Report Information from ProQuest

June 15 2017 18:30

Table of contents

1. A cointegration analysis of the Asian dollar and Eurodollar interest rate transmission mechanism..... 1

A cointegration analysis of the Asian dollar and Eurodollar interest rate transmission mechanism

Author: Fung, Hung-Gay; Isberg, Steven C; Leung, Wai K

Publication info: Asia Pacific Journal of Management : APJM; Singapore 9.2 (Oct 1992): 167.
ProQuest document link

Abstract:
A cointegration analysis and error correction model are used to investigate the transmission mechanism between the Asian dollar and the Eurodollar markets for the period 1981-1989. Results indicate the absence of reverse causality in the Asian dollar market throughout the 1980s. In the Eurodollar market, reverse causality exists in the first half but disappears in the second half of the decade. Both markets are evolving into rapid incorporation of prior interest rate information into current rates. These results are likely to be due to reduced market regulation, expansion of futures trading, more sophisticated telecommunications, and 24-hour trading practices.

Links: Linking Service

Full text:
As world financial markets have evolved in the past decade, offshore transactions in both Europe and Asia have had an increasing degree of importance in determining interest rates and financial flows. Factors such as the expansion of futures markets, advancements in telecommunications and the advent of 24-hour trading, have changed the pace and volume of international financial market activity.
Knowledge of relationships among offshore markets is important to the understanding of international financial market integration, especially given the rising significance of the Asia Pacific financial sector. In addition, other developments have contributed to changes in this sector. For example, the Singapore government, in an attempt to compete with Hong Kong for leadership in the Asian dollar market, eliminated its 40% withholding tax on interest paid to non-residents in 1968 and reduced its tax on bank profits on Asian dollar offshore loans in 1973. Moreover, other taxes have been reduced or eliminated, along with the liberalisation of exchange control measures for promoting growth in the Asian dollar market. These and other deregulatory measures have lowered barriers to trading in the Asian dollar markets (Ahkong (1989)).
Interest Rate Transmission A variety of studies have investigated the issue of international financial market integration and have produced some interesting findings. Fung and Isberg (1992), Swanson (1988), Kaen and Hachey (1987), Schnitzel (1983), Giddy, Dufey and Min (1979) and Levin (1974) analyse the relationship between Eurocurrency and United States interest rates. Collectively, the results indicate that there have been structural changes in international interest rate markets, with fewer instances of uni-directional causality between the United States and Eurodollar markets being observed. Bhoocha-oom and Stansell (1990) investigate the relationship between Asian dollar, United States, and Hong Kong interest rates. Their findings indicate that these financial markets are becoming more liquid and fully integrated.
Despite the scope and detail of these studies, a thorough test of the relationship between the Asian and European markets is lacking in the interest rate literature. Therefore, the purpose of this study is to examine the linkage between the Asian dollar (A$) and Eurodollar (E$) interest rate markets to determine whether any cross-market causality exists between the two. The methodology first tests A$ and E$ certificate of deposit (CD) rates for the existence of cointegration. Once cointegration is documented, error correction models (ECM), as specified in Engle and Granger (1987), are then estimated for the period 1981-1989.
The economic theory put forth in Granger (1986) and in Engle and Granger (1987) calls for the use of an ECM in examining causal relationships in cases where two series are cointegrated. Existing studies of international

interest rate transmission primarily rely upon the Granger-Sims causality test (Bhoocha-oom and Stansell(1990), Swanson (1988) and Kaen and Hachey (1987)). Since A$ and E$ CD rates are essentially prices of the same asset determined in different locations, an error correction model specified to account for cointegration between the two interest rate series should provide robust results. Hence, this study contributes to the extant literature on international interest rates by examining the linkage between A$ and E$ markets and using a different, but appropriate, methodology.

The rest of the paper is organised as follows: Section 2 outlines the research methodology; Section 3 discusses the empirical results; and a final section offers some conclusions and implications for further research. Findings indicate that structural relationships both within and between the A$ and E$ markets have changed during the 1980s.

2. RESEARCH METHODOLOGY

The specific model employed in this study is developed in Granger (1986) and Engle and Granger (1987). Consider two time series, Y sub t , and X sub t , that are non-stationary. In order to achieve stationarity, the two variables need to be differenced. It is generally true that any linear combination of the two time series is also non-stationary. However, if Y sub t , and X sub t , are cointegrated, then there exists a constant A, such that:

z sub t = Y sub t - AX sub t --(1)

is stationary. The parameter A is called the cointegrating parameter that links the two time series together. Further, the relationship

Y sub t6 = AX sub t + z sub t --(2)

is considered a long-run or "equilibrium" relationship, as suggested in economic Therefore, the relationship in (1) measures the extent to which the system X sub t and Y sub t is out of equilibrium, providing the basis for the error correction model. Before testing two time series for cointegration, however, it is important to ensure that they both exhibit the same order of non-stationarity. To accomplish this, a standard unit root test is applied to each series as follows:

DeltaY sub t = b sub 0 + b sub 1 Y sub t - 1 + b sub 2 Delta Y sub t - 1 + b sub 3 Delta Y sub t -2 + e sub t --(3)

where DeltaY sub t = Y sub t - Y sub t 1 ; the b sub i are constant parameters; and e sub t , is a white noise disturbance term. If autoregressive representation of Y sub t contains a unit root (ie, is integrated of order one), the t-ratio for b sub 1 should be consistent with the hypothesis b sub 1 = 0. Conventional t-tables are inappropriate for this hypothesis test. Therefore, the results of Dickey and Fuller (1979) and the tabulated distribution in Fuller (1976, p 373) are applied to interpret the t-ratio.

Assuming that each series has the same number of unit roots, the cointegration test can be applied using an OLS regression in the following form:

Y sub t = c + alphaX sub t + u sub t --(4)

where a is the estimator for the equilibrium parameter, A; c is the intercept (Engle and Granger (1987) suggest the inclusion of a intercept term); and u sub t is the disturbance term. This regression result provides the basis for the first of two tests of cointegration, in which the Durbin-Watson (DW) statistic is examined. If the DW statistic exceeds the critical value, the null hypothesis of non-cointegration is rejected.

The disturbance terms of the cointegration regression (u sub t) provide the means for developing the second test of cointegration employed here, the augmented Dickey-Fuller (ADF) test. Using the residuals from equation (4), the ADF requires estimation of the following model:

(Equation omitted)--(5)

where phi, and b sub 1 are the estimated parameters and e sub t , is the error term. The number of lags (n) chosen in equation (5) should be sufficient to ensure that the error term, e sub t , is white noise. The test for cointegration involves the significance of the estimated phi coefficient. If the statistic of the coefficient exceeds the critical value, the u sub t residuals from the cointegration regression are stationary and the variables X and Y are cointegrated.

If cointegration exists between the two time series, an error correction model should then be used to estimate their relationship. The error correction model can be expressed as:
(Equation omitted)--(6)
where z sub t - 1 is the error correction term (z sub t - 1 = Y sub t - 1 - alphaX sub t - 1 ; alpha being the estimated coefficient from the cointegration regression (4)), n and m are the optimal numbers of lags for the lagged dependent and independent variables respectively, and v sub t is the error term.
The results of equation (6) provide a test of the relationship between changes in a domestic interest rate (Y sub t) and lagged changes in an external interest rate (X sub t). Similarly, by reversing the role of X and Y it is possible to test the impact of lagged changes in domestic rates on external rates using the same equation. An important issue regarding the estimation of equation (6) is the selection of an appropriate lag structure for the variables (Y sub t - 1 - Y sub t - i - 1) and (X sub t - j - X sub t - j - 1). A variety of operational solutions to the problem of choosing the optimal lag length are available in the literature. Most of these solutions emerge from the objective of choosing lag length to minimise the mean square error of prediction (Akaike (1974), Amemiya (1980), Mallows (1973) and Parzen (1977)). Geweke and Meese (1981) find no significant differences between the results of these methods. In this study, optimal lag length is selected using Akaike's final prediction error (FPE) method, which minimises the values of:
FPE = (T + g + 1)/ (T - g -1)! (SSE/T),--(7)
where T is the number of observations, and g is the number of lags in the autoregression. This criterion has been widely used in the literature (Hsiao (1981), Callen, Chan and Kwan (1989) and Fung and Lie (1990), among others).
To apply the Akaike test, the optimal order of Beta sub i 's in equation (6) is first determined by constraining all tau's to zero. Autoregressions containing from one to 20 lags are estimated and the FPEs compared. Second, using the optimal order of Beta sub i found in the first step, regressions are estimated and FPEs calculated for m = 1 up to m = 20 to determine the optimal lag for the cross-market terms, tau sub j .
With the introduction and expansion of the use of various interest rate hedging instruments since 1981, along with changes in regulatory attitudes in Europe, Asia and the United States, there is sufficient reason to suspect that the parameters of the international interest rate transmission mechanism have changed since that time. Hence, once the model with optimal lags has been estimated for the period 1981-1989, the sample is broken down into different sub-periods, and tests are conducted to determine whether or not any structural change has taken place in the transmission model. To test for structural change in the time series relationship, a Chow test is employed. To apply the Chow test, the model is first estimated over the entire sample period, and then it is re-estimated for each of the two subperiods. Estimates from the entire period and both sub-periods are then used to compute the Chow statistic.(1)
To evaluate the significance of the impact of the cross-market term (X sub t,) on the own market term (Y sub t), a Wald test is employed. Each error correction model (equation (6)) is estimated in its restricted form (ie, the coefficients on lagged cross-market terms, namely X sub t , are constrained to zero). The model is then estimated in its unrestricted form by removing the constraint. The Wald test statistic, which has an F-distribution, is then applied to test for the significance of the added cross-market terms.(2)
3. EMPIRICAL RESULTS
The data for this study are composed of weekly observations for three-month maturity yields on Eurodollar deposits and Asian dollar deposits for the period beginning January 1981 and ending December 1989. The Eurodollar data are gathered from the Wall Street Journal, and the Asian dollar data from the Far Eastern Economic Review.
UNIT ROOT TEST RESULTS
Results of the unit root test on the level and the first differences of each interest rate series (equation (3)) are reported in Table 1.(table 1 omitted) For the interest rate levels, there is failure to reject the hypothesis of non-

stationarity based on the magnitude and significance of the b sub 1 coefficients for each series. In the case of the first differences in the interest rates, however, the hypothesis of non-stationarity is rejected, as indicated by the sign and significance of the b sub 1 coefficients. These results imply that the two interest rate series each demonstrate first order integration, validating the application of the cointegration test and the error correction

COINTEGRATION TEST RESULTS

Table 2 reports the results of tests for cointegration between A$ and E$ deposit rates. The Durbin-Watson (DW) statistics for the A$ and E$ regressions are both 1.88, which exceeds the critical value of 0.51 at the 1% level (Engle and Granger (1987), Table II).(Table II omitted) This leads to rejection of the hypothesis of unit roots and implies that A$ and E$ rates are cointegrated.

The augmented Dickey-Fuller test estimates of e, are-12.39 for the A$ and-12.48 for the E$, as also shown in Table 2. Two lags are employed in the analysis. Since the critical value is-3.77 (Engle and Granger (1987), Table II), the augmented Dickey-Fuller test also leads to the rejection of the unit root (non-stationarity) hypothesis and documents the presence of cointegration. (Results obtained using a greater number of lags show that no power is added, and thus are not reported here.)

ERROR CORRECTION MODEL ESTIMATION AND TESTS

Results of the final prediction error tests of both the A$ and E$ error correction models are reported in Table 3.(Table 3 omitted) For the A$ model, the optimal lag structure contains 19 lagged own-market terms and zero lagged cross-market terms (ie, 19, 0). This implies the absence of significant causality leading from the E$ market to the A$ market. All information contained in lagged E$ rate changes is apparently incorporated into the A$ rate rapidly. Because there are no significant cross-market lagged terms, the Wald test is not applicable to the A$ model.

For the E$ model, however, the optimal lag structure consists of 19 lagged own market terms and one lagged cross-market rate term (ie, 19, 1). One would suspect that presence of only one lagged A$ term in the model also implies the presence of little, if any, causality leading from the Asian to the Eurodollar market. The Wald test result of 3.18 is less than the critical value of 3.865 (1 and 407 df at the 5% level), which confirms this suspicion, and hence the hypothesis of reverse casualty in the E$ market is initially rejected.

The Chow test statistics determine the extent to which structural change takes place in each model within the 1981-1989 study period. For the A$ model, the Chow test statistics 1.95 with 21 and 367 degrees of freedom. As the critical value for rejection of the null hypothesis is 1.59 at the 5% level of significance, this suggests that there is a structural change in the A$ model. For the E$ model, the Chow test statistic is 0.90 (with 22 and 365 degrees of freedom) which is less than the critical value of 1.572 at the 5% level of significance. This evidence supports the hypothesis that there is no structural change in the model of Eurodollar interest rate determination during the study period.

RESULTS OF ECM ESTIMATION FOR SAMPLE SUB-PERIODS

In order to determine whether the Wald test results are sensitive to selection of the sample period selection, error correction models for the E$ market are estimated for each of two sub-periods. The first spans the period from January 1981 to June 1985. The second covers the period beginning July 1985 and ending December 1989. The results, presented in Panel (a) of Table 4, show that the Wald tests differ in each sub-period. (Table 4 omitted) Applying the original optimal lag structure to the first sub-period, it is found that the lagged A$ terms do have a significant impact on E$ interest rates. The Wald test statistic of 5.65 exceeds the critical value of 3.89 with 1 and 182 degrees of freedom at the 5% level. This indicates the presence of significant cross-market causality in the Eurodollar market during the first half of the 1980s. In the second half, however, the Wald test statistic of 0.49 is not statistically significant at the 5% level (the critical value is 3.89 with 1 and 183 degrees of freedom). The differing results across the two sub-periods suggest that there have been structural changes in the E$ market that have not been picked up by the earlier Chow test.

To pursue this issue further, optimal lag structures were re-estimated for the E$ model in each distinct sub-

period. As can be seen in Panel (b) of Table 4, the optimal lag structure for the first sub-period consists of 17 own-and one cross-market terms. The Wald test for the first sub-period is 4.04, which exceeds the critical value of 2.73 with 1 and 186 degrees of freedom at the 5% level, again supporting the hypothesis of reverse causality in the E$ market. In the second sub-period, however, the optimal lag structure changes, consisting of two own- and ten cross-market terms. The Wald test statistic for the second period is 1.60, which is not significant at the 5% level (the critical value is 1.66 with 18 and 200 degrees of freedom). This implies that despite the presence of a greater number of cross-market terms, changes in A$ rates do not add any significant explanatory power to the model, and hence, reverse causality in the E$ market disappeared. This is not surprising given the institutional changes that have taken place since the early 1980s. By comparing further the optimal lag structures between the two sub-periods, it is evident that the Eurodollar market is also incorporating information into interest rate changes more rapidly, as the number of own-market lagged terms is reduced from 17 to two. Recalling that the Chow test statistic suggests structural change in the A$ model, optimal lag structures are also re-estimated for each sub-period. As can be seen in Panel (b) of Table 4, the optimal lag for the A$ model in the first sub-period is still (19, 0). In the second sub-period, however, it consists of two lagged own-market and zero lagged crossmarket terms. When this finding is considered along with the Chow test result, it is apparent that the Asian dollar market is evolving to more rapid incorporation of information into interest rate changes.

4. CONCLUDING REMARKS

This study investigates the international interest rate transmission between the Asian dollar and Eurodollar markets for the period 1981-1989. The results indicate that the two interest rates are cointegrated. The Asian dollar market shows no evidence of cross-market causality during the sample period, even when broken down into different sub-periods. Changes taking place in the Asian dollar model indicate that as time has progressed, the market has evolved in such a way as to more rapidly incorporate information conveyed by prior interest rate changes into current rates. This is not surprising given the institutional changes noted earlier.

In the case of the Eurodollar market, recent historical development of its characteristics appears to be different. In the early 1980s the E$ market demonstrated evidence of reverse causality, where changes in the Asian dollar rate had a significant lagged impact on E$ rates. In the later sub-period, however, the Asian dollar's impact on the Eurodollar became insignificant. This implies that the two markets have become more completely integrated.

The main reason for the existence of reverse causality in the Eurodollar but not in the Asian dollar market may be the comparative degree of regulation. The Asian dollar market has historically been characterised by less restrictive regulation. In the Eurodollar market regulation has been more severe, but its reduction may be related to the disappearance of reverse causality later in the decade. In the same way as the A$ market, the E$ market appears to be incorporating information into interest rate changes more rapidly. Contributing to these structural changes is the expansion of futures market trading. Greater futures market trading tends to reduce arbitrage opportunities and facilitates more rapid cross-market price adjustment, thus leading to greater efficiency in the pricing processes of the various cash markets.

* Assistant Professors of Finance, University of Baltimore, and Louisiana State University respectively. The authors wish to thank Zoltan Acs and Elizabeth Cooperman for helpful comments and suggestions. Invaluable assistance in data collection and entry was provided by Brett Salazar. Any errors remain our own.

1. The Chow test statistic is computed as:

(SSE(W) - ((SSE(1) + SSE(2))/(k + 1)/ (SSE(1) + SSE(2))/ (n sub 1 + n sub 2 - 2k - 2)! where SSE(W) is the sum of square of error for the whole period; 1 and 2 denotes the period; k is the number of dependent variables; and n sub 1 and n sub 2 are the number of observations for the first and second half of the observations.

2. The Wald test statistic is computed as:

SSE(R) - SSE(U)!/SSE(U)!* df(U)/(df(R) - df(U))!

where SSE(R) is the sum of square of error for the restricted version. U denotes the unrestricted version. df is

the degree

REFERENCES

1. Ahkong, A, (1982), Financial transactions: Taxation and tax planning techniques, East Asian Executive Reports 8, 17-20.

2. Akaike, H, (1974), A new look at the statistical model identification, IEEE Transactions on Automatic Control, 714-723.

3. Aliber, R Z, (1978), The integration of national financial markets: A review of theory and findings, Weltwirtschaftliches Archiv, 448-480.

4. Amemiya, T, (1980), Selection of regressors, International Economic Review, 331-352.

5. Bhoocha-oom, A and S Stansell, (1990), A study of international financial market integration: An examination of the US, Hong Kong and Singapore markets, Journal of Business Finance and Accounting, 193-212.

6. Dickey, D A and W A Fuller, (1979), Distribution of the estimators for autoregressive time series with a unit root, Journal of American Statistical Association, 427-431.

7. Dufey, G and J H Giddy, (1978), The International Money Market, Englewood Cliffs, NJ: Prentice Hall.

8. Engle, R F and C W J Granger, (1987), Co-integration and error correction: Representation, estimation, and testing, Econometrica, 251-276.

9. Fuller, W A, (1976), Introduction to Statistical Time Series, New York: John Wiley and Sons.

10. Fung, H G and C J Lie, (1990), Stock market and economic activities, in S G Rhee and R P Chang, eds: Pacific-Basin Capital Markets Research, North Holland.

11. Fung, H G and S Isberg, (1992), The international transmission of Eurodollar and US interest rates: A cointegration analysis, Journal of Banking and Finance 16, forthcoming.

12. Geweke, J and R Meese, (1981), Estimating regression models of finite but unknown order, International Economic Review, 55-70.

13. Giddy, I, G Dufey and S Min, (1979), Interest rates in the US and Eurodollar markets, Weltwirtschaftliches Archiv, 51-67.

14. Granger, C W J, (1986), Developments in the study of cointegrated economic variables, Oxford Bulletin of Economics and Statistics, 213-228.

15. Hsiao, C, (1981), Autoregressive modelling and money-income causality detection, Journal of Monetary Economics, 85-105.

16. Kaen, F R and G A Hachey, (1983), Eurocurrency and national money market interest rates, Journal of Money, Credit and Banking, 327-338.

17. Levin, J, (1974), The Eurodollar market and the international transmission of interest rates, Canadian Journal of Economics, 205-224.

18. Maddala, G S, (1977), Econometrics, McGraw Hill Company.

19. Mallows, C L, (1974), Some comments on C sub p , Technometrics, 579-590.

20. Parzen, E, (1977), Multiple time series: Determining the order of approximating autoregressive schemes, in P Krishnaiah, ed: Multivariate Analysis, IV, Amsterdam: North Holland.

21. Schnitzel, P, (1983), Testing for the direction of causality between the domestic monetary base and the Eurodollar system, Weltwirtschaftliches Archiv, 616-629.

22. Swanson, P E, (1988), The international transmission of interest rates: A note on causal relationships between short-term external and domestic US dollar returns, Journal of Banking and Finance, 563-573.

Subject: Mathematical models; International markets; Foreign exchange rates; Foreign exchange futures; Eurodollars;

Location: Europe Asia

Classification: 9180: International; 9179: Asia & the Pacific; 9175: Western Europe; 9130: Experimental/theoretical treatment; 3400: Investment analysis

Publication title: Asia Pacific Journal of Management: APJM ; Singapore

Volume: 9

Issue: 2

Pages: 167

Number of pages: 11

Publication year: 1992

Publication date: Oct 1992

Publisher: Springer Science & Business Media

Place of publication: Singapore

Country of publication: Netherlands

Publication subject: Business And Economics--Management

ISSN: 02174561

Source type: Scholarly Journals

Language of publication: English

Document type: PERIODICAL

Accession number: 00738498

ProQuest document ID: 228418878

Document URL: http://search.proquest.com.proxy-ub.researchport.umd.edu/docview/228418878?accountid=28969

Copyright: Copyright National University of Singapore, Faculty of Business Administration Oct 1992

Last updated: 2014-08-23

Database: ABI/INFORM Global

Contact ProQuest
Copyright © 2017 ProQuest LLC. All rights reserved. - Terms and Conditions