figure 1. Factors affect intention of cross-buying insurance in a bank.**

From **Table 6**, this study decided the TOPSIS was following $C_1^* > C_2^* > C_3^* > C_4^* > C_5^* > C_6^* > C_8^* > C_7^*$.

In other words, after conducting the TOPSIS, this research showed the experts' attitude tendency toward the 8 cross-buying intentions from the most important to the least important as followings: (1) Image, (2) Service Convenience, (3) Interpersonal Relationship, (4) Trust, (5) Payment Equity, (6) Experience, (7) Product Variety, and (8) Pricing. However, according to **Table 3**, most of experts graded "Product Variety" and "Pricing" 1 or 2. Therefore, this study decides to choose top six cross-uying intentions including [19]: Image (0.927), Service Convenience (0.809), Interpersonal Relationship (0.825), Trust (0.698), Payment Equity (0.647), and Experience (0.549) as factors of cross-buying intentions. The adjusted cross-buying intentions by TOPSIS used in this study are reported in **Figure 1**.

For a formal analysis, the different attribute levels ha- ve to be dummy-encoded in a binary manner. The lowest a- bute level serves as a reference point and gets a binary code of 0 [28]. For any other attribute level, a binary digit of 1 is given if the level is present, and 0 is given if it is not.

Due to s of the attributes having two levels, the total number of possible combinations is $2^6 = 64$ alternatives (stimuli). This is far too many possible combinations to be evaluated by any decision maker. Therefore, we had to construct a design of the inquiry that defined a restricted set of stimuli to be considered and the pairs of these stimuli to be compared.

Starting with a basic orthogonal plan generated by A-delman [29], 8 stimuli were determined (see **Table 7**). Using the stimuli of the orthogonal array, a difference design was constructed by a randomized procedure following the principles given by Hausruckinger & Herker [30].

The CA questionnaire was developed on the basis of some of the literature and shortlist select by TOPSIS methodology, planned with an orthogonal design, and distributed to 300 customers. 269 questionnaires were completed in the survey.

According to the CA report (see **Table 8**), the most important factor was payment equity (relative importance = 31.352%), the second most important factor was image (relative importance = 23.827%) and the third most important factor was interpersonal relationships (relative importance = 14.352 %).

Table 7. Attribute level and orthogonal plan card of cross-buying intentions.

Factors		Attribute Level			Card No.							
					1	2	3	4	5	6	7	8
Image	1	Good	0	Not Good	0	1	1	0	1	1	0	0
Services Convenience	1	Convenience	0	Not Convenience	0	0	1	0	1	0	1	1
Interpersonal Relationships	1	Good	0	Not Good	0	1	0	1	1	0	1	0
Trust	1	High	0	Low	1	0	1	1	1	0	0	0
Payment Equity	1	Equal	0	Not Equal	1	1	0	0	1	0	0	1
Experience	1	Good	0	Not Good	0	0	0	1	1	1	0	1

Table 8. Relative importance of factors affecting intention of cross-buying insurance in a bank.

Factors	Variable		Part-Worth Utility	Relative Importance
Image	1	Good	0.513	0.23827
	0	Not Good	0.000	
Services Convenience	1	Convenience	0.174	0.08082
	0	Not Convenience	0.000	
Interpersonal Relationships	1	Good	0.309	0.14352
	0	Not Good	0.000	
Trust	1	High	0.229	0.10636
	0	Low	0.000	
Payment Equity	1	Equal	0.675	0.31352
	0	Not Equal	0.000	
Experience	1	Good	0.253	0.11751
	0	Not Good	0.000	
Total Utility			2.153	

5. Conclusions & Recommendations

Since 1964, conjoint analysis study are issued firstly by conjoint measure study of Luce & Tukey [31], and used many years. Since 1998, Hair *et al*. [19] suggest the conjoint analysis is useful for measuring up to about 6 attributes, but no research provides the method of shortlist selections, this study find the TOPSIS is an useful method to help this study to shortlist these attributes.

In order to collect data to identify and shortlist selection the intentions of cross-buying insurance in banks by TOPSIS, and develop an evaluation structure to weigh the intentions of cross-buying insurance in banks, an interview protocol was designed. The interview question was initially developed based on intentions found in prior studies and shortlist selection by TOPSIS. Moreover, the finalization of the interview question was enabled by means of qualitative research.

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