CHAPTER VI

TESTING THE EFFECTIVENESS OF THE PRACTICES AS PREDICTORS OF EXPORT PERFORMANCE

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CHAPTER VI

TESTING THE EFFECTIVENESS OF THE PRACTICES AS PREDICTORS OF EXPORT PERFORMANCE

The previous chapter presented the influence of the risk management practices on the export performance of the firms. This chapter presents the results of Multiple regression to assess the effectiveness of the risk management practices as good predictors of export performance. Since the actual practices and the best practices are correlated ($r=0.75, p = 0.00$), the scores saved from the output of PCA was used for Multiple Regression. This chapter also presents the grouping results of the firms based on their risk management practices.

6.1 Testing the Predictive power of the Firms Towards Export Performance using Multiple Regression

The factor scores saved are used to predict export performance. First the regression factors are tested for their correlation. These factor scores are fed into the Bivariate Correlation process.

6.2 Variables used for the Model

The following tables discuss the results of the multiple regression. The independent variables entered are the Regression scores saved after the PCA. The dependent variables are the Average Annual Turnover, Average Annual Revenue and the export intensity. These variables are
used to measure the export performance of the firms. The dependent variables are entered one by one. The independent variables are entered together.

6.3 Average Annual Turnover and Risk Management Practices

The first dependent variable tested is the average annual turnover. The variable is termed TURNOVER. The regression scores saved are entered together. The following tables present the results of the analysis.

Table 6.1

<table>
<thead>
<tr>
<th>Model</th>
<th>Independent Variables Entered</th>
<th>Dependent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>• Strategic Risk Management decisions</td>
<td>TURNOVER</td>
</tr>
<tr>
<td></td>
<td>• Exposure Management</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Hedging Policy,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Hedging decisions,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Derivative Usage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Derivative Decisions</td>
<td></td>
</tr>
</tbody>
</table>

The first output shows that all the variables were entered together using the ENTER method. This confirms that the variables are entered. As the second step, the model and the equation has to be generated.
Table 6.2
Results of Multiple Regression

<table>
<thead>
<tr>
<th>Number</th>
<th>Test Statistics</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Multiple Correlation</td>
<td>0.975</td>
</tr>
<tr>
<td>2</td>
<td>R Square Value</td>
<td>0.951</td>
</tr>
<tr>
<td>3</td>
<td>Adjusted R Square</td>
<td>0.950</td>
</tr>
<tr>
<td>4</td>
<td>F value</td>
<td>1045.3</td>
</tr>
<tr>
<td>5</td>
<td>P value</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

Source: Primary Data

6.3.1 Interpretation of the Regression Statistics

The $R^2$ statistic, which is nothing but the correlation coefficient, shows strong relationship between the predictor and the criterion variables. The Adjusted R square measures the strength of association. The closer the value to 1 means stronger the relationship. Here, the score of .950 is considered strong. When the overall fit of the model was tested using Anova test, the value was found to be less than 0.05 proving that the model was fit.

The standardized Beta Coefficients give a measure of the contribution of each variable to the model. A large value indicates that a unit change in the predictor variable has a large effect on the criterion variable. The t statistic and the p values give an indication of the impact...
of the predictor variable. A p value less than 0.01 (here) is considered significant and a large t value indicate that the predictor value has a huge impact on the criterion variable.

All the six predictor variables namely strategic risk management policy (β, Exposure Management, Hedging policy, Hedging decisions, Derivative decisions and Derivative usage are good predictors of the regressed variable Average Annual Turnover. The general formula for Multiple regression is

\[ Y_1 = a + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5 + b_6 x_6 + e_i \]

Where \( Y_1 \) = Average Annual Turnover

\( a = \) constant

\( b_1 = \) regression coefficient for strategic risk management policy (\( x_1 \))

\( b_2 = \) regression coefficient for exposure Management (\( x_2 \))

\( b_3 = \) regression coefficient for Hedging policy (\( x_3 \))

\( b_4 = \) regression coefficient for Hedging decisions (\( x_3 \))

\( b_5 = \) regression coefficient for Derivative decisions (\( x_5 \))

\( b_6 = \) regression coefficient for Derivative usage (\( x_6 \))

By substituting the values in the equation we get the first equation as

\[ Y_1 = 9680.485 + 0.792 \ x_1 + 0.414 \ x_2 + 0.339x_3 + 0.141x_4 + 0.225x_5 + 0.162x_6 \]
The regression output has both standardized and unstandardized scores. If the standardized scores are taken, the equation will not have any error value. This equation is constructed using the standardized scores, hence no error term.

It can be inferred from the statistics that all the six variables entered for predicting is able to predict Annual Turnover of the firms. The relationship between the variables is also strong upto 95%. The strongest of all the relationships is seen between strategic risk management policy and the least is seen between average turnover and hedging decisions. The firms strategic decisions on risk management policies have an impact on their Average Annual turnover.

6.4 Average Annual Revenue and Risk Management Practices

The next variable that was entered for analysis was the average annual revenue of the firms. The independent variables were all entered into together.

<table>
<thead>
<tr>
<th>Model</th>
<th>Independent Variables Entered</th>
<th>Dependent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>• Strategic Risk Management decisions, Exposure Management, • Hedging Policy, • Hedging decisions, • Derivative Usage , • Derivative Decisions</td>
<td>REVENUE</td>
</tr>
</tbody>
</table>
The variables are entered again to test the predicting Average Annual Revenue of the respondent firms. The method used was Enter Method. The output of the model are included in the Annexure. The detailed statistics are presented in the Table 6.4.

Table 6.4  
Results of Multiple Regression

<table>
<thead>
<tr>
<th>Number</th>
<th>Test Statistics</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Multiple Correlation R</td>
<td>0.945</td>
</tr>
<tr>
<td>2</td>
<td>R Square Value</td>
<td>0.893</td>
</tr>
<tr>
<td>3</td>
<td>Adjusted R Square</td>
<td>0.891</td>
</tr>
<tr>
<td>4</td>
<td>F value</td>
<td>447.528</td>
</tr>
<tr>
<td>5</td>
<td>P value</td>
<td>0.00</td>
</tr>
</tbody>
</table>

The F statistic was found out to be 447.528 which is fairly large. The significant value was also less than 0.05 that makes the model fit.

The standardized Beta reveals the scores for the equation. The t values are also large enough for prediction of the model. The significance value, being less than 0.05, makes the model fit. The constant is found to be 31.40 and the error term is 0.087.
\[ Y_2 = 31.400 + 0.810 \ x_1 + 0.347 \ x_2 + 0.317x_3 + 0.080x_4 + 0.107x_5 + 0.134x_6 \]

Where \( Y_2 = \) Average Annual Revenue

- \( a = \) constant
- \( b_1 = \) regression coefficient for strategic risk management policy \((x_1)\)
- \( b_2 = \) regression coefficient for exposure Management \((x_2)\)
- \( b_3 = \) regression coefficient for Hedging policy \((x_3)\)
- \( b_4 = \) regression coefficient for Hedging decisions \((x_3)\)
- \( b_5 = \) regression coefficient for Derivative decisions \((x_5)\)
- \( b_6 = \) regression coefficient for Derivative usage \((x_6)\)

The predictor variables have a strong relationship to predict the dependent variable Annual Average Revenue. If there is a change in the risk management practices a corresponding change is seen in the average revenue of the sample respondent firms. The highest influence is seen with the Strategic risk management policy on the Average Revenue of the firms and the least is seen between hedging decisions and Average revenue. The firms strategic decisions on risk management policies have an impact on the average revenue of the firms.
6.5 Export Intensity and Risk Management Practices

The export intensity is the third dimension using which the export performance was measured. The regression scores are used to predict the export intensity by employing the same steps that was used in the previous cases. The results of the analysis yield the following results. They are represented in the Tables presented below.

The Anova test revealed that the F statistic was found to be 457.268 and the significance value was 0.00 making the model fit. The standardized beta scores have to be tested for getting the function scores for the model specified. The strength of the relationship lies in the values that the output produces in the Table.

<table>
<thead>
<tr>
<th>Number</th>
<th>Test Statistics</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Multiple Correlation R</td>
<td>0.946</td>
</tr>
<tr>
<td>2</td>
<td>R Square Value</td>
<td>0.895</td>
</tr>
<tr>
<td>3</td>
<td>Adjusted R Square</td>
<td>0.893</td>
</tr>
<tr>
<td>4</td>
<td>F value</td>
<td>457.268</td>
</tr>
<tr>
<td>5</td>
<td>P value</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

Table 6.5
Results of Multiple Regression
The standardized beta scores reveal the function scores for the regression model. When the variables were regressed on the variable Export intensity, the constant was found out to be 53.874 and the error term remained 0.303. The regression equation was found out to be

\[ Y_3 = 53.874 + 0.820x_1 + 0.357x_2 + 0.301x_3 + 0.11x_4 + 7.193x_5 + 7.55x_6 \]

Where \( Y_3 = \) Average Annual Revenue

\[ a = \text{constant} \]

\[ b_1 = \text{regression coefficient for strategic risk management policy} \]

\( (x_1) \)

\[ b_2 = \text{regression coefficient for exposure Management} \ (x_2) \]

\[ b_3 = \text{regression coefficient for Hedging policy} \ (x_3) \]

\[ b_4 = \text{regression coefficient for Hedging decisions} \ (x_3) \]

\[ b_5 = \text{regression coefficient for Derivative decisions} \ (x_5) \]

\[ b_6 = \text{regression coefficient for Derivative usage} \ (x_6) \]

All the variables had strong relationship with the criterion variable, as seen in the coefficients. The least influence is seen in the Hedging policy \( (b = 0.11) \). The strongest influence is seen with the Derivative usage levels. This again emphasizes on the fact that the firms’ investment in derivatives is very crucial in determining export performance.
6.6 Grouping of the Firms using Currency Risk Management Practices

At the individual level of the study, the managers/owners of the firms are tested for their agreement with the statements that reflected prominent risk management practices that impacted the export performance. At the firm level, the practices of the firms are compared with each other and tested for its relationship with the firm-specific characteristics. This section deals with the checking of possibilities of grouping the firms based on risk management practices. Thus the industry level application of the model is tested in this section.

6.6.1 Variables used for grouping

Based on the results of the analysis conducted so far, three main variables for grouping the firm are identified. The variables used are

1. The attitude of the firms towards risk management practices

2. The currency risk management practices followed by the firms

3. The derivative practices of the firms and the policies relating to it.

The three variables are measured in the following ways.

1. The scores given to the agreement of the respondents towards risk management practices were taken and the average of the agreement was taken for the first variable
2. For the second variable, currency risk management practices followed by the companies were measured and given scores. Each of the practices was given a score out of 10 and then totaled for each firm.

3. The derivative policies, usage, awareness and the success factors associated was measured and given scores out of 10 for each of these practices.

These scores were fed into the system and the results were compared with their export performance variables. The existence of the variability among the firms could be felt, making the firms grouped into three. One set of firms that scored high on these three variables had high export performance, the second set consisted of firms with low scores on these variables with low levels of export performance and a set of firms stood in between the other two firms.

6.6.2 Practices of Firms with Proper Risk Management System (Group C)

One group consists of firms with a strong risk management system in place. They have a separate department to take care of monitoring the exchange rates and also to monitor exposure levels. Some firms have an exclusive treasury department (centralized or decentralized) and in some firms, the finance and or accounting department takes care of the job of a
treasury department. Next they have risk management system with or without a policy.

They have well-defined hedging practices, even if it is to be buying a forward contract. Definite techniques of hedging, decisions as to leave it open or hedge etc are all communicated to the employees. Some firms even used various advanced techniques like MonteCarlo Simulation etc for risk assessment. VaR is the most common method used to risk assessment. Hedging decisions are centralized in some firms and in some other firms decisions are decentralized, but the system is well-defined. Derivative usage is also not uncommon in the case of certain firms. These firms had the highest average of the variables that were used to measure the export performance like Average Annual Turnover, Average Annual Revenue, and Export intensity. The exhibit shown here depicts the practices of the firms with a well-defined system.
Exhibit 6.1
Risk Management System of Firm Grouped “c”

Forecasting (Treasury Department)

YES

Inbuilt

ERP

Exposure Measurement

NO

Outside

Bank

Simulation

MonteCarlo

HEDGING

Hedge

Not to Hedge

Techniques

Internal

External

Both

VAR

PROFIT

BEP

LOSS
6.6.3 Practices of Firms with Flexible Risk Management System (Group B)

This set consists of firms with flexible risk management system. They do have a system, but take decisions on hedging based on the instructions from higher authorities. At times of crisis, the decision-making authorities also keep changing. The level of decision-making changes with the nature of the crisis and also based on the solemnity of issue. The exposure levels also determine whether the risk has to be hedged or not. The policy does not mention the details of risk management. The averages of the export performance variables stand between the two other groups.

6.6.4 Practices of Firms without a Risk Management System (Group A)

The third set of firms consists of those firms that do not have any risk management policy. The exposure management and hedging activities are highly time-dependent. Most of the exposures are managed by taking a forward contract. The awareness levels of the firms with regard to the exotic derivatives are very little. Their export intensity is also very less. They take decisions on hedging by taking the advice of bankers.
6.7 **Application of Cluster Analysis to test the Group Association of the Firms**

Using the technique of K means Cluster Analysis, an attempt to group the firms based on their risk management practices is made. The variables are fed into the system and the group classification is attempted.

6.7.1 **Interpretation of the Results**

The output of the Cluster Analysis is presented in the Annexure II and the interpretation of the output is presented in this session.

When the first table of the output is analyzed, it shows the changes that had happened in the clusters due to clustering. By default SPSS has 10 iterations. But since the current study needed only 3 iterations, the system stopped within that.

The subsequent analysis of the second table that represented the final clusters with central values for each of the variables, found that three variables were used to classify the firms. First the risk management practices, secondly the derivative practices, and the average of the export performance variables. The ANOVA test is done to compare the differences between the Clusters and the differences within the clusters. The basic objective is to minimize the differences within the clusters and to maximize the differences between the clusters. A higher F value suggests maximum differences between the clusters. The Anova test is conducted not to test any hypothesis on the distances between the
clusters. But the significance value adds strength to the clusters by showing that the firms are adequately grouped.

6.7.2 Classification Results

The table shows the number of cases in each cluster. Earlier, the firms were classified into three based on the risk management practices. It had 111 firms in Group C, 129 in Group B and 90 in Group A. Using K-means it was proved correct.

Table 6.6
Classification Results

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>F</th>
<th>Mean square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currency Risk Management Practices</td>
<td>37</td>
<td>60</td>
<td>69</td>
<td>3256.194</td>
<td>28300.187</td>
</tr>
<tr>
<td>Derivative practices</td>
<td>50</td>
<td>71</td>
<td>88</td>
<td>4716.904</td>
<td>37195</td>
</tr>
<tr>
<td>Average score</td>
<td>2.61</td>
<td>3.15</td>
<td>3.68</td>
<td>547.973</td>
<td>28.890</td>
</tr>
<tr>
<td>Number of firms in each cluster</td>
<td>111</td>
<td>129</td>
<td>90</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6.7.3 Inference

The k means Clustering technique is able to successfully classify all the 330 respondent firms into three groups using Currency Risk Management practices, Derivative Practices and Attitude towards risk
management practices as a determinant of export performance. This increases the applicability of the model developed through this study.

**6.8 Discriminant Analysis**

The cluster membership that was produced as an output of Cluster Analysis is saved and used for further analysis for group membership confirmation using Discriminant Analysis. The output of the SPSS is in Annexure 3. The interpretation alone is presented here. Prior to conducting k-means clustering, Hierarchical Clustering was conducted to find the number of clusters. Using that as the base, the number of clusters were fed into the k-means clustering input. All the 330 cases have been taken for the model.

The Group Statistics revealed the mean and the standard deviation of the variables in the three groups. The first group showed highest standard deviation compared to the other two groups.

The tests of equality of group means shows the Wilk’s Lambda as per the F-Test. Since the significance values for all the three variables are less than the significant value 0.05, all the three variables could be considered for further analysis.
<table>
<thead>
<tr>
<th>Cluster Number</th>
<th>Variables used for grouping</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Derivative Practices</td>
<td>36.73</td>
<td>1.07</td>
<td>111</td>
</tr>
<tr>
<td></td>
<td>Currency risk management practices</td>
<td>49.86</td>
<td>2.62</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average score for attitude</td>
<td>2.60</td>
<td>0.23</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Derivative Practices</td>
<td>59.93</td>
<td>3.42</td>
<td>129</td>
</tr>
<tr>
<td></td>
<td>Currency risk management practices</td>
<td>71.02</td>
<td>3.33</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average score</td>
<td>3.15</td>
<td>0.13</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Derivative Practices</td>
<td>68.56</td>
<td>3.37</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>Currency risk management practices</td>
<td>88.22</td>
<td>2.11</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average score for attitude</td>
<td>3.68</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>Derivative Practices</td>
<td>54.48</td>
<td>13.44</td>
<td>330</td>
</tr>
<tr>
<td></td>
<td>Currency risk management practices</td>
<td>68.60</td>
<td>15.30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average score</td>
<td>3.11</td>
<td>0.48</td>
<td></td>
</tr>
</tbody>
</table>

ANOVA makes an important assumption that the variances were equivalent for each group, but in Discriminant Analysis the basic assumption is that the variance–co-variance matrices are equivalent. Box’s M tests the null hypothesis that the covariance matrices do not
differ between groups formed by the dependent variable. The statistics should reveal that the significance value is higher than the cut-off value of 0.05, so that the null hypothesis could be retained. For this the log determinants should be equal. Generally, very small log determinants are deleted from the analysis.

The Log Determinant shows the values which presents the details of the Box’s test. The Rank column presents the number of independent variables. This number also indicates that all the cases are analyzed using these independent variables. The Log determinants are relatively equal except the third cluster which is slightly lower.

This Table presents the results of the test conducted to prove that the groups have different covariance and thus do not conform to the assumptions of homogeneity of covariance. The significance value should be less than 0.05 to accept the alternative hypothesis that the datasets differ from each other.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Wilks Lambda</th>
<th>F value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Derivative Practices</td>
<td>0.048</td>
<td>3256.19</td>
<td>0.01</td>
</tr>
<tr>
<td>Currency risk management practices</td>
<td>0.034</td>
<td>4716.90</td>
<td>0.01</td>
</tr>
<tr>
<td>Average Score for attitude</td>
<td>0.230</td>
<td>547.973</td>
<td>0.01</td>
</tr>
</tbody>
</table>
Eigen value gives the amount of variance in the original variables accounted for by each component. Higher Eigenvalues reflects greater strength of the relationships. Here, the values for both the equations are adequate, hence the functions are considered strong. Canonical Correlation Coefficient represents the correlation between the discriminant scores and the dependent variables. Discriminant Score is the weighted linear combination of the variables. It is considered better for the function, if it is closer to 1. Here, both the values are closer to 1, again proving the relationship function strong.

It is the ratio of within groups sums of squares to the total sums of squares. It is the total variance in the discriminant scores not explained by differences among the groups. A lambda of 1.00 occurs when the observed group means are equal. A small lambda makes the group differ. The value of the first equation is very less compared to the second. The variance contributed by the equation stands at 68.4%. (100-31.6)

The chi-square statistics reveal the significance value less than 0.00 rejecting the null hypothesis that the Canonical Correlation is 0.

The Table 6.4 presents the Canonical discriminant function Coefficients. The variables indicated are the predictor variables. Higher the number, stronger the correlation. Here, Derivative has a negative relationship indicates negative relationship or predicting power. Before conducting the analysis, the data would have been standardized.
Function 1 = 0.619 Derivative + 0.988 practices - 0.867 average

Function 2 = -1.504 derivatives + 1.053 practices + 0.58 average

The table indicates the average discriminant score for subjects in the two groups. This is yet another way of interpreting the Discriminant Analysis. It is used to describe each group in terms of its profile, using the group means of the predictor variables. These group means are called centroids. In this case,

Derivatives = -8.410 and 0.749

Practices = 1.862 and -1.777

Average of performance = 7.705 and 1.624

**Table 6.9**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Canonical Correlation</th>
<th>Chi-Square</th>
<th>Wilks Lambda</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.988</td>
<td>1599.3</td>
<td>0.007</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>0.827</td>
<td>375.3</td>
<td>0.316</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Discriminant Analysis presents the output after conducting the analysis in two dimensions. For both the dimensions, the correlation of the variables with the function is high.
Table 6.10
Results of the Discriminate Scores

<table>
<thead>
<tr>
<th>Grouping Variables</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Currency Risk Management practices</td>
<td>0.619(0.827) *</td>
</tr>
<tr>
<td>Derivative Practices</td>
<td>0.988(0.687) *</td>
</tr>
<tr>
<td>Average Score for attitude towards practices</td>
<td>-0.867(0.280) *</td>
</tr>
</tbody>
</table>

When the correlations between the observed variables and the dimensions created with the unobserved discriminant function were analyzed it was found that all the correlations were significant at 5%. This is represented in the Table. This is another way of indicating the relative importance of the predictors.

These Pearson coefficients are structure coefficients or discriminant loadings. They serve as factor loadings in factor analysis. The table shows significant correlations (flagged) for all the three variables namely Average, Derivatives, and risk management practices for predicting group membership.

This stage is the final stage and the table shows that the groups have been correctly classified. The Prior column shows the equal
distribution and the cases used in the analysis represents the classification. This also confirms the earlier classification done using cluster analysis.

The analysis confirmed the model that can be used to classify the firms based on risk management practices. The firms with good risk management systems are able to show a high performance and firms with no systems are able to show the least level of performance. Firms that follow a flexible system are placed slightly higher than the low-performing groups.

6.9 Chapter Summary

This chapter presents the group membership analysis of the groups based on the risk management practices. It is found that the firms with sound risk management practices are successfully separated and grouped as their average export performance measures are also high. The second group consists of the firms with flexible risk management system and the third group consists of the firms with no risk management systems and their decisions on derivatives, hedging varied according to the situation and their average export performance measures were the least compared to the other two groups. Thus it is proved that the model developed here has practical significance. The results and the discussions are presented in the next chapter.