Chapter V.

Empirical Study

The study will consist of four procedures. First, test for stationary. The VAR methodology has a condition that every variable applied to VAR estimation has to be stationary at I(1). Thus, before testing the model, we need to test the stationary of each variable in our model.

Second, estimate the model of Forward Rate Unbiasedness (FRU) and Uncovered Interest Parity (UIP) using Ordinary Least Square (OLS) in two periods: June 1995 – June 1997, July 1997 – June 1999.

Third, estimate the two-variable VAR model to reveal interrelationship between multiple variables in the model under the hypothesis of Forward Rate Unbiasedness (FRU) and Uncovered Interest Parity (UIP) by using the Wald test to those same two periods.

Fourth, estimate the three-variable VAR model of Forward Rate Unbiasedness (FRU) and Uncovered Interest Parity (UIP) within the same model by using VAR methodology.

<u>Figure 5.1</u> the history of change in spot, forward premium and interest rate differential from January 1994 to June 1999.

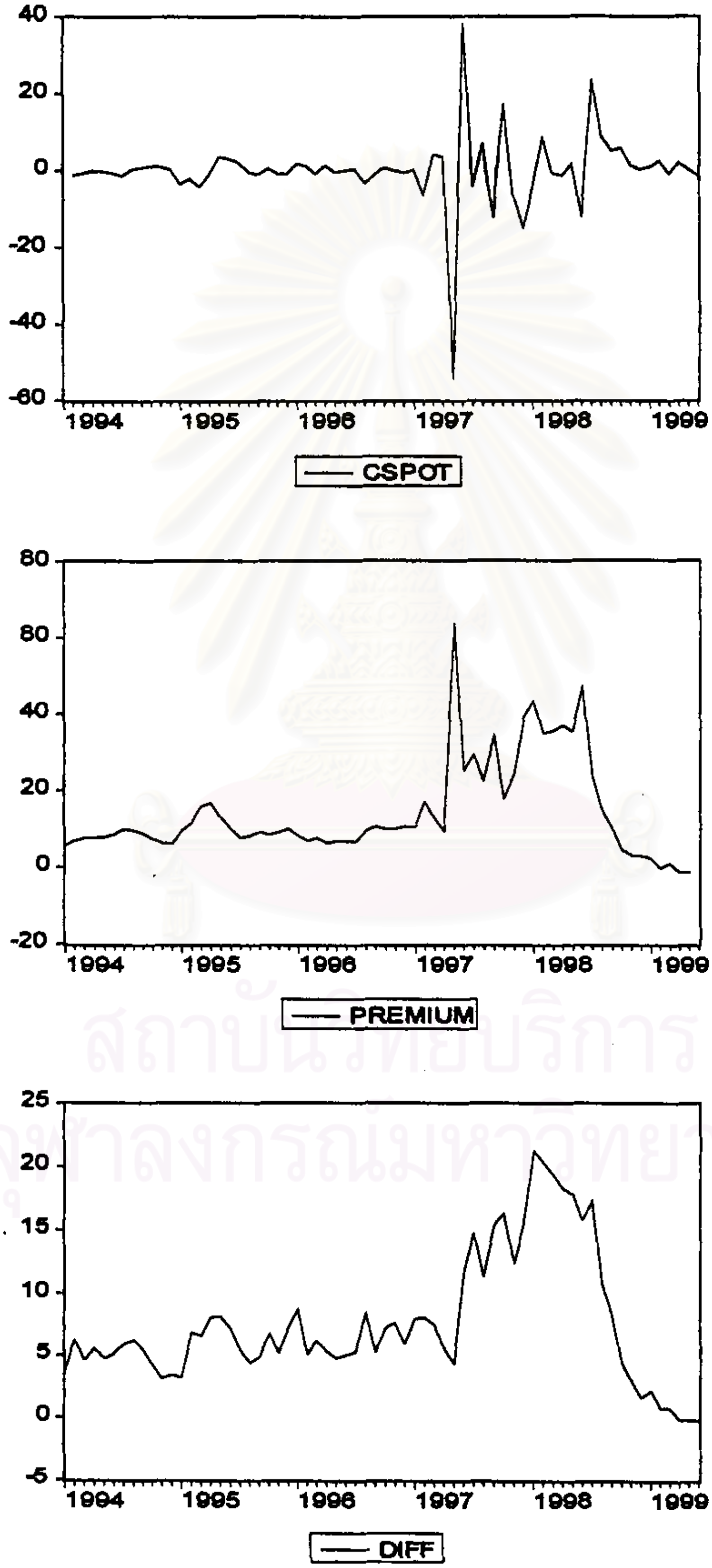
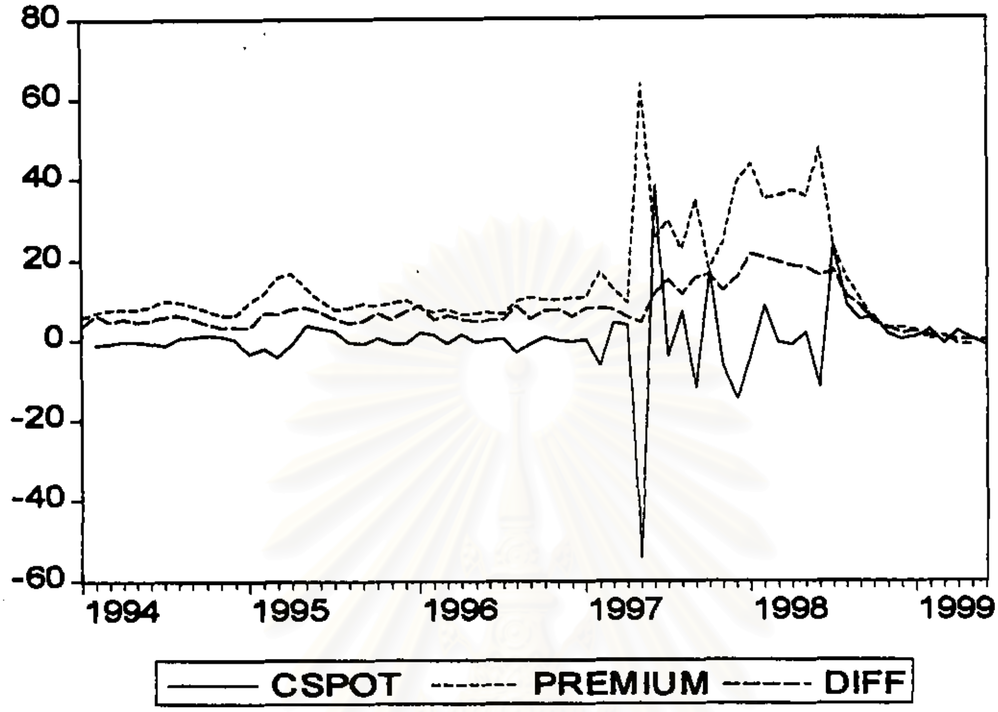


Figure 5.2 the combined history of forward premium, change in spot and interest rate differential from January 1994 to June 1999.



Both the pictures 5.1 and 5.2 showed that the fluctuation of these three variables started after the change in the exchange rate regime during the year 1997. Before that, the trends of each variable are relatively stable. We will perform the test to check whether the value of these three variables is efficient especially during the floating exchange rate regime.

5.1. Stationary test

In this study, the test of stationary will be tested by using the Augmented Dickey Fuller (ADF). The null hypothesis of the test is

H_0: Stationary

H_1: Non-Stationary

The study considers that the variable is stationary if the absolute value of ADF from calculation is less than the critical value. If the absolute value of ADF from calculation is more than critical value, the variable is considered non-stationary.

Moreover, the test of stationary has another important condition. The test has to select the lag number that is appropriate to the calculation of ADF. In this study the Akaike Information Criterian (AIC) is used to select the lag number. The AIC can be calculated from the following equation.

$$\text{AIC} = \log\left(\frac{\sum \hat{\varepsilon_i}^2}{N}\right) + \frac{2k}{N}$$

Where;

$\sum \hat{\varepsilon_i}^2$ is the sum of squared residuals.

The AIC are measures of goodness of fit that correct for the loss of degrees of freedom that results when additional lags are added to a model. These statistics can be used to help determine the number of lags to include in a VAR. The lag number that gives lowest absolute value of AIC is that lag number that appropriates to calculate ADF value.

Table 5.1 the outcome of the stationary test.

Variables	ADF Statistic	
	At level	First Difference
CSPOT	-5.32	-7.30
Length of lags	1	3
PREMIUM	-1.69	-6.85
length of lags	1	1
DIFF	-1.45	-3.29
length of lags	3	2

The outcome of the stationary test is shown in Table 5.1. The test with the US dollar is composed of the three variables: CSPOT, PREMIUM and DIFF for which the following calculations can be made.

CSPOT: the suitable lag number for CSPOT is one, which has the ADF value equal to –5.32. The absolute value of ADF is equal to 5.32, which is greater than the critical value at the 5% level of significance. This means CSPOT at level is stationary at the 5% level of significance. After that we test for stationary of the first difference. The lag number that is appropriate is three, and the ADF statistic of CSPOT is –7.30 and its absolute value is 7.30. The absolute value is more than the critical value at the 5% level of significance. This can be concluded that by first difference CSPOT is stationary at the 5% level of significance.

From the test we can conclude that the CSPOT is stationary in both I(0) and I(1).

PREMIUM: from the table 5.1 the proper lag number of PREMIUM is one with the ADF equal to –1.69. The absolute value of –1.69 is 1.69, which is less than the critical value at the 5% level of significance. Thus PREMIUM at 5% level of significance is non-stationary. For first difference the lag number which fit for PREMIUM is one with an ADF equal to –6.85. The absolute value of –6.85 is 6.85, which is more than the critical value at the 5% level of significance therefore, PREMIUM is stationary at the 5% level of significance for first difference.

From the test we can conclude that the PREMIUM is stationary only in I(1).

DIFF: The lag number, which is best for DIFF is three and the ADF is –1.45. Its absolute value is 1.45. This value is less than the critical value at the 5% level of significance. This implies that DIFF is non- stationary. After that we test the first difference, the lag number that is proper of DIFF is two with ADF equal to –3.29. The absolute value of –3.29 is 3.29. This number is more than the critical value at the 5% level of significance. Hence, DIFF is stationary at the 5% level of significance for first difference.

From the test we can conclude that the DIFF is stationary only in I(1).

From all the tests of stationary in every variable: CSPOT, PREMIUM and DIFF we found that all variables in our model are stationary at I(1) and this follow the VAR requirement. Therefore we can use all variables to estimate coefficient in order to seek their relation in the next section.

5.2 Model One

5.2.1 Model One: OLS Estimation

In this study, the market will efficient if the restriction of the coefficient is accepted, which means it follow the theory of either FRU or UIP. Therefore, this study is the test restriction of the coefficient.

OLS is used here to estimate a one-period test for market efficiency. The period is one month. The equation for the Forward Rate Unbiasedness (FRU) is

$$\Delta S_{t+1} = \alpha + \beta fp_t + \varepsilon_t$$

The Hypothesis of Forward Rate Unbiasedness (FRU) is

$$H_0: \alpha = 0, \beta = 1$$
$$H_1: \alpha \neq 0, \beta \neq 1$$

The equation of Uncovered Interest Parity (UIP) is

$$\Delta S_{t+1} = \alpha + \beta(r-r^*)_t + \varepsilon_t$$

The Hypothesis of Uncovered Interest Parity (UIP) is

$$H_0: \alpha = 0, \beta = 1$$
$$H_1: \alpha \neq 0, \beta \neq 1$$

5.2.2 The Wald Test of Restriction for Model One

The hypothesis of the test of restriction for the market efficiency of both FRU and UIP is:

$$H_0: a_{11} = 0, a_{12} = 1$$
$$H_1: a_{11} \neq 0, a_{12} \neq 1$$

June 1995 – June 1997

Forward Rate Unbiasedness (FRU) can be written as follows:

$$\Delta S_{t+1} = a_{11}\,\Delta S_t + a_{12} fp_t + w_{1t+1}$$

Using the Ordinary Least Square (OLS), we found that the result of the FRU equation in period one from June 1995 – June 1997 is as follows:

$$\Delta S_{t+1} = -0.283467\ \Delta S_t + 0.006728\ fp_t$$

F-statistic	92691.24	Probability	0.000000
Chi-square	185382.5	Probability	0.000000

$R^2 = 0.0856$

S.E. of regression = 0.1170

Durbin-Watson statistic = 1.7352

The probability from the calculation is 0.00, which is less than 5% level of significance and the F-statistic, 92691.24, is greater than F-statistic from the table, which is equal to 2.07. Therefore, the hypothesis of FRU during the fixed exchange rate regime is rejected at 5% level of significance.

The result from UIP during the same period is

$$\Delta S_{t+1} = -0.249917\ \Delta S_t + 0.010315\ (r-r^*)_t$$

F-statistic	37888.64	Probability	0.000000
Chi-square	75777.29	Probability	0.000000

$R^2 = 0.0904$

S.E. of regression = 0.1167

Durbin-Watson statistic = 1.7346

The null hypothesis of UIP is rejected at 5% level of significance due to the probability from the calculation is 0.00, which is less than 5% level of significance and the F-statistic, which is 37888.64, is greater than the F-statistic from the table, 2.07. The market was inefficient during the fixed exchange rate regime.

Hence, we can conclude that it rejected both null hypotheses of FRU and UIP in during June 1994 – June 1997.

July 1997 – June 1999

Using the Ordinary Least Square (OLS) with FRU equation in floating exchange rate from July 1997 – June 1999, the result is as following:

$$\Delta S_{t+1} = 0.238934\ \Delta S_t - 0.006863\ fp_t$$

F-statistic	972.8532	Probability	0.000000
Chi-square	1945.706	Probability	0.000000

$R^2 = 0.0483$
S.E. of regression = 3.1676
Durbin-Watson statistic = 1.8928

The F-statistic is 972.8532, which is greater than F-statistic from the table, 2.07. The probability is 0.00, which is less than 5% level of significance. Hence, the null hypothesis of FRU is rejected during the floating exchange rate regime.

The result from UIP during July 1997 – June 1999 is

$$\Delta S_{t+1} = 0.226177\ \Delta S_t + 0.030137\ (r-r^*)_t$$

F-statistic	189.2736	Probability	0.000000
Chi-square	378.5473	Probability	0.000000

$R^2 = 0.0591$
S.E. of regression = 3.1495
Durbin-Watson statistic = 1.8621

The probability is 0.00 that is less than 5% level of significance and F-statistic is 189.2736, which is greater than F-statistic from the table, 2.07. Thus, the null hypothesis of UIP is rejected during a floating exchange rate system.

So, it can conclude that both FRU and UIP are rejected during the period of July 1997 – June 1999 at confidence interval 95%.

By using the OLS to estimate one-period, which is equal to one month. The result from the test the market efficiency showed that it did not follow the theories of FRU and UIP in both periods of fixed and floating exchange rate regimes.

5.3 Model Two

5.3.1 Model Two: Two-variable VAR Estimation

The model of OLS estimation was not able to include feedback effect, which occur among exchange rates, forward rates and interest rates. It is hard to determine which variable has an influence on the other because those variables are linked together and have feedback that affect each other back and force. Therefore, using the VAR methodology to estimate is appropriate and will give better explanation to the theories and the variables.

The model of FRU and UIP in VAR form is

UIP:

$$\Delta S_{t+1} = a_{11}\, \Delta S_t + a_{12}\, fp_t$$
$$fp_{t+1} = a_{21}\, \Delta S_t + a_{22}\, fp_t$$

FRU:

$$\Delta S_{t+1} = a_{11}\ \Delta S_t + a_{12}\ (r-r^*)_t$$
$$fp_{t+1} = a_{21}\ \Delta S_t + a_{22}\ (r-r^*)_t$$

After test for stationary and found that all variables are stationary and therefore we are able to forecast coefficient of the model that explained in chapter 4.

5.3.2 The Wald Test of Restriction for Model Two

The hypothesis for the test of restriction of FRU and UIP is:

$$a_{11}^2 + a_{12} * a_{21} + a_{11} = 0$$
$$a_{11}a_{12} + a_{12} * a_{22} + a_{12} = 1$$

The study will accept the null hypothesis when value of calculation Chi-square is less than the value of Chi-square from the table or the probability from the calculation is more than a level of the level of significance. In this case is 5% level of significance. On the other hand, if the value of Chi-square from the calculation is greater than the value of the Chi-square from table or if value of the probability is smaller than level of the confidence interval, the null hypothesis is rejected or H_0 but accepted H_1.

June 1995 – June 1997

The result from the test of FRU is

$$\Delta S_{t+1} = -0.283467\ \Delta S_t + 0.006728\ fp_t$$

t-stat (-1.19) (2.53)

$R^2 = 0.0856$

S.E. of regression = 0.1170

Durbin-Watson statistic = 1.7352

$$fp_{t+1} = 26.05974\ \Delta S_t + 0.987076\ fp_t$$

t-stat (1.15) (3.88)

$R^2 = 0.0261$

S.E. of regression = 11.1727

Durbin-Watson statistic = 1.2822

Using the Wald test to test for market efficiency under the restriction above.

Chi-square 9.443172 Probability 0.008901

The result shows that it rejected the null hypothesis of FRU. The probability is 0.01, which is smaller than the value of 5% level of significance. Chi-square, 9.44, is greater than 3.84, which is chi-square from the table degree of freedom one. Therefore, we can conclude that it rejected the null hypothesis of FRU at 5% level of significance.

The result from the test of UIP in the period of June 1995 – June 1997 is

$$\Delta S_{t+1} = -0.249917\ \Delta S_t + 0.010315\ fp_t$$

t-stat (-1.09) (2.56)

$R^2 = 0.0904$

S.E. of regression = 0.1167

Durbin-Watson statistic = 1.7346

$$fp_{t+1} = 9.698140\ \Delta S_t + 0.896491\ fp_t$$

t-stat (2.30) (12.15)

R^2 = -0.4107

S.E. of regression = 2.1348

Durbin-Watson statistic = 2.0002

Using the Wald test to test for market efficiency under the restriction above.

Chi-square 12.39214 Probability 0.002037

The probability is 0.00, which is smaller than the 0.05 confidence interval. It shows that it rejected the null hypothesis of UIP. Chi-square, 12.39, is greater than 3.84, which is chi-square from the table degree of freedom one. Therefore, we can conclude that it rejected the null hypothesis of UIP at 5% level of significance.

Therefore, under the relatively fixed exchange rate regime the market was inefficient under the theories of FRU and UIP by using two-variable VAR estimation due to it rejected both null hypotheses of FRU and UIP.

June 1997 – June 1999

The result from the test of FRU during June 1997 – June 1999 is as following:

$$\Delta S_{t+1} = 0.238934\ \Delta S_t + 0.006863\ fp_t$$

t-stat (1.16) (0.30)

$R^2 = 0.0483$

S.E. of regression = 3.1676

Durbin-Watson statistic = 1.8928

$$fp_{t+1} = 0.235796\ \Delta S_t + 0.839232\ fp_t$$

t-stat	(0.23)	(7.42)

$R^2 = 0.2740$

S.E. of regression = 15.6577

Durbin-Watson statistic = 2.1169

Using the Wald test to test for market efficiency under the restriction above, the result is

Chi-square 1.048143 Probability 0.592105

The result shows that it accepted the null hypothesis of FRU. This is due to the probability is 0.59, which is greater than the value of 5% level of significance and the Chi-square, 1.05, is less than 3.84, which is chi-square from the table degree of freedom one. Therefore, we can conclude that it accepted the null hypothesis of FRU at 5% level of significance.

The result from the test of UIP in the period of June 1997 – June 1999 is

$$\Delta S_{t+1} = 0.226177\ \Delta S_t + 0.030137\ fp_t$$

t-stat	(1.11)	(0.60)

$R^2 = 0.0591$

S.E. of regression = 3.1495

Durbin-Watson statistic = 1.8621

$$fp_{t+1} = 0.158783\ \Delta S_t + 0.961006\ fp_t$$

t-stat (0.78) (19.25)

$R^2 = 0.8361$

S.E. of regression = 3.1194

Durbin-Watson statistic = 1.6083

Using the Wald test to test for market efficiency under the restriction above.

Chi-square 3.375205 Probability 0.184963

The result can conclude that it rejected the null hypothesis of UIP at 5% level of significance. The probability is 0.18, which is greater than the value of 5% level of significance. It shows that it accepted the null hypothesis of UIP. Chi-square, 3.38, is less than 3.84, which is chi-square from the table degree of freedom one also supported the conclusion.

Therefore, under the floating exchange rate regime the market is efficient under the theories of FRU and UIP by using two-variable VAR estimation due to it accepted both null hypotheses of FRU and UIP during this period.

The result from the test in model two showed that it rejected the null hypotheses of FRU and UIP during the fixed exchange rate regime but accepted those null hypotheses during the floating exchange rate regime.

5.4 Model Three

5.4.1 Model Three: Three-variable VAR Estimation

The equation of FRU and UIP can be combined and rewrite in VAR form as following:

$$\Delta S_t = a_{11}\Delta S_{t-1} + a_{12}fp_{t-1} + a_{13}d_{t-1} + w_{1t}$$
$$fp_t = a_{21}\Delta S_{t-1} + a_{22}fp_{t-1} + a_{23}d_{t-1} + w_{2t}$$
$$d_t = a_{31}\Delta S_{t-1} + a_{32}fp_{t-1} + a_{33}d_{t-1} + w_{2t}$$

Therefore, the test will be able to test both FRU hypothesis and UIP hypothesis in the same model.

5.4.2 The Wald Test of Restriction for Model Three

From the equation 26, 27 in chapter 4, The hypotheses for the test of restriction of FRU and UIP are:

The restriction of FRU

$$\sum_{i=1}^{m} e1' A^i - e2' = 0$$

The restriction of UIP

$$\sum_{i=1}^{m} e1' A^i - e3' = 0$$

The test will perform only two-period test therefore the restriction of FRU is

$$e1'(A + A^2) - e2' = 0$$

Or

$$e1'(A + A^2) = e2'$$

And the restriction of UIP is

$$e1'(A + A^2) - e3' = 0$$

Or

$$e1'(A + A^2) = e3'$$

Where;

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

$$A^2 = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix} \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

We can expand A^2 to be

$$\begin{bmatrix} a_{11}^2 + a_{12}a_{21} + a_{13}a_{31} & a_{11}a_{12} + a_{12}a_{22} + a_{13}a_{32} & a_{11}a_{13} + a_{12}a_{23} + a_{13}a_{33} \\ a_{11}a_{21} + a_{21}a_{22} + a_{23}a_{31} & a_{12}a_{21} + a_{22}^2 + a_{23}a_{32} & a_{13}a_{21} + a_{22}a_{23} + a_{23}a_{33} \\ a_{11}a_{31} + a_{21}a_{32} + a_{31}a_{33} & a_{12}a_{31} + a_{22}a_{32} + a_{32}a_{33} & a_{13}a_{31} + a_{23}a_{32} + a_{33}^2 \end{bmatrix}$$

And $(A + A^2)$ is equal to

$$\begin{bmatrix} a_{11}^2 + a_{12}a_{21} + a_{13}a_{31} + a_{11} & a_{11}a_{12} + a_{12}a_{22} + a_{13}a_{32} + a_{12} & a_{11}a_{13} + a_{12}a_{23} + a_{13}a_{33} + a_{13} \\ a_{11}a_{21} + a_{21}a_{22} + a_{23}a_{31} + a_{21} & a_{12}a_{21} + a_{22}^2 + a_{23}a_{32} + a_{22} & a_{13}a_{21} + a_{22}a_{23} + a_{23}a_{33} + a_{23} \\ a_{11}a_{31} + a_{21}a_{32} + a_{31}a_{33} + a_{31} & a_{12}a_{31} + a_{22}a_{32} + a_{32}a_{33} + a_{32} & a_{13}a_{31} + a_{23}a_{32} + a_{33}^2 + a_{33} \end{bmatrix}$$

From chapter 4, we stated that "Where the vectors eJ have unity in the Jth element and zeros elsewhere (J=1,2,3)". Hence,

$$e1' = (1, 0, 0)$$
$$e2' = (0, 1, 0)$$
$$e3' = (0, 0, 1)$$

The left hand side of the restriction of FRU is $e1'(A + A^2)$, which is equal to

$$\begin{bmatrix} a_{11}^2 + a_{12}a_{21} + a_{13}a_{31} + a_{11} & a_{11}a_{12} + a_{12}a_{22} + a_{13}a_{32} + a_{12} & a_{11}a_{13} + a_{12}a_{23} + a_{13}a_{33} + a_{13} \\ a_{11}a_{21} + a_{21}a_{22} + a_{23}a_{31} + a_{21} & a_{12}a_{21} + a_{22}^2 + a_{23}a_{32} + a_{22} & a_{13}a_{21} + a_{22}a_{23} + a_{23}a_{33} + a_{23} \\ a_{11}a_{31} + a_{21}a_{32} + a_{31}a_{33} + a_{31} & a_{12}a_{31} + a_{22}a_{32} + a_{32}a_{33} + a_{32} & a_{13}a_{31} + a_{23}a_{32} + a_{33}^2 + a_{33} \end{bmatrix} \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$

After multiply $(A + A^2)$ by $e1'$, the matrix is

$$\begin{bmatrix} a_{11}^2 + a_{12}a_{21} + a_{13}a_{31} + a_{11} \\ a_{11}a_{21} + a_{21}a_{22} + a_{23}a_{31} + a_{21} \\ a_{11}a_{31} + a_{21}a_{32} + a_{31}a_{33} + a_{31} \end{bmatrix}$$

The restriction of FRU is $e1'(A + A^2) = e2'$ therefore the above matrix is equal to (0, 1, 0).

$$\begin{bmatrix} a_{11}^2 + a_{12}a_{21} + a_{13}a_{31} + a_{11} \\ a_{11}a_{21} + a_{21}a_{22} + a_{23}a_{31} + a_{21} \\ a_{11}a_{31} + a_{21}a_{32} + a_{31}a_{33} + a_{31} \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$$

The restriction of FRU can be written in equation form as:

$$a_{11}^2 + a_{12}a_{21} + a_{13}a_{31} + a_{11} = 0$$
$$a_{11}a_{21} + a_{21}a_{22} + a_{23}a_{31} + a_{21} = 1$$
$$a_{11}a_{31} + a_{21}a_{32} + a_{31}a_{33} + a_{31} = 0$$

The restriction of UIP is $e1'(A + A^2) = e3'$ therefore it is equal to

$$\begin{bmatrix} a_{11}^2 + a_{12}a_{21} + a_{13}a_{31} + a_{11} \\ a_{11}a_{21} + a_{21}a_{22} + a_{23}a_{31} + a_{21} \\ a_{11}a_{31} + a_{21}a_{32} + a_{31}a_{33} + a_{31} \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

And the restriction in equation form of UIP is

$$
\begin{aligned}
a_{11}^2 + a_{12}a_{21} + a_{13}a_{31} + a_{11} &= 0 \\
a_{11}a_{21} + a_{21}a_{22} + a_{23}a_{31} + a_{21} &= 0 \\
a_{11}a_{31} + a_{21}a_{32} + a_{31}a_{33} + a_{31} &= 1
\end{aligned}
$$

June 1995 – June 1997

Apply the Wald test to test for market efficiency under FRU theory. The result is

$$\Delta S_{t+1} = -0.268429\, \Delta S_t + 0.002674\, fp_t + 0.006417 d_t$$

t-stat (-1.10) (0.28) (0.44)

$R^2 = 0.0936$
S.E. of regression = 0.1191
Durbin-Watson statistic = 1.7314

$$fp_{t+1} = 25.82890\, \Delta S_t + 1.049305\, fp_t - 0.098502\, d_t$$

t-stat (1.10) (1.14) (-0.07)

$R^2 = 0.0263$
S.E. of regression = 11.4225
Durbin-Watson statistic = 1.2934

$$d_t = 8.841628\, \Delta S_t + 0.123733\, fp_t + 0.716155 d_t$$

t-stat (1.20) (0.71) (2.70)

$R^2 = -0.3791$
S.E. of regression = 2.1583
Durbin-Watson statistic = 1.8752

The result form the Wald test shows that

Chi-square = 8.658470 Probability = 0.034194

The result showed that the probability from the calculation is 0.03, which is less than the value of 5% level of significance, 0.05. The chi-square from the test, 8.66, is greater than chi-square form the table, which is 5.99 at degree of freedom equal to two at 5% level of significance. From both conclusion of probability and chi-square this means it rejected the null hypothesis of the FRU at 5% level of significance.

For UIP, the result form the test shows that

Chi-square = 7.893186 Probability = 0.048272

For UIP, the result probability from the test is 0.048, which is smaller than the value of 5% level of significance. And the chi-square from the test is 7.89, which is greater than chi-square from the table, 5.99 at degree of freedom equal to two at 5% level of significance. From both result form probability and chi-square we can conclude that it rejected the null hypothesis of UIP at 5% level of significance.

The outcome is that during the period June 1995 – June 1997, it rejected both null hypotheses of FRU and UIP.

June 1997 – June 1999

Apply the Wald test to test for market efficiency under FRU theory during June 1997 – June 1999, which was the period under floating exchange rate regime.

$$\Delta S_{t+1} = 0.229306\ \Delta S_t - 0.056923\ fp_t + 0.149533 d_t$$

t-stat	(1.11)	(-0.81)	(0.95)

$R^2 = 0.0861$

S.E. of regression = 3.1737

Durbin-Watson statistic = 1.7659

$$fp_{t+1} = 0.101398\ \Delta S_t - 0.051203\ fp_t + 2.087408\ d_t$$

t-stat	(0.12)	(-1.17)	(3.20)

$R^2 = 0.5045$

S.E. of regression = 13.2267

Durbin-Watson statistic = 1.1262

$$d_t = 0.158063\ \Delta S_t + 0.013079\ fp_t + 0.933534\ d_t$$

t-stat	(0.76)	(0.18)	(5.94)

$R^2 = 0.8364$

S.E. of regression = 3.1870

Durbin-Watson statistic = 1.6130

The result form the Wald test shows that

Chi-square = 1.912547 Probability = 0.590755

From both conclusion of probability and chi-square this means it accepted the null hypothesis of the FRU at 95% the confidence interval. The result showed that the probability from the calculation is 0.59, which is greater than the value of 5% level of significance. And the chi-square from the test, 1.91, is less than chi-square form the table, which is 5.99 at degree of freedom equal to two at 5% level of significance.

For UIP, the result form the test shows that

Chi-square = 5.552131 Probability = 0.135554

For UIP, the result probability from the test is 0.14, which is greater than the value of 5% level of significance. And the chi-square from the test is 5.55, which is less than chi-square from the table, 5.99 at degree of freedom equal to two at 5% level of significance. Therefore, the conclusion from probability and chi-square is the null hypothesis of UIP is accepted at 5% level of significance.

The outcome is that during the June 1997 - June 1999, it accepted both null hypotheses of FRU and UIP.

Thus, the conclusion for model three is that it rejected both null hypotheses of FRU and UIP in the period of fixed exchange rate regime but accepted those null hypotheses in the period of floating exchange rate regime.