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The Banking Sector in Hong Kong

Competition, Efficiency, Performance and Risk

Edited by

Hans Genberg and Cho-Hoi Hui

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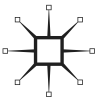

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Foreword

Financial innovations steadily increase the complexity of financial markets creating new challenges for monetary authorities whose responsibility is to safeguard financial stability. In this environment it is essential that central banks stay at the forefront of research in order to be in a position to evaluate possible sources of fragility and signs of instability. The Hong Kong Monetary Authority is Hong Kong's central banking institution, and one of its responsibilities is to promote the safety of Hong Kong's banking system. The Research Department of the HKMA supports this function by conducting research that serves as an input to the surveillance of the Hong Kong economy in general and the banking sector in particular. The papers included in this volume were written by staff of the Market Research Division of the Research Department as part of this process. Together they present an up-to-date view of the degree of competition, efficiency, and profitability in the banking sector; of interest-rate and default risk in the mortgage market; and of measuring risk and capital adequacy as well as conducting stress testing in the context of the implementation of the Basel II regulatory framework in Hong Kong.

By promoting research on banking issues and by encouraging its dissemination to a wide audience the HKMA seeks to contribute to an understanding of the banking sector in Hong Kong as well as to scholarly research on banking and risk assessment issues more generally. We hope that the papers collected in this volume will stimulate others to carry out similar research for other economies and to conduct further research on banking and financial issues in Hong Kong.

Peter S. T. Pang
Deputy Chief Executive
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Hans Genberg and Cho-Hoi Hui

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Introduction

Hans Genberg and Cho-Hoi Hui

The banking sector in Hong Kong has undergone significant changes and developments over the past decade. A series of market liberalization measures took place during this period. In particular, the interest rate deregulation was fully completed by July 2001, and the restriction on the number of branches and offices for foreign banks was completely removed in 2001. At the same time, there were major mergers and acquisitions in the industry, resulting in a higher degree of market concentration. How these changes may have affected competition, efficiency and the performance of banks are issues of interest. Market liberalization has also brought about increased price competition, which calls for greater attention to interest rate and credit risks. In this regard, one main area of interest has been the interest rate risk of mortgage lending, which accounts for about 24 per cent of banks' domestic loan portfolios. Internationally, an important initiative regarding the adequacy of capital under the Basel New Capital Framework, also known as Basel II, has begun to replace the current Basel Accord in various jurisdictions since 2007. Under the internal ratings-based (IRB) approach in Basel II, credit risk measures are estimated by banks. Quantifying risks and capital requirements have thus also become an important field of banking studies. To cover each of these three areas of interest, the chapters in this book is grouped into three respective parts.

Part I: Competition, Efficiency and Profitability

Chapters 1 to 4 assess the current levels and trends of competition and efficiency in the banking industry, whether collusion exists, and whether large banks are benefiting from scale economies and have substantial pricing power over smaller banks. While each of the chapters is by itself a stand-alone study and examines specific issues, together they present a consistent picture for the industry. Four themes are highlighted: cost efficiency, market structure, effects of mergers and acquisitions on competition, and the pricing power of large banks. The main conclusions of each will be described briefly.

- *Cost Efficiency*

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 overall economic performance. In addition, inefficiency would affect banks' earnings, thus hampering their ability to withstand shocks. Using the stochastic frontier approach and a panel dataset of retail banks, Chapter 1 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 per cent to 29 per cent 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 Severe Acute Respiratory Syndrome (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.

- *Market Structure, Competition and Collusion*

Competition could have a significant impact on efficiency and profitability. The degree of competition in the banking industry is therefore always of interest. This is particularly the case for Hong Kong, where the industry is characterized by a few major banking groups and a relatively high degree of market concentration. Evidence of co-movements of the best lending rates and fee setting among banks, even after the removal of the interest rate agreement, has also caused some concerns about the possible existence of oligopolistic coordination among banks. Whether such a phenomenon reflects collusive pricing behaviour or is simply the result of price competition is of interest to policy markers. To examine the issue, three different approaches have been employed:

(i) The first is the Panzar-Rosse approach in Chapter 2 which reveals the market structure by investigating the responsiveness of revenues

to changes in input costs of banks. The relationship between the responsiveness and market structure is directly derived from standard economic theories.

(ii) In Chapter 3, the conjectural variation approach is adopted, which reveals the degree of price coordination among banks by estimating price inter-dependence from a system of equations that describes the demand, supply and cost structures of banks.

(iii) In Chapter 4, the third approach, due to Berger and Hannan, provides estimates of how market structure (such as market concentration and market shares of banks) and efficiency affect the profitability and pricing power of banks.

The empirical results all suggest that the degree of competition in the banking sector was fairly high during the period 1992–2002, with banks operating in a competitive fashion without any significant sign of collusion on pricing. This situation was largely maintained from 2003 to 2005, notwithstanding significant changes in the operating conditions, in particular a number of mergers and acquisitions.

The studies show that the market structure of Hong Kong's banking sector is one of monopolistic competition, which is similar to most other banking centres, including Germany, Japan, Switzerland, the UK, the US and many other OECD countries. Such a market structure has the following characteristics: (a) Each bank provides some products which are differentiated from other banks (that is imperfect substitution of products), implying that any particular bank would find it difficult to get the entire market share of a particular product. (b) There is free entry and exit of banks in response to profit. If any bank is making significant profit with a particular product, it signals to other banks to produce similar products. Other banks which are not then present will also be attracted to the market. Because of the large number of suppliers and choices available in the market, high competitive pressures are maintained, and they force abnormal profit to zero in the long-run. In reality, while bank entries and exits are not frequently observed in Hong Kong, it is not difficult to observe that if a bank launches a new product which draws positive responses from customers, other banks will usually offer very similar (but not exactly the same) products to compete in a very short period of time (for example, HIBOR-based mortgages). This observation is consistent with the finding that the banking market in Hong Kong is one of monopolistic competition.

- *How Have Recent Mergers and Acquisitions Affected Competition?*

The impact of industry consolidations on market concentration is apparent. As shown in the studies, the degree of market concentration measured by the Herfindahl-Hirschman index increased sharply around the second half of 2001, reflecting merger and acquisition activities. Unfortunately, the precise effect of increased market concentration on competition cannot in this case be clearly estimated econometrically, as the major mergers and acquisitions around 2002 happened to coincide with major regulatory liberalization, including the full implementation of interest rate deregulation. This has resulted in a close resemblance of the time series data representing de-regulation and those representing market concentration. As a result, our analysis in Chapter 2 can only estimate the net effect of these two developments, but not their separate impacts.

On the whole, the results indicate that market concentration either has not had a significant negative impact on competition, or that its adverse effect has been largely offset by regulatory liberalization (and technological progress). The emergence of a number of larger banks through mergers and acquisitions which should be more capable of competing with existing large banks may have also contributed. Given the uncertainties surrounding the estimates of the effect of market concentration on competition, the consequence of ongoing industry consolidations should be monitored closely in the years to come.

- *Do Large Banks Have Substantial Pricing Power Over Smaller Banks?*

Chapter 4 assesses the main determinants of banks' profitability and finds that banks' profits and margins are mainly determined by their cost efficiency and the macroeconomic environment. The empirical results suggest that banks with lower production costs may earn higher profits through optimizing the input mix. Combined with findings in Chapter 1 that larger banks are in general more cost efficient than smaller banks, this finding suggests that larger banks can offer services at lower prices than smaller banks, yet attaining a similar or even higher level of profit. Smaller banks are therefore more vulnerable to intense competitions than larger banks.

Part II: Interest Rate and Default Risks in the Mortgage Market

Part II examines the issue of interest rate and default risks in relation to banks' mortgage portfolios. In Hong Kong, mortgage loans extended by

banks are primarily adjustable rate mortgages, which are largely priced with reference to the best lending rate, while banks' cost of funds is determined by a mix of interest rates including customers' savings and time deposit rates and Hong Kong Interbank Offered Rates (HIBORs). Under Hong Kong's Linked Exchange Rate system, local interest rates tend to largely follow their US counterparts. However, due to the interest rate and market structures of Hong Kong's banking system, the various local interest rates have shown different responses to changes in US rates, in terms of speed and magnitude. This gives rise to possible interest rate risks to banks' mortgage loan portfolios. During periods when the upward adjustments by banks of the best lending rate (BLR) lag significantly behind the rises in HIBORs and time deposit rates, banks' interest rate margin could be squeezed. Such risk in fact materialized in early 2005. Strong price competition in Hong Kong's mortgage market, coupled with the abundance of liquidity, resulted in a significant reduction in the effective mortgage rates by late 2004 to a level which was not sufficient to buffer for a possible sharp rise in the funding cost (due to a possible sharp increases in HIBORs arising from the liquidity situation returning to normal) along with a more moderate rise in the BLR. As a result, as HIBORs rose sharply during the first half of 2005, some banks which relied heavily on time deposits and interbank borrowing as funding sources had suffered from a squeeze of the interest rate margin of their mortgage loans.

In Chapter 5, a stress-testing framework is developed to assess this particular type of interest rate risk to which banks in Hong Kong are exposed. The framework utilizes a model that describes the dynamics of the BLR and therefore the net interest margin of banks in Hong Kong in response to variations in US interest rates and the differential between Hong Kong dollar and US dollar interest rates (resulting from changes in the liquidity situation). The framework can be employed to assess the impact of interest rate shocks on the interest income of banks in Hong Kong.

The use of BLR as the reference rate for setting mortgage rates has been adopted by banks for many years. However, the analysis in Chapter 5 suggests that such a practice may not be conducive to banks' management of interest rate risk, as the movement of BLR may deviate significantly from banks' cost of funds. Drawing on overseas experience, Chapter 6 examines several local interest rates in order to assess their relevance as alternative reference rates. The assessments are made by evaluating the appropriateness of each rate based on criteria of importance to consumers and factors relevant to banks. Together with other factors, the two key criteria for the assessment are (i) the stability of mortgage rates over time which is regarded as important by both borrowers and banks, and

(ii) conduciveness to interest rate risk management which is important for banking stability. A comparative analysis suggests that a composite rate reflecting movements in various deposit rates, interbank and other interest rates is probably the best as it tracks closely the cost of funds of most local banks and is more stable than the interbank rates and the yield of exchange fund notes. These findings have later resulted in the compilation of a composite interest rate by the Hong Kong Monetary Authority (HKMA), which is now updated and released regularly on a monthly basis, and has become an important indicator of the average funding cost of Hong Kong banks.

In the mortgage loan market, the importance of underwriting standards has been highlighted vividly by the subprime loan problems which are currently plaguing global financial markets. In addition to proper assessment of repayment capability, Chapter 6 examines what other factors are crucial to residential mortgage default risk. The empirical analysis reveals the role of current loan-to-value ratio (CLTV) as a major determinant for mortgage default decisions. It also finds that the default probability is positively correlated with the level of interest rates and the unemployment rate, and negatively correlated with financial market sentiment. Given the importance of the CLTV for defaults, this study lends strong support to Hong Kong's prudential policy of encouraging the adoption of a maximum 70 per cent LTV ratio in residential mortgage lending.

Part III: Quantifying Risks, Capital Adequacy and Stress-testing Framework of Systemic Risk

While banks have faced difficulties over the years for a multitude of reasons, the major cause of serious banking problems continues to be directly related to lax credit standards for borrowers, poor portfolio risk management, or a lack of attention to changes in economic conditions and interest rates or other circumstances that can lead to a deterioration in the credit standing of their counterparties and narrowing of banks' net interest incomes. The Basel Committee on Banking Supervision has played a leading role by fostering an appropriate credit risk assessment approach and by setting out principles for sound banking practices. The Basel Committee is responsible for proposing regulatory requirements, including capital and provisioning requirements, for internationally active banks. Typically, bank supervisors around the world adopt the guidelines put forth by the committee. These practices should be applied in conjunction with a system of quantitative risk

measures for determining the adequacy of capital and provisions and for assessing interest rate risk. Such development has been supported by an enormous expansion in the areas of financial economics including equilibrium analysis in financial markets, asset-pricing theory and option-pricing theory during the last two decades.

Under the initiative regarding the adequacy of capital under Basel II, banks are allowed to calculate regulatory capital charges for their credit exposures using the standardized approach based on supervisory risk weights or the IRB approach. Over time, banks are expected to evolve to the IRB approach, which relies on the banks' own measures in determining the risk components of various asset classes.

In Hong Kong, banks generally maintain capital adequacy ratios well above the regulatory requirement. Chapter 8 shows that such buffers are largely determined by internal considerations of the banks, their responses to market discipline, and the regulatory framework. The chapter also argues that to the extent that part of the high capital buffer is due to the agency problem, information asymmetries, or a mismatch between the expectation of the regulator and banks over the approach to maintaining a capital buffer, action could be taken to improve the use of capital. In this connection, the initiative under Basel II is expected to help.

Under the IRB approach in Basel II, credit risk measures are estimated by banks. Systematic underestimation of such measures and the corresponding regulatory capital in a bank (or a number of banks) will increase the bank's vulnerability to adverse changes in market conditions, in particular during a financial or banking crisis. Therefore, the validation of IRB systems has emerged as one of the important issues of the implementation of Basel II. For validation purposes, Chapter 9 uses an approach pioneered by Merton to provide structural model-based methodology for credit risk assessment (probability of default) and capital requirements under Basel II. Benchmark probability of default obtained from the model could be used as external and independent probability of default estimates for comparisons with banks' internal probability of default estimates of listed companies. Significant deviations from this benchmark provide a reason to review the banks' internal estimates and their credit rating processes.

Apart from capital adequacy, the development of the methodologies of determining provisions has also emerged as an important research area. Chapter 10 develops a simple model for measuring the provision for a pool of collateralized retail loans with homogenous characteristics, where the collateral coverage is treated as a put option with the

strike price equal to the outstanding loan amount of the pool. The collateral value and the probabilities of default of borrowers in the pool are the two correlated stochastic variables in the model. As the information associated with these factors is in general available in banks' retail portfolios, the model can be readily incorporated into their internal risk management systems as a useful quantitative tool for measuring provisions.

To monitor stability of the Hong Kong banking system, stress testing and vulnerability indicators are important tools for assessing systemic risk. Chapter 11 introduces a stress-testing framework that involves the construction of macroeconomic credit risk models, each consisting of a multiple regression model explaining the default rate of banks' credit exposures, and a set of autoregressive models explaining the macroeconomic environment estimated by the method of seemingly unrelated regression.

Chapter 12 derives a multiple default risk index based on an option-pricing model to assess the multiple default risk of a portfolio of publicly-listed banks in Hong Kong during the period of January 1997 to January 2006. The index jumped in advance of the Asian financial crisis in 1997, indicating its early-warning capability. By incorporating asset correlations between banks, this indicator has the advantage of providing high frequency information that can be used to assess the systemic risk in the banking system.

Disclaimer

The views and analysis expressed in this book are those of the authors, and do not necessarily represent the views of the Hong Kong Monetary Authority