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/ Determinants of banking sector's credit granting policy for the yacht industry in Taiwan

# Determinants of banking sector's credit granting policy for the yacht industry in Taiwan

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## Abstract

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### Purpose

This paper aims to investigate bank credit policies and uncover yacht building finance assessment factors from bank credit policies toward the yacht industry.

### Design/methodology/approach

This study's questionnaire attempts to identify survey respondents' degrees of awareness through difference analysis, and then uses entropy weighting and gray relational analysis to discover priority ranking order of bank credit assessment considerations from the perspective of Taiwan's banking sector.

### Findings

The research findings show that yacht builders have to review their ship financing application methods and improve shortcomings to meet banks' credit granting requirements.

### Originality/value

Banks emphasize yacht builders' repayment ability to protect their depositors and shareholders.

## Keywords

[Credit policy](#)[Gray relational analysis](#)[Shipping finance](#)[Yacht industry](#)

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## 1. Introduction

Taiwan's boat building industry can be classified as the categories of large ship builders, small and medium ship builders, yacht builders and ship part suppliers. As most people in Taiwan have little contact with yachts in daily life, the yacht industry is an often neglected industry, and the government has given it little active support. On the other hand, the industry has made Taiwan famous as a center of yacht building, and the luxury yacht belonging to the president of the Louis Vuitton group was made in Taiwan.

At present, domestic yacht building firms have made the transition from original equipment manufacturing (OEM) under contract to well-known foreign companies to original brand manufacturing. Owing to the excellent performance of Taiwan's yacht exports, export value has increased from US\$105 m in 1999 to US\$323 m in 2008, representing a growth rate of 208.06 per cent. However, export value fell to US\$206 m in 2009 due to the global recession triggered by the American subprime mortgage crisis. In addition, the proportion of exports going to the American market fell from 78.36 per cent in 1999 to 37.85 per cent in 2015. This reveals that Taiwan's yacht industry is gradually losing its focus on the USA and instead targeting the global market. In particular, large yachts are becoming increasingly popular in the Austria market and Asia market. Yachts are a luxury commodity and are deeply affected by the business cycle. For instance, due to the bank credit crunch that followed the global guidelines crisis in 2009, foreign buyers became much less willing to buy yachts, and Taiwan's yacht export growth rate fell to 36.26 per cent. Because Taiwan's yacht industry must enhance manufacturing technology to pursue market segmentation, and yacht building firms must also maintain sufficient operating capital, banks' credit policies toward the yacht industry has become a very important issue ([Table I](#)).

Banks consider the yacht industry to be a high-risk industry due to the fact that yachts are a luxury product easily affected by the business cycle, and they provide a lower level of loans to yacht firms than to companies in other industries. One geographical reason for this is that the yacht industry cluster is concentrated in southern Taiwan, and the majority of domestic banks are unfamiliar with this industry. But as an increasing number of orders are placed for mega

yachts, firms need more time to produce these yachts than they would for smaller boats. Furthermore, as foreign distributor and final customers often cannot readily obtain a

sufficient amount of L/C credit due to the bank credit crunch, it has resulted in prolonged collection periods. As a consequence, small and medium boat builders now require more bank loans than before to meet their need of operating capital and cash flow during the period from order acceptance to boat delivery.

[Agyapong et al. \(2011\)](#) suggested that it is necessary for small and medium enterprise borrowers to gain an understanding of the decision criteria used by financial institutions to increase the probability of obtaining loans. In other words, companies should understand how banks evaluate loan applications if they wish to successfully receive loans. In practice, as banks chiefly rely on credit scoring models to assess whether a loan should be granted to a loan applicant, scoring methods and assessment criteria should be chosen carefully ([Chiang and Cheng, 2011](#)).

Gray relational analysis (GRA) was proposed by Julong Deng in 1982 as an extension of gray theory, which had already been proved to be a simple and accurate method for solving decision-making problems with multiple attributes ([Tsai et al., 2003](#)). Gray system theory offers the advantages of minimal data requirements, simplicity of use and reasonable expected results and GRA involves first translating the performance of all alternatives into a comparability sequence. In 1948, Shannon proposed the use of entropy to measure the uncertainty, stability and the quantity of information. Information is a measure of the degree of order, and entropy is measure of the degree of disorder of a system; in any system, both have equal absolute value but opposite sign ([Zhao et al., 2008](#)). The relationship between entropy and the degree of order is that a system with high entropy has low order or high disorder ([Lee et al., 2010](#)).

Entropy and GRA have been increasingly applied to academic research during recent years, and some literature describes application to financial and banking issues. For example, [Tan \(1998\)](#) used entropy and GRA to evaluate the performance of mutual funds in an investigation of investment strategies. [Su \(2005\)](#) used entropy and GRA to analyze the financial performance of the banks in Taiwan. [Lee et al. \(2010\)](#) used similar methodology to compare the financial performance of shipping companies in Taiwan and Korea.

Taking the viewpoint of the banking sector, this study applies the concept of entropy to calculate the relative weights of factor assessment criteria in the process of granting credit to yacht firms, and then uses GRA with entropy weighting values to evaluate the ranking order of assessment criteria. The study aims to improve banks' credit evaluation models and is limited to the evaluation of yacht building firms.

The chief objectives of this paper are as follows:

- to review the current status of Taiwan's yacht industry

- and the bottlenecks that it faces;
- to review banks' assessment factors when granting credit to the yacht industry; and
- to propose several suggestions for banks when examining credit evaluation policies and for borrowers when formulating loan application strategies.

## 2. Literature review

### 2.1 Development of the yacht industry in Taiwan

The first yachts made in Taiwan emerged after the American Military Assistance Advisory Group in Taiwan introduced wooden sailing boat designs to professional Taiwanese woodworkers in 1958. After the American army shipped Taiwanese yachts to the USA, American yacht builders were favorably impressed by the high technical skill, good quality and low cost of Taiwan's yachts, which opened the door to OEM exports by the Taiwanese yacht industry.

The industry gradually grew from two original yacht builders (Da Qiao and Chen Zhen Ji) to over 100 companies during the peak period. These companies were mostly concentrated in two clusters located in northern and southern Taiwan, respectively; the northern Taiwan cluster was located along the Tamsui river, and the southern Taiwan cluster was located near the Port of Kaohsiung ([Lin and Lin, 2006](#)). Taiwan's yacht industry hit a remarkable output record of 1,573 vessels produced for export in one year during 1988, earning US\$190 m in gross revenue and the title of "Asia's yacht kingdom". However, the industry also began confronting unfavorable operating conditions after 1988, and gross revenue of Taiwan's yacht industry soon fell to a low of only US\$7.1 m in 1994.

After 1994, 70 per cent of yacht building companies went out of business due to the depressed state of the yacht industry, reminding the remaining yacht builders that they had to transform themselves into manufacturer of value-added, refined products. Many yacht builders adapted by giving up the production of smaller, relatively low-priced 30-40' yachts, and switching to the production medium and mega size yachts over 60' in length. In 2005, export value of Taiwan yachts exceeded US\$200 m, 235 yachts were exported, and the average unit price of a yacht was approximately US\$940,000.

According to statistics from the [Customs Administration, Ministry of Finance \(2016\)](#), the yacht industry's exports increased steadily during 2007 and 2008, exceeding 200 boats, but slumped in 2009 due to the impact of the US subprime mortgage crisis and rising energy prices. [Chen \(2010\)](#) suggested that the stagnation of the major consumer markets of North America and Europe will hamper the global yacht market's recovery. As the average

production capacity of domestic yacht producers has decreased by 30-50 per cent, and mega yachts require at least one year from order acceptance to delivery, the

depressed state of the yacht industry continued through 2010.

While Taiwan's yacht industry may yet rejuvenate itself and reach a new peak, the domestic operating environment has become a major obstacle to the industry's development, and such factors as the lack of relevant laws and regulations, restrictions on yacht purchases, complicated yacht purchase procedures and lack of regulations governing sailing from port have prevented a domestic market from emerging. In contrast, many foreign governments have encouraged boating, and many foreigners enjoy sailing boats on weekends; many of these countries have excellent yacht docking facilities and effective yachting regulations. Taiwan's yacht industry should consequently take steps to promote yacht sales in each of these countries. [Figure 1](#) shows that Taiwan's main yacht export markets consist of North America (accounting for 39 per cent of export value), Europe (6 per cent), Australia (35 per cent) and Asia (20 per cent). Asia is expected to be a major economic center and large potential yacht market in the future, especially in view of China's rapid economic development ([Customs Administration, Ministry of Finance, 2016](#)).

According to statistics from ShowBoats International, the number of ultra-large yachts built worldwide decreased from 916 vessels in 2008 to 734 in 2015. The top five leading yacht builders were consisted of Italy, USA, The Netherlands, Germany and the UK. Italy was the world's largest yacht manufacturer, with total yacht length of 34,364 feet, and was followed by The Netherlands, Turkey, the UK and USA. Taiwan was sixth place with 5,312 feet and was followed by Germany with 5,200 feet. In terms of average yacht length, Germany was first with 93 meters, followed by the Greece with 82 meters and The Netherlands with 56 meters ([Table II](#)). It should be noted that this list is in the order of yacht length; while there are other ways measuring a yacht's size, such as weight, displacement or square meters of deck space, length is the traditional measure of yacht size.

As shown in [Table III](#), the leading yacht size category was 100-199 feet in length, and 157 vessels of this type were ordered in 2015; the next most popular categories were 120 to 149 feet, with 125 vessels, and 150-199 feet, with 106 vessels. In addition, statistics from ShowBoats International reveal that Taiwan's Horizon Yacht Company was ranked No. 10 in the global yacht industry in 2015 with 514 meters of total ordered length; after being ranked No. 16 in 2008, Horizon has since risen to No.10 in the rankings. The world's top three yacht builders consisted of the Azimut-Benetti group, Sanlorenzo and Sunseeker group ([Table IV](#)).

## 2.2 Credit granting assessment criteria

Shipbuilding companies with a large scale of operations and good credit reputation can easily secure adequate capital funds. However, due to the growing influence of

globalization, both large and small/medium-sized shipbuilding companies must seek out sources of loans in the capital market to maintain their competitiveness and enhance their scale of operations. Owing to their good credit and reputation, large companies can easily raise money from the stock market or international financial market. Indeed, shipbuilding companies with a large size, and good reputation can readily find sources of ship financing, and foreign commercial banks and financial institutions prefer to provide consulting and lending services to such customers ([Chen, 1998](#)). As a result, such large companies have little problem obtaining capital loans. A major portion of global shipbuilding is therefore financed through a combination of mortgage finance from traditional shipping banks, export-import finance and owner's own equity. Larger companies may also use financing from capital markets for other aspects of their business, freeing up equity for shipbuilding ([OECD, 2004](#)).

Due to a lack of credit reputation, shorter history and smaller scale of operation, small and medium-sized shipbuilding companies do not find it easy to borrow money. These companies must commonly confront problems associated with restrictions on loan amount and requirement for bank guarantees. Because they are typically family-run and have a smaller scale of business, these companies may also have lower management standards, less-sound finances, a lower level of integration and weaker business information transparency. As a consequence, these firms often cannot meet the lending requirements of commercial banks or financial institutions.

As the majority of capital for shipbuilding in Taiwan is obtained from commercial banks, shipbuilders are very sensitive to fluctuations in capital market. Furthermore, ship finance is readily affected by such critical factors as the supply-demand situation in financial markets, loan restrictions and conditions, loan contract terms and repayment maturity and capital collection terms. In addition, ship finance is closely linked with capital market conditions such as interest rates, currency values and exchange rates, which may indirectly influence bankers' willingness to provide loans to ship owners.

[Gek \(2006\)](#) discussed various aspects of financing from the perspectives of both banker and borrower. From the banker's viewpoint, the bank provides a source of financing and services so as to obtain maximum earnings with the minimum repayment period by way of ship mortgages, additional asset mortgages and joint liability guarantees. From the viewpoint of the borrower, the ship owner wishes to obtain a faster response and multiple financing channels from the bank, along with simple loan application procedures and a short lead time. Furthermore, the borrower wishes to obtain lower loan interest charges.

Ship financing is characterized by a high level of inputs, strong technological requirements and a long return period. Foreign financial institutions consequently strive for close

cooperation with shipping brokers to minimize market risk and property risk by monitoring prices and technological status during every stage, including design, construction, operation and completion of the transaction. On the other hand, due to the lack of appropriate professional managers, Taiwanese banks do not undertake ship financing assessment without a full set of assessment methods for the shipping and shipbuilding industry. As ship mortgage procedures are more complicated than lending procedures, general banks are therefore not willing to handle ship mortgages. Taiwanese banks currently adopt direct credit for shipping companies. However, because the Taiwanese banks offer higher loan rates than foreign banks and lower loan amounts than foreign bank, domestic banks are unlikely to provide a strong financial foundation for the shipping industry's development. As seen in [Table VI](#), domestic banks commonly offer four types of credit items to the yacht: short-term loan or guarantee, medium and long-term loan or guarantee, export finance for sight/usance L/C for domestic or foreign country's development and long-term foreign currency ([Table V](#)).

[Berger and Udell \(2002\)](#) suggested that lending to small businesses focuses on financial statement, asset base and relationship. [Tamvakis \(1995\)](#) claimed the best criteria for evaluating the performance of shipping loans including macroeconomics, microeconomics and vessel nature.

[Agyapong et al. \(2011\)](#) propose that the assessment of the creditworthiness of small business borrowers is based on the experience and skill of the bankers in applying basic lending principles, such as the 5Cs (character, capacity, capital, collateral and conditions) and CAMPARI (character, ability, margin, purpose, amount, repayment and insurance). [Lee et al. \(1995\)](#) recognized that one of the most important factors determining a firm's ability to repay its debts is the characteristics of the industry in which the firm operates. [Yang et al. \(2001\)](#) asserted that the most important aspect revealed in financial analysis is the ability to repay loans. [Yurdakul and Ic \(2004\)](#) used the analytic hierarchy process (AHP) method to establish a credit evaluation model incorporating a firm's credibility score, financial score, revenue generation capacity, cost control capacity and other factors. [Su \(2005\)](#) claimed that financial structure, repayment ability, management ability, profitable ability and growth ability are key indicators allowing the assessment of a borrower's financial performance. [Grammenos \(2002\)](#) introduced the 5 "C" (character, capacity, capital, conditions and collateral) in credit analysis for ship finance.

[Mitroussia et al. \(2016\)](#) suggests that financial factors, non-financial factors, ship owners' experience and employability and market risk indicators are the best criteria for

evaluating the performance of shipping loans during turbulent market conditions and periods when financing options are restricted.

Lending is not only a critical business for banks but also one of their main earning bases. The quality of credit may therefore exert a direct influence on the soundness of bank's operations. The main functions of credit granting include compliance with government policy, promotion of economic development, service to the public, the need to earn reasonable revenue for the bank and protection of the rights of depositors and shareholders.

With regard to the credit granting assessment criteria used by banks, the [Taiwan Academy of Banking and Finance \(2007\)](#) proposed that the four principles of credit granting should include safety, profitability, liquidity and the public interest. Properly evaluating the credit status of a loan borrower can be considered critical to the improvement of loan quality, and the improper assessment of the financial reputation of a borrower can affect protection of bank debt and may also hurt a bank's profitability and liquidity. To accomplish the two missions of debt protection and meeting an enterprise's financial requirements, a bank may handle credit granting in accordance with the 5 Ps (people, purpose, payment, protection and perspective) proposed by [Huang and Ye \(1994\)](#) and [Tusiani \(1996\)](#) ([Table VI](#)). [McNamara and Bromiley \(1999\)](#) proposed a set of criteria used by lenders comprising the borrower firm's management capabilities, market position, financial health (cash flow, assets, net income, liquidity and leverage), collateral and sources of loan payment.

Due to the emergence of mega-size yachts, the increasing inventory of raw material and semi-finished products needed by manufacturers may result in a rising proportion of inventory to revenue when foreign orders drop. Another issue is that Taiwan's yacht builders are currently facing strong competition from boat builders in China that have adopted a low price strategy. When domestic banks examine credit applications from yacht builders, there are more factors apart from collateral that must be considered than in the case of other industries; these factors include market characteristics of the yacht industry, management capabilities of the enterprise owner, industrial position of the enterprise and its product R&D capabilities. Furthermore, because the accounting information in small and medium companies' financial reports may not be accurate, banks must also carefully analyze enterprises' cash flow statements.

### 3. Methodology

#### 3.1 Entropy

Shannon first used the concept of entropy in 1948 to measure the uncertainty, stability and quantity of information. Information is a measure of the degree of order, and entropy is a measure of a system's disorder; in any system, both have equal absolute value but opposite sign ([Zhao et al., 2008](#)). The relationship between entropy



and the degree of order is that a system with high entropy has low order or high disorder ([Lee et al., 2010](#)).

### 3.1.1 Performance evaluation matrix.

Entropy input data are first collected in the form of equation (1), which represents the performance of each alternative when considering each evaluation criterion:

$$\begin{array}{c}
 a_1 \\
 \vdots \\
 a_i \\
 \vdots \\
 a_m
 \end{array}
 \begin{bmatrix}
 C_1 & \cdots & C_j & \cdots & C_n \\
 x_{11} & \cdots & x_{1j} & \cdots & x_{1n} \\
 \vdots & & & & \vdots \\
 x_{i1} & \cdots & x_{ij} & \cdots & x_{in} \\
 \vdots & & & & \vdots \\
 x_{m1} & \cdots & x_{mj} & \cdots & x_{mn}
 \end{bmatrix}$$

Find  $P_{ij}$ .

This step consists of normalization of the foregoing matrix:

$$[P_{ij}]_{m \times n} = \left[ x_{ij} / \sum_{i=1}^m X_{ij} \right]_{m \times n}$$

### 3.1.2 Entropy for all criteria.

Calculate the entropy of all criteria in equation (2):

$$e_j = -k \sum_{i=1}^m P_{ij} \ln p_{ij} \quad \forall j$$

Where  $k$  is Boltzmann's constant, which equals  $k = 1/\ln m$  and ensures that that  $0 \leq e_j \leq 1$ .

The degree of diversification of the information  $\bar{e}_j$  provided by the alternative performance evaluation value of criterion  $j$  can be defined as:

$$\bar{e}_j = 1 - e_j$$

### 3.1.3 Normalization of criteria.

Determine relative weights within the range (0, 1) to satisfy the GRA constraints; the value obtained in Step 4 should be normalized using equation (4):

$$r_j = \bar{e}_j / \sum_{j=1}^n \bar{e}_j \quad \forall j$$

Where  $\sum_{j=1}^n r_j = 1$ .

### 3.2 Gray relational analysis

The gray relational method is a data processing method used to determine the degree of correlation between influencing factors in a system with uncertain information (Deng, 1988). To overcome the restrictions of small sample size, GRA can be used to group the initial evaluation indicators and select the most representative indicators (Wang et al., 2004; Wen, 2004).

The processed data, including alternatives ( $x_i$ ), evaluation criteria ( $c_j$ ), relative weights ( $w_j$ ) and alternative performance under each criterion ( $x_{ij}(j)$ ), must be normalized in advance, and the data matrix is therefore normalized.

After the collection of relevant data, the aspired ( $x^*$ ) and worst ( $x^-$ ) value can be identified using the performance matrix, where  $x^*(j) = \max_i (x_{ij}(j))$  and  $x^-(j) = \min_i (x_{ij}(j))$ .

After the data are collected and processed, GRA is performed in accordance with the steps below:

1. Gray relational coefficients for aspired values:

$$\gamma(x^*(j), x_i(j)) = \frac{\min_i \min_j |x^*(j) - x_i(j)| + \delta \max_i \max_j |x^*(j) - x_i(j)|}{|x^*(j) - x_i(j)| + \delta \max_i \max_j |x^*(j) - x_i(j)|}$$

Grade (degree) of gray relation (larger is better):

$$\gamma(x^*, x_i) = \sum_{j=1}^n w_j \gamma(x^*(j), x_i(j))$$

Where the weight  $w_j$  can be obtained by entropy, and the  $\delta$  value is assumed to be 0.5.

2. Gray relational coefficients for worst values:

$$\gamma(x^-(j), x_i(j)) = \frac{\min_i \min_j |x^-(j) - x_i(j)| + \delta \max_i \max_j |x^-(j) - x_i(j)|}{|x^-(j) - x_i(j)| + \delta \max_i \max_j |x^-(j) - x_i(j)|}$$

Grade (degree) of gray relation (larger is worse, smaller is better):

$$\gamma(\bar{x}, x_i) = \sum_{j=1}^n w_j \gamma(x^-(j), x_i(j))$$

3. Relative gray relation scores:

Combine the foregoing (1) and (2) to obtain a ranking based on the relative gray relations of the aspired and worst values:

$$R_i = \frac{\gamma(x^*, x_i)}{\gamma(x^-, x_i)}$$

### 3.3 One-way analysis of variance

One-way analysis of variance was used to identify whether differences in perception of the foregoing assessment criteria used in credit granting to the yacht industry existed due to various demographic statistical variables such as age, type of business, job title and working experience ([Mardia et al., 2000](#)). This paper uses the least significant difference post-hoc test to determine whether there are significant differences among three groups' perceptions of ship finance assessment criteria.

### 3.4 Questionnaire design and survey respondents

The empirical survey was conducted using a questionnaire based on the ABC bank's ship finance credit rating indicators for the yacht industry; these indicators use the 5P principles and consider the characteristics of the yacht industry. Before the formal survey was conducted, the questionnaire underwent a pre-test involving rational and specific assessment of survey questions by respondents consisting of personnel at domestic banks. The purpose of the questionnaire was to establish ship finance credit granting indicators for the yacht industry from the perspectives of a bank. The credit granting indicators included 5 dimensions and 17 assessment factors.

The questionnaire was composed of two sections. The first section attempted to determine the importance of ship finance credit granting indicators for the yacht industry. This section used a five-item Likert scale (in which 1 indicated strongly disagree, 3 indicated neither agree nor disagree and 5 indicated strongly agree). Another section of the

questionnaire requested the respondents' demographic data, including type of business, job title and working experience.

This study sought to determine ship finance credit granting indicators for the yacht industry from the perspective of a bank, and the survey therefore focused on domestic banks, foreign banks and yacht builders. Furthermore, as the yacht industry is clustered in Kaohsiung City, the questionnaires were administered by paper or e-mail in Kaohsiung City.

### 3.5 Assessment variables

The credit granting assessment criteria were developed chiefly based on the credit evaluation model used by the ABC Bank in Taiwan, and the 5P principles ([Huang and Ye, 1994](#)) and related banking literature were used to identify credit granting assessment criteria for the yacht industry from the perspective of the bank. As [Table VIII](#) shows, five assessment dimensions and 17 assessment criteria were used. The assessment dimensions were loan purpose (e.g. Mixed usage of funds by company and shareholders, Designated capital usage is same as application purpose and Misuse of long-term or short-term debit) ([Yurdakul and Ic, 2004](#); [Agyapong et al., 2011](#)), market prospect (e.g. Projected international macroeconomic situation, Stability of international financial market and Development status of global yacht builders) ([Huang and Ye, 1994](#)), borrower profile (e.g. Business experience, Team members, and prospects, Borrower's production status, Sales status of borrower, Foreign investment status and Status of the company within the industry) ([Huang and Ye, 1994](#); [Berger and Udell, 2002](#)), credit protection (e.g. Evaluation of collateral, Financial background of principal and joint liability guarantee, Company's credit rating and transparency of public information) ([McNamara and Bromiley, 1999](#); Pan, 2006) and repayment ability (e.g. Rational accounts receivable for orders at each stage, Profitability status and Liability situation) ([Yang et al., 2001](#); [Su, 2005](#)) ([Table VII](#)).

## 4. Empirical analysis

### 4.1 Descriptive statistics

During April and May 2011, a total of 100 questionnaires were distributed by mail to personnel at domestic and foreign banks and yacht building companies specializing in ship financing tasks in Taiwan; 81 questionnaires were recovered, for a recovery rate of 81 per cent. In terms of business type, 74.1 per cent of respondents worked at domestic bank, 14.8 per cent worked at yacht builders and 11.1 per cent worked at foreign banks. In terms of job title, 50.6 per cent were staff, 27.2 per cent were managers and 18.5 per cent were directors. In terms of working experience, 28.4 per cent had 16-20 years of experience, 21 per cent had 6-10 years and 16 per cent had 21-25 years.

The respondents' titles, lines of business and working experience suggested that their opinions were informed and representative ([Table VIII](#)).

## 4.2 Mean analysis

[Table IX](#) shows the ranking order of assessment dimensions based on mean score, where the dimensions are in the order of repayment ability, borrower profile, loan purpose, creditor protection and market prospect. In addition, [Table X](#) shows that three top-ranking assessment criteria are sales status of borrower, profitability status and designated capital usage is same as application purpose.

## 4.3 Difference analysis

We investigated the respondents' perceptions concerning the various attributes of the credit granting assessment dimensions to determine whether there were any significant differences attributable to demographic variables such as age, type of business, job title and working experience. Our findings indicated that significant differences were associated with type of business and working experience; the former affected responses concerning Loan purpose, Borrower profile, Creditor protection and Repayment ability, and the latter affected responses concerning Loan purpose ([Tables XI](#) and [XII](#)).

## 4.4 Entropy analysis

In line with the aforementioned research methodology, this paper first used entropy analysis to evaluate the ranking order of bank credit granting assessment dimensions based on degree of importance. The following entropy analysis evaluation procedures were used:

- Definition of bank credit granting assessment variables:  $x_{ij}$  in equation (1) represents the assessment indicator values of major factors affecting banks' credit decisions.
- Equation (2) is used to normalize each indicator evaluation matrix and calculate  $P_{ij}$ .
- Equation (3) is used to calculate the entropy of all criteria in equation (2), where the entropy value is expressed as  $e_j$ .
- Equation (5) is used to compute the weight value ( $r_j$ ) of each assessment criterion, and the weight values used to determine the ranking order.

The foregoing research methodology was used to identify the relative weights of ship finance assessment dimensions for the yacht industry using the concept of entropy. The GRA method with entropy weighting values was then used to evaluate the ranking order of ship finance assessment criteria for the yacht industry.

As shown in [Table XIII](#), use of the entropy weighting value method indicates that ship financing assessment criteria for the yacht industry are ranked in the order of repayment ability (0.501), creditor protection (0.435), loan purpose (0.029), borrower profile (0.025) and market prospect (0.010). These figures reveal that the majority of respondents regarded repayment ability as the foremost

factor to be considered when banks assess credit applications. Attention to this factor can enable a bank to avoid default on the part of the yacht builder, which would cause bad debts for the bank, and also avoid losses for shareholders of the bank.

#### 4.5 Gray relational analysis

It can be seen from [Table XIV](#) that the ranking order of ship finance assessment criteria for the yacht industry is liability situation (0.813); profitability status (0.741); rational accounts receivable for orders at each stage (0.728); principal and joint liability guarantee (0.654); evaluation of collateral (0.653); corporate credit rating and transparency of public information (0.629); mixed usage of funds by company and shareholders (0.063); designated capital usage is same as application purpose (0.052); misuse of long-term or short-term debit (0.045); business experience, team members and prospects (0.044); borrower's production status (0.043); sales status of borrower (0.040); status of the company within the industry (0.037); development status of global yacht builders (0.016); projected international macroeconomic situation (0.016) and stability of international financial market (0.016). The fact that the three leading assessment criteria all belong to the assessment dimension repayment ability indicates that banks must pay close attention to the future repayment ability of yacht builders. In practice, in addition to inspecting applications for ship financing by the yacht industry, Taiwanese banks have implemented a series of credit examination procedures that include understanding the company's liability situation and determining the profitability of the company to ensure that it can perform future repayment in a timely manner, prevent the occurrence of bad debts and ensure a smooth lending process for the bank.

[Table XV](#) shows the ranking order of assessment criteria evaluation by entropy and the GRA method and by mean value. According to the former ranking order, the top three assessment criteria are liability situation, profitability status and rational accounts receivable for orders at each stage. The top three according to the latter ranking order are sales status of borrower, profitability status and mixed usage of funds by company and shareholders. Both methods recognize that profitability status is a critical factor for banks granting credit to yacht builders. Banks typically first consider a yacht builder's repayment ability, and then perform a credit assessment of the builder and evaluate the borrower's material guarantees and foreign investment.

As yachts have grown larger and larger, their manufacture has become even more time-consuming. However, now that buyers find it difficult to open letters of credit due to banks recent credit tightening in the wake of the finance crisis, buyers must prolong their payment periods and increase the payment percentage. In particular, small and medium-sized shipyards must find increased funds to meet their operating needs prior to the delivery of yachts. To survive,

these shipyards must obtain bank loans in an environment characterized by credit tightening.

Due to the impact of the global economic downturn and financial turmoil in recent years, the trend toward mega-sized ships has caused yacht builders to require operating capital at every production stage while the ship building period grows from six months to one year. Yacht builders should establish good relationships with their banks and clearly understand the credit granting policies of Taiwan's banks, especially the fact that repayment ability is considered a critical determinant of bank financing. Yacht builders must establish loan application strategies that comply with Taiwanese bank's credit granting policies; this will help yacht builders to obtain sufficient loans from their banks to meet their long-term and short-term capital requirements, enhancing their competitive advantage in the global market.

## 5. Conclusions

Credit granting is major source of earnings for banks, and most banking services in Taiwan are highly competitive due to the large number of domestic banks in the financial market. Inter-bank competition has not only narrowed the differences in loan interest charged by different banks but also created major issues in the banking sector. Banks use conservative operating mechanisms for loan evaluation, and the yacht industry in Taiwan may be unfamiliar with banks' credit evaluation models. As the time needed to manufacture a mega yacht may exceed one year, yacht builders may find it difficult to obtain sufficient loans for the purchase of materials, processing costs, labor costs, etc.

This study sought to determine the chief factors considered by banks when granting credit to the yacht industry and conducted a questionnaire survey targeting senior personal familiar with practical ship finance business and working at yacht builders, and domestic and foreign banks.

Furthermore, this study used entropy and GRA methods to identify the chief factors considered when banks make credit granting decisions. The study aims to improve banks' credit evaluation models and is limited to the evaluation of yacht building firms.

The several findings of this study were as follows: First, most current yacht builders in Taiwan are small and medium-sized companies, and there is a trend toward mega-size yachts among the chief exported yacht products. As a consequence, companies must raise more funds to support the manufacture of these large vessels, which require longer manufacturing periods, resulting in a greater working capital burden for builders. This study thus seeks to

help yacht builders review their ship financing application methods and improve shortcomings to meet banks' credit granting requirements.

Second, difference analysis of the questionnaire results revealed that demographic attributes may affect respondents' opinions concerning banks' credit granting assessment criteria, and the differences in the views of respondents with different types of business and difference lengths of working experience were significant. In particular, the viewpoints of personnel at domestic and foreign banks concerning creditor protection and repayment ability are distinctly different from those of personnel employed by yacht builders. These differences can be attributed to the fact that repayment ability is considered a critical factor in ship finance for yachts from the perspective of banks. In addition, respondents with working experience of 16-20 years expressed significantly different views from those of respondent with working experience of 6-10 years concerning recognition of loan purpose. The more experienced respondents were especially concerned about the issue of mixed use of ship financing loans by borrowers due to their stronger risk management perspective.

Third, the ranking order of bank credit granting assessment dimensions was found to be repayment ability, creditor protection, loan purpose, borrower profile and market prospect. This finding is consistent with the safety principles proposed by Taiwan Academy of Banking and Finance and reveals that banks emphasize yacht builders' repayment ability to protect their depositors and shareholders. Furthermore, a source of funds for repayment is considered necessary to ensure the recovery of principal and avoid default.

Fourth, the ranking order of the top three assessment criteria based on entropy and the GRA method was liability situation, profitability status and rational accounts receivable for orders at each stage. This finding supports the profitability principle suggested by the Taiwan Academy of Banking and Finance because profitability can guarantee the future repayment ability of yacht builders and therefore decrease the risk of default.

Finally, domestic banks are not familiar with ship financing for yacht builders. As the government of Taiwan has started to emphasize the development of the yacht industry, banks should grasp this opportunity to obtain new business by enhancing their recognition and knowledge of the yacht industry and increase their granting of credit to the yacht industry. Doing so will provide banks with a new source of earnings while providing the capital needed for the yacht industry's development.

## Figures

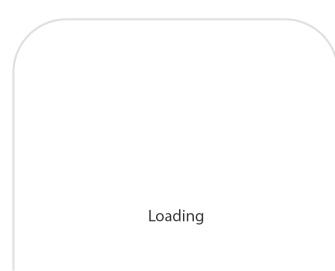




Figure 1.

Relative importance  
Taiwan's yacht  
export markets  
in 2015

Table I.

Yacht export statistics for Taiwan

Year	No. (yachts)	Amount (US\$)	Growth rate (%)	Proportion to US market (%)	U.S. share (%)
1999	350	105,024,600	0.36	78.36	3.3
2000	315	157,891,900	50.34	76.92	5.1
2001	296	171,395,300	8.55	73.55	5.1
2002	345	157,026,300	-8.38	73.10	4.4
2003	269	129,968,540	-17.23	72.94	4.4
2004	234	170,007,220	30.81	73.91	7.1
2005	238	216,830,960	27.54	63.73	9.0
2006	228	206,290,630	-4.86	66.00	9.0
2007	236	281,054,080	36.24	66.31	11.1

Table II.

The world's top ten yacht-building countries

Rank in 2015	Country	Quantity (vessels)	Total length (M)	Total length (feet)	Average length (M)
1	Italy	269	10,474	34,364	39
2	The Netherlands	76	4,270	14,009	56
3	Turkey	68	3,005	9,859	44
4	UK	76	2,216	7,270	29
5	USA	56	2,096	6,877	37
6	Taiwan	53	1,619	5,312	30
7	Germany	17	1,585	5,200	93
8	China	28	1,055	3,461	37
9	USA	15	663	2,175	44

Table III.

Mega yacht length statistics

Total length (feet)	Unit (feet)						
	2008	2009	2010	2011	2012	2013	2014
79-89	253	286	187	158	178	119	111
90-99	114	117	89	78	70	94	88
100-119	179	190	144	151	151	142	131
120-149	175	193	150	155	150	151	141
150-199	125	155	122	132	109	100	111

Table IV.

## Top ten list of global yacht builders

2015 rank	Company	Total(m)	Total(ft)	New build projects	(
1	Azimut/Benetti	2,555	8,383	66	:
2	Sanlorenzo	1,690	5,545	48	:
3	Ferretti Group	1,551	5,089	49	:
4	Sunseeker	1,082	3,550	36	9
5	Lurssen	878	2,881	9	:
6	Amels/Damen	793	2,602	12	2
7	Feadship	724	2,375	12	:
8	Princess Yachts	708	2,323	25	9
9	Heesen Yachts	565	1,854	11	:

## Table V.

Credit items commonly offered to the yacht industry by Taiwanese banks

Credit item	Credit purpose	Credit period
Short-term loan or guarantee	Without restriction on borrowing purpose, used to provide normal working capital	Normally less than 1 year
Medium and long-term loan or guarantee	Acquisition of land, factory construction, machinery and equipment, etc	7-15 years

## Table VI.

Summary of 5P principles

Principle	Description
People	To understand the borrower's financial status, including strong or weak management capabilities, high or low responsibility and good or bad financial record with banks
Purpose	To grasp the borrower's financial purpose, comprising meeting the needs of corporate development, reasonable capital use for the project and rational credit amount
Payment	Repayment ability is an important factor determining whether a loan can be

## Table VII.

Description of assessment criteria

Dimension	Assessment criteria	Description
Loan	Mixed usage of	Financial reports

Loan purpose Dimension	Mixed usage of funds by company and Assessment criteria	Financial reports contain transactions with shareholders. Description
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**Table VIII.**

Overview of respondent attributes

Category	Item	Frequency	(%)
Type of business	Domestic bank	60	74.1
	Yacht builder	12	14.8
	Foreign bank	9	11.1
Job title	Staff	41	50.6
	Manager	22	27.2
	Director	15	18.5
	General manager	3	3.7
Working experience	16-20 years	23	28.4
	6-10 years	17	21.0
	21-25 years	13	16.0
	11-15 years	12	14.8

**Table IX.**

Descriptive statistics concerning assessment dimensions

Assessment dimension	Mean	SD	Rank
Repayment ability	4.494	0.615	1
Borrower profile	4.420	0.630	2
Loan purpose	4.296	0.697	3
Creditor protection	4.296	0.749	4
Market prospect	4.136	0.607	5

**Table X.**

Descriptive statistic concerning assessment criteria

Assessment criteria	Mean	SD	Ranking
Sales status of borrower	4.346	0.595	1
Profitability status	4.321	0.629	2
Designated capital usage is same as application purpose	4.259	0.648	3
Liability situation	4.259	0.685	4
Business experience, team members and prospects	4.235	0.638	5
Borrower's production status	4.198	0.641	6
Rational accounts receivable for orders at each stage	4.185	0.691	7
Development status of global yacht builders	4.136	0.586	8

**Table XI.**

Difference analysis of assessment dimension scores attributable to type of business

Dimension	Type of business	LSD
	F-value	p-value

Dimension	Type of business	F-value	p-value	LSD
Loan purpose	4.244	0.018*		Foreign Bank > Yacht builder, Domestic Bank
Market prospect	2.786	0.068		-
Borrower	3.768	0.027*		Domestic Bank

**Table XII.**

Difference analysis of assessment dimensions based on working experience

Dimension	Working experience		LSD
	F-value	p-value	
Loan purpose	4.707	0.001**	16 ~ 20 years > 6 ~ 10 years
Market prospect	0.800	0.554	-
Borrower profile	0.586	0.710	-
Creditor	0.942	0.461	-

**Table XIII.**

Summary of assessment dimensions ranked by entropy

Dimension	Domestic banks	Yacht builders	Foreign banks	$e_j$ value	1-va
Loan purpose	3.802	4.259	3.877	0.999	0.0
Market prospect	3.926	3.864	4.136	1.000	0.0
Borrower profile	4.235	4.198	4.346	0.999	0.0
Creditor protection	4.111	4.086	4.136	0.983	0.0
Repayment ability	4.185	4.321	4.259	0.981	0.0

**Table XIV.**

Summary of assessment criteria ranked by entropy and gray relational analysis

Dimension and assessment criteria	Domestic banks	Yacht builders	Foreign banks	GRA score
Loan purpose				
Mixed usage of funds by company and shareholders	3.9167	3.0000	4.1111	0.063
Designated capital usage is same as application	4.2833	4.0833	4.3333	0.052

**Table XV.**

Comparison of assessment criteria ranked by entropy and

Assessment criteria	Entropy and GRA score	Rank	Mean score	Rank
Mixed usage of funds by company and shareholders	0.063	7	3.802	16
Designated capital usage is same as application purpose	0.052	8	4.259	3
Misuse of long-term or short-term debit	0.045	9	3.877	14
Projected	0.016	16	2.026	12

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