The relationship between bank efficiency and stock returns: evidence from Asia and Latin America

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The relationship between bank efficiency and stock returns: evidence from Asia and Latin America

Christos Ioannidis¹, Philip Molyneux², Fotios Pasiouras¹*

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Abstract
This paper examines the relationship between bank efficiency change and stock price returns. We first estimate the cost and profit efficiency of a sample of Asian and Latin American listed banks over the period 2000-2006 while controlling for cross-country differences such as regulations and the macroeconomic environment. We then regress the annual efficiency changes on stock returns. The results indicate a positive and robust relationship between profit efficiency changes and stock returns. However, we find no evidence that cost efficiency changes are reflected in stock returns. We also find that profit efficiency better explains bank stock returns compared to traditional accounting profits measures (ROE). Overall, we conclude that profit efficiency measures include useful information for shareholders wishing to explain bank stock returns.

Keywords: Asia, Banking, Efficiency, Latin America, Stock returns

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1. Introduction

Over the last forty years, the relationship between stock returns and publicly available information has attracted considerable attention in the accounting and finance literature. Starting with the seminal work of Ball and Brown (1968) these studies find that earnings reflect some of the information in stock prices, however, this constitutes only a small proportion of price movements (Kothari, 2001; Chen and Zhang, 2007).

The present study examines the relationship between efficiency change and stock returns in 19 Asian and Latin American banking sectors. The motivation for our study is twofold. First, as Chen and Zhang (2007) highlight, the majority of the existing studies on accounting information and stock returns focus on earnings which are applicable only under special economic settings and fail to consider the role of balance sheet data (Patel, 1989). It is therefore not surprising that recent research has shifted towards the use of additional data such as accruals (e.g. Sloan, 1996; DeFond and Park, 2001), revenues (e.g. Jegadeesh and Linvat, 2006), economic value added (Biddle et al., 1997) and efficiency (Alam and Sickles, 1998), to understand how they affect stock prices and returns. Kothari (2001) points out that, overall, the results from such studies indicate that performance measures that have evolved voluntarily in an unregulated environment are more likely to be incrementally informative than those mandated by regulation. The efficiency measures used in the present study fulfill the aforementioned criteria and have several advantages over traditional accounting ratios as performance measures, and have also been shown in the past to better explain stock returns.

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1 Sloan (1996), and DeFond and Park (2001) examine the price impact and profitability of trading strategies based on total accruals and discretionary accruals and reveal that financial statement information beyond earnings has significant value implications. Jegadeesh and Linvat (2006) show that stock price reactions to earnings announcement data is significantly related to contemporaneous as well as past revenue surprises. Alam and Sickles (1998) examine the U.S. airline industry and report a significant positive relationship between stock market returns and changes in technical efficiency. In contrast, Biddle et al. (1997) examine whether economic value added (EVA) performance measures correlates more highly with stock returns and prices than historical cost accounting earnings and find that earnings generally outperform EVA.

2 Berger and Humphrey (1997) and Bauer et al. (1998) emphasise that efficient frontier approaches seem to be superior compared to the use of traditional financial ratios. Thanassoulis et al. (1996) point out that the advantage of efficiency frontier techniques is that they take into account simultaneously all inputs and all outputs of a firm, in contrast to ratios where one input (e.g. total assets) is related to one output (e.g. profits) each time. In a similar manner, Berger and Humphrey (1997) argue that frontier approaches offer an overall objective numerical score and ranking, an efficiency proxy to comply with the economic optimization mechanism. Beccalli et al. (2006) find that a model that includes efficiency estimates obtained through data envelopment analysis explains a much higher variability in stock prices than a model developed with traditional accounting ratios.
Second, Cooper et al. (2003) and Beccalli et al. (2006) point out that the literature on accounting information and stock returns typically excludes banking institutions due to their high leverage and other distinguishing characteristics of the industry (e.g. regulations). In an attempt to close this gap, studies from the banking literature have recently investigated the relationship between bank efficiency, and stock returns\textsuperscript{3}. However, despite the substantial number of studies on bank efficiency, this specific strand of the literature remains rather limited with only a handful of country-specific studies covering Australia (Kirkwood and Nahm, 2006), Greece (Pasiouras et al., 2008a), Malaysia (Sufian and Majid, 2006), Spain (Adenso-Diaz and Gascon, 1997), Singapore (Chu and Lim, 1998; Sufian and Majid, 2007), and the US (Eisnbeis et al., 1999). Furthermore, in a cross-country setting, Beccalli et al. (2006) provide evidence from the five principal banking sectors (i.e. France, Germany, Italy, Spain, UK), Liadaki and Gaganis (2008) investigate the EU-15, while Fernandez et al. (2002) examine fifteen countries from the European economic area as well as US, Canada, and Japan. Generally, these studies (that typically focus on developed banking systems) indicate that efficiency measures derived from various frontier estimation procedures are related to bank stock price performance.

The aim of this paper is to extend the aforementioned literature by drawing on a sample across 19 developed and developing Asian and Latin American countries, the majority of which have not been examined in the past. As Myring (2006) points out, differences in the environment such as the quality of accounting standards (Ali and Hwang, 2000), the relative importance of a country’s equity market to the economy, macro corporate governance mechanisms (Ball et al., 2000) and the availability of earnings forecast may impact the performance-returns relation. Therefore, we evaluate the bank returns – efficiency relationship by estimating a common frontier while accounting for environmental differences across countries. As such, we avoid the limitations of using a small sample, a drawback that is common to the three earlier studies that provide country-specific evidence from emerging markets\textsuperscript{4}. Another important aspect of our study is that we examine both cost and

\textsuperscript{3} In addition to the bank efficiency-stock return studies, Cooper et al. (2003) examine the predictability in the cross-section of bank stock returns using information contained in individual variables such as income from derivative usage, previous loan commitments, interest raw swap activity, loan-loss reserve, earnings and leverage.

profit efficiency in contrast to most of the previous studies that focus on the relationship between technical and/or cost efficiency and stock returns\textsuperscript{5,6}. Profit efficiency is a wider concept as it combines both costs and revenues in the measurement of efficiency and as Maudos et al. (2002) argue it provides a more important source of information than the partial view offered by analyzing cost efficiency. Furthermore, from a shareholder’s perspective, we would expect shareholders to be more sensitive to the profits of a bank rather than its costs, because the dividends that they receive depend on the bank’s earning. Thus, profit efficiency changes may be reflected better in stock returns, compared to other measures such as cost and technical efficiency changes.

The rest of the paper is structured as follows. Section 2 presents the data and methodology. Section 3 discusses the empirical results and section 4 concludes the study.

2. Data and Methodology

2.1. Data

Our starting point consisted of the population of commercial banks and bank holding companies that are listed on the stock exchanges of Asia and Latin America, and appear in the Bankscope database\textsuperscript{7}. After excluding banks due to: (i) missing or zero values for inputs/outputs, and (ii) missing values in the case of the country-specific control variables, we obtained a sample of 260 banks operating in 19 countries between 2000 and 2006. The dataset is unbalanced and consists of 1,629 yearly observations. Table 1 presents the distribution of the sample by year and country.

Obviously, both the efficiency estimates and the second stage regressions could be influenced by the small number of observations.

\textsuperscript{5} Technical efficiency (TE) indicates whether a bank uses the minimum quantity of inputs to produce given quantity of outputs. Allocative efficiency (AE) refers to the ability of a bank to use the optimum mix of inputs given their respective prices. Cost efficiency, which is the product of TE and AE, shows the ability of a bank to provide services without wasting resources as a result of technical or allocative efficiency.

\textsuperscript{6} Chu and Lim (1998) in Singapore, Sufian and Majid (2006) in Malaysia, and Pasiouras et al. (2008a) in Greece estimate profit-oriented measures of efficiency by defining expenses as inputs and profits as outcomes. However, these studies do not use information on input and/or output prices which are required for the estimation of cost and profit efficiency (Coelli et al., 2005). Thus, one can relatively easily argue that these studies focus on technical efficiency from a different perspective rather than profit efficiency. One study that actually examines profit efficiency is the one of Kirkwood and Nahm (2006) in Australia. Finally, Liadaki and Gaganis (2008) examine the relationship between cost and profit efficiency and stock returns in the EU-15.

\textsuperscript{7} Information on whether banks were listed or not on a stock exchange was also obtained by Bankscope.
We collected information from various sources. Bank-specific data were obtained from Bankscope database of Bureau van Dijk and were converted to US dollars. As in Altunbas et al. (2001) and Lozano-Vivas and Pasiouras (2008) among others, we express the data in real terms using country GDP deflators. Information on bank regulations and supervision was obtained by the World Bank (WB) database developed by Barth et al. (2001) and updated by Barth et al. (2006, 2007). Data for concentration were collected from the updated version of the WB database on financial development and structure (Beck et al., 2006b). Data for the macroeconomic conditions and financial development indicators were obtained from the Global Market Information Database (GMID). The International Monetary Fund (IMF) list served as the basis for classifying countries into developed and developing.

2.2. Methodology

2.2.1. Efficiency estimates

We use the Battese and Coelli (1995) model that allows the estimation of efficiency in a single stage, while controlling for cross-country differences. In its general form, the cost model can be written as follows:

\[
\ln C_{it} = C(q_{it}, p_{it}; \beta) + u_{it} + v_{it}, \quad i = 1, 2, \ldots, N; \quad t = 1, 2, \ldots, T \tag{1}
\]

where: \(C_{it}\) is the total cost of bank \(i\) at time \(t\); \(q_{it}\) is a vector of outputs; \(p_{it}\) denotes a vector of values of input prices associated with a suitable functional form; \(\beta\) is a vector of unknown scalar parameters to be estimated; \(u_{it}\) and \(v_{it}\) are random errors.

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8 This WB database is available for only three points in time. Version I was released in 2001 and has information for 117 countries (Barth et al., 2001b). For most of the countries, information corresponds to 1999, while for others information is either from 1998 or 2000. Version II describes the regulatory environment at the end of 2002 in 152 countries (Barth et al., 2006). Version III describes the situation in 142 countries in 2005/06 (Barth et al., 2007). Consequently, we had to work under the assumption that the scores of our regulatory variables remain constant within short windows of time. More precisely, we used information from Version I for bank observations from the period 1999-2000, from Version II for bank observations from the period 2001-2003, and from Version III for bank observations from 2004-2006. Other studies that have used this database across a number of years have obviously worked under a similar assumption (e.g. Demirguc-Kunt and Detragiache, 2002; Demirguc-Kunt et al., 2004; Fernandez and Gonzalez, 2005; Beck et al., 2006c; Pasiouras et al., 2008b; Lozano-Vivas and Pasiouras, 2008).
assumed to be i.i.d. and have \( N(0, \sigma_u^2) \); \( u_{it} \)'s are the non-negative inefficiency effects in the model which are assumed to be independently (but not identically) distributed, such that \( u_{it} \) is obtained by truncation (at zero) of the \( N(m_{it}, \sigma_u^2) \) distribution where the mean is defined by:

\[
m_{it} = z_{it}\delta
\]

(2)

where \( z_{it} \) is a \((1 \times M)\) vector of observable explanatory variables that influence the inefficiency of bank \( i \) at time \( t \); and \( \delta \) is an \((M \times 1)\) vector of coefficients to be estimated (which would generally be expected to include an intercept parameter). The parameters of equations (1) and (2) are estimated in one-step using maximum likelihood\(^9\).

The specification of the profit frontier model is the same as that of the cost frontier (equation (1)) with profit before tax (PBT) replacing total costs as the dependent variable. However, the sign of the inefficiency term now becomes negative (-\( u_{it} \)). Thus, as in most previous studies, we estimate an alternative profit frontier, which ignores output prices\(^10\). Furthermore, since a number of banks in the sample exhibit negative profits (i.e. losses), the dependent variable in the profit model is transformed to \( \ln(PBT + \max(PBT)) + 1 \), where \( \max(PBT) \) is the minimum absolute value of PBT over all banks in the sample.

For the selection of the inputs and outputs, we follow the intermediation approach. We use three outputs namely loans (Q1), other earning assets (Q2), and non-interest income (Q3), and two input prices that account for the cost of borrowed funds (W1), and the cost of non-financial inputs (W2)\(^11\). A time trend (T=1 for 2000,

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\(^9\) See Battese and Coelli (1995) and Coelli et al. (2005), for further details.

\(^10\) Berger and Mester (1997) argue that alternative profit efficiency may provide useful information and be preferred when one or more of the following conditions are applicable: (a) there are substantial unmeasured differences in the quality of banking services; (b) outputs are not completely variable; (c) output markets are not perfectly competitive; (d) output prices are not accurately measured. Based on these arguments, Kasman and Yildirim (2006) point out that in international comparisons with a diverse group of countries and competition levels it seems more appropriate to estimate an alternative rather than a standard profit function. Furthermore, DeYoung and Hasan (1998) point out that output quantities tend to vary across banks to a greater extent than output prices, thus explaining a larger portion of the variation in profits in regression analysis.

\(^11\) Non-interest income is used as an output to account for the fact that a large proportion of total income is generated by off-balance-sheet and other non-traditional activities. The cost of borrowed funds is calculated as the ratio of interest expenses to total deposits. The cost of non-financial inputs is calculated as non-interest expenses to total assets. Ideally, we would include three input prices, one for labour (e.g. personnel expenses to total), one for borrowed funds (interest expenses to deposits) and
T=2 for 2001,…, T=7 for 2006) is included in the function to account for changes in technology over time. As in Lensink et al. (2008) the trend is included with both $T$ and $T^2$ terms. Following Berger and Mester (1997) among others, we specify equity as a fixed input to control for differences in bank capitalization. We impose linear homogeneity restrictions by normalizing the dependent variables and input prices by the second input price $W_2$. Using the multi-product translog specification gives our empirical cost frontier model as follows:\(^{12}\):

$$
\ln \frac{TC}{W_2} = \beta_0 + \beta_1 \ln(Q1) + \beta_2 \ln(Q2) + \beta_3 \ln(Q3) + \beta_4 \ln\left(\frac{W_1}{W_2}\right) + \beta_5 \frac{1}{2} (\ln(Q1))^2
$$

$$
+ \beta_6 \ln(Q1) \ln(Q2) + \beta_7 \ln(Q1) \ln(Q3) + \beta_8 \frac{1}{2} (\ln(Q2))^2 + \beta_9 \ln(Q2) \ln(Q3) + \beta_{10} \frac{1}{2} (\ln(Q3))^2
$$

$$
+ \beta_{11} \ln\left(\frac{W_1}{W_2}\right)^2 + \beta_{12} \ln(Q1) \ln\left(\frac{W_1}{W_2}\right) + \beta_{13} \ln(Q2) \ln\left(\frac{W_1}{W_2}\right) + \beta_{14} \ln(Q2) \ln\left(\frac{W_1}{W_2}\right) + \beta_{15} \ln(EQ) + \beta_{16} \frac{1}{2} (\ln(EQ))^2 + \beta_{17} \ln(E) \ln(Q1) + \beta_{18} \ln(E) \ln(Q2) + \beta_{19} \ln(E) \ln(Q3) + \beta_{20} \ln(E) \ln\left(\frac{W_1}{W_2}\right)
$$

$$
+ \beta_{21} T + \beta_{22} T^2 + \beta_{23} \ln(Q1) T + \beta_{24} \ln(Q2) T + \beta_{25} \ln(Q3) T + \beta_{26} \ln\left(\frac{W_1}{W_2}\right) T + \beta_{27} \ln(EQ) T + u_{it} + v_{it}
$$

To control for cross-country differences and bank-specific risk we define $m_u$ in Equation (2) as:

$$
m_u = \delta_0 + \delta_1 LLR + \delta_2 CAPITRQ + \delta_3 OFFPR + \delta_4 MDISCIP + \delta_5 ACTRS + \delta_6 CONC + \delta_7 INF + \delta_8 GDPGR + \delta_9 CLAIMS + \delta_{10} DEVEL + \delta_{11} JAPAN
$$

Where LLR is calculated as loan loss reserves to gross loans and controls for bank-risk. $CAPITRQ$, $OFFPR$, $MDISCIP$ and $RESTR$ are variables that control for the main

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\(^{12}\) For brevity of space, we present only the cost function here. As mentioned before, for the estimation of profit efficiency, we replace total costs by profit before taxes, and change the sign of the inefficiency term ($-u_{it}$).
regulatory conditions in the various banking sectors. \textit{CAPITRQ} is a measure of capital requirements that accounts for both initial and overall capital stringency. \textit{OFFPR} is a measure of the power of the supervisory agencies indicating the extent to which they can take specific actions against bank management and directors, shareholders, and bank auditors. \textit{MDISCIP} is an indicator of market discipline and shows the degree to which banks are forced to disclose accurate information to the public and whether there are incentives to increase market discipline. \textit{RESTR} is a proxy for the level of restrictions on banks’ activities. It is determined by considering whether securities, insurance, real estate activities, and ownership of non-financial firms are unrestricted, permitted, restricted, or prohibited. \textit{CONC} is the concentration in the banking sector, as measured by the proportion of total assets held by the three largest banks in the country. \textit{INF} is the annual rate of inflation and \textit{GDPGR} is the real GDP growth, both capturing macroeconomic conditions. \textit{CLAIMS} measures the activity in the banking sector and it is calculated by dividing bank claims to the private sector with GDP. \textit{DEVEL} is as a dummy variable that takes the value of one for developed countries and zero for developing countries. Finally, \textit{JAPAN} is as a dummy variable that takes the value of one for Japan and zero for other countries.

The individual bank (in)efficiency scores are calculated from the estimated frontiers as $CE_{kt} = \exp(u_i)$ and $PEF_{kt} = \exp(-u_i)$, the former taking a value between one

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13 Recent studies that have used these variables in the efficiency and productivity literature include Pasiouras (2008), Pasiouras et al. (2008b), Delis et al. (2008), and Lozano-Vivas and Pasiouras (2008).

14 For the construction of \textit{CAPITRQ, OFFPR}, and \textit{MDISCIP}, we use the summation of the 0/1 quantified answers as in Gonzalez and Fernandez (2005), Barth et al. (2001b, 2004b, 2007), Pasiouras et al. (2006, 2008b), Pasiouras (2008), Fonseca and Gonzalez (2008), Lozano-Vivas and Pasiouras (2008), Delis et al. (2008). An alternative would be to use the principal component as in Beck et al. (2006a). Barth et al. (2004a) have followed both approaches. They mention that on the one hand the drawback of using the summation for the construction of the index is that it assigns equal weight to each of the questions whereas on the other hand the disadvantage of the first principal component is that it is less transparent how a change in the response to a question changes the index. While they only report the empirical reports using the principal component indexes, they mention that “we have confirmed all this paper’s conclusions using both methods” (p. 218), implying that there are no differences in the results. Further information on the calculation of these variables is available in the Appendix.

15 We include this dummy variable in the analysis in an attempt to capture any distinguishing characteristics of the Japanese banking sector and account somehow for the large number of Japanese banks in our sample. For instance, Japan is the world’s second-biggest economy and a highly advanced developed country with a large financial market. It is also being considered as the largest bank-based economy (Liu and Tone, 2008) and more than 100 Japanese banks are constantly being listed in the 1,000 largest world banks accounting for 10% of the Top 1000 Tier 1 capital and total assets in 2007 (The Banker, 2004, 2007). However, at the same time, Japan’s banking industry was one of the most distressed in the region in recent years and has been subject to significant restructuring. After several years of poor performance, Japanese banks recorded profits in 2004, however their average return of capital (5.2% in 2004 for the 113 banks included in the world top 1,000) was well below the Asian (12.1%) and Latin American (23.9%) corresponding figures (The Banker, 2004).
and infinity and the latter between zero and one. In both cases, scores closer to 1 indicate higher efficiency. To make our results comparable, we calculate the index of cost efficiency as follows: $CEF_{kt} = 1/ CE_{kt}$. Hence, both cost and profit efficiency scores take values between 0 and 1 with values closer to 1 indicating a higher level of efficiency.

2.2.2. Efficiency change and stock returns

To test whether cost and profit efficiency changes are incorporated into stock valuation and they subsequently result in higher returns for the banks’ shareholders, we undertake the estimation of the simple linear model:

$$r_{12m_{it}} = \beta_0 + \sum_j \beta_j d(cf)_{it} + \sum_k \gamma_k d(prf)_{it} + h_{it},$$

$$h_{it} = \epsilon_i + \omega_{it},$$

(5)

Where $r_{12m_{it}}$ denotes the annual returns of bank (i) over the time period (t). Changes in cost efficiency per bank over the same period are given by $d(cf)_{it}$ ($d$ is the first difference operator), and profit efficiency changes are shown as $d(prf)_{it}$.

The stochastic component $h_{it}$ contains the unobserved bank specific effect $\epsilon_i \sim IID(0,\sigma_\epsilon)$ that is assumed to be time invariant and the idiosyncratic disturbance $\omega_{it} \sim IID(0,\sigma_\omega)$.

The role of the bank-specific stochastic component in the error structure cannot be determined a-priori; it will be established depending on the method of estimation. Allowing for unknown correlation between this component and the regressor requires the estimation of such parameter; to obtain consistent estimates of the parameter vector $(\beta_j, \gamma_k)$, this is normally referred as fixed effects estimation. Alternatively the assumption of zero correlation between the firm-specific unobserved element and the regressor reduces the number of parameters to be estimated thus

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16 We use a 12-months window that covers the same period as the fiscal year. As in Chu and Lim (1998) we use stock prices from the first and the last day of the window that we examine, and calculate the returns as $[(P_t-P_{t-1})/P_{t-1}]$. Stock prices have been adjusted based on the stock split/dividend ratio and as other bank-level data are expressed in real terms using GDP deflators.
increasing the efficiency of the estimated coefficients; in this case the appropriate method is what is known as random effects.

By and large, inference in this context requires robust estimators of the variance matrix as the usual least squares estimators rely heavily on the very strong assumptions of time invariance and independence of the conditional variances of both error components and zero conditional co-variances. To establish the appropriate estimation method the test statistic proposed by Hausman (1978) is used. Under the null hypothesis both fixed and random effects estimators are consistent with the random effect being the efficient choice. Under the alternative the fixed effects is inefficient but it remains consistent whilst the random effects estimator becomes inconsistent. Rejection of the null hypothesis advises against the use of the random effects estimator.

If improvements in cost and profit efficiency are reflected in stock returns, we expect that there will be a positive association between these changes and the dependent variable. In addition, to establish whether the same variables carry information that cannot be fully reflected in other published accounting data, we incorporate in the model another variable that indicates financial performance, namely the change in bank’s return on equity (ROE). By augmenting the previous model: Under the null hypothesis that ROE incorporates all the relevant information and therefore efficiency improvements do not convey independent information it is expected that:

\[ r12m_{it} = \beta_0 + \sum_j \beta_j d(cf)_{it} + \sum_k \gamma_k d(prf)_{it} + \sum_l \delta_l d(roe)_{it} + h_{it} \quad (6) \]

\[ \beta_j = \gamma_k = 0 \quad \forall j, k \]

3. Results

3.1. Efficiency scores

Table 2 presents the cost and profit efficiency estimates by year and geographical region. It is evident that there are marked differences in their evolution and range and in addition between the groups of Asian banks on the one hand and Latin American in the other.
By and large, the measures of cost efficiency are far more predictable in all cases as measured by the coefficient of variation (s.d/mean). This measure of volatility does not exceed 10% in any case and shows remarkable stability over time. In addition, the steady mean figures, in the region of 92% with similar median figures (95%) indicate a near symmetric distribution. Both Asian and Latin American banks exhibit very similar distributions as both the differences between the first and second moments are not significantly different from zero, over the whole period of the sample. From our sample, it appears that all the banks are performing very near the limit of maximum cost efficiency implying that local managers are mindful of expenses when allocating resources to the production of the bank’s different outputs. Thus, the average bank in the sample should reduce its costs by only 7.24% to match the best practice bank. The similarity between the means and standard deviations are indicative of a common production technology that is present in the banking sector in the region under study. The adoption of such technology may limit managerial discretion in choosing a somewhat idiosyncratic combination of resources reflecting individual preferences. The transmission of technology across countries for the making of similar products is a well established consequence of globalisation and from this, preliminary, assembled evidence it appears that this process is not limited to manufacturing but it is also present in the production of financial products and services.

Turning to the profit efficiency the average figure is equal to 0.7025 meaning that the average bank in sample should improve its profits by 29.75% to match the best practise bank. A correlation analysis of the cost and profit efficiency scores, confirms the results of previous studies that these scores do not move in parallel as one could expect. One explanation is that the profitability of the bank depends both upon the costs that are incurred in the production of the services and products and the yield of the assets and liabilities that they manage. The management of assets and liabilities is probably the most demanding task that the managing team is facing. Their

17 Our finding is consistent with Berger and Mester (1997), Rogers (1998), Pasiouras et al., (2008b). In our case, the Pearson’s coefficient is as low as 0.096. As in Rogers (1998), we also examine the relationship between the rankings of the banks, rather than the efficiency scores. In this case, the Spearman’s coefficient is equal to 0.306, indicating that there are important differences in the ranking of banks between these two measures of efficiency.
actions are limited by ‘domestic’ regulatory practices and other institutional factors. It is in this metric that the ‘quality’ of managerial teams is distinguished and their relative performance is judged by the shareholders whose judgement will be reflected on the value of equity. In our sample, we observe significant differences between banks from the two geographical blocks. The Asian banks exhibit profit efficiency at least twice the level exhibited by Latin American banks. The mean efficiency score for Asian banks is 0.75 and 0.35 for the Latin America banks. In addition to such discrepancies at the mean, there is significant difference in the coefficient of variation. Unlike the performance of cost efficiency where there is no significant difference between the moments of the two distributions, in this case there is a marked increase in the coefficient of variation in both distributions. Regarding profit efficiency, the relevant magnitudes are at least twice as large compared to the cost efficiency averaging 24% and 43% for Asian and Latin American banks respectively. Such diversity of performance between the geographical blocks and between the banks may be informative predictors of volatile series such as bank stock returns and so we expect their inclusion will add significant value to the explanation of bank stock return variation.

3.2. Regression results

Panel A in Table 3 presents the second stage regression results of the model discussed in section 2. The exclusion restrictions $\gamma_k = \delta_i = 0$ were not rejected in either fixed or random effects model the p-values of the test statistics being 0.11 and 0.12 respectively. The exclusion restriction regarding the contribution of the variable denoting improvements in profit efficiency was decidedly rejected in both cases with p-value equal to 0.0025.

As our sample contains extreme return observations and these may exercise undue influence on the estimated coefficients we reformulate the model by transforming the dependent variable into binary values, assuming the value of 1 if $r12m_{it} > 0$ and zero otherwise. The resulting logistic panel regression is therefore free form all scale
factors of the dependent variable and allows for robustness in the reported results. In this case, we are examining whether changes in efficiency categorise the bank into one belonging to a set of banks experiencing positive stock returns independently of their size. The results of the logistic regression are shown in Panel B. As in the previous specification, we established that profit efficiency improvements are incorporated into stock returns and their information content makes a modest but independent contribution that is not captured by changes of ROE.

To conclude, our results show that profit efficiency changes are reflected in stock returns, although this is not the case for cost efficiency changes. These results are consistent with the ones of Liadaki and Gaganis (2008) for the EU-15 banking sector. One potential explanation is that rational shareholders are supposed to be interested in their eventual wealth, which is the result of dividend payments and capital gains\(^\text{18}\) (Board and Day, 1989). Consequently, because dividends will be paid on the basis of profits, stock returns are more sensitive to profits efficiency rather than cost efficiency. Furthermore, while cost efficiency offers an indication as for the capability of managers, it will not necessarily result in improvements in profits, as these are subject to revenue efficiency as well. This is particularly important because it is the capability in generating profits rather than solely managing costs that allows companies to implement their strategies and grow.

As for our observation that profit efficiency appears to be more important than traditional indicators of profitability (i.e. ROE) this can be potentially attributed to “quality of earnings” and the “persistency of earnings” explanations. As Chan et al. (2006) point out, there have been growing concerns about the quality of earnings, or the extent to which reported earnings reflect operating fundamentals. Furthermore, Nichols and Wahlen (2004) demonstrate that stock returns react more strongly to changes in profits that are likely to recur than to changes likely to be transitory. As a positive \(d(prf)\) indicates that the bank is capable of operating efficiently in terms of generating profits there is an increased likelihood that it will continue to generate earnings in the future. In addition, efficiency is an indicator of quality that may allow banks to improve their profits, at least relative to competitors, even under adverse

\(^{18}\) Obviously, not all investors intend to keep the stocks in the long-term and benefit from dividend payments. However, this group of investors will also have an interest on the stream of expected future dividends since the stock price should reflect the present value of future dividends. Thus, positive changes in the expectations about the dividends will result in positive stock price changes, allowing them to earn profits on sale (Board and Day, 1989).
environmental circumstances. In other words, because profit efficiency changes take into account input and output considerations simultaneously via economic optimization mechanisms (we would argue) that they provide more information about the quality and the persistency of earnings than changes in ROE. Furthermore, Destefanis and Sena (2007) mentions that ratios such as ROE under-represent the firm’s value because of the investment myopia problem, while this is not the case for efficiency scores. Destefanis and Sena (2007) also note that if managers engage in myopic behaviour, long-term investment should be expected to decrease resulting in lower efficiency. Additionally, due to the separation between management and ownership, managers may have incentives to invest in projects granting power and prestige, but not resulting in an improvement in productivity (Shleifer and Vishny, 1997). Such behaviour is likely to be instantly reflected in a reduction in efficiency, justifying the interest of shareholders in such indicators of performance (Destefanis and Sena, 2007).

4. Conclusions

The relation between stock returns and publicly available information has traditionally attracted the attention of researchers in accounting and finance. While the majority of the literature focuses on earnings, some recent studies examine other firm attributes such as accruals, revenue surprises, economic value added, and efficiency. Motivated by the limited research in banking, the present study examines the relationship between efficiency change and stock returns in 19 Asian and Latin American banking sectors.

We first use the stochastic frontier analysis to obtain estimates on the cost and profit efficiency of banks during 2000-2006, while accounting for environmental differences. Then, we regress annual efficiency changes on annual stock returns. The results indicate a positive and robust relationship between profit efficiency changes and stock returns. However, we find no evidence that cost efficiency changes are reflected in stock returns. Furthermore, we observe that the change in the return on equity does not provide incremental information.

There are a number of potential explanations for these findings. First, shareholders are interested in profits rather than costs due to the relationship of the former with dividends that influences both the future dividend payments and
subsequent movements in stock prices. Second, it is likely that profit efficiency measures are indicators of the “quality of earnings” and the “persistency of earnings” while traditional profitability ratios are not. Finally, efficiency measures may be able to provide information that is not biased by the investment myopia problem or agency problems.

References


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### Table 2- Descriptive statistics of Cost and Profit efficiency estimates

#### Panel A: Cost efficiency 2000-2006

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<td>Total</td>
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#### Panel B: Profit efficiency 2000-2006

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<td>Latin America</td>
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Table 3 – Regression results

Panel A: Linear Regression (Dependent Variable = Bank stock return over twelve months, $r_{12m_{i,t}}$)

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<tr>
<td>d(cf)</td>
<td>0.00359 (0.997)</td>
<td>0.643 (1.07)</td>
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<td>d(prf)</td>
<td>0.35 (3.03)</td>
<td>0.354 (3.22)</td>
<td>0.2269 (3.03)</td>
<td>0.219 (2.64)</td>
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<tr>
<td>d(roe)</td>
<td>-0.559 (1.93)</td>
<td>-0.472 (1.88)</td>
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<tr>
<td>R-sqr</td>
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Panel B: Logistic Regression (Dependent Variable: $d_{pos}$=1 if Bank stock return over twelve months : $r_{12m_{i,t}}$>0, 0 otherwise)

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<tr>
<td>d(cf)</td>
<td>0.023 (0.74)</td>
<td>0.037 (1.63)</td>
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<tr>
<td>d(prf)</td>
<td>0.009 (1.98)</td>
<td>0.010 (2.69)</td>
<td>0.00842 (2.32)</td>
<td>0.00845 (2.04)</td>
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<td>d(roe)</td>
<td>-0.007 (0.02)</td>
<td>-0.008 (1.10)</td>
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Notes: d(cf) = cost efficiency change, d(prf) = profit efficiency change; d(roe) = roe change; t-statistics are in parentheses.
## Appendix - Information on regulatory variables

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<td>Capital requirements</td>
<td>This variable is determined by adding 1 if the answer is yes to questions 1-6 and 0 otherwise, while the opposite occurs in the case of questions 7 and 8 (i.e. yes=0, no =1). (1) Is the minimum required capital asset ratio risk-weighted in line with Basle guidelines? (2) Does the ratio vary with market risk? (3-5) Before minimum capital adequacy is determined, which of the following are deducted from the book value of capital: (a) market value of loan losses not realized in accounting books? (b) unrealized losses in securities portfolios? (c) unrealized foreign exchange losses? (6) Are the sources of funds to be used as capital verified by the regulatory/supervisory authorities? (7) Can the initial or subsequent injections of capital be done with assets other than cash or government securities? (8) Can initial disbursement of capital be done with borrowed funds?</td>
</tr>
<tr>
<td>MDISCIP</td>
<td>Market discipline</td>
<td>This variable is determined by adding 1 if the answer is yes to questions 1-7 and 0 otherwise, while the opposite occurs in the case of questions 8 and 9 (i.e. yes=0, no =1). (1) Is subordinated debt allowable (or required) as part of capital? (2) Are financial institutions required to produce consolidated accounts covering all bank and any non-bank financial subsidiaries? (3) Are off-balance sheet items disclosed to public? (4) Must banks disclose their risk management procedures to public? (5) Are directors legally liable for erroneous/misleading information? (6) Do regulations require credit ratings for commercial banks? Is there a compulsory external audit by a certified/licensed auditor? (8) Does accrued, though unpaid interest/principal enter the income statement while loan is non-performing? (9) Is there an explicit deposit insurance protection system?</td>
</tr>
<tr>
<td>OFFPR</td>
<td>Official disciplinary power</td>
<td>This variable is determined by adding 1 if the answer is yes and 0 otherwise, for each one of the following fourteen questions: (1) Does the supervisory agency have the right to meet with external auditors to discuss their report without the approval of the bank? (2) Are auditors required by law to communicate directly to the supervisory agency any presumed involvement of bank directors or senior managers in illicit activities, fraud, or insider abuse? (3) Can supervisors take legal action against external auditors for negligence? (4) Can the supervisory authorities force a bank to change its internal organizational structure? (5) Are off-balance sheet items disclosed to supervisors? (6) Can the supervisory agency order the bank's directors or management to constitute provisions to cover actual or potential losses? (7) Can the supervisory agency suspend director’s decision to distribute dividends? (8) Can the supervisory agency suspend director’s decision to distribute bonuses? (9) Can the supervisory agency suspend director’s decision to distribute management fees? (10) Can the supervisory agency supercede bank shareholder rights and declare bank insolvent? (11) Does banking law allow supervisory agency or any other government agency (other than court) to suspend some or all ownership rights of a problem bank? (12) Regarding bank restructuring and reorganization, can the supervisory agency or any other government agency (other than court) remove and replace management? (13) Regarding bank restructuring &amp; reorganization, can supervisory agency or any other government agency (other than court) remove and replace directors? (14) Regarding bank restructuring &amp; reorganization, can supervisory agency or any other government agency (other than court) remove and replace directors?</td>
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<tr>
<td>RESTR</td>
<td>Restrictions on banks activities</td>
<td>The score for this variable is determined on the basis of the level of regulatory restrictiveness for bank participation in: (1) securities activities (2) insurance activities (3) real estate activities (4) bank ownership of non-financial firms. These activities can be unrestricted, permitted, restricted or prohibited that are assigned the values of 1, 2, 3 or 4 respectively. We use an overall index by calculating the average value over the four categories.</td>
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Note: The individual questions and answers were obtained from the World Bank database developed by Barth et al. (2001b, 2006, 2007)