Predicting Corporate Governance Ratings

AHMED ELBADRY [a], DIMITRIOS GOUNOPOULOS[b], FRANK SKINNER[c1]

Abstract

In this paper we use six governance variables to predict the ISS's indexes values. Using a sample of 392 UK companies, the results indicate that governance variables can predict the ISS's governance rates with a higher degree of accuracy and significance. This suggests that corporate governance indexes (CGI) actually measure what they claim to measure: corporate governance. Moreover, these results suggest that corporate governance indexes' values are predictable in an out of sample context. So, those wishing to invest in companies with "good" corporate governance can do so by using the suggested ordered probit model applied on observable proxies for corporate governance.

Keywords: Corporate Governance, ISS's Ratings, Board Independence, CEO Compensation, Ownership Structure and Large Creditors.

JEL Classification: G34, D82, G30, G32

[1] Ahmed Elbadry (corresponding author) is from Cairo University, Faculty of Commerce, Business Administration Department, Giza, Egypt. E-Mail: abadry2002@yahoo.com., Dimitrios Gounopoulos is from School of Business, Management and Economics, University of Sussex, Falmer, Brighton, Sussex, BN1 9SL, UK. Frank Skinner is from School of Economics and Finance, University of Brunel, Uxbridge, BD9 4JL, UK.

1. Introduction

The main idea of employing indexes rather than using variables of corporate governance is that the indexes consider corporate governance as a set. The index reflects the effect of a group of corporate governance variables rather than measuring the effect of each individual variable (Webb, 2006). Moreover, the use of indexes supports the idea of interaction between corporate governance mechanisms. A further idea is to examine the interdependence relationship between corporate governance indexes and variables to test if these variables and indexes complete each other and strengthen the measure of corporate governance quality.

Corporate governance indexes are used as short-hand, accessible, single value summary statistics for those stakeholders wishing to know whether the company has a "good" corporate governance structure. An unresolved issue is whether these indexes actually measure the quality of corporate governance. Nowadays, some indexes are issued by various organizations to reflect the quality of corporate governance across countries. The *Standard and Poor's* (S&P) ranking for disclosure; the comprehensive *Institutional Shareholders Services* (ISS) rankings for board, audit, compensation, ownership and anti-takeover provisions; *Credit Lyonnais Securities Asia* (CLSA); and *General Metrics International's* (GMI) governance rank are examples of these indexes.

Many of recent studies use these ratings as governance indicators to reflect governance quality. Aggarwal et al. (2009) use the ISS's rankings to examine the quality of firm-level governance between 5296 US and 2234 foreign firms by using 44 common governance attributes defined by ISS and find that ISS's indexes rates are value relevant. This result support the results of Brown and Caylor (2006) that changes in ISS's governance rates are related to changes in the value of the firm measured by Tobin's Q. Durnev and Kim (2005) use the CLSA ratings and find that the increase of corporate governance index is related to an increase in Tobin's Q. Moreover, Ammann, Oesch and Schmid (2011) investigate the relation

between firm-level corporate governance and firm value based on GMI rating for 6663 firms in 22 developed countries. They find a strong positive relation between firm-level corporate governance and firm value.

Based on previous literature, we can see that various corporate governance rating systems are reliable and can be used as good indicators to reflect the quality of corporate governance. However, if these indexes actually measure the quality of corporate governance then values of corporate governance proxies, used by the literature to measure corporate governance, should be related to the values of the indexes in an out of sample test. Accordingly, the objective of this study is to predict corporate governance indexes' rates. Specifically, if an investor has to construct his investment portfolio and believes that corporations with higher corporate governance standards form a "better" investment, and the corporate governance index values are missing for a group of companies, then being able to anticipate the corporate governance indexes' ratings will enable him to select the companies that have higher standards of corporate governance.

We use some governance variables related to board of directors, compensation system, ownership structure, and large creditors to predict the ISS's governance ratings' values. Using a sample of 392 UK companies we find that corporate governance variables which include NONEXESIZE, CEOBENFITS, INSIDERSSIZE, LONGDEBTTOCAPITAL, INSIDERSOWN and BLOCKOWN can predict the ISS's corporate governance indexes' values. The results indicate that our model is reasonably successful in predicting the corporate governance indexes' rates out of sample. The ratio of success for CGAUDIT, CGBOARD, CGCOMPENSATION, CGINDEX and CGINDUSTRY equal to 54%, 58% 40.4%, 68.1 and 68.2% respectively. But it is clear that the success rate for all of the corporate governance indexes increased with higher ratings. That is because the actual rates of these indexes are concentrated between 4 and 5 in most of the UK companies in our sample. Nevertheless, the

RMSE statistic and the paired-sample t-test indicate that our predictions are accurate and significant.

Finally, the robustness analysis using year 2005 as in, and 2006 as out of sample data, confirms and supports the above results, indicating that corporate governance variables can predict corporate governance indexes' rates with a higher degree of accuracy and significance. This is good news, as it suggests that corporate governance indexes actually measure what they claim to measure: corporate governance quality. Moreover, these results suggest that corporate governance indexes' values are predictable in an out of sample context. So, the investors expecting to invest in companies with "good" corporate governance can do so by using the suggested ordered probit model applied on observable proxies for corporate governance.

Our study is related to the work of Ashbaugh-Skaife, Collins and Lafond ((2006)), Black, Love and Rachinsky ((2006)), Doidge, Karolyi and Stulz ((2007)), Braga-Alves and Morey ((2012)) empirically examine the relationship between corporate governance and firms market values. We update their work using a comprehensive sample of UK public companies, and exploring if governance variables can predict the ISS's indexes values.

The remainder of our study is organized as follows: The next section discusses the corporate governance indexes. Our third section explains the model and the sample selection. Section four presents the results and reports our robustness checks. Finally, we present our conclusions in section five.

2. ISS's Corporate Governance Indexes

In June 2002 the Institutional Shareholder Services (ISS) issued corporate governance indexes measuring the quality of corporate governance in some capital markets. ISS is the world leading provider of proxy voting and corporate governance services, with over 20 years of experience. ISS serves more than 1,600 institutional and corporate clients worldwide with its core business - analysing proxies and issuing informed research and objective vote

recommendations for more than 33,000 companies across 115 markets worldwide. ISS' Corporate Governance Quotient (CGQ) has been designed to assist institutional investors in evaluating the quality of corporate boards, and the impact governance practices may have on portfolio performance. Many of the world's largest and most respected financial institutions have incorporated ISS' CGQ ratings into various aspects of their equity research and investment decision-making processes[2].

From the Bloomberg Database, we collected our data about the ISS's corporate governance indexes. The corporate governance quintile depends on the analysis of the components of a company's corporate governance characteristics. Each company is scored individually, based on 63 variables, and is ranked relative to its index and industry peer group. CGQ ratings are calculated on the basis of eight core categories: 1) board of directors, 2) audit, 3) charter and bylaw provisions, 4) laws of the state of incorporation, 5) executive and director compensation, 6) qualitative factors, 7) ownership, and 8) director education. But, some of these ratings are not available for the UK companies. So, we collect all data which is available for the UK companies. Then a weighting is applied by the ISS to these profile characteristics to produce a raw score for each company. Table 1 presents the main corporate governance ratings and the global corporate governance quotient criteria which are used in measuring the ratings.

<Please Insert Table 1 About here>

Meanwhile, we collected data about corporate governance board, compensation, ownership structure, large creditors from the annual reports of the UK companies in our sample. The

[2] CGQ is the industry's most comprehensive corporate governance database, scoring more than 8,000 companies worldwide, representing more than 98% of the US equity market and all of the major global indexes.

definitions of these variables are presented in table (1), panel B. We regress each ISS's corporate governance rate (as a dependent variable) with these six proxies of corporate governance (as independent variables) to examine, firstly, the relation between ISS's ratings and the actual corporate governance proxies. This step mainly explain if the ISS's ratings reflect the quality of corporate governance. Then, we use the extracted ordered probit models in our predictions. In the next section, the methodological issues of the ordered probit used to predict corporate governance indexes' values are discussed. Then, it follows the results of regression models.

3. Methodology

The ordered probit regression models have been used by a number of studies (Zattoni and Cuomo, 2008; Werner and Zimmermann, 2006; Chen et al., 2006; Gruszczynski, 2006; Fich and White, 2005). Accordingly, we will follow the methodology of these papers.

In this section we use ordered probit to predict ISS's governance indexes' ratings (as dependent variables) using corporate governance variables (as independent variables). We depend on the ordered probit regression because the ratings of corporate governance indexes are ordinal (ranked from 1 to 5). The main objective of this step is to determine whether corporate governance variables can predict corporate governance indexes' rates. Accordingly, we question if we can anticipate the rates of corporate governance indexes through the values of corporate governance variables? The anticipated values of corporate governance indexes could help all stakeholders in building their investment plans and in making decisions.

The ordered probit analysis include the general and sub-indexes of corporate governance, specifically: CGAUDIT, CGBOARD, CGCOMP/OWN, CGINDEX and

CGINDUSTRY[3]. Because the data set of CGINDEX and CGINDUSTRY is continuous (ranging from 0% to 100%), we transform it into ordinal data so that the ordered probit regression method is appropriate. For CGINDEX and CGINDUSTRY we develop a scale from five points and divided the data as follows:

- If the actual value is from 0% to 20% the transformed value will be 1.
- If the actual value is from 21% to 40% the transformed value will be 2.
- If the actual value is from 41% to 60% the transformed value will be 3.
- If the actual value is from 61% to 80% the transformed value will be 4.
- If the actual value is from 81% to 100% the transformed value will be 5.

We build-up an ordered probit model that can predict the value of each corporate governance index using corporate governance variables. The standard ordered probit model is widely used to analyse ordinal data and is built around a regression of the following form:

$\mathbf{yi = x\,\beta + \varepsilon}$

Where **x** and **β** are standard variable and parameter matrices, and ε is a vector matrix of normally distributed error terms (Yang and Raehsler, 2005).

As the rate of corporate governance indexes (Y) is ranked from 1 to 5 (discrete data) so, Y has 5 ordered categories (1, 2, 3, 4 and 5). For ordered probit estimation, the normal distribution curveis cut into 5 sections by 4 cut points.

- **Y = 1 (or rank of 1) If $Xi\beta < \mu 1$** **(1)**
- **Y= 2 (or rank of 2) If $\mu 1 < Xi\beta < \mu 2$** **(2)**
- **Y= 3 (or rank of 3) If $\mu 2 < Xi\beta < \mu 3$** **(3)**
- **Y = 4 (or rank of 4) If $\mu 3 < Xi\beta < \mu 4$** **(4)**

[3] We excludethe CGTAKEOVERS index because no anti-takeover provisions are permitted in the UK capital market.

• **Y = 5 (or rank of 5) If Xiβ > μ4** **(5)**

The multiple regression form for this stage is stated as follows:

Yi = α + β1 X1i + β2 X2i + β3 X3i+ ……. + β6 X6i + εi **(6)**

Where Yi can take one of the values of:

$Y_{CGBOARD}$ = Quintile ranking within index peers for Corporate Governance Quintile (CGQ) board characteristics.

$Y_{CGCOMP/OWN}$ = Quintile ranking within index peers for CGQ ownership and compensation characteristics.

$Y_{CGAUDIT}$ = Quintile ranking within index peers for CGQ audit characteristics.

$Y_{CGINDUSTRY}$ = Quintile rating relative to industry peers.

$Y_{CGINDEX}$ = Quintile rating relative to all industries.

α = Regression intercept

X_1 =the normal score of non-executive directors size (NONEXESIZE).

X_2 = the normal score of the ratio of CEO benefits and bonuses (CEOBENFITS).

X_3 = the normal score of the ratio of insiders' ownership (INSIDERSOWN).

X_4 = the normal score of insiders' size (INSIDERSSIZE).

X_5 = the normal score of the ratio of block-holders ownership (BLOCKOWN).

X_6 = the normal score of long-term debt/total capital (LONGDEBTTOCAPITAL) and,

ε_i = the random error term.

To take advantage of the five corporate governance indexes, we use equation 6 five times. Depending on the model, we can predict the values of corporate governance indexes using corporate governance variables. Thus, we use a sample of 392 non-financial companies listed in the London Stock Exchange. The time period of analysis for all companies falls between 2003 and 2006.

The data of corporate governance indexes and variables are divided into two categories. The first category includes "in sample data" which is used to calculate the ordered probit

regression. The second category includes "out of sample data"[4]. The out of sample data are used to test the accuracy of the ordered probit results. It follows a "systematic sampling" method where we sort our data alphabetically by company name and then use every fourth company from our data set to construct "out of sample data". The rest of the companies construct "in sample data"[5].

Furthermore, the previous regression coefficients will be used to compute the linear predictor (x*beta) for each observation. The linear predictor will generate the predicted value (y_i). Then, the predicted values (y_i) will be compared with the actual values of corporate governance indexes (using the out of sample data). Next, the absolute value of the forecast error will be calculated using the following equation:

$$\mathbf{Ei} = \left| \boldsymbol{Yi} - \mathbf{yi} \right| \qquad (7)$$

Where:

Ei is the forecast error for company i,

Yi is the forecast value of the index for company i, and

Yi is the actual value of the index for company i.

If the E_i of company (i) equals zero, it means the actual value of the index equals the predicted value and we count it as a success. On the other hand, if the E_i of company (i) is more than zero, the actual value of the index is not equal to the predicted value and we count it as a fail. Then, we measure the ratio of prediction failure and success following, Howe and Olsen (2006), as follows:

$$\textbf{\% Prediction fail} = (\textstyle\sum \textbf{Ei}/ \textbf{ sample size})*100 \qquad (8)$$

$$\textbf{\% Prediction success= 100\% - \% Prediction fail} \qquad (9)$$

[4]The size of the out of and in sample data will be different in every regression model since the data is not available for all variables for all companies.

[5] The number of observations changes according to the availability of data for each index.

The closer the prediction fail ratio is to zero, the higher the forecasting accuracy and the higher the accuracy of the ordered probit model in predicting the rates of corporate governance indexes.

4. Analysis

Table 2 presents descriptive statistics of corporate governance indexes (as dependent variables) and corporate governance proxies (as independent variables) for the whole sample, which includes 392 non-financial UK companies listed in the London Stock Exchange from 2003 to 2006.

<Please Insert Table 2 About here>

Table 2, panel A shows that the means of CGAUDIT, CGBOARD, and CGCOMP/OWN equal 4.29, 4.25, 3.98 and 4.75 respectively. These results indicate that, on average, most of the UK companies have higher rates of corporate governance indexes because all of the sub-indexes are nearly close to five. Additionally, the means of the general corporate governance indexes (CGINDEX and CGINDUSTRY) equal 85% and 84%, respectively. These results reveal that most of the UK companies are in compliance with the combined code of the best practices of 2003 and have higher corporate governance quality. All variables have relatively low degrees of variability, because the coefficients of variation (CVs) were equal to, or less than 0.26 for all indexes. However, the standard deviation remains close to, or more than one for all indexes. So, substantial variations in the data remain.

Concerning corporate governance variables, first, the average BSIZE is 8.5, while, on average, NONEXESIZE is 4.5. This suggests that the average board of directors has a balance of executive and non-executive directors. Therefore, a very large proportion of the sample complies with the combined code of corporate governance for 2003, by enhancing the

independence of the board of directors from the executives of the companies. This finding is consistent with results in previous studies revealing an increase in the independence of UK boards, as measured by an increased willingness to employ independent non-executive directors, and to separate the positions of the CEO and the Chairman of the board (Hillier and McColgan, 2006; O'Sullivan and Diacon, 2003; Wire and Laing, 2003; O'Sullivan and Wong, 1999).

Second, the average of CEOBENEFITS is 37.7%. This result indicate that a large part of the CEO annual income comes from benefits and bonuses. Third, the means of INSIDERSOWN and INSIDERSSIZE are 6.9% and 8.8 (persons), respectively specifying that, on average, 6.9% of the UK companies' shares are held by 8.8 insiders (executive directors, managers and workers). On the other hand, the means of BLOCKOWN is 40.5%. It becomes obvious that, on average, 40.5% of the UK companies' shares are held by institutions, families, and/or anchor investors. This symbolises the direction of the UK companies in the sample toward ownership concentration, especially through the institutional investors[6]. Last, the mean of LONGDEBTTOCAPITAL is 24.2% showing that, on average, most of debt is long-term debt (24.2% from 32.1%)[7].

Because our data showed non-normality distribution[8], steps are taken to transform them. We utilized the Normal Scores of the independent variables using Van der Waerden's Formula. This transformation technique have already been employed in previously published

[6] By reviewing the annual reports and the names of investors in the sample, we find that most of the block-owners who have more than 3% of the UK companies' outstanding shares are institutional investors. Also, most of the largest owners who have the largest ownership stake in the UK companies are institutional investors.

[7] The means of DEBTTOCAPITAL and LONGDEBTTOCAPITAL are 32.1% and 24.2%. These results reflect that, on average, debt equals about one-third of the UK companies' total capital, and most of this debt is long-term debt (24.2% from 32.1%). Also, the mean of the ratio of total debt to assets (LEVERAGE) is 18.9%. This means, on average total debt equal 19% of the total assets in the UK companies. All of these data have been calculated but not included in this paper but available under request.

[8] By measuring Skewness and Kurtosis the distribution of the data set resembles non-normal distribution for all corporate governance variables and ISS's rates, as most of the Z-tests for Skewness and Kurtosis ratios were outside the range of ±1.96. Also, the Kolmogorov-Smirnov (K-S) Lilliefors normality test statistics suggest that the assumptions of normality were not met. All corporate governance variables (except BLOCKOWN) have p-values < 0.05. Accordingly, we reject the assumption of normality for all corporate governance variables.

studies on corporate governance (Cooke, 1998; Haniffa and Cooke, 2002; Mangena and Tauringana, 2007).

Table 3, panel A presents the results of ordered probit regression using the "systematic sampling" method in selecting the "in sample" data. We used the normal scores of corporate governance variables (independent variables) to predict the rate of corporate governance indexes. Statistics like Pseudo R^2 measure the goodness of fit of the model. Using NCGAUDIT, NCGBOARD, NCGCOPM/OWN, NCGINDEX and CGINDUSTRY as dependent variables, the models are significant at least at the 10 % level of significance, since the P-value of LR chi^{2}significance is < 0.10. The Pseudo R^2 of NCGAUDIT, NCGBOARD, NCGCOPM/OWN, NCGINDEX and CGINDUSTRY are 0.07, 0.09,0.03, 0.11 and 0.10, respectively.

<Please Insert Table 3 About here>

The results indicate that the NCGAUDIT index (which reflects the quality of the audit committee and activities) is significantly positively related to NINSIDERSSIZE and negatively related to NBLOCKOWN. All other variables in the probit regression are not related to NCGAUDIT at the 10% level of significance. These results drive us to some conclusions. First, the higher the number of owners inside the company, the higher the probability that the rate of NCGAUDIT will increase. Also, the higher the fraction of outstanding shares owned by block-holders, the higher the probability that the rate of NCGAUDIT will decrease.

Second, the significant relationship between the NCGAUDIT index, INSIDERSSIZE and BLOCKOWN (as in corporate governance variables related to ownership) reflects an important conclusion regarding the interactions between corporate governance mechanisms. This result reveal that audit characteristics (audit committee, audit fees, auditor rotation and auditor ratification) are affected by ownership structure variables (INSIDERSSIZE and BLOCKOWN). This result opens a new window for future research to study the relationship between ownership structure and audit characteristics or quality.

Moreover, the results indicate that NCGBOARD (which reflects the quality of board independence and activities) is significantly positively related to NONEXESIZE and significantly negatively related to NINSIDERSOWN. All other variables in the probit regression are not significantly related to NCGBOARD at the 10% level of significance. These results highlight that the higher the number of non-executive directors serving on the board, the higher the probability that the rate of CGBOARD will increase. Also, the higher the fraction of outstanding shares held by insiders, the higher the probability that the rate of CGBOARD will decrease. Second, CGBOARD (as an index) and NONEXESIZE (as a variable) which are related to board factors, are significantly positively related and reinforce information about each other.

Third, the results support the ideas of Shleifer and Vishny (1997) and John and Kedia (2003) regarding the interactions between corporate governance mechanisms, since the same ownership factors like NISIDERSOWN affect the quality of corporate governance measured by NCGBOARD. It appears that board characteristics which are related to NCGBOARD are affected by the ratio of insiders' ownership. This result opens a new window for future research to study the relationship between ownership structure and board characteristics or quality. Fourth, the above results indicatet that the increase of NONEXESIZE and the decrease of INSIDERSOWN are related to an increase in corporate governance quality in the UK capital market.

The ordered probit regression model using NCGCOPM/OWN (which reflects the quality of remuneration committee and activities, and also reflects ownership structure in each company) is negatively significantly related to NBLOCKOWN. All other variables in the probit regression are not significantly related to NCGCOPM/OWN at the 10% level of significance. These results reflect some conclusions. First, the higher the fraction of outstanding shares owned by block-holders, the higher the probability that the rate of NCGCOPM/OWN will decrease. This is in supports of previous findings that the decrease of BLOCKOWN is related to an increase in corporate governance quality in the UK capital market. Second, the result reflects the interdependence between corporate governance indexes and variables, since some factors which construct NCGCOPM/OWN are related to ownership concentration (like the BLOCKOWN variable).

Last, the results show that NCGINDEX and NCGINDUSTRY are significantly positively related to NNONEXESIZE and significantly negatively related to NINSIDERSOWN. Accordingly, the higher the number of non-executive directors on boards of directors, the higher the probability that the rate of NCGINDEX and NCGINDUSTRY will increase. Conversely, the higher the fraction of outstanding shares owned by block-holders, the

higher the probability that the rate of NCGINDEX and NCGINDUSTRY will decrease. Also, NLONGDEBTTOCAPITAL is significantly negatively related to CGINDEX, which means that the higher the ratio of long-term debt to capital, the higher the probability that CGINDEX will decrease. All other variables in the probit regression are not significantly related to NCGINDEX and NCGINDUSTRY. Board independence (as measured by NNONEXESIZE) and ownership concentration (as measured by NINSIDERSOWN) appear to be important factors in determining the quality of corporate governance (measured by NCGINDEX and NCGINDUSTRY).

4.1 Robustness Test

Table 3 (panel B) shows the robustness analysis of our results using a different method of selecting "in sample" data. We change the method of selecting the "in sample" and "out of sample" data by using the data of the year 2005 as "in sample" and the data of year 2006 as "out of sample" data. That means we will use year 2005's data to predict the corporate governance indexes' rates of the year 2006.

Most of the results of the ordered probit regressions for all indexes using the systematic sampling's "in sample data" (Panel A) are consistent with the results of the 2005's "in sample data" (Panel B). Interestingly, the robustness analysis reflected new results. First, NCGCOMP/OWN is significantly positively related to NONEXESIZE, whereas before it was not significant (see table 1, panel A). That means the higher the number of non-executive directors on the board, the higher the probability that CGCOMP/OWN will increase. Second, NCGBOARD, NCGINDEX and NCGINDUSTRY are significantly positively related to NISIDERSSIZE, whereas before they were not significant (see table 1, panel A) showing the higher the number of owners inside the company, the higher the probability that the rates of NCGBOARD, NCGINDEX and NCGINDUSTRY will increase. Third, NCGINDUSTRY is significantly and negatively related to NBLOCKOWN, whereas prior it was not significant (see

table 3, panel A). That indicates the higher the fraction of outstanding shares owned by block-holders, the higher the probability that the rate of CGINDUSTRY will decrease, and accordingly, the lower the quality of corporate governance on the industry level.

Overall, the results appear as significant as the "systematic sampling" method, and so should prove to be no better than the systematic method in predicting out of sample effects. Nevertheless, to be sure, we will use both the "systematic sampling" method and "2005-2006" method to divide the sample into the "in and out of sample" data sets to test the ability of corporate governance variables to predict corporate governance indexes' values out of sample.

4.2 Measuring the Accuracy of Prediction Using the Ordered Probit Regression

To test the accuracy of the prediction of the ordered probit regression models using NCGAUDIT, NCGBOARD, NCGCOMP/OWN, NCGINDEX and NCGINDUSTRY we use the prior regression coefficients to compute the linear predictor (x*beta) for each observation. Table 4 (panels A and B) presents the summary of prediction results using the ordered probit regression between corporate governance indexes and corporate governance variables. In table 4, we see that corporate governance indexes have 5 rates (1, 2, 3, 4 and 5). The table presents the actual number of companies which have each rate in the sample, the number of prediction successes and failures, and the ratios of success and failure.

The results of table 4, panel A, indicate that the CGAUDIT, CGBOARD, CGINDEX and CGINDUSTRY models are reasonably successful over the entire set of companies. The ratio of success equals 54%, 58%, 68.1% and 68.2%, respectively. It is clear that the success rate increased with the higher CGAUDIT, CGBOARD, CGINDEX and CGINDUSTRY rates. For example, the success ratio for rate 5 equals 92.3% in the CGAUDIT model, 91% in the CGBOARD model, 98% in the CGINDEX model and 98% in the CGINDUSTRY model. This

is because most of the actual values of these indexes' rates of the UK companies ranged from 3 to 5.

Moreover, the results specify that the NCGCOPM/OWN ordered probit regression model is not reasonably successful over the entire sample. The ratio of success equals 40.4%. But it is clear that the success rate increased with the fifth NCGCOPM/OWN rate. The success ratio for rate 5 equals 90%. This is because most of the actual values of NCGCOPM/OWN rates of the UK companies ranged from 3 to 5. Accordingly, the ordered probit regression was affected by these higher values of NCGCOPM/OWN.

Table 4, panel B, using 2006 "out of sample" data, shows consistent results for CGINDEX and CGINDUSTRY models, as they are reasonably successful over the entire set of companies. The ratios of success equal 69.6% and 60.6%, respectively. Inversely, CGAUDIT, CGBOARD and NCGCOPM/OWN are not reasonably successful over the entire sample as the ratios of success equals to 44.4%, 35.5% and 44.3%, respectively. The results of table 3, panels A and B, are roughly consistent, because the success rate increased with the higher corporate governance indexes' rates. This is mainly due to the actual values of these indexes' rates of the UK companies which range from 3 to 5. Accordingly, the ordered probit regression areaffected by these higher values of these indexes.

<Please Insert Table 4 About here>

Further, we calculate the Root Mean Squared Error (RMSE)[9]. The RMSE is calculated twice. The first RMSE measures the accuracy of prediction of each ordered probit model by calculating the differences between the actual and predicted values of each index using the following equation:

[9] We follow Diebold and Li (2006) and Diebold and Mariano (1995) in using RMSE as a method in calculating prediction accuracy.

$$RMSE(Model) = \sqrt{\frac{\sum_{i}^{N} (Yi - yi)2}{N}} \quad (12)$$

Since:

Yi is the actual rate of the index for company i.

yi is the predicted rate of the index for company i.

N is the "out of sample" size for each index.

The second RMSE measures the accuracy of the predictions by comparing the actual values with the mode of actual indexes' rates[10] using the following equation:

$$RMSE(Mode) = \sqrt{\frac{\sum_{i}^{N} (Yi - Mode)2}{N}} \quad (13)$$

We use the mode because it is the rate of each index that occurs most frequently. Since the rate of each index ranged between 1 and 5, we find that the mode of all indexes is 5 in the systematic sampling's "in sample" data. By comparing the RMSEs of the predictions with the RMSEs of the mode, we are able to decide which method of prediction is accurate in anticipating the rate of the index. In other words, are we better off simply getting all companies that have the most frequently occurring index values of 5, rather than using the predictions of the model developed in this paper? If so, then the RMSE when using the mode should be lower than the RMSE when using the predictions from the model developed in this paper. Table 5, panel A and B, summarizes the results of RMSEs using the ordered probit models and the mode.

<Please Insert Table 5 About here>

Table 5, panel A, using "systematic sampling" out of sample data, shows that the RMSEs of predicted corporate governance indexes' rates using the ordered probit models are

[10] We used the mode rather than the mean because the data is ordinal, there is no value of 4.5, the mean, but either 4 or 5 is observed.

less than the RMSEs of the mode of each index. Also, table 5, panel B, using 2006 "out of sample" data, shows consistent results with panel A. The results shows that the RMSEs of predicted corporate governance indexes' rates using the ordered probit models are less than the RMSEs of the mode of each index. This reflects that our predictions with the rate of corporate governance indexes using the ordered probit regression models are more accurate than using the mode, and provide evidence that, the corporate governance indexes actually do measure the quality of corporate governance. Moreover, these results suggest that one can predict the general quality of corporate governance using observable measures of corporate governance.

As the values of RMSE are near to each other (for example: 0.91 and 0.92 for RMSEs of the CGAUDIT index in panel A), we use a paired-sample t-test to examine if there is a significant difference between the predictions using the ordered probit model and the predictions using the mode. A paired-sample t-test is used to determine whether there is a significant difference between the average values of the same measurement made under two different conditions. Both measurements are made on each unit in a sample, and the test is based on the paired differences between these two values. In our discussion, the paired-sample t-test is mainly used to examine if there are significant differences between the forecast error of the prediction using the ordered probit model (actual values of the index- predicted values using the probit model) and the forecast error of the prediction using the mode (actual values of the index – mode). Thus, we are comparing the prediction errors of two different models that were applied at the same dataset[11]. Table 5 (panel A) presents the main results of the paired-sample t-test.

[11]A paired-sample t-test is used to determine whether there is a significant difference between the average values of the same measurement made under two different conditions. Both measurements are made on each unit in a sample, and the test is based on the paired differences between these two values. The paired-sample t-test is a more powerful alternative to a two sample procedure, such as the two sample t-test, but can only be used when we have matched samples (see Field, 2005, pp. 288-294).

Table 5, panel A, indicate that there are significant differences at the 10% level between the forecasting errors of predictions using the ordered probit models and the predictions using the mode. Only the t-value of CGINDEX is insignificant at the 10% level. The RMSE of CGINDEX (table3, panel A) using the ordered probit regression model is lower than the RMSE using the mode. Moreover, the results of Table 5, panel B, show consistent results with Table 5, panel A, as there are significant differences at the 10% level between the forecasting errors of predictions using the ordered probit models and the predictions using the mode for all indexes. Accordingly, we conclude that the predictions of corporate governance indexes using the ordered probit regression models are more accurate and significant than using the mode of these indexes.

The results of tables 3, 4, and 5 suggest that corporate governance variables, namely NNONEXESIZE, NCEOBENFITS, NINSIDERSSIZE, NLONGDEBTTOCAPITAL, NINSIDERSOWN and NBLOCKOWN, could be used to predict corporate governance index values, especially for the companies which have higher rates of corporate governance index values. This means that these indexes actually measure the quality of corporate governance. Also, the idea of using corporate governance (variables) to predict with corporate governance (indexes) should enable firms to choose these companies with good corporate governance even when the short-hand corporate governance index values are not available.

As an additional robustness analysis, in table 6 we repeated all the previous procedures of predictions for CGINDEX and CGINDUSTRY using the probit regression rather than using the ordered probit regression. We have transformed the values of CGINDEX and CGINDUSTRY into binary values (0, 1) depending on the value of the mean of each index. If the value of the index is less than the mean, we transform it into 0, and if it is more than the mean we transform it into 1. The results support and confirm our results, that we can use corporate governance variables in predicting corporate governance indexes' rates (using the probit regression) with higher degrees of accuracy.

<Please Insert Table 6 About here>

5. Conclusion

In this study we report that corporate governance variables which include NNONEXESIZE, NCEOBENFITS, NINSIDERSSIZE, NLONGDEBTTOCAPITAL, NINSIDERSOWN and NBLOCKOWN can predict corporate governance indexes' values. Ordered probit regression model is reasonably successful in predicting the corporate governance indexes' rates out of sample. The ratio of success for CGAUDIT, CGBOARD, CGCOMPENSATION, CGINDEX and CGINDUSTRY equal 54%, 58%, 40.4%, 68.1% and 68.2%, respectively (using systematic sampling "in and out of sample" data).

The success rate for all of the corporate governance indexes increased with higher rates. That is because the actual values of these indexes are concentrated between 4 and 5 in most of the UK companies in our sample. Nevertheless, the RMSE statistic and the paired-sample t-test indicate that our predictions are more accurate and significant than using the mode as a predictor for corporate governance indexes' values.

Finally, the robustness analysis using year 2005 as in, and 2006 as out of sample data, confirms and supports the above results, and indicate that corporate governance variables can predict corporate governance indexes' rates with a higher degree of accuracy and significance. Moreover, these results suggest that corporate governance indexes' values are predictable in an out of sample context. So, those wishing to invest in companies with "good" corporate governance can do so by using our ordered probit model applied on observable proxies for corporate governance.