



Innovative Applications of O.R.

CEO compensation and bank efficiency: An application of conditional nonparametric frontiers

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ARTICLE INFO

Article history:

Received 12 January 2015

Accepted 19 October 2015

Available online 30 October 2015

Keywords:

Bank efficiency

CEO compensation

Conditional efficiency measures

Data envelopment analysis

ABSTRACT

The paper investigates in a dynamic context the effect of Chief Executive Officer (CEO) bonus and salary payments on banks' technical efficiency levels. Our methodological framework incorporates the latest developments on the probabilistic approach of efficiency measurement as introduced by Bădin et al. (2012). We apply time-dependent conditional efficiency estimates to analyse a sample of 37 US banks for the period from 2003 to 2012. The empirical evidence reveals a non-linear relationship between CEO bonus and salary payments and banks' efficiency levels. More specifically it is reported that salary and bonus payments affect differently banks' technological change and technological catch-up levels. Finally, the empirical evidence suggests that higher salary and bonus payments are not always aligned with higher technical efficiency levels.

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1. Introduction

Over the past decades several influential papers¹ have explored empirically the link between Chief Executive Officer (CEO) compensation levels and firms' performance (known as pay-for-performance relationship). These studies examine the pay-for-performance relationship mainly for industrial US firms. They explored how firms' performance² determines CEO compensation levels. The majority of the empirical evidence suggest that the relationship is positive,³ however, there are also a few studies providing evidence of a weak relationship (Buck, Bruce, Main, & Udueni, 2003; Conyon & Murphy, 2000; Zhou, 2000). On the other hand, some other studies report that there is even a negative relationship between excess CEO compensation and firms' performance (Brick, Palmon, & Wald, 2006; Core, Holthausen, & Larcker, 1999). Arguments in the literature (Bertrand & Schoar, 2003; Crossland & Hambrick, 2007, 2011; Finkelstein & Boyd, 1998; Hambrick & Quigley, 2014) suggest that when managerial

discretion⁴ and CEO compensation are aligned then firm performance should be higher. Furthermore, earlier studies suggest that cash compensation should be structured in such a way that will enable high rewards to be associated with high performance (Hall & Leibman, 1997; Jensen & Murphy, 1990a, 1990b; Mehran, 1995).

Despite the importance of such a relationship in the banking industry, surprisingly a few empirical studies have been exploring the link between CEO compensation and bank performance. This study contributes to current empirical research on CEO compensation in general and banking in particular. The paper differs from other recent studies in several ways.

Firstly, we explore for the first time the effect of CEO bonus and salary payments on banks' efficiency levels. We use a sample of 37 US bank holding companies over the period from 2003 to 2012. We examine in a nonparametric context the CEO payment-bank performance relationship. Secondly, we apply the latest developments of data envelopment analysis (DEA),⁵ as have been introduced by Bădin, Daraio, and Simar (2012) and Mastromarco and Simar (2014). Specifically, we model bank technical efficiency by taking into consideration time effects and the effects imposed by CEO compensation levels without imposing the restrictive separability assumption.⁶

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¹ See, for example, Ciscel and Carroll (1980), Coughlan and Schmidt (1985), Murphy (1985), Jensen and Murphy (1990a, 1990b), Kaplan (1994), Mehran (1995), Hall and Leibman (1997), Finkelstein and Boyd (1998) and Aggarwal and Samwick (1999a, 1999b).

² The extant research uses stock prices and financial and accounting based ratios as a measure of firms' performance.

³ For an extensive literature review see Murphy (1999) and Core et al. (2003).

⁴ Managerial discretion is the ability of a CEO (or a top manager) to make strategic decisions that have both direct and indirect impact on firms' performance (Finkelstein & Boyd, 1998; Bertrand & Schoar, 2003)

⁵ Recently Chen et al. (2013) have illustrated the usefulness of DEA methodology for the top management level due its ability to measure firms' performance by identifying the firms' imposing competitive advantage.

⁶ For details see the studies by Simar and Wilson (2007, 2011).

This is done by treating time and CEO compensation levels as external/environmental factors which in turn influence banks' production process. A number of recent studies, e.g. Bizjak, Lemmon, and Naveen (2008, 2011), Hayes and Shaefer (2009), Holmstrom and Kaplan (2003); among others, provide empirical support for the view that there is a common practice of competitive benchmarking to determine CEO compensation. Bizjak et al. (2008) point out that the practice is questionable since it can increase executive pay without taking into account a firm's performance. On the other hand, competitive benchmarking can be used as an efficient tool to retain valuable CEOs. In other words, CEO compensation is not necessarily determined by the firm itself but reflects compensation packages across the sector.⁷

Moreover, we apply full and partial time-dependent conditional efficiency measures that enable us to explore separately the effect of time and CEO bonus and salary payments on banks' technological change (shifting of the frontier) and technological catch-up (distribution of efficiency).⁸ Thirdly, we deploy banks' technical efficiency estimates instead of financial and accounting based ratios that are commonly used. Such an approach circumvents all the disadvantages related to those performance measures. The advantages of using relative rather than absolute measures for the analysis of the pay-for-performance relationship are discussed in detail by Antle and Smith (1986) and Gibbons and Murphy (1990). Steigenberger (2014), then discusses the limitation of financial and accounting ratios as a measure of firms' performance. Fourthly, our model does not impose any assumptions related to the functional form of the examined relationship that allows us to reveal any nonlinearities. This is an important contribution to current research in the banking industry. The previous studies have assumed a linear relationship between CEO remuneration and bank performance.

The structure of the paper is as follows: Section 2 reviews the related literature of the pay-for-performance relationship with a particular emphasis on the banking sector. Section 3 provides a description of the variables used and presents the proposed methodological framework. Finally, Section 4 discusses the empirical findings. Section 5 provides a summary of our findings.

2. Review of the literature

The prevailing empirical research on the CEO compensation-firm performance relationship has mostly been conducted for industrial firms.⁹ Coughlan and Schmidt (1985), for example, examine how the changes in compensation affect stock price performance. They provide supporting evidence that compensation affects both firms' stock price and sales growth levels. Murphy (1985) analyses the same relationship by adopting, as a dependent variable, the compensation level and as an independent variable, shareholder returns (rather than accounting profits) and growth of firms sales on the sample of 500 executives from the 73 largest manufacturing companies over the period from 1964 to 1981. The study shows that the performance measures that were adopted are strongly related to CEO compensation. Jensen and Murphy (1990a) also argue that CEOs' financial rewards affect directly firms' performance levels. They conclude that CEOs' remuneration incentives are very important determinants of firms' performance levels. In addition, they provide evidence that CEOs' performance incentives come from stock ownership. Jensen and Murphy (1990b) then emphasize that cash compensation should be structured in such a way that enables high rewards to be associated with high performance. There is, however, evidence that cash compensation and corporate performance are weakly interrelated. Thus,

it means that the 'efficient' structure of cash compensation should reflect upon firms' performance levels. In the same spirit, Kaplan (1994) regresses the annual compensation changes on several accounting and share price performance metrics for 119 Japanese companies over the period from 1982 to 1984. He provides evidence of a positive relationship between compensation and firm performance. Mehran (1995) further examines CEO compensation and firm performance. The model uses as dependent variables two performance measures: Return on Assets (ROA) and Tobin's Q. The tested sample includes 153 manufacturing firms during the period from 1979 to 1980. The findings of this study show that CEO compensation explains significantly firms' performance variations. In other words, the structure of compensation is a crucial determinant for firm performance. Hall and Leibman (1997) provide empirical evidence of a positive relationship between CEO compensation and firms' financial performance. Finkelstein and Boyd (1998) use as a measure of performance Return on Equity (ROE) and ROA. They find that prior firm performance is not linked to CEO compensation but firm size is a key determinant. Aggarwal and Samwick (1999a) show that relative performance evaluations are not linked with CEOs compensation contracts. Aggarwal and Samwick (1999b) provide convincing evidence that there is a link between sensitivity of compensation with the performance of rival firms. They also suggest that relative performance evaluation is very important for our understanding of executive compensation.

On the other hand, there are a number of studies that confirm the relationship between CEO rewards and firms' performance. Brunello, Graziano, and Parigi (2001), who use a sample of 107 Italian firms, point out the positive relationship between CEO compensation and firms' profit levels. Mitsudome, Weintrop, and Hwang (2008) compare Japanese and US companies and their results indicate that there is a significantly positive relationship between CEO compensation and short-term performance. However, they could not confirm such a relationship for the Japanese firms when they use sales growth levels as a proxy for firm performance.

Barro and Barro's (1990) study was among the first studies to investigate pay-for-performance contracts in the banking industry. They explore the relationship using a sample that includes US commercial banks during the period from 1982 to 1987. They find that the growth of compensation is positively related to accounting earnings and stock returns. That means the compensation growth depends on relative and aggregate performance. Later Hubbard and Palia (1995) provide evidence of a stronger relationship of compensation-performance during the 1980s, i.e., the period of interstate banking permission. They show that bank size also determines the level of compensation. Crawford, Ezzell, and Miles (1995) examined the sensitivity of CEO performance after the deregulation period for a sample of 37 commercial banks over the period from 1976 to 1982. They provide evidence that during the deregulation period there was an increase in pay-performance sensitivities. Houston and James (1995) analyse a sample of 134 banks over the period from 1980 to 1990 and examine the determinants of CEO cash compensation (salary plus bonus) and CEO stock and option holdings. They find that there is a positive relationship between stockholder wealth with both types of compensation. They also provide evidence that bank CEOs' cash compensation is sensitive to stock market performance. Furthermore, their findings suggest that for larger banks the pay for performance relationship is relatively weak. In contrast, Bliss and Rosen (2001) provide evidence that bank mergers and acquisitions contributed to a significant increase in CEO compensation, despite the fact that shareholder values declined through the lower value of bank shares. Their findings support several other studies suggesting that the size has a positive influence on CEO compensation. Ang, Lauterbach, and Schreiber (2002), by using a sample of 166 US banks, provide evidence that the compensation of top bank executives is determined by bank performance and the size of the bank. They also show that the payment is higher when it is linked to long-term performance

⁷ In a competitive environment, there is a high degree of discretion of how CEOs are compensated, see, for example, Finkelstein and Boyd (1998) for a further discussion.

⁸ See, for example, Kumar and Russell (2002) and Henderson and Russell (2005).

⁹ This was mainly related to data availability issues.

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