Determinants and stability of demand for money in Vietnam

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Extended Abstract:

This paper explores the determinants of money demand in Vietnam during the period of 2003-2014 using monthly data. To prevent the inaccuracy of unit root test conclusion, we use unit root test with breakpoint structure to test stationary characteristics. We find that the break date of first differences shows the gap phase around 2007-2010 period. Basing on the stationary of variables, we apply cointegration techniques to estimate money demand function using error correction model, fully modified ordinary least square, dynamic ordinary least square, and canonical cointegration regression. Within comparable results, the canonical specification is well-determined with long run covariance matrix method adjustment. Our main findings indicate that, in the long-run, real industrial production volume, VN-index and treasury bill rate positively effect on the narrow money demand (M1), whilst real gold price, deposit interest rate, effective exchange rate and consumer price index have negatively effect on M1. We figure out the roles of gold price and effective exchange rate that strongly significant impact on money demand. Real deposit interest rate was not an effectively investment channel compared with holding other assets. In the short-run, real gold price, industrial production volume and deposit interest rate are insignificant. By CUSUM and CUSUM squared tests, the result shows the stability of money demand function in Vietnam over the investigating period.

1. Data, specification and method

1.1. Data

The data are collected from 2003 to 2014 based on the monthly data publicized by General Statistics Office (GSO), the International Monetary Fund (IMF), Vietstocks and Zsolt Darvas (2012). The raw data include gold price index, nominal gold price, industrial production volume, VN-Index, effective exchange rate, narrow money supply, deposits interest rate, treasury bill rate, and consumer price index. For the purpose of the study, we use lrm1s (real M1, in natural logarithm form), lrgolds (real gold price, in natural logarithm form), lrips (real industrial volime, in natural logarithm form), vnindex (Vietnam index stock, percentage), reer (real effective

exchange rate, percentage), rfidr (real deposit interest rate, percentage), rfitb (real treasury bill rate, percentage), cpi (consumer price index, percentage). Variables such as lrm1s, lrm2s, lrgolds, lrips are removed seasonal components by using seasonal dummies. From 2003Dec to 2009Mar, we could not collect SJC nominal gold prices. The data was estimated by the formula $gold_{t-1} = gold_t * 100 / $ index of gold prices. This index presents the current month gold price index compared to the previous month.

1.2. Specification

The model specification is considered both literature review and previous empirical researches. Assuming $M_D = M_S$, real money supply M1 (lrm1s) is selected as the dependent variable. Scale variable is selected by the domestic industrial volume (lrips). The opportunity cost variables are selected including real domestic gold price (lrgolds), the VN-Index (vnindex), the real effective exchange rates (reer), real deposit rates (rfidr), treasury bill rate (rfitbr) and consumer price index (cpi).

$$lrm1s = f(lrips_+, lrgolds_-, vnindex_{+/-}, reer_{+/-}, rfidr_-, rfitbr_-, cpi_-)$$

1.3. Method

We use quantitative analysis method including vector error correction model (VECM), cointegration regression model. Inside cointegrating regression model, there are three models including fully modified ordinary least square (FMOLS), dynamic ordinary least square (DOLS), canonical cointegrating regression (CCR). The difference of these models is the calculated approach of long run covariance matrix to remedy model diseases. Before estimation, we use unit root test and unit root test with breakpoint structure to check the stationary characteristic of all variables.

2. Empirical results

Unit root test with breakpoint structure

Table 1
Result of unit root test.

Variables	ADF test		ADF test with breakpoint structure			
	zero difference	1st difference	zero difference	Break date	1st difference	Break date
lrm1s	-2.582	-5.920*[1]	-3.812	2011m2	-8.845*[1]	2008m2
lrm2s	-2.854	-7.474*[1]	-4.475	2006m12	-7.724*[1]	2008m2
lrgolds	-0.522	-7.859*[1]	-3.569	2011m2	-10.484*[1]	2006m6
lrips	-1.959	-13.315*[1]	-4.081	2010m11	-13.576*[1]	2011m8
vnindex	-2.532	-6.587*[1]	-5.458	2007m11	-7.895*[1]	2007m3
reer	-2.334	-8.891*[1]	-3.379	2010m7	-9.926*[1]	2008m12
rfidr	-0.518	-10.342*[1]	-3.728	2007m12	-14.997*[1]	2007m1
rfitbr	-0.923	-7.532*[1]	-3.261	2008m2	-10.214*[1]	2008m7
cpi	-2.220	-4.758*[1]	-3.205	2010m11	-6.351*[1]	2010m9

Before starting cointegration test, we perform the null hypothesis of unit root against the alternative hypothesis of stationarity using the Augmented Dickey–Fuller (ADF) and Augmented Dickey–Fuller with break point structure. For ADF with breakpoint structure test, we use Zivot and Andrews (1992) method to test the unit root hypothesis under structural breaks. Null hypothesis is set that the variable has unit root (not stationary). The character which notice *, **, ***, have meaning that null hypothesis is rejected correlatively at the 10%, 5%, 1% level of significance. All tests have mark up and no tendency in the series. The stationarity tests are given in Table 1. We cannot reject the hypothesis that all the variables are unit root at zero difference. However, all of them are stationary at the first difference at 1% significance level. The break date gap is smaller when first taking first differences and around 2007-2010 period. It is consistent with the world economy crisis in 2008. The structural break months which is indicated in Table 1, does not match compared with 2008. We consider that there is a latency when this crisis affects to Vietnam economy. With the stationary of all variables, we will continue consider our analysis for the next step.

Cointegration test

Following FPE, AIC, HQIC, SBIC criteria, lag selection results suggest using two lags for cointegration test. The trace and maximal rank results are summarized in Table 2. This test confirmed the existence of long run equilibrium relationship between these variables. For more than one cointegrating vector, the maximum rank indicates one cointegrating equations at 1% significance level and two cointegrating equations at 5% significance level. Because all variables are stationary at 1% significance level, we choose one cointegrating equations to analyze next step.

Table 2

Result of lag selection

Lag	LR	FPE	AIC	HQIC	SBIC
0	-	6.55313	24.583	24.655	24.7603
1	2781.6	7.60E-09	4.01216	4.66072	5.60833*
2	223.63	$3.7x10^9$*	3.27081*	4.49586*	6.2858
3	93.37	$4.90x10^9$	3.53926	5.34081	7.97307
4	100.86*	6.40x109	3.74963	6.12767	9.60227

Table 3

Result of Johansen tests for cointegration

Max rank	Eigen value	Trace statistic	5% critical value	1% critical value

0	-	212.0584	170.8	182.51
1	0.43647	136.9243*[1]	136.61	146.99
2	0.27784	94.2828*[5]	104.94	114.36
3	0.233	59.5332	77.74	85.78
4	0.16278	36.2584	54.64	61.21
5	0.1177	19.8535	34.55	40.49

(*[1]), (*[5]): Significance level at 1%, 5%.

Results

Short-run estimates

Table 4 shows the determinants of money demand in the short-run. These factors are vnindex, reer, rfitbr and cpi. The variables of rgolds, lrips, rfidr have no statistical significance. Speed of error correction is small (-0.0632535 <0). This coefficient explains that the M1 money demand deviates from equilibrium values, then in the next period of real M1 money demand will adjust up about 6.32% deviation to recover equilibrium status.

Table 4

Estimation result of M1 money demand for short term.

Variables	Coefficient	Standard error	P value
ECT(-1)	-.0340634	.0167926	0.043*
Δlrm1s(-1)	.0617752	.0852173	0.469
Δlrgolds(-1)	.0471475	.0829781	0.570
Δlrips(-1)	.0270579	.0206414	0.190
Δvnindex(-1)	.0001469	.0000563	0.009***
Δreer(-1)	.4521859	.2108798	0.032**
Δrfidr(-1)	-.0007669	.0019962	0.701
Δrfitbr(-1)	-.0058979	.0024104	0.014***
Δcpi(-1)	-.0211578	.0042211	0.000***
Constant	.0157713	.0042211	0.000***

***, **, *: Significance level at 1%, 5%, 10%.

Long-run estimates

Results of various cointegration techniques are presented in Table 5. The results show that all of the independent variables are statistically significant. From the comparable results, CCR model is well-determined because its outputs give high meaning explanation and high significance level compare with other techniques.

Table 5

Estimation result of M1 money demand function in the long-run

Variables	VECM	FMOLS	CCR	DOLS
lrgolds	-.4595683**	-0.242***	-0.245***	-0.147*
	(.2336489)	(0.0510)	(0.0520)	(0.0840)
lrips	.5403968***	0.282***	0.282***	0.324***
	(.2014496)	(0.0360)	(0.0478)	(0.0860)
vnindex	-.0013442***	0.000308***	0.000310***	0.000412***
	(.0001489)	(2.93e-05)	(3.45e-05)	(6.40e-05)
reer	-4.324238***	-0.772***	-0.753***	-0.441
	(.914772)	(0.163)	(0.199)	(0.380)
rfidr	.0843073***	-0.0245***	-0.0245***	-0.0383***
	(.009864)	(0.00197)	(0.00235)	(0.00397)
rfitbr	-.1001702***	0.0117***	0.0117***	0.0278***
	(.0107419)	(0.00209)	(0.00250)	(0.00460)
cpi	-.0089349**	-0.00745***	-0.00757***	-0.00738***
	(.0049226)	(0.000995)	(0.00111)	(0.00192)
Constant	395.3594	107.8	105.9	71.31

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Observe	131	132	132	129
R – square	0.3782	0.841	0.869	0.971

- Numbers in parenthesis are standard error.
- ***, **, *: Significance level at 1%, 5%, 10%.

As our expected, the estimated coefficient of lrgolds, reer, rfidr and cpi which represent the semi-elasticity, is negative and significant at 1% level of significance. In contrast, lrips, vnindex and rfitbr are positive at the same significance level. According to the results above, we can conclude that there are two main factors impacting on money demand in Vietnam. They are lrgolds and reer. These facts are important for state government to control money demand more effective. Remarkably, cpi variable also affect negatively on money demand as in short-run relationship.

Stability tests

We exam the stability of *M1* demand function using *CUSUM* and *CUSUMSQ* test during the period. To conserve space, we report only the *CUSUMSQ* (as shown in Figure 1) tests results for 2003Dec to 2014Dec periods. These scores are computed for maximum (supremum) and average (mean) values over the period of analysis and we denote these tests as $\text{Sup}_{t \in T} Q_t^{(t)}(i)$ and $\text{Mean}_{t \in T} Q_t^{(t)}(i)$ where $i = S$. The null hypothesis is that parameters are stable (constant). The stability result of CUSUMSQ tests illustrate that *M1* demand function is stable in both over the 2003Dec-2014Dec period. Previous studies by Ha Huynh Hoa (2008), Nguyen Huyen Diu and Made D. (2010) also conclude that M1 money demand function is stable over the period.

Figure 1. The result of CUSUM and CUSUM-square for M1 money demand.
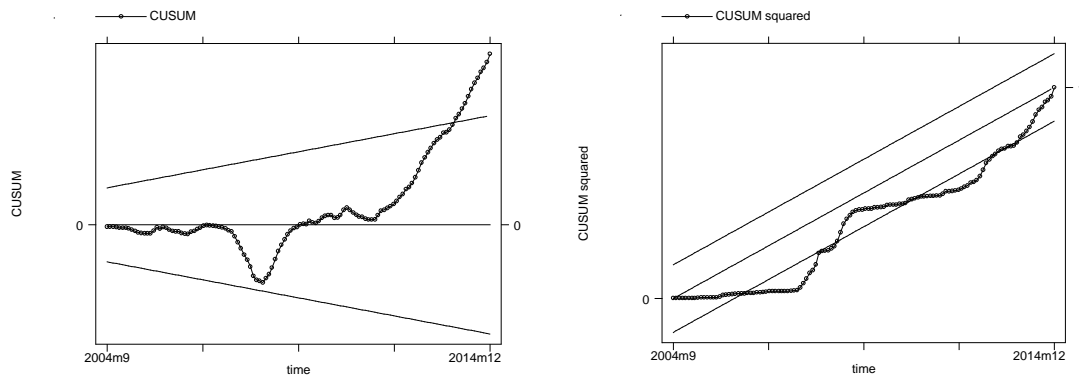
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