The Social Sciences 10 (1): 6-12, 2015
ISSN: 1818-5800

Microstructure of Foreign Exchange Market in Malaysia

Tenku Nur Shahrul Hizam YM Tengku Izham and Md. Aminul Islam
School of Business Innovation and Technopreneurship, Universiti Malaysia Perlis,
Arau, Perlis, Malaysia

Abstract: The liquidity aspect of Kuala Lumpur foreign exchange market continues to be a puzzle to researchers. Most of microstructure literatures focused on developed and matured markets such as England, US, Japan, Europe and Australia. However, conceptual studies on the Kuala Lumpur foreign exchange market are often neglected by most researchers due to the smallest trading size and Malaysian Ringgit is not being one of active currencies traded in the international market. The purpose of this study is to provide an overview, structure and liquidity in Kuala Lumpur foreign exchange market which will distinguish this study from most of the literatures. This study focuses on a particular blend of Malaysia ingredients USD/MYR that have the potential to put Malaysia at the forefront of this research. Furthermore, this study provides the historical background of Malaysian Ringgit for a better understanding of the development and growth of the foreign exchange market in Malaysia. This study provides an overview of Kuala Lumpur foreign exchange market from microstructure perspectives.

Key words: Foreign exchange market, liquidity, trading size, microstucture, Malaysia

INTRODUCTION

The origins of foreign exchange market started after the international merchant banker devised bills of exchange which were transferable 3rd party payments that allowed flexibility and growth in foreign exchange dealings. The system of money existed when gold and silver was used as token convertible into property (Temple, 1899). The modern foreign exchange market started in 1973 with introduction of Traditional Asset Pricing Theory on financial assets. The failure of empirical test on short horizon of traditional asset pricing theory has open new dimension for the development of microstructure theory. The determinants of liquidity in foreign exchange market are becoming increasingly important, as the market microstructure analysis had shown many positive empirical results in equity and fixed income market. Foreign exchange market is the largest financial market in the world. However, there is limited research on microstructure of Kuala Lumpur foreign exchange market. Geographically, the foreign exchange markets spans the globe with prices moving and currencies traded from every minutes of every business day from Monday to Friday. The foreign exchange market is an arena where a nation's currency is exchanged for other currency simultaneously. The ordinary trading deals with goods where we exchange money for goods. However, foreign exchange market deals with buying and selling currencies. The price of one currency in terms of another is called an exchange rate.

Malaysian Ringgit liquidity is provided to the system by the Bank Negara Malaysia by undertaking foreign exchange spot transactions and open market operation. When investigating on microstructure issues, the most important aspect is how liquidity may be affecting the integration and efficiency of the day to day markets operation in Malaysia. Liquidity fundamental and determinants are importance, as it influenced by trading costs on required returns of financial asset. Amihud and Mendelson (1986a) were the first researchers who analyzed microstructure dimension liquidity as one of determinants of stock returns. They found that liquidity reduces cost of capital and improve the trading and exchange process in security market. They analyzed stock returns against relative risk and spread using 3 models: Black *et al.* (1972), Fama and MacBeth (1973) and Black and Scholes (1974) models. Contrast to Jacoby *et al.* (2000), they also developed a link between liquidity cost and return on asset by measuring systematic risk using Capital Asset Pricing Model (CAPM) frameworks. However, they found different results compared to Amihud and Mendelson (1986b). Generally, structure of exchange organization, regulation and government intervention could influence liquidity of Kuala Lumpur foreign exchange market.

Corresponding Author: Tenku Nur Shahrul Hizam YM Tengku Izham, School of Business Innovation and Technopreneurship, Universiti Malaysia Perlis, Arau, Perlis, Malaysia

Furthermore, a better understanding of liquidity determinants should increase market participants confidence in financial markets and thereby enhance the transparency in the global foreign exchange markets. Not withstanding the importance of research about liquidity, existing microstructure literatures have been performed over short time spans of a year or less. For example, Lyon (1997) studied the behaviour of market maker using dealer's intraday inventory and trade data on foreign exchange market. By using model that account for trading volume, the share of interdealer trading and transparency of order flow among multiple dealers, Lyon (1997) believed customer trades represent the major source of asymmetric information.

The empirical evidence of market microstructure has come mainly from the stock markets. Most literatures usually focused on the liquidity of individual securities in developed country, such as the United State of America (USA) and United Kingdom (UK). In addition, Stoll and Whaley (1990) extended a research on the co-movement of stock index and stock index futures contract using time series analysis in the days the stock market crash on October 19, 1987. Furthermore, this study is a fundamental study which focuses on Kuala Lumpur foreign exchange market. It makes a difference, this study from previous literatures. Most of researchers focused on bid-ask spreads, volatility and heterogeneity issues while few studies focused on the dealers behaviour using indirect measures of volume traded and dealers inventory positions. In addition, the existence of High Frequency Data (HFD) from reliable source, such as WM/Reuters-D3000 Xtra could be a new dataset which can be obtained from Malaysian bank trading and settlement platforms such as Continuous Linked Settlement system (CLS), Murex, Globus and others.

Liquidity can be defined from many perspectives and measured using variety of models with variety of time horizons. However, the practitioners worry about trading at anomalous price since this would introduce randomness to his/her returns that he/she would rather avoid for short run. To foreign exchange traders in spot market, a low liquidity environment might be the one of situation where the price will move against his/her expectation. When assessing the market, the trader will look on the current bid-ask spreads in the market and the changes of width of the market spread/gains.

In the earliest literature, researchers recognized the determination of exchange rate from perspective of international goods market but it failed in empirical test. Exchange rates can have an effect on the liquidity of foreign exchange market. Demand for the currency is not only come from the purchase and sales of goods or assets but also exist to fulfil the role as a medium for speculations. Since, traditional macro models usually neglect the reality features of market, it might not be the right direction to solve the puzzle of exchange rate movements using the macroeconomic theory for short term horizon.

The foreign currency exchange business was not open to the public initially. However, there is a massive market and demand by individuals due to introduction of online systems. The introduction of automated dealing systems in the 1980's, matching systems in the early 1990's and internet trading in the late 1990's completely altered the way foreign exchange was conducted. After 1998, the foreign exchange market was opened to individuals. The dealing systems had a major role in expanding the foreign exchange business by providing full accounting coverage, ticket writing, back office processing and risk management implementation due to their reliability, speed and safety. Now, there are new players in the market and internet foreign exchange traders.

FOREIGN EXCHANGE MARKET IN MALAYSIA

The foreign exchange market is one of the largest financial markets in the world when compare to global equity markets. It is a market whereby buyers and sellers meet to transact in convertible currencies at agreed rate and amount on specified delivery date (Dun and Bradstreet, 2007).

Size of foreign exchange market: The FX market is associated with a unique combination of features which makes studying microstructure of FX determination attractive. Firstly the FX market is fast paced, volatile and enormous. The huge increase of 71% volumes between April, 2004 and 2007 (BIS, 2007) has led FX market as a highly liquid market place compared to capital market (equity and bond market). From triennial reports in 2010 and 2013, Bank International Settlements had shown that foreign exchange market is the largest financial market that contributes approximately USD3.981 billion of foreign exchange daily trading volume in 2010 (BIS, 2010) and total turnover of $5.3 trillion volume per day in April, 2013 (BIS, 2013). It had proven that foreign exchange market is the largest and most profitable financial market in the world. Furthermore, currency pairs such as EUR/USD, USD/JPY and GBP/USD together constitute over 60% of actively traded currency pairs in the global foreign exchange markets. Literature on liquidity are importance to dealers in developing trading and risk management

strategies and to fulfil their roles, as liquidity provider in foreign exchange market, especially to small market like Malaysia, Thailand, Philippines and Indonesia.

Centre of foreign exchange trading: There are 3 main centres of trading which handle the majority of all FX transactions United Kingdom (UK), United State (US) and Japan. As at April 2013, the largest market is the United Kingdom which consists of 40.90% of total global daily turnover amounted $2726 billion going through London, followed by the US daily turnover was 18.9% with trading volume of $1263 billion. Transactions in Singapore, Switzerland, Hong Kong, Germany, France and Australia account for most of the remaining transactions in the market. Unlike other markets, Kuala Lumpur foreign exchange market has contributed around USD1 billion (0.1%) of net gross basis of global foreign exchange market turnover in 1998. However in year 2013, Malaysia has reported tremendous growth by 57.14% from $7 billion in 2010 to $11 billion in 2013. Kuala Lumpur foreign exchange market, itself is actually a less developed, small volume compared to Singapore.

Malaysian Ringgit: The Ringgit was first produced by the Central Bank of Malaysia in 1967. Initially, the official currency was Dollar Malaya which was also used by Singapore and Brunei. Malaysian Dollar is issued by the Bank Negara Malaysia to replaced Malaya and British Borneo Dollar. It was quoted against Pound Sterling at par value of 0.290299 g of gold. However, due to floating and devalued of sterling in June, 1972, Bank Negara Malaysia decided to quote the currency against the US Dollar (USD). The Malaysian Ringgit (MYR) had been linked to the US Dollars, since then until 1975. After 1975 with the government intervention, Ringgit has been linked to a basket of currencies of Malaysia's major trading partners such as the US, Japan, Singapore, Germany, UK and the Netherlands.

The Bank Negara Malaysia intervened in the interbank foreign exchange market transactions to maintain the Ringgit Dollar exchange rates within a desirable range. The Malaysian Ringgit was introduced in 1990's as the official currency of Malaysia. The Malaysian Ringgit is a managed floating and the partial convertibility currency. It is quoted as the number of Malaysia Ringgits (MYR) per US Dollar. Malaysia has experienced 2 different exchange rate regimes which were the intermediate floating exchange rates and peg the Ringgit against the USD on 2 September, 1998 at MYR3.80 (Fig. 1).

On 1 September 1998, Malaysia imposed a range of foreign exchange and capital controls that substantially

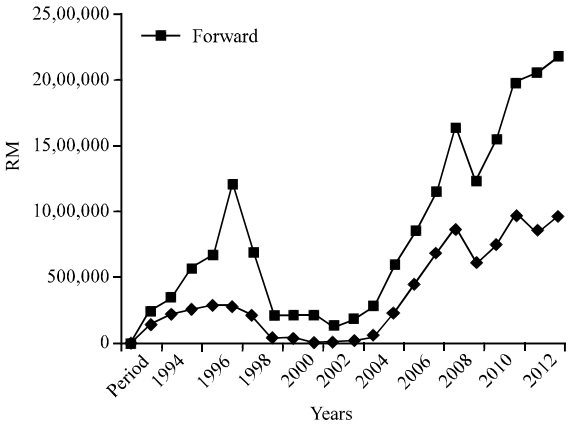

Fig. 1: Volume of interbank transactions in the Kuala Lumpur foreign exchange market (USD/MYR)

insulated Malaysian financial markets from external influences and effectively closed down the offshore Ringgit market. It led to an appreciation of the Ringgit and on 2 September, the authorities fixed the exchange rate at RM3.80 to the US Dollar. The legally permitted foreign exchange trading and activities in Malaysia take place onshore rather than offshore trading. The Ringgit was pegged at RM3.80 to 1 US Dollar to make Malaysia more competitive while allowing stable normal business transactions to be carried out in Malaysia (Mohamad, 1999).

Type of foreign exchange contracts: With the global daily turnover of $5.3 trillion, trading activities spread across many foreign exchange instruments such as spot, swap, forward, option, outright forward and currency swaps. The BIS (2013) survey shows that foreign exchange swap is the largest instruments traded in the market (42%) followed by spot market trading (38%); outright forward (13%); option (6%) and currency swap (1%). Compare to Malaysia, foreign exchange transactions usually involve the exchange of domestic currency Malaysian Ringgit (MYR) for foreign currencies such as US Dollar (USD), Singapore Dollar (SGD), Great Britain Pound (GBP), Euro (EUR) and Swiss Franc (CHF). Kuala Lumpur foreign exchange transaction mainly focused on spot and forward contract transaction. The volume of USD/MYR Spot Interbank transaction was MYR969,135.80 while the main FX transaction comes from RM1,206,043.80 of USD/MYR forward transaction.

The 24 h trading: Foreign exchange operates on a 24 h basis, spanning from one zone to another in all the major financial centres. Foreign exchange trading opens in New Zealand, followed by Australia, Japan, Asia, the

Middle East, Europe and America. At 3.00 a.m. Eastern Standard Time (EST), the exchange market is opening in London while the trading day is ending in Singapore, Malaysia and Hong Kong. At 8.00 a.m. EST, the New York market opens for business and later the traders in San Francisco conduct their business. As the market closes in San Francisco at 9.00 p.m. EST, Singapore, Malaysia and Hong Kong markets are starting their day. New York and London markets overlap from 8.00 a.m. to 12.00 noon EST where trader will find the highest volume of trades involves thousands of big market makers and large number of institutional investors from all over the world.

US Dollar as the predominant currency: The US Dollar is the predominant traded foreign currency in Malaysia. From 1993-2013, the main currency pair of interbank transaction is USD/MYR. For example, total volume of Interbank USD/MYR spot and forward transaction was MYR258,210.50 while in 2013 the volume increased to MYR2,175,179.60. The other currency pairs are USD/SGD, USD/JPY, GBP/USD, EUR/USD and USD/CHF are also traded in Malaysia. US Dollar plays an important role, as commodity currency in cross currency transaction in Malaysia when 2 other currencies being exchanged. Malaysian Ringgit is first converted into USD because market concentration is focused on US Dollar market. Furthermore, it is easier to find counterparties who are willing to trade 2 other currencies for US Dollar as the market is liquid and lower transaction cost. The liquidity of the US Dollar is reflected from its bid-ask spread quoted by the interbank dealer.

Kuala Lumpur foreign exchange market participants: As at end of 17 July, 2013, Malaysia has Bank Negara Malaysia, 27 licensed commercial banks, 16 Islamic banks, 4 international Islamic banks, 13 investment banks and 2 other financial institutions. Bank Negara Malaysia is functioning as the regulator and supervisor to the Kuala Lumpur foreign exchange markets. Due to its roles as regulator, the central bank is the most important participant in the foreign exchange market. Bank Negara Malaysia appoints authorized foreign exchange dealers or agents who are given full authority in transacting foreign exchange business (Ng, 1988). The 2nd participants in Malaysia FX market is the group of investment banks. In Malaysia, it has been the practice that investment banks operate on their own account. They are not required to surrender any amount of foreign exchange to Bank Negara Malaysia. In addition to dealers, brokers also another important group of market participants in the interbank foreign exchange market. Brokers arrange and facilitate foreign exchange transactions among other parties mainly commercial and investment banks.

In the 1990's, the FX market can be divided in 2 layers: The interbank and customer market (corporate sales market). Interbank trades can be done via electronic broking system or market makers. Besides, the 2 tier of foreign exchange market, there is also new internet trading platform which allow retail player to participate in foreign exchange trading. However, the research will focus on the main group traders: Customer markets and interbank dealers as they are the main players in the Kuala Lumpur foreign exchange market.

The interdealer market is made up of several thousand commercial banks and other institutions located throughout the world. Trades of interbank dealers are neither made public nor are they currently available in machine-readable form. Trading is either interdealer direct (bilateral or taking place between dealers) or voice broker (interdealer trades) or electronic method. The second important layer is customers markets. It is also known, as the ultimate end-users of currency and they make the largest single trade. Prior to the advent of the internet, customers traded only with banks. Customers may be central banks, government, importer and exporters of goods, financial institution like hedge and pension funds. At retail transaction level, there are also money changers and bureau de change in Malaysia. They deal mainly in the sale and purchase of variety foreign currencies denomination notes and coins from the publics.

Foreign exchange trading in Malaysia always follows a sequence. Customer or retail trading is the primary source of currency demand. It starts with a customer contacting the bank (business to customer). The transaction is executed by the corporate dealer with a customer who wishes to trade. The bank acts as market maker and gives quotes to the customer. Customers do not have access to the interbank market. For customer, trading with counterparty directly involve credit risk which could be handled more efficiently by a bank. A corporate dealer in the treasury of a bank turns to the interbank market (business to business) to cover their customer trade. Interbank trading actually accounts for 60-80% of the total FX trading volumes. In the interbank market, the dealer has several options to trade, for example trading with brokers or direct dealing.

Decentralize and heterogeneous dealers: Due to decentralized in nature, no transaction prices or volume data for the broad market is available. The major source of information about the current state of the market is communication through broker boxes which announced the volume and prices of anonymous interdealer transaction as well as customers order. As the structure of foreign exchange market opposed to centralized equity

exchange, dealer exclusively handle differing portion of aggregate order flow. They can internally match customer orders or accommodate them through internal inventory adjustments without resorting to trading on the interdealer market. This trading environment produces heterogeneous dealer expectation of foreign exchange rates. The lack of a physical exchange enables the foreign exchange market to operate in a massive interconnected worldwide electronic exchange. It is carried out and connected by telephone lines black box, telex and computer screens (reuters and bloomberg) by a wide selection of institutions large banks, governments, great financial institutions, multinational companies, central banks, governments and currency speculators.

Oligopolistic market: The unique characteristics of the Kuala Lumpur foreign exchange market are that dealers have oligopolistic market power with minimum competition, opaque and low transparency compared to equity market. With opaque in nature, Kuala Lumpur foreign exchange market remains the least regulated, independent guide to only who know the depth of the instrument and market. Furthermore, the decentralized telephone market structure, it operates directly between 2 dealers in unregulated environment. Therefore, no single regulatory body in this market though individual country may impose some restriction on banks situated within its borders.

Low transparency: The lack of regulation disclosure requirement and due to its size, makes the Kuala Lumpur foreign exchange market characterized by low transparency financial market. Customers do not trade with each other. Trading and customers flows convey private information for the banks and dealers. There are few of the dispersed signals that order flow reveal will be observed by a single dealer. Transparency, also relates to how efficient dealers can aggregate information from the market participants. Although, foreign exchange spot and forward contracts are the largest global markets in the world, the research effort to study Kuala Lumpur foreign exchange market has been relatively modest compare to the research on equities or fixed income securities markets. Most of foreign exchange transactions in Malaysia are executed through the banking institutions. MYR/USD is the most traded currencies pairs by corporation, financial institutions. Although, these 2 markets are different in the term of structure, liquidity and market participants, they are strongly related to each other.

MARKET MICROSTRUCTURE

Microstructure theory was 1st developed in the research of capital (equity and bond) market. It started an analysis of the price fluctuation and spread determination in the equity market in the United State of America. However, equity market and foreign exchange are not sharing the similar structure, unique to each other market. Due to the difference between these markets it give unique results to the depth, width of quotes, liquidity and information to market and it shows the incomplete picture of dealers behaviour in foreign exchange market. Microstructure is a bridge to reality in explaining the crystal structure of currencies, size and volume, composition of currency, trading floor orientation and structure, exchange rate formation, the interaction between the players in the markets, strategy for risk management and ultimately, the effects on the FX market liquidity.

Cohen *et al*. (1979) defined microstructure as the elements of the equity trading process. They defined equity trading process as the process of arrival and dissemination of information; the generation and arrival of orders and the market architecture which determines how orders are transformed into trades. The analysis also takes into account the behaviour of specific types of market participants: Non-professional investors, institutional investors, speculators, dealers and specialists. The study of intermediation and the institutions of exchange is the definition of market microstructure given by Spulber (1999). From the traditional and theoretical microstructure models, O'Hara (1995) defined market microstructure as the study of the process and outcomes of exchanging assets under explicit trading rules.

In the event of 2007 financial crisis, most of financial markets in the world exposed to liquidity problems. Foreign exchange markets eventually frozen during the crisis as traders were reluctant to price the exchange rate. For example, Cassino and Wallis (2010) documented that increased in volatility and risk appetite in financial markets change the nature of foreign exchange trading in New Zealand during financial crisis. Even though, MYR is categorized as non-internationalized currency compared to other currencies such as US Dollar, Pound Sterling and Japanese Yen but it is open to the international economy. The most liquid Malaysian Ringgit (MYR) trading is located within Malaysia, although there is offshore market in Labuan that trade USD/MYR with overseas institutions. Due to the nature of its market, dealers have widen their spreads, changed their risk appetite in trading which leads to increase in the MYR volatility, decline in asset prices and thin liquidity in MYR market.

Foreign exchange price movement is not only dependent on tracked statistics of economics data but also on the market's view of economics. Liquidity may influenced by the technology, trading mechanisms or protocols, rules, regulations and other elements of the market place and the exchange rate is generated in the transaction between the market participants. Therefore, microstructure of foreign exchange analysis is the right direction to focus on the features of real market. It provides an insight to how dealers behaviour and trading activity influence liquidity of Kuala Lumpur foreign exchange market. Market microstructure theory seems to be the best fit theory for foreign exchange market. The dimension of microstructure such as behaviour of traders, types of orders, market regulations, trading process are the features that make the Kuala Lumpur foreign exchange market interesting. It probably can provide us the bridge of information and knowledge to the puzzle of the short run exchange rate behaviour.

There are limited literatures on liquidity of foreign exchange market, especially in Malaysia. Return on financial instruments has effected by liquidity while liquidity can be measured by many variables such as bid-ask spread (Amihud and Mendelson, 1991). In addition, Kamara (1994) investigated the differences in liquidity between notes and bills while Eleswarapu (1997) predicted liquidity premium based on Amihud and Mendelson (1986a) model and found that bid-ask spread is the one of best fit determinant for transaction cost that influenced liquidity in NASDAQ market. Contrast to Amihud and Mendelson (1991), Kamara (1994), Eleswarapu (1997) and Brennan and Subrahmanyam (1996) used price formation models in securities market to analyze illiquidity in asset returns. They used two techniques from asset pricing: CAPM Model and market microstructure: Glosten-Harris and Hasbrouck-Foster-Viswanathan models to measure trading cost and estimate liquidity parameter for New York stock exchange listed firm in year 1984.

Liquidity represents price immediacy. Markets are known as liquid market if trader can buy and sell currencies inventory quickly with low transaction cost and at a price close to the prevailing price. However, spot liquidity in foreign exchange market is not easy to measure. It is very difficult to differentiate between normal price movement and factors that attribute to large orders of inventory or trading volume. Liquidity can also be defined, as the cost of trading in the market. Direct transaction cost is the cost differential between the actual price paid for a certain trade and the observed midpoint price at the moment the decision to trade was taken. The other characteristic is when market has large quantities of inventory of currency pairs can be bought and sold with few transaction costs is also known as a liquid market.

The 1st determinants of liquidity can be measured by the width of bid-ask spread. Bid-ask spread is the price demanded by the market maker for providing liquidity service and the immediacy of execution (Amihud and Mendelson, 1986b). In a continuous electronic market where any market participant can freely enter and exit the market at any time supposed could make Kuala Lumpur foreign exchange market liquid as other foreign exchange markets.

CONCLUSION

Due to its nature, size and structure, Kuala Lumpur foreign exchange market are less transparent, data is rarely available and liquidity is complex issue in financial market, many researchers developed liquidity model to investigate the distribution of price returns changes using variety of model and method. For example, cost of executing a trade can be assessed by bid-ask spread and volatility. The availability of High Frequency Data (HFD) will improve the investigation of the distribution of price returns changes during the trading session. However, there is a drawback of using high frequency data; it creates the issue of microstructure noise associate with the HFD data. The expected outcome of this study is to provide an overview of the Malaysian foreign exchange market.

REFERENCES

Amihud, Y. and H. Mendelson, 1986a. Asset pricing and the bid-ask spread. J. Financial Econ., 17: 223-249.

Amihud, Y. and H. Mendelson, 1986b. Liquidity and stock returns. Fin. Anal. J., 42: 43-48.

Amihud, Y. and H. Mendelson, 1991. Liquidity, maturity and the yields on U.S. treasury securities. J. Fin., 46: 1411-1425.

BIS., 2007. Triennial central bank survey: Foreign exchange and derivatives market activity in April 2007. Bank for International Settlements. http://www.bis.org/press/p070925.htm.

BIS., 2010. Triennial central bank survey: Foreign exchange and derivatives market activity in April 2010. Bank for International Settlements. http://www.bis.org/publ/rpfx10.htm.

BIS., 2013. Triennial central bank survey: Foreign exchange and derivatives market activity in 2013. Bank for International Settlements. http://www.bis.org/publ/rpfx13.htm.

Black, F., M.C. Jensen and M.S. Scholes, 1972. The Capital Asset Pricing Model: Some Empirical Tests. In: Studies in the Theory of Capital Markets, Jensen, M. (Ed.). Praeger Publishers Inc., New York, USA., pp: 79-121.

Black, F. and M. Scholes, 1974. The effects of dividend yield and dividend policy on common stock prices and returns. J. Fin. Econ., 1: 1-22.

Brennan, M.J. and A. Subrahmanyam, 1996. Market microstructure and asset pricing: On the compensation for illiquidity in stock returns. J. Fin. Econ., 41: 441-464.

Cassino, E. and Z. Wallis, 2010. The New Zealand dollar through the global financial crisis. Reserve Bank of New Zealand Bulletin, Vol. 73, No. 3, September 2010, pp: 20-30.

Cohen, K.J., S.F. Maier, R.A. Schwartz and D.K. Whitcomb, 1979. Market makers and the market spread: A review of recent literature. J. Fin. Quantitative Anal., 14: 813-835.

Dun and Bradstreet, 2007. Foreign Exchange Market. Tata McGraw-Hill Education, New Delhi.

Eleswarapu, V.R., 1997. Cost of transacting and expected returns in the Nasdaq market. J. Fin., 52: 2113-2127.

Fama, E.F. and J.D. MacBeth, 1973. Risk, return and equilibrium: Empirical tests. J. Political 7 Econ., 81: 607-636.

Jacoby, G., D.J. Fowler and A.A. Gottesman, 2000. The capital asset pricing model and the liquidity effect: A theoretical approach. J. Fin. Markets, 3: 69-81.

Kamara, A., 1994. Liquidity, taxes and short-term treasury yields. J. Fin. Quantitative Anal., 29: 403-417.

Lyon, R., 1997. A simultaneous trade model of the foreign exchange hot potato. J. Int. Econ., 42: 275-298.

Mohamad, M., 1999. Case study for a country under economic stress. http://unpan1.un.org/intradoc/groups/public/documents/apcity/unpan003215.pdf.

Ng, B.K., 1988. The development and growth of foreign exchange markets in the Seacen countries. The Seacen Centre Staff Papers No. 28, May 1988, pp: 1-29.

O'Hara, M., 1995. Market Microstructure Theory. Blackwell Publishers Inc., Massachusetts.

Spulber, D.F., 1999. Market Microstructure: Intermediaries and the Theory of the Firm. Cambridge University Press, UK.

Stoll, H.R. and R.E. Whaley, 1990. The dynamics of stock index and stock index futures. J. Fin. Quantitative Anal., 25: 441-468.

Temple, R.C.C., 1899. Beginning of currency. J. Anthropol. Instit. Great Britain Ireland, 29: 99-122.