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Top management turnover and firm default risk: Evidence from the Chinese securities market

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ABSTRACT

China has moved rapidly from a socialist planned economy to a market economy. As a result, many enterprises in China are seeking talented top management to increase their performance and decrease their default risk. Studies abound regarding top management turnover and its relationship with firm performance, however, few studies have connected top management turnover with firm default risk. In China, a market with extensive financial fraud, firm default risk is an important factor and thus we explore this relationship in the Chinese securities market. Our results indicate that firms with higher default risk are more likely to change their top management in the next financial reporting period. In addition, following changes in top management, such firms default less than other companies.

1. Introduction

China has sustained a rapid rate of economic growth since the start of its economic reforms. The trials and tribulations of the reform process have been well documented (Cao et al., 1999; Gao, 1996; Groves et al., 1994; Lin and Zhu, 2001) and analysis of the effectiveness of these reforms has begun to appear in the literature (Allen et al., 2005). Following this trend, many academic articles have focused on China, examining topics such as the effect of foreign direct investment (Pingyao, 2002; Liu et al., 2002), the volatility of the stock market (Xu and Chen, 2001; Yeh and Lee, 2000), the effect of trading strategies (Kang et al., 2002) and the determinants of stock returns in the Chinese market (Bailey et al., 2003).

One of the most important policies for the Chinese securities market has been China's rapid transformation from a socialist planned economy into a market economy. Many state-owned enterprises (SOEs) are listed on the Chinese securities market and the majority shareholders of such firms are the Chinese government, which has relatively little experience in increasing firm performance. Accordingly, many studies have suggested that developing an improved system of managerial resource allocation that is responsive to market forces is important to China's economic reform (Groves et al., 1995). Groves et al. (1995) found that poor performing firms were more likely to select a new manager by auction, were required to post a

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higher security deposit and were subject to more frequent reviews of management contracts. Managers could be and have been fired for poor performance and higher default risk. They conclude that top management plays an important role in Chinese enterprises. Many empirical studies link top management turnover to firm performance and provide evidence to show that the likelihood of management turnover is negatively related to firm performance (Coughlan and Schmidt, 1985; Warner et al., 1988; Weisbach, 1988). Stiglitz and Weiss (1983) explored the termination of managers' contracts and found that the probability of top management turnover depends on current and past relative performance. Warner et al. (1988) also found that firms with low stock returns are more likely to change their top management. Coughlan and Schmidt (1985), Kim (1996) and Weisbach (1988) also report similar results.

Although, several studies have explored the relationship between top management turnover and firm performance, few have explored the relationship between top management turnover and the probability of firm default. Recently, many notorious accounting scandals, such as Enron and WorldCom, have forced the public to pay more attention to firm default risk. Corporate scandals in emerging markets are even more serious. In China, Sun and Zhang (2006) point out that about 20% of publicly listed firms have been convicted by the China Securities Regulations Committee (CSRC) for serious fraud or other scandals since the Chinese stock market was established in the early 1990s. Numerous cases of financial fraud have occurred recently in China, such as those involving the Chang An Information Industry Company and the Yuan Hua Company. Accordingly, in this study we explore the relationship between top management turnover and the probability of firm default in the biggest emerging market, China, which has extensive fraud and few mature securities regulations to protect investors.

In addition to finding that poor performing firms are more likely to have a new manager, many studies show that after replacing top management there is a potential improvement in firm performance, and subsequently firm value. Denis and Denis (1995) and Huson et al. (2004) document a substantial improvement in firm performance after the incumbent top management were removed following poor firm performance. Therefore, in our study we also assess the effect of replacing top management on firm performance.

Our study makes several contributions to the literature in this field. First, we provide evidence of the relationship between top management turnover and firm default risk, thus complementing the findings of prior studies. Second, we examine firms listed on the Chinese stock market to explore such relationships. Companies in emerging securities markets have higher default risk, therefore investors look for good top management to improve firm performance and reduce default risk. Accordingly, in this study we explore whether top management can effectively control firm default risk. Finally, we explore whether the probability of default decreases following the removal of the incumbent top management. This provides evidence regarding whether the appointment of new management is likely to improve firm performance. The empirical findings in this study should help investors to make appropriate investment decisions.

We use a random effects panel regression model rather than ordinary least squares (OLS) estimation in this study, because the panel regression model is able to supply more accurate inferences for the parameters and reduce any collinearity that may exist amongst the explanatory variables. Our results show that there is a greater prior risk of default when firms replace top management. Furthermore, after firms replace their top management, the probability of firm default is lower than for other companies.

The remainder of this paper is organized as follows. Section 2 presents the literature review and develops our hypotheses. Section 3 describes the data sources and empirical methodology. Section 4 provides descriptive statistics and presents the empirical results and analysis. The final section summarizes the conclusions.

2. Literature review and hypothesis development

2.1. Default risk and fraud

Dechow et al. (1996) and Johnstone (2000) indicate that firms with higher default risk have more incentive to use discretionary accruals to manipulate their financial statements, which is a type of fraud. In addition, many studies find that firms with a lower credit rating have higher default risk, thus they have more motivation to manipulate their financial statements (Bhojraj and Sengupta, 2003; Klock et al., 2005). Thus, firms facing higher default risk tend to use fraud to hide their default risk, and/or firms that commit fraud tend to go bankrupt once their fraud is detected, as happened in the case of Enron.

DeAngelo et al. (1994) find that managers use accounting choices primarily to reflect their firms' financial difficulties, rather than to attempt to inflate income. DeFond and Jiambalvo (1994) indicate that managers of firms that are approaching default respond with income-increasing accounting changes. In addition, many studies provide evidence that if a firm's covenant is violated, the lender has more opportunity to evaluate the borrower's performance. The managers of such firms then have more incentive to commit fraud and manipulate financial statements (Smith, 1993; Chen and Wei, 1993; Gopalakrishnan and Parkash, 1995; Dichev and Skinner, 2002). In summary, firms facing higher default risk tend to use fraud (such as manipulating their financial statements) to hide their high default risk.

2.2. CEO replacement and the probability of default

Many studies indicate that management turnover is negatively related to past firm performance (Coughlan and Schmidt, 1985; Warner et al., 1988; Weisbach, 1988; Gilson, 1989; Gilson and Vetsuypens, 1993). Desai et al. (2004) show that the

uncovering of fraud results in a large decline in firm value (due to the large penalty imposed by the capital market), and that it may benefit the firm to initiate a change in their top management. This would explain why boards are prone to replacing managers following an increase in a firm's probability of default.

Sun and Zhang (2006) examine management turnover associated with fraud and find that firms associated with fraud have higher management turnover than a matched sample of non-fraud firms. Gilson (1989) investigated top management turnover in financially distressed firms and found that 52% of firms with top management turnover in the investigative year are either in default on their debt or are bankrupt. Similar results are also reported by Ofek (1993) and Gilson (1989). Although, these studies find that top management turnover is closely related to bankruptcy, they only focus on bankrupt or fraudulent firms. For investors or debt holders it is more important to be able to accurately predict the probability of firm default. However, previous studies do not provide information that will help investors or debt holders to understand the relationship between top management turnover and the probability of default. In addition, many studies indicate that fraud increases a firm's default risk (Haldeman, 2006; Vassalou and Xing, 2004). In this study, we use a KMV model to estimate the probability of default for all firms, thus allowing us to explore more accurately the relationship between top management turnover and firm default risk. Following Sun and Zhang (2006) and Gilson (1989), we predict that there will be a positive correlation between top management turnover and the risk of bankruptcy for a firm. Thus, our first hypothesis is as follows:

Hypothesis 1. A positive relationship exists between firm default risk and top management turnover.

If the replacement of top management leads to lower default risk, the probability of default should decrease with higher levels of top management turnover. Accordingly, we propose our second hypothesis as follows:

Hypothesis 2. Following the replacement of top management, the probability of default decreases.

3. Data and methodology

3.1. Data description

Our investigation of the relationship between top management turnover and the probability of firm default is based on data obtained from the Chinese Stock Market and Accounting Research (CSMAR) database. This sample is comprised of all publicly listed enterprises on the Shanghai and Shenzhen Stock Exchanges. As the China Securities Regulatory Commission (CSRC) has required all publicly listed firms on these stock markets to compile their corporate governance data since 2001, our sample covers the five-year period from 2001 to 2005.

Only those companies which conform to our selection criteria are used in our analysis. First, we include only firms that have their financial year-end in December. This ensures that the information obtained from financial statements is available each year. Second, we select only those firms for which there is complete data (book value of total debt and assets, market value of equity, stock price volatility, etc.) for the financial years 2001 to 2005, to fully satisfy the computation requirements of the KMV model. This selection process yields a total of 433 firms and 2165 firm-year observations.

3.2. Empirical models

We employ a multivariate random effects balanced panel regression model to examine the relationship between top management turnover and default risk for publicly listed firms in China. We begin by constructing an annual time series model of top management turnover and corporate default risk using the KMV model to assess the probability of default. The KMV model calculates the actual probability of default based on the option pricing theory of Black and Scholes (1973) and Merton (1974). The computation of 'expected default frequency' (EDF) is based on the company's capital structure, volatility of its asset returns and current asset value. The process of deriving EDF is described in Appendix A.

Guided by related theories drawn from the aforementioned studies, the control variables comprise the debt ratio, return on assets, natural logarithm of total assets, a dummy variable indicating the same person occupies both the chairman and CEO positions, and the number of board directors. Calendar year dummy variables are also included to control for time effects on default risk. To explore H1, we use the probability of "prior" firm default in model (1) to explore the relationship between top management turnover and the probability of firm default. Model (1) is described as follows:

$$RISK_{it-1} = \alpha_0 + \alpha_1 CEOCHANGE_{it} + \alpha_2 CEOCHANGE_{it-1} + \alpha_3 DEBT_{it} + \alpha_4 ROA_{it} + \alpha_5 LNASSET_{it} + \alpha_6 SAME\_DIR_{it} + \alpha_7 DIRECT_{it} + \alpha_8 Y02_{it} + \alpha_9 Y03_{it} + \alpha_{10} Y04_{it} + \alpha_{11} Y05_{it} + \varepsilon_{it} \quad (1)$$

To explore H2, we use the probability of "subsequent" firm default in model (2) to explore whether the probability of firm default decreases following the replacement of top management. Model (2) is described as follows:

$$RISK_{it+1} = \alpha_0 + \beta_1 CEOCHANGE_{it+1} + \beta_2 CEOCHANGE_{it} + \beta_3 DEBT_{it} + \beta_4 ROA_{it} + \beta_5 LNASSET_{it} + \beta_6 SAME\_DIR_{it} + \beta_7 DIRECT_{it} + \beta_8 Y02_{it} + \beta_9 Y03_{it} + \beta_{10} Y04_{it} + \beta_{11} Y05_{it} + \varepsilon_{it} \quad (2)$$

where $RISK_{it}$ is the default risk of the ith firm computed from the KMV model in year t; $CEOCHANGE_{it}$ represents the ith firm's change in their top management in year t; $DEBT_{it}$ is the ith firm's debt ratio in year t; ROA_{it} indicates the ith firm's return on assets in year t; $LNASSET_{it}$ expresses the ith firm's natural logarithm of total assets in year t; $SAME\_DIR_{it}$ is a dummy variable that takes the value of one if the same person occupies both the chairman and CEO positions in the ith firm in year t; $DIRECT_{it}$ indicates the size of the board of directors in the ith firm in year t; $Y02_{it}$, $Y03_{it}$ and $Y04_{it}$, $Y05_{it}$, are (0,1) dummy variables controlling for the effects of calendar years; and ε_{it} is the error term of the model for the ith firm in year t.

3.3. Predictions

To investigate the relationship between top management turnover and the probability of firm default, we use $RISK_{it-1}$ as the dependent variable in model (1). The coefficients for subsequent management turnover, $CEOCHANGE_{it}$, and current management turnover, $CEOCHANGE_{it-1}$, capture the connection between the probability of default and future and current management turnover. A positive coefficient on $CEOCHANGE_{it}$ indicates that firms with a higher probability of default are more likely to change their top management in the future. A positive coefficient on $CEOCHANGE_{it-1}$ indicates that firms with a higher probability of default are more likely to change their top management in the same period.

In model (2) we use $RISK_{it+1}$ as the dependent variable. The coefficients for current management turnover, $CEOCHANGE_{it+1}$, and prior management turnover, $CEOCHANGE_{it}$, capture the connection between future and current management turnover and the probability of default. A negative coefficient on $CEOCHANGE_{it+1}$ indicates that when firms change their top management the probability of default decreases in the same period. A negative coefficient on $CEOCHANGE_{it}$ indicates that when firms change their top management the probability of default decreases in the next period.

We include the debt ratio ($DEBT_{it}$), operating performance (ROA_{it}), firm size ($LNASSET_{it}$), the same chairman and CEO ($SAME\_DIR_{it}$), and the number of directors ($DIRECT_{it}$) as control variables in the model. According to Carey and Simnett (2006) and Vasiliou et al. (2003), firms with a high probability of default have more debt. We therefore predict that the coefficient on $DEBT_{it-1}$ is positive. Vasiliou et al. (2003) found that firms with higher profitability ratios tend to amass less debt than firms that do not generate high profits. We therefore infer that default risk will be lower when the profitability of firms is higher and the coefficient on *ROA* is expected to be negative. Many studies use total assets as a proxy for firm size. Warner (1977) and Bradbury and Lloyd (1994) reveal a strong negative relationship between default risk and firm size. Thus, we expect the coefficient on $LNASSET_{it}$ to be negative.

Jensen (1993) suggests that the dual appointment of chairman and CEO gives too much power to the individual and this can make it easier to reach a decision that may result in fraudulent actions. Hence, we predict that the coefficient on $SAME\_DIR_{it}$ is positive. Jensen (1993) argues that large corporate boards are less effective and CEOs find it easier to control them. In support of this notion, Yermack (1996) found that firms with small boards have superior financial performance. However, Uzun et al. (2004) found that board size has no association with corporate fraud. Therefore, the evidence is mixed and we make no prediction for the coefficient on $DIRECT_{it}$.

4. Empirical results and analysis

4.1. Summary statistics

Our sample comprises 433 firms, with a total of 2165 firm-year observations from 2001 to 2005. Table 1a presents the descriptive statistics for the pooled sample of all firm-year observations. From Table 1a, we find that the mean firm's probability of default (*RISK*) is 0.0038. The mean of *DEBT* is 0.5672, which is similar to the finding of Zhu (2005), and is higher than for countries with a well developed securities environment, such as the U.S. On average, *ROA* is 0.0166 and the logarithm of total assets is 0.1012. The average of *SAME_DIR* is 14.3051, thus more than 14% of companies on China's stock market have the same person occupying both the chairman and CEO positions. The mean of *DIRECT* is 9.742, thus the average board of directors consists of 9.742 directors.

Table 1a
Summary descriptive statistics ($N = 2165$).

Variable[a]	Mean	Std. Dev.	Median
$RISK_{it}$	0.0038	0.0556	7.90E-09
$DEBT_{it}$	0.5672	0.3932	0.5487
ROA_{it}	0.0166	0.1117	0.0278
$LNASSET_{it}$	0.1012	0.3016	0.0000
$SAME\_DIR_{it}$	14.3051	0.9321	14.2877
$DIRECT_{it}$	9.6873	2.2179	9.0000

[a] $RISK_{it}$ is the ith firm's default risk computed from the KMV model in year t, $DEBT_{it}$ is the ith firm's debt ratio in year t, ROA_{it} indicates the ith firm's return on assets in year t, $LNASSET_{it}$ expresses the ith firm's log total assets in year t, $SAME\_DIR_{it}$ is a dummy variable taking the value one if the chairman and CEO positions are held by the same person in the ith firm in year t, $DIRECT_{it}$ indicates the size of the board of directors in the ith firm in year t.

Table 1b
Summary descriptive statistics for replacement of top management.

Variable[a]	No replacement of top management in year t (1367)			Replacement of top management in year t (798)		
	Mean[b]	Std. Dev.	Median	Mean	Std. Dev.	Median
$RISK_{it}$	0.0033	0.0518	7.27E-09	0.0047	0.0615	1.08E-08
$RISK_{it-1}$	0.0022**	0.0316	7.52E-10	0.0070	0.0726	2.60E-09
$DEBT_{it}$	0.5553*	0.3841	0.5391	0.5875	0.4078	0.5607
ROA_{it}	0.0254***	0.1010	0.0297	0.0015	0.1267	0.0224
$LNASSET_{it}$	14.3797***	0.9018	14.3735	14.1772	0.9691	14.1193
$SAME\_DIR_{it}$	0.1075	0.3099	0.0000	0.0902	0.2867	0.0000
$DIRECT_{it}$	9.7242	2.2152	9.0000	9.6241	2.2226	9.0000

[a] $RISK_{it}$ is the ith firm's default risk computed from the KMV model in year t, $DEBT_{it}$ is the ith firm's debt ratio in year t, ROA_{it} indicates the ith firm's return on assets in year t, $LNASSET_{it}$ expresses the ith firm's log total assets in year t, $SAME\_DIR_{it}$ is a dummy variable taking the value one if the chairman and CEO positions are held by the same person in the ith firm in year t, $DIRECT_{it}$ indicates the size of the board of directors in the ith firm in year t.
[b] The two-tailed t-test was adopted to examine the means according to the two different groups.
* Indicates significance at the 10% level.
** Indicates significance at the 5% level.
*** Indicates significance at the 1% level.

Table 1c
Summary risk descriptive statistics after replacement of top management.

Variable[a]	No replacement of top management in year t-1 (1333)			Replacement of top management in year $t-1$ (832)		
	Mean	Std. Dev.	Median	Mean	Std. Dev.	Median
$RISK_{it}$	0.0043	0.0593	2.18E-08	0.0030	0.0491	3.64E-09
$RISK_{it-1}$	0.0038	0.0488	1.21E-09	0.0043	0.0538	1.40E-09

[a] $RISK_{it}$ is the ith firm's default risk computed from the KMV model in year t.

To investigate the relationship between firm default risk and top management turnover, we classify the data into two groups based on whether or not firms replaced their top management in the current year t. Table 1b displays the summary descriptive statistics for the replacement of top management. The results show that there is no significant difference in the current default risk ($RISK_{it}$) of the two groups. The mean prior default risk ($RISK_{it-1}$) is significantly higher for firms that replaced their top management in year t. That is, firms with higher default risk are more likely to change their top management in the next period but not in the current period. In addition, firms that change their top management are also associated with worse debt contract conditions (higher $DEBT_{it}$), lower performance (lower ROA_{it}) and smaller size (lower $LNASSET_{it}$). In Table 1c we explore whether the probability of default changes following a change in top management. The results show no significant differences between the two groups. Therefore, a firm's risk of default may not be mitigated by a change in top management.

4.2. Empirical analysis

The empirical results exploring the relationship between top management turnover and the probability of firm default, as presented in model (1), are shown in Table 2. The coefficient estimates of the balanced panel multivariate regression model use the 2165 firm-year observations.

After controlling for all other variables, the estimated coefficient of $CEOCHANGE_{it}$ is positive and statistically significant at the 5% level, but the estimated coefficient of $CEOCHANGE_{it-1}$ is not statistically significant. These results indicate that firms with a higher risk of bankruptcy have an increased motive to replace top management in the next period but not the current period, thereby providing evidence in partial support of Hypothesis 1, in accordance with Sun and Zhang (2006) and Gilson (1989).

The coefficient of *DEBT* is positive and statistically significant at the 1% level, implying that firms with poor solvency have a higher probability of default; this is in line with the findings of Opler and Titman (1994). The effect of *ROA* on default risk is negative and statistically significant at the 1% level, indicating that as firm operational performance increases, there is a corresponding reduction in default risk. This is consistent with Vasiliou et al. (2003). The influence of firm size on bankruptcy is negative and statistically significant at the 1% level, which suggests the probability of default is lower for larger firms, in agreement with the findings of Jeanblanc and Rutkowski (2000).

We also investigate whether the probability of a firm defaulting decreases following the replacement of top management. In this model, we use the probability of subsequent default as the dependent variable as presented in model (2). The empirical results are provided in Table 3.

Table 2
Regression results for top management turnover and firms' prior default risk ($N = 2165$). $RISK_{it-1} = \alpha_0 + \alpha_1 CEOCHANGE_{it} + \alpha_2 CEOCHANGE_{it-1} + \alpha_3 DEBT_{it} + \alpha_4 ROA_{it} + \alpha_5 LNASSET_{it} + \alpha_6 SAME\_DIR_{it} + \alpha_7 DIRECT_{it} + \alpha_8 Y02_{it} + \alpha_9 Y03_{it} + \alpha_{10} Y04_{it} + \alpha_{11} Y05_{it} + \varepsilon_{it}$.

Variables[a]	Predicted Sign	Coeff.[b]	*t*-statistic
Constant		0.028	1.445
$CEOCHANGE_{it}$	+	0.004**	2.005
$CEOCHANGE_{it-1}$	+	−0.002	−0.900
$DEBT_{it}$	+	0.078***	24.916
ROA_{it}	−	−0.121***	−12.864
$LNASSET_{it}$	−	−0.005***	−3.567
$SAME\_DIR_{it}$	+	−2.978E-04	−0.087
$DIRECT_{it}$	?	7.786E-04	1.553
$Y02_{it}$	?	−0.008***	−3.063
$Y03_{it}$	?	−0.011***	−3.856
$Y04_{it}$	?	−0.014***	−5.222
$Y05_{it}$	?	−0.009***	−3.384
Adjusted R^2		0.1789	

[a] $RISK_{it}$ is the *i*th firm's default risk computed from the KMV model in year *t*, $CEOCHANGE_{it}$ represents the *i*th firm's change in their top management in year *t*, $DEBT_{it}$ is the *i*th firm's debt ratio in year *t*, ROA_{it} indicates the *i*th firm's return on assets in year *t*, $LNASSET_{it}$ expresses the *i*th firm's log total assets in year *t*, $SAME\_DIR_{it}$ is a dummy variable taking the value one if the chairman and CEO positions are held by the same person in the *i*th firm in year *t*, $DIRECT_{it}$ indicates the size of the board of directors in the *i*th firm in year *t*, $Y02_{it}$, $Y03_{it}$ and $Y04_{it}$, $Y05_{it}$, are (0,1) dummy variables controlling for the effects of calendar years; if the data is extracted from year 2002, then $Y02_{it}$ is 1, otherwise 0, and so on for the years 2003–2004.
[b] *Indicates significance at the 10% level; **indicates significance at the 5% level; and ***indicates significance at the 1% level.

Table 3
Regression results for top management turnover and firms' subsequent default risk ($N = 2355$). $RISK_{it+1} = \alpha_0 + \beta_1 CEOCHANGE_{it+1} + \beta_2 CEOCHANGE_{it} + \beta_3 DEBT_{it} + \beta_4 ROA_{it} + \beta_5 LNASSET_{it} + \beta_6 SAME\_DIR_{it} + \beta_7 DIRECT_{it} + \beta_8 Y02_{it} + \beta_9 Y03_{it} + \beta_{10} Y04_{it} + \beta_{11} Y05_{it} + \varepsilon_{it}$.

Variables[a]	Predicted sign	Coeff.[b]	*t*-statistic
Constant		0.023	1.194
$CEOCHANGE_{it+1}$	−	−0.001	−0.479
$CEOCHANGE_{it}$	−	−0.005***	−2.748
$DEBT_{it}$	+	0.107***	36.747
ROA_{it}	−	−0.094***	−11.620
$LNASSET_{it}$	−	−0.005***	−3.881
$SAME\_DIR_{it}$	+	−1.243E-05	−0.004
$DIRECT_{it}$	?	−8.627E-05	−0.188
$Y02_{it}$	?	−0.002	−0.751
$Y03_{it}$	?	−0.005***	−2.389
$Y04_{it}$	?	−0.005**	−2.169
$Y05_{it}$	?	−0.007***	−2.935
Adjusted R^2		0.1632	

[a] $RISK_{it}$ is the *i*th firm's default risk computed from the KMV model in year *t*, $CEOCHANGE_{it}$ represents the *i*th firm's change in their top management in year *t*, $DEBT_{it}$ is the *i*th firm's debt ratio in year *t*, ROA_{it} indicates the *i*th firm's return on assets in year *t*, $LNASSET_{it}$ expresses the *i*th firm's log total assets in year *t*, $SAME\_DIR_{it}$ is a dummy variable taking the value one if the chairman and CEO positions are held by the same person in the *i*th firm in year *t*, $DIRECT_{it}$ indicates the size of the board of directors in the *i*th firm in year *t*, $Y02_{it}$, $Y03_{it}$ and $Y04_{it}$, $Y05_{it}$, are (0,1) dummy variables controlling for the effects of calendar years; if the data is extracted from year 2002, then $Y02_{it}$ is 1, otherwise 0, and so on for the years 2003–2004.
[b] *Indicates significance at the 10% level; **indicates significance at the 5% level; and ***indicates significance at the 1% level.

After controlling for all other variables, the estimated coefficient of $CEOCHANGE_{it}$ is negative and statistically significant at the 1% level; however, the estimated coefficient of $CEOCHANGE_{it+1}$ is not statistically significant. These results reveal that after replacement of top management, the probability of firm default is lower than for firms that did not replace top management in the previous period. Nevertheless, when firms change top management, the probability of default does not result in an immediate decrease in the current period. This provides evidence to partially support Hypothesis 2. Furthermore, the coefficient of *DEBT* is significantly positive, whereas the effects of *ROA* and *ASSET* are significantly negative. These results are similar to those presented in Table 2.

To summarize Tables 2 and 3, we find that the probability of default has an important influence on the turnover of top management. When firms face a higher probability of default they have more incentive to change their top management. Furthermore, the top managers of bankrupt firms often have difficulty finding other work, which provides a motive for them to leave companies with a higher probability of default. The results in Table 3 also show that after the replacement of top management, the probability of default is significantly lower than for other firms. In other words, replacement of top management can mitigate firm default risk.

4.3. Robustness analysis

Several studies have used the Z-score to compute the default risk of firms. We therefore also adopt the Z-score as the dependent variable to undertake robustness analysis, based on the same type of model calculated by Carcello et al. (1995) and subsequently adopted by Carey and Simnett (2006). The results are consistent with the results presented. We also use real default risk as the dependent variable to explore the relationship between default risk and top management turnover. The results are consistent with those presented, thereby indicating the overall robustness of the results of this study.

As the potential problem of endogeneity between top management turnover and default risk has been recognized in many previous studies, we adopt the generalized method of moments (GMM) approach to control for a potential endogeneity bias in the original regression models. The GMM, which was developed by Hansen (1982), is an appropriate method for dealing with estimations when there is a potential endogeneity bias. The GMM methodology provides a unified estimation and testing framework that is naturally suited to empirical problems where endogeneity and instrument validity are central (Hayashi, 2000; Wooldridge, 2001; Baum, Schaffer and Stillman, 2003). Furthermore, GMM also provides an appropriate econometric specification for dealing with the endogeneity issues which we are likely to encounter when estimating the governance/performance relationship (Arellano and Bover, 1995; Blundell and Bond, 1998). Using this methodology, our results are again consistent with those presented.

5. Conclusions

In China, a country that is changing from a socialist planned economy to a market economy, firms need top managers who are talented and professional decision-makers who can increase firm performance and decrease risk. Accordingly, improving top management in Chinese listed companies is very important. However, many companies in China's listed securities market are state-owned enterprises, which in the past have not exerted pressure on top management to increase firm performance or decrease firm default risk. Nevertheless, since the start of economic reforms in China, top management have increasingly had to answer to the failure of firms. The literature suggests that sub-par performance provides the board of directors with an incentive to change top management. In China, where financial crisis and fraud are widespread, efficiently controlling the probability of firm default risk is also an important mission for top management.

However, few studies have explored the relationship between top management turnover and firm default risk. Therefore, in our study we compute the actual probability of default as an alternative proxy to explore this relationship and our findings complement those of prior studies. We find that firms with higher default risk are more likely to change their top management. The probability of default risk decreasing or increasing following a change in top management is also important. Our results show that firms that change their top management have a lower subsequent risk of default compared to other companies. In another words, replacement of top management can mitigate firm default risk.

Appendix A

We use the KMV model – a model developed by the KMV Company in 1993 – to estimate and measure the default risk of the firms used in this study. The KMV model calculates the 'expected default frequency' (EDF) based on the firm's capital structure, volatility of asset returns and current asset value in accordance with the option pricing model of Black and Scholes (1973) and Merton (1974). This model is best applied to publicly traded companies for which the value of equity is determined by the market.

There are three steps involved in deriving the actual probability of default. First, we estimate the asset value and the volatility of asset returns. Financial models usually consider the market value of assets, not the book value, since the latter represents only the historical cost of the physical assets, net of depreciation. Second, we calculate the default point. According to the KMV model, default occurs when the asset value reaches a level somewhere between the value of total liabilities and short-term debt. This point, which is referred to as the default point (DPT), is considered within the KMV model as the sum of the short-term debt plus half of the long-term debt. Third, we calculate the 'distance to default' (DD), an index measure of default risk, which is the number of standard deviations between the mean of the distribution of the asset value and DPT. We then scale the DD to the actual probability of default using a default database. The estimation procedure is as follows:

$$\frac{dV_A^t}{V_A^t} = udt + \sigma_A dZ_t \tag{3}$$

where V_A^t is the total market value of the firm's assets at time t for China, u is the expected rate of return and σ_A is the volatility of asset returns. Thus, we can state the above equation in accordance with the option pricing model as follows:

$$V_E = V_A N(d_1) - Xe^{-r_f t} N(d_2) \tag{4}$$

$$d_1 = \frac{\ln\left(\frac{V_A}{X}\right) + \left(r_f + \frac{\sigma_A}{2}\right)t}{\sigma_A\sqrt{t}}, \quad d_2 = d_1 - \sigma_A\sqrt{t} \tag{5}$$

$$\sigma_E = \frac{V_A}{V_E} N(d_1)\sigma_A \tag{6}$$

where V_A is the market value of assets for firms listed on Chinese Stock Exchanges, V_E is the market value of equity for the Chinese listed company, σ_E represents the volatility of equity returns, X is the book value of the total debt on the balance sheet, t represents the time to maturity of the debt, r_f is the one-year risk-free rate from the central bank of China, $N(d_1)$ expresses the hedging ratio with a cumulative probability density function, $N(d_2)$ is the probability that the market value of assets is greater than the liability at maturity t, a cumulative density probability function.

The implied market value and volatility of assets, V_A and σ_A, can be calculated from Eqs. (4) and (6). We also need to compute the 'distance to default' (DD). Given that the total debt is regarded as the default point (DPT) for the firm, after being standardized by the standard deviation of asset returns, its DD can be expressed as:

$$\mathrm{DD} = \frac{\ln(V_A) - \ln\left(u - \frac{\sigma_A^2}{2}\right)t}{\sigma_A\sqrt{t}} \tag{7}$$

The implied default risk for any period t – that is, the probability that the market value of assets will be lower than liabilities at maturity – is measured in accordance with the risk-neutral method. The procedure is as follows:

$$EDF_t = \Pr[V_A^t \le X_t | V_A^0 = V_A] = \Pr[\ln V_A^t \le \ln X_t] \tag{8}$$

After being represented in compliance with the Ito Process, the market value of assets can be expressed, in logarithmic form, as follows:

$$\ln V_A^t = \ln V_A^0 + \left(u - \frac{\sigma_A^2}{2}\right)t + \sigma\sqrt{T}\varepsilon \tag{9}$$

where ε denotes a random factor of asset returns.

We place Eq. (9) into (8) after hypothesizing that the asset returns follow a normal distribution. After arranging the related terms, we obtain the default probability EDF_t, as follows:

$$EDF_t = \Pr[V_A^t \le X_t | V_A^0 = V_A] = \Pr\left[\ln V_A^0 + \left(u - \frac{\sigma_A^2}{2}\right)t + \sigma\sqrt{T}Z_t \le X_t\right] = \Pr\left[Z_t \le -\frac{\ln\left[\frac{V_A^0}{X_t}\right] + \left[r - \frac{\sigma_A^2}{2}\right]t}{\sigma\sqrt{t}}\right] = N(-d_2) \tag{10}$$

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