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THE COST EFFICIENCY OF COMMERCIAL BANKS IN HONG KONG

Key Points:

- *Given banks' special role in channelling funds from savers to investors, their cost efficiency has a significant effect on the supply of credit and, in turn, on the overall economic performance. In addition, inefficiency would affect banks' earnings, thus hampering their ability to withstand shocks. The issue of banks' cost efficiency is therefore of interest to policy makers.*

- *Using the stochastic frontier approach and a panel dataset of retail banks, this paper assesses the cost efficiency of the banking sector in Hong Kong. The average cost inefficiency during the period 1992-2005 is found to be about 15% to 29% of observed total costs, which is largely in line with the experience of US and European banks.*

- *Cost efficiency is found to be correlated with macroeconomic conditions, with a significant rise in cost inefficiency triggered by the Asian financial crisis and the outbreak of SARS during the period 1998-2003, partly due to the lack of perfect flexibility by banks to adjust their factor inputs (labour, funds and capital) in response to falling outputs. Additional resources spent on risk control, new business initiatives and strengthening customer relationships may also have contributed. Nevertheless, the cost efficiency has started to improve by 2004 Q1, along with the recovery of the economy. This suggests also that the adjustments and streamlining by the banks in recent years may have begun to bear fruit.*

- *Empirical results also indicate that cost efficiency is positively correlated with bank size, suggesting large banks are on average more efficient than smaller banks. Efficiency is also observed to be sensitive to banks' business mix, with banks which focus more on lending business exhibiting a higher level of efficiency compared to banks that focus relatively less on loans. In addition, banks suffering from larger loan loss provisions are found to be less efficient, probably due to higher operational costs relating to credit risk and loan loss management.*

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I. INTRODUCTION

The cost efficiency of banks has attracted much attention of academics and policy makers, along with scale and scope economies. Given their special role in channelling funds from savers to investors, poor cost efficiency of banks would restrain the creation of credit, thus jeopardising economic performance. In addition, inefficiency would affect banks' earnings, hampering their ability to withstand shocks. The cost efficiency of the US and European banking industries has been intensively examined.[1] As for the banking sector in Hong Kong, the issue was only recently studied by Kwan (2002, 2006) and Drake et al. (2006a, 2006b).

By using a non-parametric approach, Drake et al. (2006a) analysed the potential impact of environmental and market factors on the efficiency of the Hong Kong banking system. Many institutions were found to have a high level of technical inefficiency, and there were considerable variations in efficiency levels and trends across size groups and banking sectors. Their results also suggested that the efficiency of banks in Hong Kong had been affected by external factors, mainly macroeconomic and housing market factors.[2]

Kwan (2002, 2006), based on quarterly data from 1992 to 1999 of 51 banks in Hong Kong and using the stochastic cost frontier approach, found that the X-efficiency was about 16% to 30% of observed total costs. Kwan also found that the average large bank was less efficient than the average small bank, but the size effect appeared to be related to differences in portfolio characteristics among different size banks. After controlling for on- and off- balance sheet characteristics and loan growth, Kwan (2002, 2006) showed that large banks had higher cost efficiency than smaller banks.[3] This suggests that empirical results on the size-efficiency relationship are sensitive to the specification employed, in particular the specification on how banks' outputs are measured.[4] As for the evolution of efficiency over time, Kwan (2002, 2006) found that

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[1] For example, Berger and Humphrey (1991), Kaparakis et al. (1994) and Clark and Siems (2002) studied the cost efficiency of the US banking industry, and Altunbas et al. (2001) and Vennet (2002) studied that of the European banking industry.

[2] Drake et al. (2006b) presented their further work on the issue in an HKIMR seminar in April 2005. In their study, they examined both cost and profit efficiencies for financial institutions in Hong Kong by using a parametric approach. They found that both profit and cost efficiencies revealed a secular decline over the whole sample period, but a much smaller deterioration in profit efficiency levels was observed. It suggested that Hong Kong's financial institutions were able to generate significant improvements in revenues relative to costs. Note that the paper is not yet publicly released.

[3] Drake et al. (2006a) based on the non-parametric approach and a panel dataset of banks in Hong Kong for the period 1995-2001 also showed that large banks were more efficient than their smaller competitors. The existing literature in this area also suggests that larger banks are in general more efficient. For example, Berger, Hunter and Timme (1993) reported evidence that larger banks were more X-efficient than smaller banks in the US banking industry.

[4] Similar observations were found in the US banking industry. While Kaparakis et al. (1994) found that banks generally became less efficient with increasing size for the US banking industry, they noted that the finding would alter if off-balance sheet activities were included in the analysis.

banks were getting more efficient from 1992 to 1997, but less efficient in 1998 and 1999. The deterioration after 1997 may be explained by the effects of the Asian financial crisis. It is, therefore, of interest to see how the banks have fared in recent years.

This paper reassesses the efficiency level of banks in Hong Kong and the size-efficiency relationship by incorporating off-balance sheet (OBS) outputs into the analysis, in view of the increasing importance of OBS business as a source of banks' incomes.[5, 6, 7] It also examines the relationship between cost efficiencies, bank characteristics and macroeconomic conditions. In addition, the efficiency estimates are extended to cover the period up to 2005, with the focus on retail banks.

The rest of the paper is organised as follows. The next section discusses the methodology of evaluating banks' cost efficiency. This includes an exposition of the stochastic cost frontier approach as originated from Aigner et al. (1977). Section III describes the data employed and the estimation methods, and presents summary statistics of the dataset. Section IV presents the efficiency estimates and Section V examines the relationships between efficiency, bank characteristics and macroeconomic conditions. Finally, Section VI concludes.

II. METHODOLOGY

There are two main approaches for the estimation of efficiency. They are the stochastic frontier approach (SFA) and the data envelopment approach (DEA).[8] In this paper, the stochastic cost frontier approach developed by Aigner et al. (1977) is adopted. This technique is commonly used in banking studies.[9] In this framework, the banking firm is viewed as an intermediary that combines various factor inputs to produce a number of outputs. The log of production cost is assumed to take the

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[5] Instead of using a non-parametric approach as in Drake et al. (2006a), this paper adopts the stochastic frontier approach, similar to Kwan (2002, 2006). However, the output variable is represented by the sum of both on-balance sheet and off-balance sheet items. The initial set of input variables included in the estimation is similar to Kwan (2002, 2006).

[6] Another possible extension of the current approach, which can be considered in future research, is to take a similar approach to Drake et al. (2006b), in that both the cost and profit efficiencies were estimated and the productivity growth was decomposed into two portions: one due to changes in business conditions and the other due to changes in the best practice and inefficiency.

[7] Omitting off-balance sheet (OBS) outputs in the cost efficiency estimation not only affects the size-efficiency relationship estimates, it also affects estimates of the efficiency level. Rogers (1998) and Clark and Siems (2002), by comparing the results which included proxies for the OBS outputs in the estimation, such as non-interest incomes, with those without incorporating OBS outputs in the estimation, showed that omitting OBS activities in the cost efficiency estimation could seriously understate actual bank outputs and efficiency levels.

[8] The Data Environment Analysis approach is a non-parametric method that applies mathematical programming technique to envelop the input/output data.

[9] See, for example, Kaparakis et al. (1994), Goldberg and Rai (1996), Vennet (2002) and Kwan (2002; 2006).

following general form:

$$\ln C_i = f(\ln y_{ji}, \ln w_{ki}) + \varepsilon_i, \tag{1}$$

where C_i is the total production cost of the ith bank, y_{ji} is the jth output of the ith bank, and w_{ki} is the price of the kth input of the ith bank. With the functional form of f in equation (1) specified as a multi-product translog with the usual symmetry restrictions based on the duality theorem, equation (1) can be written as[10,11]

$$\begin{aligned}\ln C_i = \alpha_0 + \sum_{j=1}^{J} \tau_j \ln y_{ji} + \sum_{k=1}^{K} \phi_k \ln w_{ki} + \frac{1}{2}\sum_{j=1}^{J}\sum_{l=1}^{J} \gamma_{jl} \ln y_{ji} \ln y_{li} \\ + \frac{1}{2}\sum_{k=1}^{K}\sum_{h=1}^{K} \varphi_{kh} \ln w_{ki} \ln w_{hi} + \sum_{j=1}^{J}\sum_{k=1}^{K} \omega_{jk} \ln y_{ji} \ln w_{ki} + \varepsilon_i.\end{aligned} \tag{2}$$

The error term ε_i has two independently distributed components:

$$\varepsilon_i = v_i + u_i. \tag{3}$$

The first component v_i is a statistical noise and is assumed to be distributed as a symmetric normal $N(0, \sigma_v^2)$. The second component u_i is bank-specific and is assumed to be distributed as a half-normal $|N(0, \sigma_u^2)|$. Given the above, the lowest attainable production cost is $f(\ln y_{ji}, \ln w_{ki}) + v_i$. This is precisely the stochastic cost frontier of the ith bank.[12]

With the estimated cost frontier of banks, the level of cost inefficiency can be assessed. In this paper, what cost inefficiency refers to is the situation in which the bank can reduce the production cost in obtaining the same quantities of outputs, given the input prices, but it has failed to do so. This means the production cost is not on the stochastic cost frontier. In other words, u_i is positive. Cost inefficiency is therefore an estimate of the percentage by which total production cost could have been reduced if the bank had operated on the stochastic cost frontier, holding the output levels and input prices constant. In the analytical apparatus of the standard production theory, such a deviation

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[10] The translog cost function can be viewed as a logarithmic second-order approximation of the true cost function, assuming that the true cost function is twice continuously differentiable (see Greene, 1998, pp.693-96). Thus, it is a flexible functional form that is less prone to the problem of specification error.

[11] The usual symmetry restrictions $\gamma_{jl} = \gamma_{lj}$, $\varphi_{kh} = \varphi_{hk}$ and $\omega_{jk} = \omega_{kj}$ are imposed to help circumvent the multi-collinearity problem arising from the fact that the same interactive explanatory variable enter into the regression equation twice in the translog specification.

[12] Conceptually, the reduced form f in equation (1) corresponds to the cost function of the standard production theory which assumes that given the target output levels the firm chooses the quantities of inputs to minimise production cost. Therefore, in the absence of "luck", so that v_i is non-zero, the production cost of the ith bank when it is fully cost efficient is $f(\ln y_{ji}, \ln w_{ki})$. However, v_i may not equal zero because in reality there could be random factors that are beyond the bank's control but influence its production cost. Given this, the stochastic cost frontier becomes $f(\ln y_{ji}, \ln w_{ki}) + v_i$.

occurs when the bank does not choose the right mix of inputs to produce the target output or employs excessive quantities of the factor inputs to produce the same amount of output.[13]

Following Jondrow et al. (1982), we estimate the observation-specific cost inefficiencies by computing the conditional expected values. For the *n*th bank, the Inefficiency Estimate (*IE* estimate), represented by the conditional expectation of u_n , can be derived as :

$$\frac{\sigma\lambda}{(1+\lambda^2)}\left[\frac{g(\varepsilon_n\lambda/\sigma)}{G(\varepsilon_n\lambda/\sigma)}+\frac{\varepsilon_n\lambda}{\sigma}\right] \tag{4}$$

where λ is σ_u/σ_v , σ^2 is σ_v^2 + σ_u^2, g and G are the standard normal density and cumulative distribution functions respectively.

III. DATA AND ESTIMATION METHODS

We employ in the estimation a panel dataset that involves 38 retail banks in Hong Kong and covers the period from 1992 Q1 to 2005 Q4.[14] Retail banks are the locally incorporated banks plus a number of larger foreign banks whose operations are similar to those of the locally incorporated banks in that they operate a branch network and are active in retail banking. The banking data are obtained from the regulatory returns that Authorized Institutions in Hong Kong must file with the Hong Kong Monetary Authority. Since our purpose is to examine the cost efficiency in Hong Kong, the sample is restricted to incorporate only data on the Hong Kong offices of retail banks.

Following past literature (see Clark and Siems (2002) and Kwan (2006)), the banking cost function is dependent upon input prices and the level of output. As for the banks' output variables, we adopt the intermediation approach by Sealey and Lindley (1977), which views banks as an agent to employ labour, funds and capital to produce interest-bearing assets. Outputs are measured by the amount of interest-bearing assets generated by the banks. We follow Kwan (2006) to define outputs which relate to banks' intermediation function. Accordingly, they are (1) loans to finance imports, exports,

[13] Why the banks may not minimise the production cost is in itself an interesting question. The explanation offered by Leibenstein (1966) is that the management may have objectives other than profit maximisation, which is known as x-efficiency. Apart from psychological reasons, this can result from a principal-agent problem. Aigner et al. (1977) attributed such deviation to productive inefficiency arising from factors such as technical and economic inefficiency, and the will and effort of the producer and his employees.

[14] Initially, there were a total of 45 banks in various periods covered by the study. After removing samples with missing information, 38 retail banks remained in the estimation. Note that the number of banks covered by the study varied in different periods. After the major mergers and acquisitions, the number fell from 38 during 2001 Q2 to 28 during 2005 Q4.

re-exports, and merchandising trade (y_1); (2) loans for non-trade related financing (y_2); and (3) non-loan earning assets including negotiable certificates of deposit, all other negotiable debt instruments and equity investments (y_3). Since many banks have moved to provide financial services off the balance sheet, the traditional measures of on-balance sheet output based on the intermediation approach tend to underestimate output levels of banks. Following the specification of Rogers (1998) and Clark and Siems (2002), non-interest incomes are added into the estimation to serve as a proxy for OBS outputs generated by banks.[15] As for the input variables, banks are considered as employing three factor inputs: labour, funds and capital. The unit price of labour is computed as the ratio of staff expense to total assets. The unit price of funds is proxied by the ratio of interest expense to total funding (the sum of deposits from customers, due to banks, amount payable under repos and negotiable debt instruments issued and outstanding). The unit price of capital is derived as the ratio of expenses, other than staff and interest expenses, to fixed assets.

Table 1. Some Descriptive Statistics of Retails Banks as of 2005 Q4

	Mean		Median	
	Amount	% Change from 1999 Q4	Amount	% Change from 1999 Q4
Average output values per bank (HK$ mn)				
Loans to finance trade	4,997	124.7	2,475	82.1
Non-trade related loans	68,876	107.5	34,949	76.8
Other earning assets	47,394	310.5	20,842	383.8
Non-interest incomes	539	6.5	127	-0.9
Input prices (HK$)				
Labor (per HK$1 mn of total assets)	1,645	-4.4	1,442	0.9
Borrowed funds (per HK$1 mn of total funding)	8,431	-36.3	7,601	-42.7
Capital (per HK$1,000 of fixed assets)	1,397	106.7	896	56.8
Others (HK$ mn)				
Average total assets per bank	190,902	120.9	81,062	97.4
Average total costs per bank	1,732	47.4	766	28.7

[15] An estimation which excludes non-interest incomes as an output was also tried. Consistent with other studies (Rogers (1998) and Clark and Siems (2002)), the estimated efficiency level is lower when the non-interest income variable is excluded, indicating that omitting OBS activities in the cost efficiency estimation could understate actual bank outputs and efficiency levels.

Table 1 provides some descriptive statistics of retail banks. In 2005 Q4, the average values of the three groups of interest-earning outputs (trade-related loans, non-trade-related loans, other non-loan earning assets) and non-interest incomes per retail bank were about HK$5.0 billion, HK$68.9 billion, HK$47.4 billion, and HK$539 million respectively. On the input side, the average cost of labour per HK$1 million of total assets, and borrowed funds per HK$1 million of interest bearing liabilities were HK$1,645 and HK$8,431 respectively, and the average cost of capital per HK$1,000 of fixed assets was HK$1,397. Compared with 1999 Q4, all interest-bearing output values increased significantly by over 100%, and non-interest incomes rose by an average 6.5%. On the input side, while the average price of capital also increased, the average cost of labour and borrowed funds registered reductions.

The stochastic cost frontier can be estimated by the pooled time-series cross-section observations of the dataset with the assumption that all banks have the access to the same production technology. By using the maximum likelihood method, the coefficients of the cost function are obtained. The conditional expectation of inefficiency in equation (4) for each bank and of each period is obtained by using the residuals and their variances derived by the estimated stochastic cost frontier.

IV. THE INEFFICIENCY ESTIMATES

The inefficiency estimates (*IE* estimates) are presented in Table 2. Charts 1 and 2 depict the time series of some descriptive statistics of the IE estimates. A higher *IE* estimate will be observed when higher input costs or lower levels of output value take place, resulting in a larger deviation from the minimum cost. In other words, a higher IE estimate means lower efficiency, and vice versa. As can be seen from the table and the charts, the weighted average *IE* estimate started to increase by 1998 and reached 26.3% in 2003 Q4, after declining gradually from 28.9% in 1992 Q4 to 15.1% in 1997 Q4. Nevertheless, since 2004 the IE estimate has resumed its declining trend and improved to 18.0% by 2005 Q4.[16]

[16] The Mann-Kendall test suggests that there exists a significant declining trend for the time series of *IE* estimates from 2003 Q4 to 2005 Q4 at the 0.05 level of significance.

Table 2. Inefficiency Estimates of Retail Banks in Hong Kong

	Weighted Average	Median	Average
1992 Q4	28.9	19.7	21.8
1993 Q4	23.9	19.5	21.3
1994 Q4	21.7	19.6	19.9
1995 Q4	20.1	16.1	17.7
1996 Q4	17.1	12.8	14.9
1997 Q4	15.1	10.0	13.8
1998 Q4	16.1	11.3	13.4
1999 Q4	15.1	12.2	14.0
2000 Q4	19.9	15.1	17.9
2001 Q4	25.0	15.4	20.4
2002 Q4	25.8	17.7	19.0
2003 Q4	26.3	17.9	21.2
2004 Q4	23.9	15.3	19.6
2005 Q4	18.0	11.7	17.2

Notes:
[1] The figures are in percentage terms.
[2] The weighted averages are calculated with banks' efficiency estimates being weighted by their asset sizes.

An examination of the evolution of the IE estimates over time shows that the estimates systematically relate to economic cycles. During the period when Hong Kong suffered from two significant economic shocks — the Asian financial crisis and the outbreak of SARS — the *IE* estimates deteriorated significantly. However, as the economy recovered in recent years, the *IE* estimates began to decline. The positive correlation between the cost efficiency of banks and economic performance will be tested formally in section V.

Chart 1. Trends of the Inefficiency Estimates

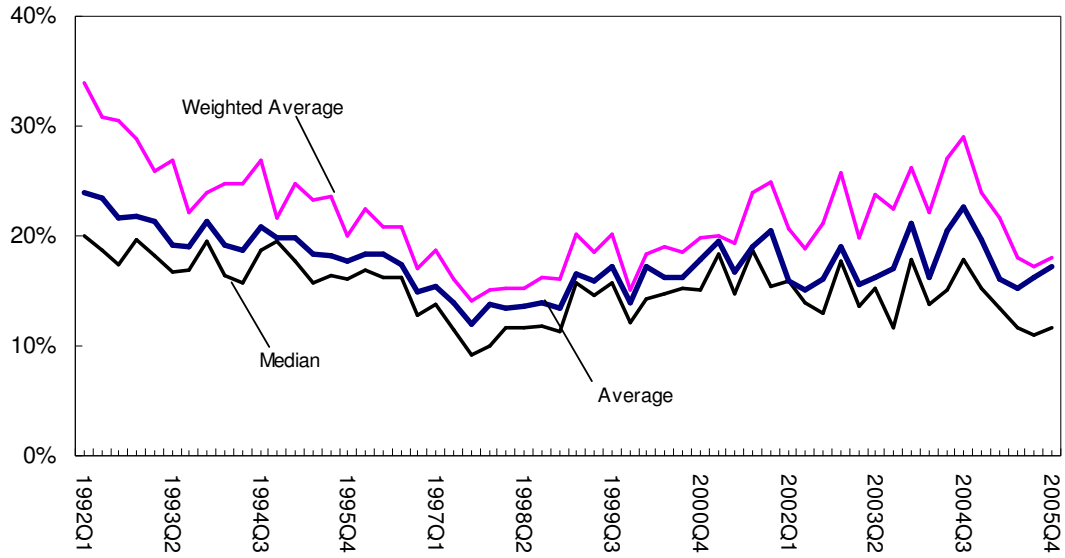
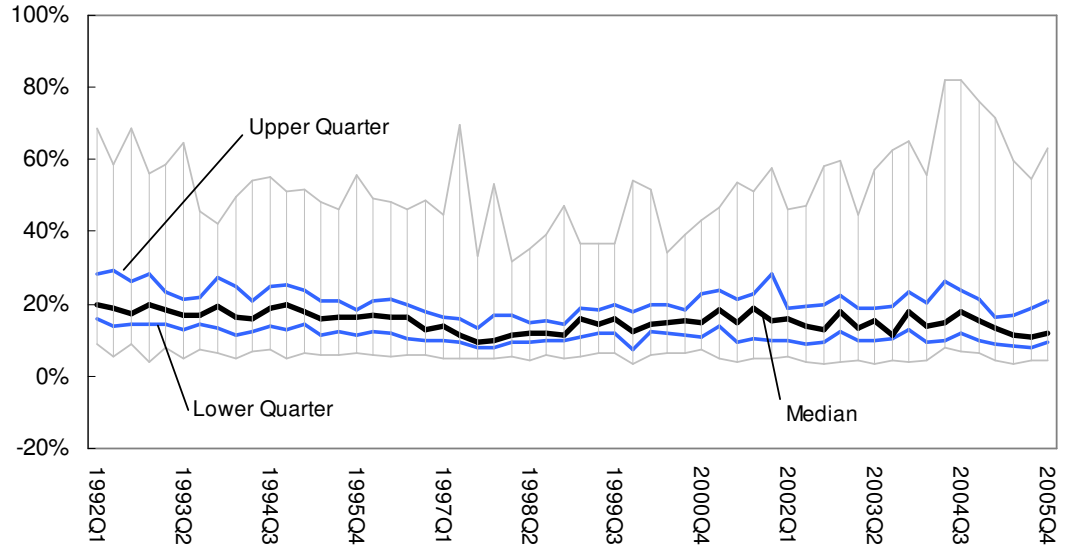


Chart 2. Dispersions of the Inefficiency Estimates



Notes: 1. The shaded area covers all the obtained estimates of retail banks' inefficiencies.
2. The weighted average is weighted by total assets.

A possible reason for this time-series property is that as risks are more likely to materialise during economic downturns, banks may have to spend additional resources (factor inputs) or to reduce the amount of outputs (such as credit) in order to better control the risks. In addition, banks may incur more costs on new business initiatives and strengthening customer relationships. In consequence, they would be

using more inputs to produce the same quantity of output, or to produce a smaller quantity of output with the same amount of inputs, giving rise to higher IE estimates. Another possible reason is that there are fixities in the factor inputs. The quantity of physical capital is obviously not easy to adjust and, with the existence of recruitment cost and investment in specific human capital, labour is likely to be quasi-fixed.[17] Moreover, banks generally do not have a perfect control over the quantity of deposits. With such fixities, banks may be unable to reduce by an enough extent the input quantities when the demand for banking services is weakened by an economic downturn. Even if such fixities may not be very rigid, it would take time for banks to adjust and streamline their operation. As a result, in economic downturns, some factor inputs may become idle, thereby deteriorating the cost efficiency.

Apart from the time-series variations, the *IE* estimates also differ substantially among banks. Chart 2 displays the range and interquartile range of the *IE* estimates. It can be seen that the cost efficiency of banks was rather diverse, for example, it ranged from 10% to 80% during 2003. It is worth noting that banks with very high *IE* estimates were also found to have a very low loan-to-asset ratio. Another interesting finding is that the distributions shown in Chart 2 are skewed significantly. Both the upper and lower quartiles and the median were very close to the minimum, indicating there were more relatively efficient than inefficient banks.

V. EFFICIENCY, BANK CHARACTERISTICS AND MACROECONOMIC CONDITIONS

To examine the relationship between cost efficiencies, bank characteristics and macroeconomic conditions, we estimate a panel data regression model to relate the *IE* estimate to a number of variables including bank size, funding sources, business mix, loan quality, and real GDP growth rates.[18] The regression model, Model A, is as follows:

$$IE_{it} = \beta_0 + \beta_1 \log(TA_{it}) + \beta_2\left(\frac{Dep_{it}}{TA_{it}}\right) + \beta_3\left(\frac{y_{1it} + y_{2it}}{TA_{it}}\right) + \beta_4\left(\frac{LLoss_{it}}{TLoan_{it}}\right) + \beta_5 GDPG_{it} + f(e_{it}), \quad (5)$$

where *TA* is total assets, *Dep* is customers' deposits, y_1 and y_2 are loans to finance imports, exports, re-exports, and merchandising trade and loans for non-trade related financing respectively, *LLoss* is loan loss provisions, *TLoan* is total loans, *GDPG* is the real GDP growth rate, and the function *f(e)* consists of autoregressive terms of a white noise process

[17] See Oi (1962) and Rosen (1968) for a discussion on the fixity of labour input.
[18] Note that the statistical relationship need not imply causality.

to capture autocorrelation in residuals.[19] The variable *TA* is used to proxy the bank size. The variables of deposits and loans to total assets ratios *Dep/TA* and $(y_1+y_2)/TA$ capture banks' funding mix and asset portfolio composition respectively. Regarding the sign of their coefficients, literature does not have a priori expectation. The loan-loss provisions capture the quality of banks' loan portfolio.[20] There are different views about the expected sign of the coefficient of this variable.[21] Finally, the growth of GDP tests the relationship between banks' operating results and the overall economic performance. The sign of the coefficient estimate should be negative, since banks operate in poor economic conditions are likely to incur higher costs or produce less outputs.

Applying the method of generalized least squares with fixed effects and cross-section weights, equation (5) is estimated with the *IE* estimates obtained from section IV. The results are reported in Table 3. The diagnostic test statistics show that the multiple regression model adequately fits the data, with the adjusted R-squares at 0.67 and the DW statistic close to 2.0. With the exception of the ratio of deposits to assets, all coefficients of the explanatory variables are significant and the coefficiency for *GDPG* has the expected sign. As the deposits to assets ratio is not significant, another model (Model B) which excludes it is considered. The estimation results show that all variables remain significant and the signs of their estimated coefficients are unchanged.

Table 3. Panel Data Regression of Inefficiency Estimates

	Model A	Model B
Constant	1.0361**	1.0237**
Log(TA)	-0.0347**	-0.0344**
Dep/TA	-0.0114	-
$(y_1 + y_2)$ / *TA*	-0.5333**	-0.5328**
LLoss/TLoan	0.4344**	0.4232**
GDPG	-0.2777**	-0.2785**
Adj. R^2	0.6661	0.6659
DW	1.9080	1.9082

[19] Data on provisions from banks' returns are used to proxy loan loss provisions. The data may include some items unrelated to loan loss such as provisions against the values of other claims and investments.

[20] Another variable CAR which represents either the respective risk level or banks' leverage is found to be insignificant.

[21] This is to be discussed in details in the following section on key findings from the estimation results.

Key findings from the estimation results are as follows:

(1) The level of efficiency of banks is found to be positively correlated with bank size. In other words, large banks are on average more efficient than smaller banks. This is consistent with Kwan (2006) and Drake et al. (2006a) that there is a strong size-efficiency relationship, with larger banks outperforming their smaller competitors. Drake et al. (2006a) commented that such results may have important implications for policy analysis on the area of mergers and consolidation. Similar observations were found in the US banking industry (Berger et al. (1993)).

(2) Efficiency is also found to be positively correlated with the ratio of loans to total assets, suggesting that banks' efficiency level may be sensitive to their business mix, with banks which focus more on lending business exhibiting a lower level of inefficiency.[22]

(3) Banks with higher loan loss provisions appeared to be less efficient. Banks with more provisions indicate poor loan quality, which may call for higher operation costs relating to credit risk and loan loss management, such as credit approval control, foreclosing bad loans, debt recovery expenses, and other loan-restructuring expenses.[23]

(4) Efficiency is positively correlated with economic performance, with banks found to be less efficient during economic downturns. As discussed in section IV, this may be partly due to the fixities in factor inputs, and additional required resources spent on risk control, new business initiatives and customer relationships during economic downturns.

(5) The funding structure is found to be not statistically significant. This suggests that while banks with a stronger deposit base could fund their assets less costly, the high cost arising from maintaining a large branch network may have offset such comparative benefit.

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[22] This appears to be in line with banks' conventional role. It suggests that banks specialising in their main intermediation function are more cost efficient.

[23] In this case, both the management board and bank supervisors may require banks to increase their resources in credit assessment and approval. Alternatively, as noted by Kwan (1997), the correlation between poor asset quality and inefficiency may be an indication of poor management of banks, or a direct consequence of the tendency of inefficient firms to make risky loans. On the other hand, to the extent that the efficiency benefit of larger revenue generated through more aggressive lending (with less stringent credit risk control) may more than offset the increased cost arising from greater resources required for the credit risk and loan loss management, the coefficient estimate may have a negative sign.

(6) The relative magnitudes of coefficient estimates suggest that the changes in cost efficiency due to a one standard deviation change in business mix, total assets and economic performance are 7.1%, 4.7% and 1.3% points respectively.[24]

VI. CONCLUSIONS

Using the stochastic frontier approach and a panel dataset of retail banks, this paper assesses the cost efficiency of the banking sector in Hong Kong. The average cost inefficiency during the period 1992-2005 is found to be about 15% to 29% of observed total costs, which is close to the findings of Kwan (2002, 2006), and is largely in line with the experience of US and European banks.[25]

Cost efficiency is found to be correlated with macroeconomic conditions, with a significant rise in cost inefficiency triggered by the Asian financial crisis and the outbreak of SARS during the period 1998-2003, partly due to the lack of perfect flexibility by banks to adjust their factor inputs (labour, funds and capital) in response to falling outputs. Additional resources spent on risk control, new business initiatives and strengthening customer relationships may have also contributed. Nevertheless, the cost efficiency has started to improve by 2004 Q1, along with the recovery of the economy. This suggests also that the adjustments and streamlining by the banks in recent years may have begun to bear fruit.

Empirical results also indicate that cost efficiency is positively correlated with bank size, suggesting large banks are on average more efficient than smaller banks. Efficiency is observed to be sensitive to banks' business mix, with banks which focus more on lending business exhibiting a higher level of efficiency compared to banks which focus relatively less on loans. In addition, banks suffering from larger loan loss provisions are found to be less efficient, probably due to higher operational costs relating to credit risk and loan loss management.

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[24] As both GDP growth and loan loss provisions correlate to the business cycle, their estimated coefficients are combined to represent economic performance in the calculation.

[25] See Kwan (2002, 2006).

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