The Determinants and Stability of Real Money Demand in Vietnam, 1999-2009[*]

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Abstract

Understanding the money demand function is highly important for monetary policy implementation, especially in a monetary targeting framework. The paper uses cointegration analysis and a reduced-form short-run error correction model to investigate the demand for money in Vietnam between 1999 and 2009. We find evidence for a cointegrating relationship between the real money demand, income, the foreign interest rate, and the real stock price. More importantly, statistical tests show that real money demand in Vietnam is stable in this period.

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I. Introduction

Defining the money demand function is a central concern for monetary policy makers, because the combination of money supply and money demand determines interest rates, and therefore affects the final goals of monetary policy. A stable money demand allows for better predictions of the effect of monetary policy on interest rates, output, and inflation, and therefore reduces the possibility of an inflation bias (Cziráky and Gillman, 2006). Stable money demand is a precondition for an effective monetary policy, especially for countries pursuing a monetary targeting framework (Qayyum, 2005).

The importance of the money demand function has encouraged a wide range of economists to empirically study its determinants and stability. Investigation to date has been conducted for both developed and developing countries, and the primary purpose has been to justify the appropriateness of existing money targeting frameworks. These studies estimate the money demand functions for various countries using various specifications which have been consistent with alternative money theories. These estimates show that a stable money demand function was not established in every country because of structural changes such as deregulation and financial innovations (e.g., Yoshida and Rasche, 1990; Lee and Chung, 1995; Sriram, 1999a).

Vietnam has been undergoing a transition from a centrally-planned to a market economy for more than twenty years, and reforms for monetary policy implementation have been part of this process. The present monetary framework is defined as monetary targeting, where the State Bank of Vietnam (SBV) conducts monetary policy in order to meet the annual M2 growth target approved by the National Assembly at the beginning of each year. In this context, it is necessary to investigate the money demand function in Vietnam. However, only a few empirical studies exist. One estimation of real money demand in Vietnam was conducted by Adam, Goujon and Guillaumont-Jeanneney (2004) for the 1990s, and another by Watanabe and Pham (2005) for the period 1993-2004. Both studies determine factors affecting real money demand in the context of dollarization and underdeveloped financial markets, in which the United States dollar (USD) provided a substitute for holdings of domestic currency. However, given that the stability of money demand was ignored in these studies, there has been no judgment about the appropriateness of the current money targeting framework. Additionally, Vietnam's economy has changed dramatically since 2004

in terms of deeper integration into the world economy and rapid development of its stock market. Such fundamental changes can be expected to have affected the demand for money in recent years as well.

Therefore, the aim of this paper is to examine two aspects of the money demand function in Vietnam: the determinants of Vietnamese money demand in the new context of deep integration and the growing stock market, and whether the demand for money is stable. Apart from similar findings as previous papers about currency substitution and the sensitivity of real money demand to inflation, this paper also finds that stock market development did impact real money demand in Vietnam, and finds evidence that the rigid interest rate policy is ineffective as the country opens. More importantly, this paper finds that real money demand in Vietnam was stable in the period between 1999 and 2009, which is an important foundation for effective implementation of monetary policy.

II. Economic Background and Monetary Policy Framework
Macroeconomic Performance

Since the initiation of the *Doi Moi* (Renovation) program in 1986, Vietnam's economy has moved away from central planning toward a market orientation. Having improved the institutions and established the fundamentals of a market economy, the country has been successful in encouraging the development of the domestic private sector and attracting massive foreign direct investment. Also, by actively opening to international trade and integration, the country has benefited from its comparative advantages and become one of the major world exporters of raw materials, agriculture products, textiles, and other goods.

The economy has achieved impressive progress. It grew dramatically at an annual rate of 7.4 percent on average in the 1990s and 7.25 percent in the 2000s, thanks to a surge in investments and exports and the increasing contribution of the private sector. Since *Doi Moi*, the economic growth rate has experienced two shocks: the Asian crisis in 1997-98 and the global financial crisis starting in 2008. Both crises induced temporary slumps in GDP growth in the periods 1999-2000 and 2008-2009, respectively, by decreasing foreign investment and exports, as Vietnam is increasingly reliant on external markets.

Inflation has been volatile since the initiation of *Doi Moi*. After the hyper-inflation period between 1989 and 1991, inflation fell quickly to single digit levels over the next two years before gaining momentum again and reaching 17.1 percent in 1995. Inflation turned into the deflation in 2001 and 2002 as a consequence of the Asian crisis, after which it accelerated to around 8 percent during the oil price shock from 2004 to 2007. It kept

increasing and reached a peak of 23.1 percent in 2008 before dropping back to 7 percent in 2009. On average, inflation was 21.4 percent in the 1990s and 6.7 percent in the 2000s, higher than many Asian developing countries such as China, the Philippines, Thailand and Malaysia (IMF, 2006). As well, the headline inflation rate and the rates for food and food stuff components tended to move together over the period, implying that inflation had been impacted significantly by supply shocks such as crop failure and oil price shocks.

Financial Market Development

Although the economy has made impressive progress, the financial system in Vietnam has been underdeveloped, and reform of the financial sector has lagged behind other sectors. Camen (2005) claims that the financial market in Vietnam is still thin and lacks interconnection among the market segments. In order to meet the surge in capital demand for a developing country, the bond market was established in the early 1990s. However, this market has not played an important role in providing funds for the economy. According to statistics from Vietnam's Ministry of Finance in 2009, the bond market, including government bonds, amounted to only 17 percent of GDP, compared to 53 percent in China, 58 percent in Thailand, 82 percent in Malaysia, 74 percent in Singapore, and 109 percent in Korea. Both Camen (2005) and Vuong and Tran (2010) agree that the primary market is weak, while the secondary market does not exist. Bonds have been held to maturity. Commercial banks are the primary investors in government bonds. Additionally, economists such as Camen (2005) find that the interest rates of government bonds are non-market based, since they are subject to a ceiling rate set by the Ministry of Finance.

Vietnam's stock market was established in July 2000 as a complementary capital market for the banking system and bond market. Vietnam's accession to the WTO in 2006 was a milestone in the development of the stock market. Before that, the stock market had been primitive with only around 30 listed firms whose market value in total amounted to less than one percent of GDP. However, WTO accession and the accompanying equitization of some major state-owned enterprises (SOEs), led to a boom in the market from late-2006 to mid-2008. The stock index tripled during that period. The size of the market increased to 44 percent of GDP at the end of 2007, while the number of the listed firms increased to about 140. Even though the stock market bubble burst by mid-2008, it has been increasingly acting as an important capital market and supporting the on-going success of SOE equitization. As of late-2009, the market's value was about 55 percent of GDP with nearly 500 listed firms.

Given the underdevelopment of the bond market and the only recent development of the stock market, the money market has been the traditional and major channel through which

to provide funds for economic activities. The money market has rapidly deepened since 1999. The ratio of broad money to GDP (M2/GDP) increased dramatically from about 24 percent at the end of 1998, to 102 percent at the end of 2008, reflecting the high monetization of the economy. The ratio of private credit to GDP (CRD/GDP) has shown the same growth pattern as M2/GDP, as it increased from about 20 percent in 1998 to 91 percent in 2008. Consequently, money velocity declined from 4.2 in 1998 to around one in 2008.

Although the number of commercial banks has increased from 12 in 1991, to 79 in 1999, and to 101 at the end of 2009, the money market is concentrated in three state-owned commercial banks (The Bank for Investment and Development of Vietnam, the Vietnam Commercial and Industrial Bank, and the Bank for Agriculture and Rural Development of Vietnam) and one large joint-stock commercial bank (The Bank for Foreign Trade of Vietnam). These four commercial banks account for 70 percent of the market share. As the largest holders of Treasury bills, they became the biggest primary counterparties of the central bank in the open market and are important for the implementation of monetary policy.

Dollarization, Exchange Rate Policy and Capital Account Openness

Volatile inflation, especially the hyperinflation in the early of 1990s, eroded the confidence of the public in the dong and resulted in high inflation expectations. The IMF (2006) found that inflation in Vietnam persists longer than in other countries in the region, because inflation expectations are slow to adjust with those memories of high inflation. As a result, apart from real assets such as real estate and gold, the dollar became a substitute for dong as a store of value. Foreign currency deposits (FCD) have accounted for a large proportion of broad money (M2) during the 20 years of *Doi Moi*. This creates challenges for the implementation of monetary policy. Although this dollarization, as measured by the ratio FCD/M2, has been decreasing gradually in recent years compared to the peak of more than 30 percent in 2001, the ratio is still significant at around 20 percent at the end of 2008.

In an attempt to anchor inflation expectations and restore public confidence in the dong, and thus reduce dollarization, the exchange rate has been kept stable. The fixed and *de facto* fixed exchange rate systems were implemented for most of the time horizon considered in this study, particularly in the periods 1991-1998 and 2003-2007. During *Doi Moi*, the country made some adjustments to its exchange rate policy. For example, a dramatic depreciation of the official rate from 4,000 to 11,000 dong per US dollar between 1989 and 1991 came after abolishment of the multiple exchange rates system which was rooted in the centrally-planned economy. Two other depreciations occurred in 1998-2000 (about 19 percent) and 2009 (about 5 percent) as a result of the Asian and global financial crises.

Whereas Vietnam's current account has been liberalized according to Article IV of IMF with the removal of all the restrictions relating to international trade and current remittances, the capital account is still under control in order to protect the weak financial system. As stated by Camen (2005), the most substantial inflows are from official transfers, foreign direct investment and remittances from Vietnamese living abroad. Except for foreign indirect investment, which is not subject to any limitation, the authorities continue to place strict restrictions on all other short-term and medium-term capital flows.

Monetary Policy Framework

The current monetary policy in Vietnam is monetary targeting. The State Bank of Vietnam (SBV) focuses on the operational target of reserve money to adjust broad money as an intermediate target and affect the final goals of a stable currency, control over inflation, social stability, and improved living standards. The intuition for the monetary targeting framework is based on the long-run relationship between money and inflation and the assumption that money demand and the velocity of money are both stable.

The monetary policy framework in Vietnam was described by Le and Pfau (2009) in their study about the monetary policy transmission mechanism in Vietnam. The SBV develops annual reports for the implementation of monetary policy and projections for the next year, and submits them to the National Monetary Policy Advisory Board (NMPAB). The SBV projects the growth rates of major monetary indicators including broad money, deposits, and credit to the private sector. All of these projected indicators need to be approved by the NMPAB before they are submitted to the National Assembly, the highest level in the hierarchy of policy approval in Vietnam. After the National Assembly agrees with the projections, the SBV will implement monetary policy and regularly report the progress to the government and National Assembly.

In order to attain the approved monetary targets, the SBV employs a number of monetary instruments. The most important and active one is open market operations (OMO), which now operate daily to increase or reduce short-term liquidity in the money market. Also, the SBV has used the required reserve ratio and lending facilities to indicate its policy stance and influence liquidity. Camen (2005) indicates that the use of OMO and lending facilities in Vietnam was narrow due to the underdeveloped nature of its financial markets, as secondary markets are lacking and only limited members participate in the primary markets. For required reserves, although they have proved to be the most powerful instrument of the SBV to control inflation, since they can immediately affect a broad range of financial institutions, the adjustment of these ratios sometimes cause liquidity problems. In the process of liquidity

management as well, the SBV takes into account its intervention into the foreign exchange market. The purpose of foreign exchange intervention is to keep the exchange rate stable.

The SBV has been trying to make use of policy rates to influence market interest rates, but has not found much success with this. Interest rates have either been directly regulated or rarely changed in accordance with economic circumstances. For example, a ceiling on the interest rate for dong-denominated deposits existed until 2002 and has more recently been reintroduced from 2008 to the present. This suggests that domestic interest rates might not be important in explaining the demand for money. However, the interest rate for household US dollar denominated deposits has been liberalized since 2001, so it might be a useful variable in quantitative studies.

III. Theory and Data Issues

Literature Review

The determinants and stability of money demand are two key aspects of money demand theories. For determinants, whereas the classic quantity theory of Fisher emphasized income as the sole explanatory factor for the money demand function, other economists including Keynes, Tobin, and Friedman also took into account the returns of other assets, such as interest rates, bond and equity returns, and the return on physical goods. However, these economists disagreed about the role of interest rates in the money demand function. Keynesians highlighted the negative effect of interest rates on the demand for money. Friedman accepted the presence of interest rates in the money demand function, but argued that a change in interest rates had little effect on money demand, serving as an update to Fisher's quantity theory.

The different opinions about the effect of interest rates resulted in inconsistent judgments from economists about the stability of money demand. In Fisher's theory, the velocity of money is stable, meaning that money demand is also stable. Friedman concluded that money velocity is predictable and money demand is stable. However, Keynesians argued that the effect of interest rates on money demand is significant, leading to the conclusion that the velocity of money and money demand are both not stable.

These two aspects of money demand theories have inspired many scholars to examine the demand functions in specific countries. Sriram (1999a) conducted a survey of recent empirical work on money demand and finds that almost all studies have estimated the demand function for money with a general form of $(M^d/P) = f(S,OC)$, where S is the selected scale variables of the economic transactions, and OC is the opportunity cost of holding

money. The selection of appropriate money stock, scale and opportunity cost variables varied from study to study, but is generally based on either transaction theory or asset theory. Transaction theory emphasizes money's role as a means of payment, and therefore deals with narrow money such as M0 and M1, income variables including Gross National Income, Gross Domestic Product, Net National Income or the Industrial Index, and short-term interest rates, such as the yield for Treasury bills. Asset theory concentrates on money's function as a store of value and focuses on broad money including M2, M3 and broader, wealth variables, and long-term interest rates and returns. Wealth variables are usually hard to measure and income variables have been widely used as proxies.

The opportunity cost of holding money includes two components, the own-rate of money and the rate of return on substitute assets (Sriram, 1999a). The own-rate of money is what people earn from holding money, so its coefficient in the money demand function should be positive. In contrast, the rate of return on alternative asset choices should have a negative effect (Hendry and Ericsson, 1990). In general, there are three types of assets which substitute for money: domestic financial assets such as government bonds, bills, and commercial paper, physical assets whose rates of return can be approximated by the inflation rate, and foreign financial assets whose returns are measured by the interest rates of foreign bills, foreign currency deposits, and the expected rate of domestic currency depreciation (Sriram, 1999b; Watanabe and Pham, 2005). Given the rapid development of stock markets in some emerging countries, changes in stock prices are sometimes included as an opportunity cost variable as well.

Sriram (1999b), Cziráky and Gillman (2006), and Mishkin (2007) argue that the stability of money demand helps predict the effect of monetary policy on interest rates, output and inflation, and therefore reduces the possibility of an inflation bias. Central banks increasingly regard stable money demand as an important condition for conducting monetary policy, and more researchers have devoted their efforts to examining this issue. One prevailing argument is that stable money demand exists if the demand for money has a long-run cointegrating relationship with its determinants (Granger, 1986). Following Granger, the error correction model (ECM) has proven to be the most useful method for estimating the real demand for money, because the cointegration in ECMs means that whenever the demand for money diverges from its steady-state, a short-run adjustment pushes it toward equilibrium.

Some studies conclude that money demand is stable after finding a long-run relationship in their estimated ECMs (see Lee and Chung, 1995; Watanabe and Pham, 2005; and Yu and Gan, 2009). Others search further and examine statistical tests for the constancy

of parameters, in order to give a robust conclusion about the stability of long-run money demand (e.g., Huang, 1994; Anglingkusumo, 2005; Cziráky and Gillman, 2006; Baharumshah, Mohd and Yol, 2007; and Wu, 2009). Bahmani-Oskooee and Shin (2002) argue that cointegration is not sufficient for stability, rather it is also important to test whether the long-run and short-run estimated elasticities are stable over time. Useful tests for this include the CUSUM and CUSUMSQ tests.

Function Specification and Data Selection

Vietnam's recent economic history shows that even though the reforms of *Doi Moi* have been ongoing for almost 25 years, 1999 was perhaps the most important year in terms of structural change. This year opened a new economic cycle for Vietnam after the Asian crisis, and more importantly, monetization has accelerated rapidly since then. In light of this, the current study investigates the demand for money in Vietnam from the first quarter of 1999 to the second quarter of 2009, for a total of 42 observations. In his study on the demand for money in Guyana, Bossogo (2000) admits that ten years is not really long enough from which to investigate the long-run relationship of money demand and its determinants. However, he could not extend his dataset due to structural changes in the economy. We are forced to proceed with the same *caveat*.

This study employs an error-correction model (ECM) to estimate the determinants of real money demand. ECM includes both long-run and short-run relationships estimated in two stages. First, the long-run relationship is:

$$\ln(RM2D)_t = \beta_0 + \beta_1 \ln(Y\_SA)_t + \beta_2 RD_t + \beta_3 RF_t + \beta_4 INF\_SA_t + \beta_5 \ln(EER)_t + \beta_6 \ln(VNI)_t + \varepsilon_t \quad (1)$$

The dependent variable is RM2D. Following most of the contemporary studies about the demand for money, the money stock used as the dependent variable is broad money (M2). In a country like Vietnam characterized by dollarization, general broad money consists of the domestic currency (the dong) in circulation and both dong and foreign currency (mainly USD) denominated deposits. As explained, the share of foreign currency deposits in M2 has gradually declined but was still nearly 20 percent at the end of 2008. This study uses only the dong component of M2 *(M2D)* for the dependent variable. Regarding the price factor *(P)*, the consumer price index is used to derive the dong component of the real money stock.

The scale variable is the real GDP *(Y)*. Since quarterly real GDP in Vietnam contains seasonal factors, it is necessary to make seasonal adjustments to the data *(Y_SA)*, which we do with Eviews 7.0's Census X-12 function. As for the opportunity costs of holding money, the own interest rate of money is taken as the average monthly short-term interest rate of

VND denominated deposits in annualized percentages *(RD)*. Although the capital account is still controlled in Vietnam, dollarization suggests that the foreign interest rate and expectations of exchange rate depreciation should be included in the analysis. We use the average 3-month LIBOR in percent per year as a proxy for the foreign currency deposit rate *(RF)*, since it is hard to collect data on the interest rates applied to foreign currency deposits in domestic commercial banks. As well, the expectation of exchange rate depreciation *(EER)* is estimated as the actual depreciation (since there is no forward market), following Sriram (1999b) and Bossogo (2000). The definition for the nominal exchange rate *(ER)* is dong per dollar (VND/USD). The history of high and volatile inflation in Vietnam motivates use of the inflation rate *(INF)* as a proxy for the change in the price of goods and services, which measures the cost of holding money in terms of lost purchasing power. We also adjust for seasonality *(INF_SA)* with the Census X-12 method.

The growing importance of the stock market provides ground to include stock prices as an opportunity cost for money as well, as Baharumshah et al. (2007) find that stock prices can be important. The real stock price *(RVNI)* is the VN-Index adjusted for inflation. Stock market data are not available prior to July 2000, but because the stock market was so small then, we maintain the constant initial index value of 100 for the period before July 2000. All data are from the IMF International Financial Statistics, except *RF* from the Reuters' database and *VNI* from the SBV database. All the variables are supposed to generate at least one vector of cointegration.

Domestic interest rates are expected to have a positive coefficient, while foreign interest rates, inflation, and exchange rates are expected to be negative. The coefficient sign for stock prices can be either positive or negative depending on whether the wealth or substitution effect dominates. For the money-income elasticity (β_1), the equation fits with the quantity theory of money if $\beta_1=1$, while the Baumol-Tobin theory is revealed if $\beta_1=0.5$, and $\beta_1>1$ provides evidence for the wealth effect. Researchers typically find that money-income elasticity in developing countries is greater than one due to the underdevelopment of financial markets and rapid monetization (Baharumshah et al., 2007; Owoye and Onafowora, 2007; Sriram, 2009).

Next, the short-run dynamic adjustment equation is:

$$\Delta \ln(RM2D)_t = \sum_{k=1}^{n} \mu' \Delta \ln(RM2D)_{t-k} + \sum_{k=0}^{n} \gamma' \Delta F_{t-k} + \alpha ECT_{t-1} + \beta CRISIS97 + \varepsilon_t \qquad (2)$$

where F is a vector of the stationary forms for five vectors related to domestic interest rates, foreign interest rates, consumer prices, exchange rates, and stock prices. CRISIS97 is

an indicator variable equaling one for 1999Q1 to 2001Q1. The error-correction-term ECT_{t-1} is defined as the difference between the actual demand for money at time t-1 and its estimate from the long-run equation in the same period. The presence of ECT_{t-1} in this equation demonstrates the dynamic short-run adjustment. When the demand for money deviates from its long-run equilibrium, the ECT term will subsequently work to bring it back to the equilibrium level. Therefore, its coefficient is expected to be negative.

IV. Integration and Co-integration

To estimate the two-stage ECM, it is necessary to first test for the stationarity of the variables and the existence of a vector of cointegration. The variables should be non-stationary but cointegrated to form the long-run relationship, while the short-run dynamic adjustment requires stationary variables.

// Table 1 About Here //

This study uses the Augmented Dickey-Fuller test for the stationarity of the model variables. Table 1 provides the test results and shows that unit roots cannot be rejected for the dong component of real money demand, GDP, the foreign interest rate, and real stock prices. However, inflation, exchange rate depreciation, and the short-term domestic interest rate appear to be stationary. Therefore, these variables are not important in explaining the long-run demand for money in Vietnam. This is consistent with Bossogo (2000), who finds that inflation and exchange rate depreciation are stationary in Guyana and did not explain long-run money demand. Baharumshah et al. (2007) also finds that the domestic interest rate was not important for analyzing the long-run demand for money in China.

// Table 2 About Here //

All the variables in the long-run equation indicate integration at order 0 or 1. Therefore, it is reasonable to conduct the multivariate cointegration test developed by Johansen and Juselius (1990) for the nonstationary variables *LNRM2D, LNY_SA, RF* and *LNRVNI,* in this order. Given the quarterly data, following Watanabe and Pham (2005), a maximum lag length of six is chosen in the initial test and reduced one-by-one until one lag is reached. The best result is then selected based on the comparison among the tests in terms of the number of cointegrated vectors, the expected sign of variables as suggested in money demand theory, the size of money-income elasticity, and the statistical significance of coefficients. A constant term is included, but no trend. The final result is illustrated in Table 2. Both the eigenvalue test and trace test reject the null hypothesis of no cointegration vectors at the 5 percent significance level and indicate that a unique cointegration vector exists.

// Table 3 About Here //

Table 3 shows for the long-run model that the explanatory variables carry the expected signs and are statistically significant at the 5 percent level. The money-income elasticity of 2.52 shows that a 1 percent increase in income leads to a 2.52 percent increase in real demand for broad money in dong, *ceteris paribus*. The elasticity is greater than one and consistent with the findings of previous studies for developing countries. For example, Huang (1994) finds that money-income elasticity for China in the period from 1979 to 1990 was 2.12, and Owoye and Onafowora (2007) find 2.067 in the case of Nigeria from 1986 to 2001. This result is also close to the figure of 2.7633 determined by Watanabe and Pham (2005) for Vietnam in 1993-2004. High elasticity reflects the wealth effect of income on money demand in the context of underdeveloped financial markets and in situations where money seems to be the only viable financial asset (Owoye and Onafowora, 2007).

Foreign interest rates negatively affect the real demand for the dong, indicating currency substitution in the context of dollarization. As the foreign interest rate increases by one percentage point, the demand for the dong component in broad money decreases by 2.1 percent, *ceteris paribus*.

The real stock price positively affects real money demand, showing that the wealth effect dominates the substitution effect. An elasticity of 0.07 means that a 1 percent increase in real stock prices, *ceteris paribus*, results in a 0.07 percent increase in demand for money. Baharumshah et al. (2007) also find that the real stock price positively affects money demand in China with an elasticity of 0.287. Stock value contributes to the wealth of households, so stock price increases are associated with stronger household money demand. As well, Vietnam's stock market developed most rapidly in the bubble period when both the size of the market and stock prices increased dramatically. Therefore, it is possible that the *hot money* invested in the market circulated very fast due to the profit-seeking activities of investors. Consequently, the demand for money rises to meet the growing demand for transaction settlements. The existence of long-run stock price elasticity indicates ongoing development of the stock market in Vietnam. However, given the minor size of the market, the elasticity is rather small.

V. The Short-run Error Correction Model
The Short-run Dynamic Adjustment Model

The short-run error-correction model (ECM) is an autoregressive distributed lag model for the stationary forms of money demand, output, domestic and foreign interest rates, consumer

prices, exchange rates, and stock prices. It is estimated using OLS. The short-run model does take into account the effects of inflation and exchange rate depreciation, in contrast to the long-run model. In the cointegration test, the variables yield a unique vector of cointegration with two lags. Therefore, the short-run ECM is initially estimated with two lags, for variables other than the ECT and other potential indicator variables. Based on the general-to-specific approach, the insignificant lags are eliminated carefully such that autocorrelation does not occur and the adjusted R^2 is not negatively affected. All the necessary data are seasonally adjusted, so no seasonal dummy is included in the model. The dummy variable of *CRISIS97* is entered in order to capture the effect of the 1997-98 Asian crisis. The time trend was not significant. The results are provided in Table 4.

// Table 4 About Here //

As expected, the error correction term carries a negative sign and is highly significant in the short-run dynamic adjustment model, which confirms the long-run relationship in the co-integration analysis. The negative sign and value of ECT_{t-1} implies that real money demand adjusts to restore 57 percent of a disequilibrium from the preceding quarter. This correction speed is rather fast compared to the findings for other countries, for example 6 percent in China (Baharumshah et al., 2007), 6.2 percent in Nigeria (Owoye and Onafowora, 2007), and 10 percent in Pakistan (Qayyum, 2005). The rapid adjustment reflects the low cost of portfolio adjustment relative to the cost of being out of the equilibrium (Thornton, 1983). This is understandable as in Vietnam the domestic interest rate, or the cost of reducing money demand for dong, and the exchange rate, or the cost of increasing money demand for dong, have been regulated closely and are rarely changed.

Other important results from the short-run ECM include, first, that inflation has an immediate negative effect on real money demand, and exchange rate depreciation affects the real money demand negatively after two quarters. These negative influences indicate a short-run substitution effect of real goods or foreign currencies for real money demand. Second, both the foreign and domestic interest rates are significant. The coefficient of foreign interest rates has a negative sign as expected and shows that a one percentage point increase in foreign interest rates leads contemporaneously to a 1.8 percentage point decrease in the growth rate of real demand for dong, *ceteris paribus*, providing further evidence for the substitution of foreign currency for domestic currency in Vietnam. This reflects the low confidence that people have in the domestic currency. Meanwhile, domestic interest rates have an immediate negative effect and a smaller positive effect after one quarter. The accumulative effect is negative, similar to the findings for China (Baharumshah et al., 2007)

and Guyana (Bossogo, 2000). Third, the effect from real income growth on real money demand is not immediate, but after one quarter it is negative, which is not expected. It is only significant at the 10 percent level. Fourth, real stock prices have a significant and overall positive effect. As such, in both the short-run and the long-run, instead of being a substitute financial asset for money, an increase in stock prices raises the wealth of households and enhances real money demand.

The diagnostic test statistics for the quality of the model do not show any evidence of problems. The adjusted R^2, with the probability of the F-statistic at nearly zero, shows that the estimated model is a good fit. The Jarque-Bera statistic, Lagrange Multiplier (LM) and ARCH tests indicate that the residual is white-noise. The Ramsey RESET test result implies that there is no specification error in the model.

The Stability of the Real Money Demand Function

If money demand is stable and well-defined, it helps central banks to meet their goals in a money targeting or an interest rate targeting mechanism. When researchers investigate this issue, the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) tests have been used most frequently (see Bahmani-Oskooee and Shin, 2002; Quayyum, 2005; and Owoye and Onafowora, 2007). Based on the break points in the dataset, the CUSUM and CUSUMSQ statistics are recursively updated and plotted with 5 percent critical boundaries. If the plotted statistics stay within the +5 percent boundaries during the investigated period, the money demand function is said to be stable. Sriram (1999a) states that testing only for long-run models can result in a specification bias, so it is better to test for the model with both long-run and short-run effects, i.e. the short-run dynamic ECM.

// Figure 1 About Here //

Figure 1 displays the results of the CUSUM and CUSUMSQ tests. The recursive statistics move within the boundaries, suggesting that the estimated real money demand function is stable. Although the recursive error in the CUSUM test approaches the upper limit of the boundaries at the end of 2005, the CUSUMSQ test shows greater stability. This confirms that the real demand for dong is stable in Vietnam.

VI. Conclusion and Policy Implications

The paper has investigated the dynamic demand for the dong component in broad money in Vietnam using an error-correction model. Compared to the most recent study conducted by Watanabe and Pham (2005) for Vietnam in the period 1993-2004, this study found some

similar results. For example, we find a dominant effect for income on real money demand for dong in the long-run, evidence of currency substitution and dollarization, and sensitivity of real money demand to inflation. These findings lead to policy implications. The persistence of dollarization from the previous study until now deems that stable exchange rate policy did not succeed, and the weak confidence in the domestic currency might have been caused by volatile inflation. This calls for a monetary policy framework which focuses on inflation stability as a primary target.

Apart from these similarities, this study also uncovers some important new results. First, we find that the on-going development of the stock market does impact real demand for dong, and it is through wealth rather than through the substitution effect. Although the effect has been small given the small size of the stock market for much of the period, this suggests that the SBV should take into account the asset channel in the monetary transition mechanism when implementing monetary policy.

Second, although Watanabe and Pham found statistical significance for domestic interest rates in 1993-2004 for the long-run analysis of real money demand, the estimation in this study provides no evidence that domestic interest rates influenced long-run real money demand in the period from 1999-2009. This implies that rigid interest rate policy might become ineffective when the economy is becoming more open, following milestones such as the establishment of the Vietnam-US Trade Agreement in December 2001 and accession to the WTO in November 2006. In the context of Vietnam's increasing integration into the world economy, interest rate policies needs to be reformed towards market principles in order to improve the effectiveness of monetary policy.

Finally, the study finds that the real money demand function in Vietnam is stable, which is an important foundation for effective implementation of monetary policy. Once the central bank can accurately predict the level of the intermediate target, either money supply or interest rates, and commit to not diverge from the target, monetary policy will not generate inflationary pressure.

References

Adam, C., Goujon M. and Guillaumont-Jeanneney, S. (2004). The Transactions Demand for Money in the Presence of Currency Substitution: Evidence from Vietnam. *Applied Economics*, 36(13), 1461-1470.

Anglingkusumo, R. (2005). Stability of the Demand for Real Narrow Money in Indonesia: Evidence from the Pre and Post Asian Crisis Era. Tinbergen Institute Discussion 2005-051/4.

Baharumshah, Z. A., Mohd, H. S. and Yol, A.M. (2007). Stock prices and Demand for Money in China: New Evidence. *Journal of International Financial Markets, Institutions and Money,* 19, 171-187.

Bahmani-Oskooe, M. and Shin, S. (2002). Stability of the Demand for Money in Korea. *International Economic Journal*, 16(2), 85-95.

Bossogo, E.P. (2000). Money demand in Guyana. IMF Working Paper WP/00/119.

Camen, U. (2005). Monetary Policy in Vietnam: the Case of a Transition Economy. BIS Working Papers No. 31.

Cziráky, D., and Gillman, M. (2006). Money Demand in an EU Accession Country: A VECM Study of Croatia. *Bulletin of Economic* Research, 58(2), 73-159.

Granger, C.W.J (1986). Developments in the Study of Cointegrated Economic Variables. *Oxford Bulletin of Economics and Statistics*, 48(3), 213-228.

Hendry, F.D. and Ericsson, R.N. (1990). Modeling the Demand for Narrow Money in the United Kingdom and the United States. Board of Governors of the Federal Reserve Systeam International Finance Discussion Papers No. 383.

Huang, G. (1994). Money Demand in China in the Reform Period: An Error Correction Model. *Applied Economics,* 26, 713-719.

International Monetary Fund. (2006). *Vietnam: Selected Issues Report*. Washington, DC.

Johansen, S. and Juselius, K. (1990). Maximum Likelihood Estimation and Inference on Cointegration - With Applications to the Demand for Money. *Oxford Bulletin of Economics and Statistics*, 52(2), 169-210.

Le, H. V., and Pfau, W. D. (2009). VAR Analysis of the Monetary Transmission Mechanism in Vietnam. *Applied Econometrics and International Development,* 9(1), 165-179.

Lee, T. H. and Chung, K. J. (1995). Further Results on the Long-run Demand for Money in Korea: A Cointegration Analysis. *International Economic Journal*, 9(3), 103-113.

Mishkin, F. S. (2007). *The Economics of Money, Banking and Financial Markets*. Boston: Pearson-Addison Wesley.

Owoye, O. and Onafowora, O.A. (2007). M2 Targeting, Money Demand, and Real GDP Growth in Nigeria: Do Rules Apply? *Journal of Business and Public Affairs,* 1(2), 1-20.

Qayyum, A. (2005). Modelling the Demand for Money in Pakistan. *The Pakistan Development Review,* 44(3), 233-252.

Sriram, S.S. (1999a). Survey of Literature on Demand for Money: Theoretical and Empirical Work with Special Reference to Error-Correction Models. IMF Working Paper WP/99/64.

_____ (1999b). Demand for M2 in an Emerging-Market Economy: An Error Correction Model for Malaysia. IMF Working Paper WP/99/173.

_____ (2009). The Gambia: Demand for Broad Money and Implications for Monetary Policy Conduct. IMF Working Paper WP/09/192. Retrieved December 10, from http://www.imf.org/external/pubs/ft/wp/2009/wp09192.pdf

Thornton, D. L. (1983). Why Does Velocity Matter? *Federal Reserve Bank of St. Louis Review*, December, 5-13.

Vuong, Q.H. and Tran, T.D. (2010). Corporate Bond Market in the Transition Economy of Vietnam, 1990 – 2010. Centre Emile Bernheim Research Institute in Management Sciences Working Paper 10/001.

Watanabe, S. and Pham, T.B. (2005). Demand for Money in Dollarized, Transitional Economy: The Case of Vietnam. Paper Presented at the 1st VDF-Tokyo Conference on the Development of Vietnam.

Wu, G. (2009). Broad Money Demand and Asset Substitution in China. IMF Working Paper WP/09/131.

Yoshida, T. and Rasche, R.H. (1990). The M2 Money Demand in Japan: Shifted and Unstable? *BOJ Monetary and Economic Studies,* 8(2), 9-30.

Yu, H. and Gan, P. (2009). An Empirical Analysis of the Money Demand Function in ASEAN-5. *International Research Journal of Finance and Economics*, Issue 33.

TABLE 1
Unit Root Test Results

	Variables in Long-Run Model			**Differences**	
	Lags	*Test statistic*		*Lags*	*Test statistic*
LNRM2D	5	-3.12[a]	dLNRM2D	4	-4.55[***]
LNY_SA	4	-1.12	dLNY_SA	3	-2.61[***]
INF_SA	1	-4.62[a***]	dINF_SA	1	-4.9[***]
EER	0	-6.38[***]	dEER	0	-11.8[***]
RD	1	-6.04[a***]	dRD	1	-6.56[***]
RF	1	-1.66	dRF	1	-3.32[**]
LNRVNI	1	-2.43	dLNRVNI	0	-3.89[***]

Note: ** and *** show that the null hypothesis can be rejected at 5% and 1% significance levels respectively; [a] indicates inclusion of a trend.

TABLE 2
Johansen Maximum Likelihood Co-integration Test Results

Hypothesized No. of CE(s)	*Eigenvalue*	*Max-Eigen Statistic*	*0.05 Critical Value*	*Trace Statistic*	*0.05 Critical Value*
r=0	0.8139	65.5901**	27.5843	85.1490**	47.8561
r<=1	0.2947	13.6215	21.1316	19.5589	29.7970
r<= 2	0.1410	5.9316	14.2646	5.9373	15.4947
r<= 3	0.0001	0.0056	3.8414	0.0056	3.8414

Note: [**] indicates the rejection of the null hypothesis at the 5 percent significance level. The maximum lag length is 2 for each variable.

TABLE 3
Long-Run Determinants of Real M2 Demand

Variable	*Coefficient*	*Standard error*
LNY_SA	2.5159	.0466**
RF	-0.0209	0.0036**
LNRVNI	0.0736	0.0183**

Note: [**] indicates the rejection of the null hypothesis at the 5 percent significance level.

TABLE 4

Reduced-Form Short-run ECM of Real M2 Demand

Variable	Coefficient	Standard error
Constant	0.153	0.022***
$dLNY\_SA_{t-1}$	-0.561	0.282*
RD_t	-0.018	0.005***
RD_{t-1}	0.009	0.004**
INF_SA_t	-0.724	0.403*
dRF_t	-0.018	0.009*
EER_{t-1}	-1.004	0.681
EER_{t-2}	-2.201	0.812**
$dLNRVNI_t$	0.128	0.022***
$dLNRVNI_{t-1}$	-0.045	0.021***
ECT_{t-1}	-0.57	0.073***
$CRISIS97_t$	0.04	0.014***

Diagnostic Statistics:

Adj.R2=0.854; F-stat=21.2294 [0.0000]; SSE=0.0229; DW=2.22
Normality - JB: $\chi 2(2)$=2.0004 [0.3678]
LM(4) test for serial correlation - BG: $\chi 2(4)$ =4.8231 [0.3059];
Heteroskedasticity - ARCH: $\chi 2(4)$=1.0857 [0.8965], F(4,30)= 0.2400 [0.9134];
Misspecification - Ramsey RESET: $\chi 2(4)$ =4.2881 [0.3684]

Note: *,** and *** indicate the rejection of the null hypothesis at 10%, 5%, and
1% significance levels, respectively. In the diagnostic statistics part, the
probability values are found in the squared brackets [.].

Figure 1

CUSUM and CUSUMSQ Statistics