Global Journal of Business Research
Vol. 11, No. 2, 2017, pp. 1-10
ISSN: 1931-0277 (print)
ISSN: 2157-0191 (online)

IBFR
www.theIBFR.com

THE INTEREST RATE PASS-THROUGH: AN EMPIRICAL STUDY OF SEVEN ASIAN ECONOMIES

Chris C. Hsu, York College, City University of New York

ABSTRACT

This paper examines the extent of interest rate pass-through in seven Asian economies including Indonesia, Korea, the Philippines, Singapore, Thailand, Hong Kong, and Taiwan. The data selected ranges from after the 1997 Asian financial crisis to right before the 2008 financial turmoil and examines the question of whether these Asian economies' banking systems have recovered and become stronger since the 1997 financial crisis. The Error Correction Model was adopted in the study, and the empirical results suggested that banks adjust the markets to their retail rates with some levels of delay and the extent of the adjustments in intermediate and long-term pass-through vary depending on the nature of financial instruments and the length of their maturities. In general, countries with more highly developed financial markets usually respond to market conditions more actively and fully, while countries with less developed financial markets tend to have a longer adjustment process. Lending rates are usually stickier than deposit rates in the countries studied.

JEL: E42, E44, E52

KEYWORDS: Interest Rate Pass-Through; Error Correction Model; Emerging Markets; Comparable Market Interest Rates

INTRODUCTION

Central banks influence money market rates by implementing policy instruments. The changes in money market rates, in turn, are translated into longer terms for market rates and retail rates of various maturities. In countries in which banking is the dominant source of financing, the consumption and investment decisions that are made by households and firms will be affected by the retail interest rates that are charged to them by banks. Before the 1980s, most financial sectors in developing Asian countries were repressed, taking on the usual forms of interest rate ceilings, credit restrictions, high bank reserve requirements, capital and exchange rate controls, and government-owned banks. The initiative for imposing restrictions on financial sectors was spurred by the desire to preserve financial stability. However, this repression came with severe costs to economies and led to less effective monetary policies and inefficient financial markets. As Caprio et al. (2001) have discussed, economic performance deteriorated progressively under financial repression, and such financial systems eventually led to bank insolvencies. In the wake of the enormous social costs that were brought on by financial repression, developing Asian countries in the 1980s began to relax their control over financial sectors. After the Uruguay Round, most developing Asian countries integrated their financial markets with those in industrialized nations (Chow and Gill, 2000).

With financial liberalization, interest rates were supposed to adjust to fulfill their roles as signals of prices for credit or loanable funds. Monetary authorities in these countries, however, still exercised implicit or explicit influence on bank interest rate-setting decisions. With lax supervision, banks engaged in risk-taking activities without devoting proper efforts toward risk management. The consequent crisis then became inevitable. The outbreak of the 1997 financial crisis in Asia severely impacted its

economic development. Subsequently, a wave of financial reforms swept across Asian countries, and Asian governments imposed various regulations to improve the efficiency of their banking systems. This paper aims to provide a comprehensive examination of the interest rate pass-through in Asia to analyze the efficiency of its banking systems. Specifically, we selected data from seven Asian economies—Indonesia, Korea, the Philippines, Singapore, Thailand, Hong Kong, and Taiwan—ranging from after the 1997 Asian financial crisis to immediately prior to the 2008 US financial tsunami. Because this study will focus on how banking systems in Asian countries recovered from the 1997 financial crisis, we chose data from the period ending right before the 2008 US financial turmoil to avoid disturbances from this crisis. We determine the extent of interest rate pass-through in each country with an error correction model. Our empirical results indicate that countries with more highly developed financial markets experienced greater immediate and long-term pass-through than those with less developed markets. The structure of this article is as follows: the next section briefly reviews the literature; Section 3 explains the data and methodology; Section 4 discusses the empirical results; and Section 5 presents our conclusions.

LITERATURE REVIEW

Interest rate pass-through is an important topic in evaluating the efficiency of a country's banking system. Delays exist when retail rates adjust to market rates. Moreover, various types of financial instruments and several lengths of instrument maturities exist, yielding many degrees of intermediate- and long-term pass-through (e.g., Cottarelli and Kourelis, 1994; Borio and Fritz, 1995; Hefferman, 1996; Hofmann and Mizen, 2004; de Bondt, 2005; Sørensen and Werner, 2006). Possible explanations for this lag adjustment phenomenon include imperfect competition in banking sectors, regulations on interest rate ceilings, costs that are associated with adjustments, bank exposure to interest rate risks, credit risks, default risks, and the long-term relationships between banks and their customers. (Kwapil and Scharler, 2006). Hefferman (1996) opined that imperfect market competition is responsible for the dynamics of retail interest rates. Winker (1999) applied the static Stiglitz-Weiss model and concluded that the disparate adjustment speeds of bank products could be rationalized by the effects of adverse selection. Hofmann and Mizen (2004) suggested that the speed of pass-through depends on the growth of the perceived gap between base and retail rates. Sørensen and Werner (2006) argued that the varying degrees of competition in the banking sector are responsible for limited bank interest rate pass-through.

Since the financial crisis of 2008, literature has switched the interest to compare the pass-through between pre financial crisis and after financial crisis periods, but mix results were reported. Hristo, Hülsewig, and Wollmershäuser (2014) adopted panel vector autoregressive (VAR) models in examining interest rate pass-through. This study focused on the three major shocks: macroeconomics, monetary policy and aggregate demand shocks, and compared the results of the data period from 2003 to 2007 with the data period from 2008 to 2011. The empirical results indicated that the pass-through was obstructed during the second period, indicating that monetary policies were distorted during the after financial crisis period. Borstel, Eickmeier, and Krippner (2016), employed the factor-augmented vector autoregression models evaluated the bank lending rates pass-through in 11 Euro members: Austria, Belgium, Germany, Spain, Finland, France, Greece, Ireland, Italy, the Netherlands and Portugal. The empirical results suggested that the interest rates pass-through didn't have significant change during the 2008 financial crisis period. Cifarelli and Paladino (2016) focused on eight Euro members and explored how country specific funding conditions affected the interest rates pass-through and the empirical results revealed that the long –run pass-through was more sensitive and was tend to directly affected by the changes of banks' funding costs than the short-run pass through. Most empirical studies on interest rate pass-through tend to focus on the Euro area, because the function of the bank in bank-based financial systems in this area renders bank interest rate pass-through particularly important to policy decisions by central banks.

Developing Asian countries, which are also characterized by bank-based financial systems in their financial sectors, have attracted little interest with regard to this study trend. Due to the rising importance of developing Asian countries in a global environment, whether bank retail rate pass-through behaviors in developing Asian countries follow the same patterns as those in developed Euro economies and whether developing Asian countries have recovered with stronger banking systems after the 1997 financial crisis merit examination. The consensus is that the Asian financial crisis in 1997 was caused by a combination of poor government policies, weak banking systems, and massive shock (Turner, 2007; Noy, 2005; Chow and Gill, 2000). The enormous social costs that were paid by developing Asian countries during the 1997 financial crisis forced the banking sectors in them to reform, the first step of which was privatization of government-owned banks. Before the crisis, government-owned banks covered a remarkable share of the total banking sector in these countries, acting as the governments' invisible hands in delivering control over financial markets. Consequently, the efficiency of the banking sector suffered, despite retail interest rates being liberalized. Privatization of government-owned banks after the crisis increased competitiveness in the banking industry, which, combined with the low level of government intervention, renders this study of interest rate pass-through in these countries significant.

DATA AND METHODOLOGY

This study examined seven Asian economies: Indonesia, Korea, the Philippines, Singapore, Thailand, Hong Kong, and Taiwan. We used monthly data from two sources: the IMF's International Financial Statistics and the central banks of the respective economies. The data that we selected comprised market interest rates and retail bank savings and lending rates with varying lengths. The sample ran from January 1999 to May 2007. Because all interest rate data were monthly, the number of observations of each type of data series was 101. We adopted the correlation analysis that was proposed by de Bondt (2005) to examine comparable market interest rates for regressions. The correlation analysis aimed to determine whether the market interest rates were related to the cost of funds for banks' retail products. This analysis is especially helpful in capturing the appropriate marginal costs of banks' retail rates when the money markets of these countries were still developing.

Theoretical Backgrounds

Rousseas (1985) proposed the marginal cost pricing model by suggesting the following relationship between banks' retail rates and market interest rates:

$$b_r = \gamma_0 + \gamma_1 mr \qquad (1)$$

In equation (1), b_r stands for the retail interest rates assigned by banks. The γ_0 represents a constant markup. The *mr* acts as the marginal costs resembled by a comparable market interest rate. The comparable market interest rate *mr* reflects actual costs of funding faced by the banks, and the markup γ_0 compensates banks for their operation risks, credit risk, and interest rate risk. According to de Bondt (2005), the magnitude of γ_1 relies on the demand elasticity of loans and deposits which will be affected by the bank interest rate. In well-developed financial markets where alternative interest rate products are easily to be found and accessed, the demand elasticity of loans and deposits is expected to be more elastic than that in the underdeveloped financial markets where the choice and availability of interest rate products are limited.

Unit Root and Cointegration Tests

Theoretically, most macroeconomic time series are usually non-stationary. The problem with using the non-stationary data in running the standard OLS regression procedures is that this process may lead to

incorrect conclusions (Granger and Newbold, 1974). To cope with this difficulty, we first analyze the unit root properties of variables under investigation. The augmented Dickey-Fuller (ADF) test was employed to test the unit root properties. The ADF test is based on the following regression:

$$y_t = \alpha + \rho y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta y_{t-i} + u_t \qquad (2)$$

The null hypothesis is $\rho = 1$. If the null hypothesis is rejected, it is concluded that the series is stationary. If the null hypothesis is not rejected, the hypothesis of more than a unit root then proceeds using the same procedure.

Empirical Specifications

The standard approach in estimating the speed and degree of bank retail rate adjustment is to employ the error correction model (ECM) with one exogenous variable, the comparable market interest rate. If a true long run relationship exists between the one exogenous variable and the comparable market interest rate, the ECM can be utilized to detect the correction from the disequilibrium of the previous period. To start applying the methodology, Pesaran and Shin (1999) suggested using the autoregressive distributed lag (ARDL) model to serve as the starting point. Thus, the model is defined as follows.

$$r_t = c + \sum_{k=1}^{m} \alpha_k \gamma_{t-k} + \sum_{q=0}^{n} \beta_q m_{t-q} + \varepsilon_t \qquad (3)$$

$$\varepsilon_t \sim IID(0, \sigma_\varepsilon^2)$$

where c is a constant term. Equation (3) says bank retail rate r at time t depends on its lag values, current market interest rate mt, and lagged market interest rate. One important assumption of equation (3) is that a stationary long-term relationship exists between r_t and m_t. Given most interest rates are non-stationary processes, this assumption requires r_t and m_t to be cointegrated. According to Weth (2002), the stability of the long run relationship requires the following three conditions: $\sum_{q=0}^{n} \beta_q$ to be positive, $\sum_{k=1}^{m} \alpha_k$ to be smaller than one, and the error term ε_t should be independent across time and not be serially correlated. Following the arithmetic derivations by Nehls (2006), equation (3) can be written as

$$\Delta r_t = c + \sum_{k=1}^{m-1} \rho_k \Delta \gamma_{t-k} + \sum_{q=1}^{n-1} \omega_q \Delta m_{t-q} + \omega_0 \Delta m_t + (\gamma + \delta)\left[\gamma_{t-1} - \frac{\gamma}{\delta+\gamma} m_{t-1}\right] + \varepsilon_t \qquad (4)$$

with

$$\rho_k = -\sum_{I=k+1}^{m} \alpha_i$$

$$\omega_0 = \beta_0, \omega_q = -\sum_{I=q+1}^{n} \beta_i$$

reduced to

$$\Delta r_t = c + \sum_{k=1}^{m-1} \rho_k \Delta \gamma_{t-k} + \sum_{q=1}^{n-1} \omega_q \Delta m_{t-q} + \omega_0 \Delta m_t + \gamma[\gamma_{t-1} - m_{t-1}] + \varepsilon_t \qquad (5)$$

$$\gamma = -\sum_{q=0}^{n} \beta_q$$

and

$$\delta = -\left(1 - \sum_{k+1}^{m} \alpha_k\right) + \sum_{q=0}^{n} \beta_q$$

$\frac{\gamma}{\gamma+\delta}$ is the measure of how an exogenous shock, in this case the change of market rate, is transmitted to the endogenous variable after all the adjustments are completed, or the long run pass-through of market interest rate to the retail interest rate. The magnitude and sign of δ determines the difference between r_t and m_t. If δ is insignificant, $\frac{\gamma}{\gamma+\delta} \approx 1$. That is, there is a one-to-one long run relationship between r_t and m_t. (δ +γ) is the adjustment coefficient. (δ +γ) tells how much of the adjustment to equilibrium takes place in each period. If (δ +γ) = 1, the adjustment is instantaneous and full. If (δ +γ)= 0:5, half of the adjustment takes place each period.

RESULTS

The ADF test results are summarized in Tables (1), (2), and (3). Table (1) reports the ADF test results of the market interest rate series with both level values and their first difference in the data series. The higher P-values for Hong Kong, Singapore, Thailand, Korea, the Philippines, and Taiwan suggest that we failed to reject the null hypothesis that $\rho = 1$, indicating that the level value of the market interest rate series I(0) in these economies were not stationary and that more than one unit root exists. Therefore, addition tests on the first difference series I(1) of market interest rates were conducted. The P-values of the first difference I(1) in the market rate series for the six sample economies were close to 0, demonstrating that the data series were stationary at the first difference level. Unlike the market interest rate time series in the six economies above, that in Indonesia was stationary at level value I(0), obviating the need to test its first difference.

Table 1: ADF Test of Market Interest Rates

	Hong Kong		**Indonesia**		**Philippines**	
	t-Statistics	**P-Value**	**t-Statistics**	**P-Value**	**t-Statistics**	**P-Value**
Market rate level	-1.438	0.5605	-4.8579	0.0010***	-2.4592	0.1288
First difference	-6.304	0.0000***	n/a	n/a	-9.0510	0.0000***
	Singapore		Korea		Taiwan	
	t-Statistics	P-Value	t-Statistics	P-Value	t-Statistics	P-Value
Market rate level	-0.593	0.86662	-1.3948	0.5819	-1.5851	0.4864
First difference	-9.018	0.0000***	-7.2634	0.0000***	-5.1053	0.0000***
	Thailand					
	t-Statistics	P-Value				
Market rate level	-0.6139	0.8617				
First difference	-8.604	0.0000***				

ADF Test of market rates in the seven sample economies including Hong Kong, Indonesia, The Philippines, Singapore, Korea, Taiwan and Thailand. The empirical results indicate that except Indonesia, the other six countries all existed first difference I(1) at 99% statistical significance level. 90% statistical significance, **95% statistical significance, ***99% statistical significance.*

Table (2) reports the ADF test results of retail bank rates with the data's level values. Like the market interest rate series, the lending and depositing retail bank rate series in Indonesia were stationary at level value I(0). The various types of retail bank rate series, including savings deposits; lending; and 1-month, 3-month, 6-month, and 12-month deposits, in Hong Kong, Singapore, and Taiwan were not stationary at level value I(0). In Korea, the series of loans to small corporations, loans to large corporations, and lending retail bank rates were stationary, whereas the saving deposit rate series was not. Thailand's lending rate series was stationary at level value I(0), but the deposit rate series was not. In Philippine, only the lending rate series was stationary at the level value; all other series, including savings deposit, short-term deposit, and long deposit, were not stationary.

Table 2: ADF Test of Retail Bank Rates (Level)

	Indonesia		**Korea**		**Thailand**	
	T-Statistics	**P-Value**	**T-Statistics**	**P-Value**	**T-Statistics**	**P-Value**
Saving deposit	n/a	n/a	-2.143	0.2285	n/a	n/a
Loan to small corp	n/a	n/a	-3.395	0.0134**	n/a	n/a
Loan to large corp	n/a	n/a	-3.395	0.0134**	n/a	n/a
Lending	-3.814	0.0039***	-5.065	0.0000***	-5.115	0.0000***
Deposit	-4.447	0.0005***	n/a	n/a	-1.759	0.3986
	Hong Kong		**Singapore**		**Taiwan**	
	t-Statistics	**P-Value**	**t-Statistics**	**P-Value**	**t-Statistics**	**P-Value**
Saving deposit	-1.585	0.4867	-1.388	0.5850	n/a	n/a
Lending	-1.517	0.5210	-1.579	0.4893	-0.984	0.7567
Deposit 1M	-1.681	0.4378	n/a	n/a	-1.501	0.5290
Deposit 3M	-2.090	0.2492	-1.183	0.6793	n/a	n/a
Deposit 6M	-1.354	0.6016	-1.113	0.7082	n/a	n/a
Deposit 12M	-1.600	0.4786	-1.172	0.6838	-1.414	0.5723
	Philippines					
	t-Statistics	**P-Value**				
Saving deposit	-1.828	0.3652				
Lending	-2.592	0.0979*				
Short Term Deposit	-2.373	0.1520				
Long Term Deposit	-2.068	0.2579				

*ADF Test of retail bank rates in the seven sample economies with their level values. Due to the differences of the data from the seven sample countries, different types retail bank rates were tested. Among them, Korea classified the landing rates into loan to small cap corporations and large cap corporations. Hong Kong, Singapore, Taiwan and the Philippines offered deposit rates with different length of maturities. 90% statistical significance, **95% statistical significance, ***99% statistical significance*

Table (3) reports the ADF test results for the retail bank rates with the data series' first difference values. In this test, we only examined the data series that filled the null hypothesis at level value, as reported in Table (2). For the series that were stationary at the level value, such as Indonesia, and most retail bank rates in Korea and Thailand, tests on their series' first difference were not necessary. According to the P-values in Table 3, all retail bank rate series that were examined at their first difference I(1) were stationary at 99% statistical significance.

Table 3: ADF Test of Retail Bank Rates (First Difference)

	Indonesia		**Korea**		**Thailand**	
	t-Statistics	**P-Value**	**t-Statistics**	**P-Value**	**t-Statistics**	**P-Value**
Saving deposit	n/a	n/a	-5.829	0.0000***	n/a	n/a
Loan to small corp	n/a	n/a	n/a	n/a	n/a	n/a
Loan to large corp	n/a	n/a	n/a	n/a	n/a	n/a
Lending	n/a	n/a	n/a	n/a	n/a	n/a
Deposit	n/a	n/a	n/a	n/a	-3.995	0.0022***
	Hong Kong		**Singapore**		**Taiwan**	
	t-Statistics	**P-Value**	**t-Statistics**	**P-Value**	**t-Statistics**	**P-Value**
Saving deposit	-4.051	0.0018***	-6.840	0.0000***	n/a	n/a
Lending	-4.081	0.0016***	-6.498	0.0000***	-9.727	0.0000***
Deposit 1M	-5.567	0.0000***	n/a	n/a	-3.559	0.0048***
Deposit 3M	-4.841	0.0001***	-6.291	0.0000***	n/a	n/a
Deposit 6M	-3.324	0.0164***	-6.908	0.0000***	n/a	n/a
Deposit 12M	-3.055	0.0334***	-6.920	0.0000***	-3.615	0.0071***
	Philippines					
	t-Statistics	**P-Value**				
Saving deposit	-8.906	0.0000***				
Lending	-16.410	0.0001***				
Short Term Deposit	-8.654	0.0000***				
Long Term Deposit	-13.516	0.0001***				

*ADF Test of retail bank rates in the seven sample economies with their first difference values. The empirical results suggest most rates are I (1) at 99% statistical significance. 90% statistical significance, **95% statistical significance, ***99% statistical significance*

After the ADF tests, cointegration tests were performed to detect the linear relationship between market interest rates and retail interest rates; the test results are reported in Table (4). The cointegration tests focused on the data series that were not stationary at level values but were stationary at their first difference I(1). Therefore, only the data series in Table 3 were selected. The lower P-values of the test results suggest that most market interest rates and bank retail rates were cointegrated, which is common in actual practice.

Table 4: Cointegration Test

	Philippines		**South Korea**		**Thailand**	
	t-Statistics	**P-Value**	**t-Statistics**	**P-Value**	**t-Statistics**	**P-Value**
Saving deposit	-12.051	0.0001***	-7.023	0.0000***	n/a	n/a
Lending	-10.250	0.0000***	n/a	n/a	n/a	n/a
Short Term Deposit	-8.143	0.0000***	n/a	n/a	-4.632	0.0002***
Long Term Deposit	-8.951	0.0000***	n/a	n/a	n/a	n/a
	Hong Kong		**Singapore**		**Taiwan**	
	t-Statistics	**P-Value**	**t-Statistics**	**P-Value**	**t-Statistics**	**P-Value**
Saving deposit	-5.988	0.0000***	-8.340	0.0000***	n/a	n/a
Lending	-5.953	0.0000***	-7.185	0.0000***	n/a	n/a
Deposit 1M	-7.456	0.0000***	n/a	n/a	-4.553	0.0003***
Deposit 3M	-6.552	0.0000***	-7.483	0.0000***	n/a	n/a
Deposit 6M	-6.721	0.0000***	-7.991	0.0000***	n/a	n/a
Deposit 12M	-6.795	0.0000***	-8.079	0.0000***	-3.274	0.0188**

The results of cointegration test are reported. Since Indonesia was I(0), the cointegration test was not performed. The results of the other six economies indicated their market interest rates and bank retail rates were cointegrated.

The empirical results are reported in Table (5), revealing that the intermediate effects varied between the seven countries, with values ranging from 0.03 to 0.63. Regarding the long-term effects, these values ranged from 0.02 to 1.006 in these countries. In general, lending rates in these countries were stickier than deposit rates. Deposit rates with longer times to maturity tended to adjust more than those with shorter times to maturity when market rates changed. Retail saving deposit rates, however, had low immediate pass-through compared with other types of deposit rates. Countries with more highly developed financial markets had higher immediate- and long-term pass-through than those with less developed markets. For Korea, Hong Kong, Singapore, and Taiwan, the average retail rate on long-run pass-through was approximately 0.75, versus 0.56 for the Philippines, Thailand, and Indonesia. Thus, the development of financial markets and the activity of financial services have positive effects on bank retail rate adjustments. Compared with previous studies, such as Cottarelli and Kourelis (1994) and de Bondt (2005), the pass-through behaviors in developing Asian countries differ from those in the Euro area. Developing Asian countries tend to have higher intermediate multipliers and incomplete long-run pass-through. In the Euro area, however, the long-run pass-through is perfect, although the intermediate multipliers are low. Notably, the lending rates in Thailand and Korea are I(0) processes despite both market rates, and their deposit rates are I(1). Given the constant change in the corresponding marginal costs of lending rates, one should observe that lending rates change with similar patterns as their costs of funding. The empirical results, however, show the opposite trend. Lending rates remain at similar levels, regardless of what the associated costs might be. Lending rates, therefore, fail to fulfill their role as a signal of real prices for loanable funds. Explanations for this phenomenon include the existence of the intervention of lending rate setting by monetary authorities, the immaturity of banking systems, and the existence of non-bank financial activities.

Table 5: Interest Rate Pass-Through

	Immediate Pass-Through	Long Term Pass-Through	Adjustment Coefficient
Hong Kong			
Saving deposit	0.1551	0.7458	-0.0823
Lending	0.1464	0.7307	-0.0875
Deposit 1M	0.4559	0.8524	-0.1097
Deposit 3M	0.4380	0.8560	-0.0676
Deposit 6M	0.3800	0.8360	-0.0555
Deposit 12M	0.3484	0.7549	-0.0496
Indonesia			
Deposit	0.0598	0.4843	n/a
Lending	0.0333	0.3991	n/a
Philippines			
Saving deposit	0.4558	0.8943	-0.2629
Lending	0.2459	0.5732	-0.4036
Short Term Deposit	0.6326	0.9815	-0.4559
Long Term Deposit	0.3211	0.6206	-0.2742
Singapore			
Saving deposit	0.0524	0.4677	-0.0115
Lending	0.0453	0.0679	-0.0233
Deposit 3M	0.0820	0.7155	-0.0092
Deposit 6M	0.0949	1.0065	-0.0088
Deposit 12M	0.1077	0.8926	-0.0100
South Korea			
Time Deposit	0.3907	0.9967	-0.2338
Taiwan			
Deposit 1M	0.4187	0.8338	-0.1901
Deposit 12M	0.4947	0.8126	-0.0780
Thailand			
Deposit	0.1914	0.0285	-0.0283

The results of interest rate pass-through in the intermediate and long term terms were reported and indicated that the pass-through adjustment speeds were vary among the seven economies

CONCLUDING COMMENTS

This study applied the ECM model to examine the interest pass-through in seven Asian economies. The data that we selected were market interest rates and retail bank savings and lending rates with varying lengths. Because this study focused on how banking systems in Asian economies recovered from the 1997 financial crisis, the sample period comprised January 1999 to May 2007 to avoid disturbances from the 2008 financial turmoil in the US. Nevertheless, how the 2008 financial crisis affected Asian economies will be discussed in a separate study. The primary results indicated that delays exist when banks adjust market rates to bank retail rates. Also, that varying financial instruments and maturities resulted in disparate degrees of intermediate- and long-term pass-through. Countries with more highly developed financial markets usually responded to market conditions more actively and fully, whereas those with less developed markets tended to take longer to adjust. Lending rates are usually stickier than deposit rates in the countries studied. Deposit rates with longer time to maturities are more elastic to market rate changes compared to deposit rates with shorter times to maturity. Logically, the next step is to extend this analysis to a bank-level investigation of bank risk management and its role in deposit and loan pricing. A greater understanding of bank risk management in banking sectors would improve the identification of factors that explain the heterogeneity in interest rate pass-through behaviors between these economies.

REFERENCES

Borio, C.E.V. and Fritz, W. (1995), *The Response of Short-term Bank Lending Rates to Policy Rates: A Cross-country Perspective*, Working Paper No. 27, Monetary and Economic Department, Bank for International Settlements, Basle.

Borstel, J.V., Eickmeier, S. and Krippner, L. (2016), The interest rate pass-through in the euro area during the sovereign debt crisis. *Journal of International Money and Finance*, 68, 386–402.

Caprio, G., Honohan, P., and Stiglitz, J. (2001), *Financial Liberalization*. Cambridge University Press.

Chow, P., and Gill, B. (2000), *Weathering the Storm: Taiwan, Its Neighbors, and the Asian Financial Crisis*. Brookings Institution Press.

Cifarelli, G., and Paladino, G. (2016), Time-varying mark-up and the ECB monetary policy transmission in a highly non linear framework, *International Review of Economics and Finance*, 45, 247–262.

Cottarelli, C. and Kourelis, A. (1994), Financial Structure, Bank Lending Rates, and the Transmission Mechanism of Monetary Policy, *IMF Staff Papers*, 41, 587-623.

de Bondt, G. (2005), Interest Rate Pass-Through: Empirical Results for the Euro Area, *German Economic Review*, 6, 37-78.

Freixas, X. and Rochet, J. C. (1998), *Microeconomics of Banking*. MIT Press.

Granger, G.W.J., and Newbold, P. (1974), Spurious Regressions in Econometrics, *Journal of Econometrics*, 2, 111-120

Hefferman, S. (1996), *Modern Banking in Theory and Practice*, Wiley.

Hofmann, B. and Mizen, P. (2004), Interest Rate Pass-Through and Monetary Transmission: Evidence from Individual Financial Institutions' Interest Rates, *Economica*, 71, 99-123.

Hristo, N., Hülsewig, O. and Wollmershäuser, T. (2014), The interest rate pass-through in the Euro area during the global financial crisis, *Journal of Banking & Finance*, 48, 104–119.

Nehls, H. (2006), The Interest Rate Pass-Through in German Banking Groups, *Journal of Economics and Statistics*, 226(4), 463-479.

Noy, I. (2005), Banking Crisis in East Asia: The Price Tag of Liberalization?, *Asia-Pacific Issues*, No. 78, East-West Center.

Pesaran, M. H. and Shin, Y. (1999), An Autoregressive Distributed Lag Modeling Approach to Cointegration Analysis. In S. Strom, *Econometrics and Economic Theory in the 20th Century: The Ranger Frisch Centennial Symposium*, Cambridge University Press, Cambridge.

Rousseas, S. (1985), A Markup Theory of Bank Loan Rates, *Journal of Post Keynesian Economics*, 8, 135-144.

Sørensen, C.K. and Werner, T. (2006), *Bank Interest Rate Pass-Through in the Euro Area*, Working Paper No. 580, European Central Bank, Frankfurt.

Turner, P. (2007), Are Banking Systems in East Asia Stronger?, *Asian Economic Policy Review* 2, 75-95.

Weth, M. (2002), The Pass-through from market interest rates to lending rates in Germany. Discussion paper 11/02, Economic Research Centre of the Deutsche Bundesbank. https://www.econstor.eu/bitstream/10419/19568/1/200211dkp.pdf

Winker, P. (1999), Sluggish Adjustment of Interest Rates and Credit Rationing: An Application of Unit Root Testing and Error Correction Modeling, *Applied Economics*, 31, 267-277.

ACKNOWLEDGMENTS

The author is grateful to Dr. Terrance Jalbert, Editor in Chief, and two anonymous referees for helpful comments on an earlier version of this paper. The usual disclaimer applies.

BIOGRAPHY

Dr. Chris C. Hsu is Director of CUNY Aviation Institute and Associate Professor of Finance at York College, The City University of New York. He can be reached at: Department of Accounting and Finance, School of Business and Information Systems, York College, The City University of New York, 94-20 Guy R. Brewer Blvd., Jamaica, NY 11451. Phone: 718-262-2513. Email: chsu@york.cuny.edu