Capital Mobility and Single Currency Adoption: Evidence from the West African Monetary Zone

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ABSTRACT

The quest of introducing a single currency in West Africa seems to be long overdue. Already, there have been three postponements and a fourth postponement is likely according to experts, simply because member countries continue to struggle to achieve the convergence criteria that were set at their initial meeting. The criteria include a single digit inflation, fiscal deficit gross domestic product ratio of less than or equal to four percent, Central Bank financing of fiscal deficit less than or equal to ten percent and gross external reserves position relative months of import cover must be equal to or greater than three months of import cover. There is, therefore, the need to look for alternatives to the convergence criteria including exploring the requirements in the optimum currency area theory. Using a panel data for the five countries in the zone for the period 1970-2010, this study investigates the level of capital mobility in the zone as specified by the theory. Employing the theoretical model based on Feldstein and Horioka paradox, capital mobility is estimated using a dynamic ordinary least square regression approach. It is observed that capital mobility within the zone is fairly high.

Keywords: *Capital Mobility, Single Currency, West African Monetary Zone, Panel*

Introduction

An important conditionality for a currency area suggested by the optimum currency (OCA) theory is capital mobility within the area. One of the few empirical works on the detailed account of capital mobility is that of Frankel (2012), although there is little evidence of the phenomenon studied in the zone. Frankel argues that financial markets are better integrated if capital controls are properly removed. It can, therefore, be inferred from this view that capital mobility is key in trying to integrate economies and eventually adopting a single currency. In the view of Feldstein and Horioka (1980), perfect capital mobility should extend beyond covered interest rate parity (Frankel, 1992; Freenstra & Taylor, 2008), uncovered interest parity (Waki, 2007; Freenstra & Taylor, 2008), real interest parity (Bordo, 2000; Eun & Resnick, 2011) and Feldstein and Horioka condition (Wadsley, Felmingham & Cooray, 2005). In all, the Feldstein and Horioka method to capital mobility, although criticised (Obstfeld, 1986), has been identified as a major approach to studying the phenomenon.

The Feldstein and Horioka (F-H) paradox posits that exogenous variations in domestic savings rate have no influence on investment rates (Taylor, 2003; Wadsley et al., 2005). The paper adopted the F-H approach in testing the nature of capital mobility in the WAMZ as it plans to integrate its economy and even introduce a single currency.

However, as Frankel (1992) indicated, the other methods of testing capital mobility are inter-dependent – uncovered interest rate parity is possible if there exists a condition of covered interest rate. Real interest rate parity requires condition of uncovered interest rate to hold. Also, employing the F-H method requires the real interest parity to hold.

Although there have been several works in the area (Mamingi,1997; Isaksson, 2001; Payne & Kumazawa, 2005,2006; De Wet & Van Eyden, 2005; Murthy, 2005; Adedeji & Thornton, 2007; Bangake & Eggoh, 2012), the concentration of these earlier studies was not on WAMZ. Indeed, none concentrated even on a currency area. The present paper focuses on the WAMZ, in order to test the presence of a key component of the OCA requirements; that is, capital mobility. The rest of the paper is organised into four parts. Part two reviews the literature followed by the methodology and the discussion. The final part highlights the conclusions and recommendations.

Literature Review

The optimum currency area theory suggests capital mobility in a region as part of the requirements for common currency adoption. The regional financial markets are said to be integrated if there is perfect capital mobility such that there is no relation between domestic saving and domestic investment, as saving responds to the regional opportunities for investment while investment is financed by the regional pool of capital (Mensah, 2006). This position is a bit too definite, because it is very rare to have perfect capital mobility. However, one important deduction that can be made from it is that capital mobility is a basis for financial integration required for introducing a common currency. According to Marashdeh (2006), financial market integration is a situation where there are no impediments, such as legal restrictions, transaction costs, taxes and tariffs against the trade in foreign assets or the mobility of portfolio equity flows.

In the previous studies, discussions on perfect and imperfect capital mobility have been unclear and sometimes inconsistent with theory. Whereas theories of integration (e.g. theory of free trade) suggest the free movement of goods and services including labour and capital, some empirical studies have argued that capital mobility is a by-product of the integration of financial markets (Mundell & Fleming, 1964). In either

case, having a common currency should also mean that investors in one country must be able to trade in financial assets in another at low transaction cost. Also, cost of capital in one country cannot deviate so much without transferring capital flows that will restore it to equilibrium. Incorporating exchange rate into the perfect capital mobility argument, the Mundell-Fleming model (Mundell & Fleming, 1964) posits that under perfect capital mobility, any interest rate differential provokes infinite capital inflows. The next important issue to be discussed is measurement of capital mobility.

The savings-investment correlations (Feldstein & Horioka, 1980) have been the main basis for measuring the degree of capital mobility. According to the F-H paradox, if capital was highly mobile in the region, then Corr (I, S) was close to zero. If Corr (I,S) is to one, then it is a closed economy; if Corr (I,S) is zero, the region can be described as a small open economy with a perfect capital mobility (CA=S-I), r is exogenous (investment and savings are affected by independent factors). The F-H estimation employs a cross section regression method to determine the investment savings relationship (Kim, 2004) specified as:

$$y_i = \alpha + \beta\omega_i + \epsilon_i \qquad 1$$

Where:

$y_i = domestic\ investment\ rate\ of\ country\ i$

$\omega_i =$
$domestic\ saving\ rate\ country\ i$

As opined by Kim (2004) and other studies before it (Coakley et al., 1998), the F-H coefficient or the savings retention coefficient tends to be high. In view of this, other studies have attempted to improve upon its predictive power (see Coakley et al., 2001; Pedroni, 2001). In all, the panel integration methods have mainly been employed (see Ho, 2002; Pedroni, 2004, Kim, 2004).

As Bangake and Eggoh (2012) indicate, there have been a number of empirical studies on OECD countries, but a limited number of attempts have been made to verify the presence of capital mobility using panel data in developing countries. In his work, Chakrabarti (2006) re-examines the relationship between savings and investment, using multivariate heterogeneous panel cointegration analysis of annual data for 126 countries during the period 1960 to 2000. He splits the sample into forty-seven low, fifty-three middle and twenty-six high-income countries and into twenty-six open economies, forty-two economies that opened after initial closure and thirty-two closed economies. It was discovered that the savings–investment association was significantly lower for non-OECD countries compared to OECD countries.

Mamingi (1997) found that savings–investment correlations for middle-income countries tend to be lower than those for low-income

countries. Similarly, Isaksson (2001), using panel methods and IV procedure technique, found that for developing economies, including African countries, capital is relatively immobile. Payne and Kumazawa (2005) and De Wet and Van Eyden (2005) discovered the presence of capital mobility in sub-Saharan African countries between the period of 1980 and 2000. Other empirical evidence (Payne & Kumazawa, 2006) indicated higher capital mobility with a savings coefficient of .36, approximately twenty-five per cent lower than the estimates based on the cross-section (CS) model for the whole sample, with little variation across the sub-regions Sub-Saharan Africa, Latin American, Middle East and Asian countries. Murthy (2005), as cited in Bangake and Eggoh (2012), indicates moderate degree of capital mobility in Africa. Still on Africa, Adedeji and Thornton (2007) applied panel cointegration techniques for six African countries to test the F-H approach and found that capital was relatively mobile in the African countries during 1970–2000, with estimated savings retention ratio of .45. Such studies are part of those that initiated the discussions on capital mobility. However, the concentration of these earlier studies was not on WAMZ. Indeed, none concentrated even on a currency area. The paper focused on the WAMZ, in a bid to test a key component of the OCA requirements that is capital mobility.

Methodology

Since the data considered varying both over time and across countries, the study considered panel (pooled) estimation that will also take time series properties of the data into consideration. This brings the problem of stationarity in econometrics studies. Empirical studies show that most of the time series are not stationary. That is, their mean and variances depend on time.

As econometric theory shows, when the variables are non-stationary, the standard ordinary least squares cannot be applied because there might be a spurious regression which affects the forecasting performance. A number of methods have been suggested to solve this problem. One of them is taking the differences of the series and putting them into regressions. However, this could lead to loss of information essential for establishing an important relationship between the variables.

In this case, two estimators, which have power to deal with stationarity problems, fully modified ordinary least square (FMOLS) and dynamic ordinary least squares (DOLS) were considered. To correct for the endogeneity bias and to obtain an unbiased estimator of the long-run parameters, DOLS uses a parametric adjustment to the errors by augmenting the static regression with leads, lags, and contemporaneous values of the regressors in first differences. Both FMOLS and DOLS

provide consistent estimates of standard errors that can be used for inference. According to Kao and Chiang (2000), FMOLS and DOLS, estimators have normal limiting properties, and the DOLS estimator outperforms the FMOLS estimator, especially in small samples. On the basis of earlier findings in favour of panel DOLS estimation, the DOLS method is employed in this paper.

The Model Specification

The specification of the DOLS estimated follows Stock and Watson (1999) specified as

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$$Y_{it} = \alpha_i + x'_{it}\beta_{DOLS} + \sum_{j=-m}^{m} \rho_{ij}\Delta x_{it+j} + u_{it} \quad (2)$$

Here, the x' is a vector of regressors, Δx is a vector of the first difference of the non-stationary variables, m is maximum lag determine by Alkaike Information criterion (AIC) and u_{it} is the error term.

Measurement of Variables

The paper employed secondary data. Annual macroeconomic data on domestic savings and investment rates (gross domestic savings and gross capital formation, each as a percentage of GDP) for the six WAMZ countries (Gambia, Guinea, Ghana, Liberia, Nigeria and Sierra Leone) over the period from 1970 to 2011 was extracted from the World Bank's World Development Indicators 2012, yielding about 41 periods.

Preliminary Test Results

Table 1 displays the descriptive statistics of the investment and savings rate series for six countries. The average investment and savings rates are 17.98% and 6.43%, respectively; their maximum values are 44.6% and 58.03%, respectively. The standard deviation (showing the degree of dispersion from the mean) for the savings rate is greater (by 5.74%) than that for the investment rate.

Table 1: Descriptive Statistics on Savings Investment for WAMZ

Descriptive Statistics	Savings	Investment
Mean	6.43	17.98
Median	7.63	19.02
Maximum	58.03	44.60
Minimum	-87.54	3.38
Std. Dev.	14.10	8.36
Skewness	-2.85	0.25
Kurtosis	18.02	2.44
Jarque-Bera	2709.58	5.96
Probability	.00	.05

Sum	1621.58	4530.57
Sum Sq. Dev.	49897.83	17559.69
Observations	252	252

Source: Authors' computation, 2013

Also reported are Jarque-Bera statistics for testing whether the series are normally distributed. Under the null hypothesis of a normal distribution, the Jarque-Bera statistic is distributed as ($p<.00$) with two degrees of freedom. The reported p-values are the probability that a Jarque-Bera statistic exceeds (in absolute value) the observed value under the null hypothesis.

A small probability value leads to the rejection of the null hypothesis of a normal distribution. For the investment and savings rate series above, the hypothesis of normal distribution at the five per cent significance level is rejected. The savings rate of the six countries is far from a normal distribution. But the investment shows otherwise.

From the savings-investment correlations (Table 2), Corr (I, S) for Nigeria is zero, indicating capital is highly mobile in that country. None of the countries in the region shows signs of a closed economy or a country with perfect capital mobility.

Table 2: Covariance of Savings and Investment of WAMZ Countries

Countries	**Investment –Savings Covariance**
Gambia	.47
Ghana	.35
Guinea	-.13
Liberia	-.12
Nigeria	-.00
Sierra Leone	.04

Source: Authors' computation, 2013

The rest of the countries showed fair movement of capital. The investment savings covariance values of the other countries were higher than zero units or score, which indicates the higher capital mobility in the region.

Table 3 shows the results of the panel unit root tests based on Levin, Lin, and Chu's (2002), Breitung's (2000) t-statistics; Hadri's (2000) z-statistics, Im, Pesaran and Shin's (2003) w-statistics, and Maddala and Wu's (1999) PP-Fisher χ^2 statistics (see Jun, 2012).

Table 3: Panel Unit Root Tests for Savings and Investment

	Tests assuming a common unit root process			Tests assuming individual unit root processes	
Series Name	Levin, Lin & Chu (LLC) t*	Breitung t-stat:	Hadri z-test	IPS W-sat	PP - Fisher Chi-square
	Ho: Unit Root	Ho: Unit Root	Ho: No Unit Root	Ho: Unit Root	Ho: Unit Root
Investment rate	-.06(.52)	1.08(.86)	2.62(.00**)	-1.19(.12)	17.36.66(.14)
Savings rate	2.04(.98)	3.01(.99)	3.09(.00**)	-.28(.39)	19.34(.08)

Notes: Numbers in parentheses denote marginal significance levels (p-values). * and ** denote significance at 5% and 1%, respectively. All four panel unit root tests above except for Hadri's (2000) have the null hypothesis of unit roots (nonstationarity), while Hadri's test posits the null of no unit roots (stationarity).

Whereas the LLC, Breitung, and Hadri tests are based on the common unit root process, assuming that the autocorrelation coefficients of the tested variables across cross sections are identical, IPS and PP-Fisher tests are based on the individual unit root process, with the assumption that the autocorrelation coefficients vary across cross sections (See Jun, 2012).

All four panel unit root tests, except for Hadri's (2000), have the null hypothesis of unit roots, while Hadri's test posits the null of no unit roots (stationarity). All five distinct panel unit root tests in Table 3 confirm that both the savings and investment rates of the six countries in the WAMZ have unit roots and are thus nonstationary.

Dynamic Panel Estimation Results

This section reports the results of the panel estimation of the savings-investment equation by DOLS. The panel DOLS techniques for six WAMZ countries to test the F-H approach indicated that capital was relatively mobile in the region from 1970 to 2011, with estimated savings retention ratio of .06 and statistically significant at five per cent. The finding indicates that capital is mobile in the region. This is because low savings retention coefficient is interpreted as evidence supporting capital mobility. The results indicate relatively high capital mobility in the region.

Table 4: Capital Mobility (DOLS Panel)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SAVINGS	.06	.03	2.27	.02
C	.34	.11	3.02	.00
R-squared	.82	Durbin-Watson stat		1.66
Adjusted R-squared	.81			
F-statistic	105.84	Prob(F-statistic)		.00

Dependent variable: Investment
Source: Authors' computation, 2013

The savings retention ratio (.06) is significant, indicating the large proportion of capital that is made mobile in the region. Again, the figure (.06) is relatively low in terms of savings retention, but better in terms of capital mobility. In several other studies on Africa, including those of Sub Saharan Africa, the results have indicated relatively high savings retention and thus relatively low mobility.

Results and Discussion

The results from the present study indicate relatively high capital mobility in the zone. The rate is relatively (.06, $p<.05$) higher than the findings from several other studies using similar methodology. Isaksson (2001) found that capital is relatively immobile in thirty-five African countries between 1975 and 1995. However, Murthy (2005) found a moderate degree of capital mobility between 1965 and 2001 in seventeen African countries. This was further supported by Payne and Kumazawa (2005), who found strong presence of capital mobility (−.027; .022) in twenty-nine African countries, between 1980 and 2001. In another study, Payne and Kumazawa (2006) further investigated capital mobility in thirteen Sub-Saharan Africa from1980 to 2003. Similarly, Adedeji and Thornton (2007) discovered a moderate degree of capital mobility in six African countries from 1970 to 2000. These forms evidence support the present finding. However, except the finding from Payne and Kumazawa (2005), the present finding indicates the strong presence of capital mobility in Sub Saharan Africa, hence satisfying one of the key requirements for an OCA.

The relatively high capital mobility in the region could be attributed to the free trade ECOWAS protocol which permits the free movement of goods and capital in the region. This notwithstanding, the possible high capital mobility could be attributed to capital account liberalization policies, development of telecommunications and information technology that have increased information availability and accessibility (Kim et al, 2005). The

results could also be attributed to law and investor protection in the region; hence, a boost in investor confidence. Kim et al (2005) opined that capital tends to be more mobile internationally than in the countries with worse protection. The result also supports the view that the ideal situation for introducing a common currency is the integration. This is because forming a monetary union may not promote integration or capital mobility. The current study supports the view in Kim et al (2005) that a monetary union does not necessarily lead to better capital mobility. This result confirms previous studies on the F-H puzzle in developing countries, which indicate that capital mobility is higher than that in developed countries (see Chakrabarti, 2006; Kim et al, 2005). The implication of the result is that one of the conditions for forming a currency area prescribed by the OCA theory, capital mobility, is met by the zone.

Conclusions

As one critical requirement of an OCA, there should be high capital mobility in the region. The test showed fair movement in capital across the region. Some reasons assigned to the relatively fair movement of capital in the zone include the free trade ECOWAS protocol which permits the free movement of goods and capital in the region; capital account liberalization policies, development of telecommunications and information technology that have increased information availability and accessibility. This is also attributed to law and investor protection in the region, which has the tendency of boosting investor confidence in a region. Policymakers should work towards removing other trade bottlenecks that still impede easy access to markets in the region, as a way to deepen trade in their quest to introducing the single currency in the zone.

References

Adedeji, O. & Thornton, J. (2007). Saving, investment and capital mobility in African countries. *Journal of African Economies*, 16 (3), 393–405.

Bangake, C & Eggoh, J.C. (2012). Pooled mean group estimation on international capital mobility in African countries. *Research in Economics*, 66, 7-17.

Bordo, M. D. (2000). The globalization of international financial markets: What can history teach us? In National Bureau of Economic Research (2000). *International Financial Markets: The Challenge of Globalization.* College Station, TX: Texas, A&M University.

Breitung, J. (2000). The local power of some unit root tests for panel data, Advances in Econometrics, 15, Nonstationary Panels, Panel Cointegration, and Dynamic

Panels, Amsterdam: JAI Press, 161–178.

Chakrabarti, A. (2006). The Saving–investment relationship revisited: New evidence from multivariate heterogeneous panel cointegration analysis. *Journal of Comparative Economics*, 34, 402–419.

Coakley, J., Kulasi, F. & Smith, R. (1998). The Feldstein-Horioka puzzle and capital mobility: A Review. *International Journal of Finance and Economics*, 3: 169-188.

Coakley, J., Fuertes, A. M. & Smith, R. (2001). Small sample properties of panel time-series estimators with I(1) errors. *Birkbeck College Discussion Paper*, No O3/2001

De Wet, A.H. & Van Eyden, R. (2005). Capital mobility in sub-Saharan Africa: A panel data approach. *South African Journal of Economics*, 73, 1–22.

Eun, O. C. & Resnick, B. (2011). *International financial management*. (6th ed.). New York: McGraw-Hill companies.

Feldstein, M., & Horioka, C. (1980). Domestic saving and international capital flows. *Economic Journal*, 90, 314–329.

Fleming, J. M. & Mundell, R.A. (1964). Official intervention on the forward exchange market: A simplified analysis. Staff Papers, *International Monetary Fund*, 11 (March), 1-19.

Frankel, J. A. (1992). Measuring international capital mobility: A review. *American Economic Review*, 82(2), 197-202.

Frankel, J. (2012). Will emerging markets fall in 2012? Available: http://econintersect.com/b2evolution/blog3.php/2012/02/01/will-emerging-markets-fall-in

Freenstra R. C. & Taylor, A. M. (2008). *Introduction to international economics.* New York: Worth Publishers

Hadri, K. (2000). Testing for stationarity in heterogeneous panel data, *Econometric Journal*, 3, 148–161.

Ho, T.W. (2002). The Feldstein–Horioka puzzle revisited. *Journal of International Money and Finance*, 21(4), 555–564.

Im, K.S., Pesaran, M.H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels, *Journal of Econometrics*, 115, 53–74.

Isaksson, A. (2001). Financial liberalisation, foreign aid, and capital mobility: Evidence from 90 developing countries. *Journal of International Financial Markets, Institutions and Money*, 11, 309–338.

Jun, S. (2012). International capital mobility and its policy implications for Asia-pacific economies. *The Korean Social Science Journal*, 39(1), 19-35.

Kao, C., & Chiang, M.H (2000). On the estimation and inference of a cointegrated regression in panel data. *Advances in Econometrics*, 15, 179-222.

Kim, H. (2004). The measurement of international capital mobility using

panel cointegration estimators. *Seoul Journal of Economic*, 17(2)

Levin, A., Lin, C.F. & Chu, C. (2002). Unit root tests in panel data: Asymptotic and Finite-sample properties, *Journal of Econometrics*, 108, 1–24.

Maddala, G.S. & Wu, S. (1999). A comparative study of unit root tests with panel data and a new simple test, *Oxford Bulletin of Economics and Statistics*, 61, 631-652.

Mamingi, N. (1997). Saving–investment correlations and capital mobility: The experience of developing countries. *Journal of Policy Modelling*, 19 (6), 605–626.

Marashdeh, A. H. (2006). Financial integration of the MENA emerging stock markets. This Paper is Posted at Research Online. Http://Ro.Uow.Edu.Au/Theses/543

Mensah, S. (2006). *Regional capital markets, integration and harmonization: Way forward*. Ministry of Finance and Economic Planning, Ghana, Annual Conference of the African Stock Exchanges Association Johannesburg, South Africa

Murthy, N.R. (2005). Capital mobility in African countries: Evidence from panel data cointegration tests. *Indian Journal of Economics and Business*, 4 (2), 257–266.

Obstfeld, M. (1986). Rational and self-fulfilling balance of payments crises. *American Economic Review*, 76, 72-81.

Payne, J.E. & Kumazawa, R. (2005). Capital mobility, foreign aid, and openness: further panel data evidence from Sub-Saharan Africa. *Journal of Economics and Finance*, 29, 122–126.

Payne, J.E. & Kumazawa, R. (2006). Capital mobility and the Felstein–Horioka puzzle: Re-examination of the less developed countries. *The Manchester Scholl*, 74 (5), 610–616.

Pedroni, P. (2004). Panel cointegration: Asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis: New results. *Econometric Theory*, 20, 597–627.

Pedroni, P. (2001). Purchasing power parity tests in cointegrated panels. *Review of Economics and Statistics*, 83, 727-731.

Stock, J. H., & M. Watson, (1999). Forecasting inflation. *Journal of Monetary Economics*, 44. 293-335.

Taylor, A. (2003). *Domestic saving and international capital flows reconsidered.* New York: North Western University.

Waldsley, A., Felmingham, B., & Cooray, A. (2005). An Extended Feldstein-Horioka Test for the degree of capital mobility. *Discussion Paper*, No 2005-11. University of Tasmania.

Waki, N. (2007). No end in sight for yen carry craze. Reuters. Retrieved 2012-07-09