European Union Expansion and the Euro: Croatia, Iceland and Turkey

Cynthia Royal Tori, PhD
Valdosta State University
Langdale College of Business
1500 North Patterson Street
Valdosta, GA 31698

Scott Leander Tori, PhD
Troy University
Troy, Alabama 36082

Abstract

This paper uses real exchange rate variability and the adjustment time for real exchange rate changes to assess the viability of adopting the euro for the nine European countries. The results suggest that Croatia and Lithuania are the only European Union countries that have convergence and minimal real exchange rate volatility when shocks occur. The persistence of real exchange rate changes and slow adjustment times suggest that the viability of euro zone membership for Bulgaria, the Czech Republic, Hungary, Poland, and Iceland requires greater integration. The results also indicate that the costs associated with adopting a common currency are high for Romania and Turkey.

Keywords: euro, real exchange rates, monetary union, common currency

1. Introduction

Over the last decade, the European Union (EU) has successfully expanded its treaty membership from 15 to 28 member countries. The EU states that its membership is open to any European country that meets its democratic, political and economic criteria. The original EU member countries were Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom. Joining the EU during 2004 were the Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Slovenia and Slovakia. The most recent countries joining the EU were Bulgaria, and Romania during 2007, and Croatia in 2013.

As part of the economic and monetary integration, the EU introduced the euro as its common currency for member countries that met specific economic criteria. In 1999, eleven of the fifteen EU countries met the economic criteria and adopted the euro as their national currency. These countries were Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxemburg, the Netherlands, Portugal, and Spain. Greece met the euro qualifications and adopted the euro one year later. Of the EU expansion countries, the countries that have met the economic criteria and adopted the euro are Slovenia in 2007, Cyprus and Malta in 2008, Slovakia in 2009, Estonia in 2011 and Latvia in 2014. In total 18 of the 27 EU member countries have met the economic criteria and adopted the euro as their national currency.[1] Six of the thirteen expansion countries have adopted the euro as their national currency.[2]

Five European countries are candidate countries. These countries have expressed an interest in joining the European Union and have taken steps to modify their national laws to comply with EU standards. These countries are Albania, Iceland, Montenegro, Serbia, The Former Yugoslav Republic of Macedonia, and Turkey. Of the six countries, only Iceland is a member of the Schengen area and cooperation, which allows for the free movement of people within the country and operates within the EU legal framework.

---

[1] An additional thirty-two countries and territories have unilaterally adopted or directly pegged their national currencies to the euro.

[2] Cyprus, Estonia, Latvia, Malta, Slovakia, and Slovenia.

The recent recession and the on-going financial turmoil in Europe have called into question the viability of the euro for the 18 countries and the adoption of the euro by the non-euro EU countries.A question often asked is if the euro survives, is adopting the euro in the best interest of the country? This study examines this question for three European countries: Croatia, the newest EU member; Iceland, a candidate country that is already a member of the European Union area and contributes financially towards the social and economy cohesion of Europe; and Turkey, a candidate country whose accession negotiations have been on hold since 2005 over territory disputes with Cyprus.

In the spirit of the methodology proposed by Von Hagen-Neumann (1994), this study provides evidence to answer this question by examining the variability of real exchange rates and the persistence of real exchange rate shocks for the euro countries. The contributions of this study are to analyze two aspects of real exchange rate shock variability. First, the study compares real exchange rate variability for the euro countries over two time periods using the Newey-West (1987) variance estimator to predict real exchange rate shocks. This approach estimates coefficients in the presence of heteroskedasticity and corrects for autocorrelation so that the error term reflects real exchange rate shocks. Second, the study compares the persistence of real exchange rate changes over the two periods using ARIMA to estimate the coefficients; The AR (1) coefficient reflects the persistence of real exchange rate shocks over time.

2. Survey of Literature

Researchers have been using the variability of real exchange rates to assess the viability of a monetary union for nearly thirty-five years. Vaubel (1976, 1978) was the first to argue that real exchange rate variability is an empirical means to identify whether countries should form a common currency area. He argued that countries should adopt a common currency only if real exchange rate adjustments were small. Meltzer (1986) and Mussa (1986) supported this conclusion by finding that a flexible nominal exchange rate is preferred in the presence of large real exchange rate variability. When real exchange rate variability is large, the costs associated with maintaining the common currency would be too great.

Von Hagen and Neumann (1994) examined real exchange rate variability of several European countries and used the relative magnitude of the real exchange rate variance to assess real exchange rate variability and adjustment. They found that although Austria, Belgium, France, Germany, Luxembourg and the Netherlands were good candidates for a common currency area, Denmark, England and Italy were not good candidates. The high variability of real exchange rates with Germany needed further adjustment before monetary union. More recently, Haug et al (2000) and Kutan and Zhou (2008) examined the fifteen original EU member country real exchange rates and confirmed these results. Further, Kutan and Zhou (2008) found that joining the Eurozone lead to a more stable real exchange rate and faster adjustment of real exchange rate shocks.

Tori and Tori (2012) used the Von Hagen and Neumann methodology to assess real exchange variability for European Union member countries. The study results supported euro zone membership for Austria, Cypress, France, Germany, Italy, Luxembourg, Portugal, Slovakia and Spain. The persistence of real exchange rate changes and slow adjustment times found greater integration would be necessary for the long-term viability of euro zone membership for Belgium, The Netherlands, Finland, Malta and Slovenia. The results also indicated that the costs associated and viability of euro membership for Greece and Ireland were in question, suggesting that Greece and Ireland should consider dropping out of the euro zone.

This paper contributes to the literature by estimating the real exchange variability and the persistence of real exchange rate shocks for Croatia, Iceland and Turkey, and compares the results with non-euro EU member countries that have joined the EU since 2004. The variability and adjustment time results are used to identify which countries are viable euro members and which countries are not. The remainder of the paper discusses the data, model and results of the study.

3. Data and Model

This study examines the variability and sustainability of the euro for the nine European countries, seven EU member countries that have not yet adopted the euro and two EU candidate countries. The countries included in the study are Bulgaria, Croatia, Czech Republic, Hungary, Iceland, Lithuania, Poland, Romania and Turkey.

The dataset are the monthly harmonized indices of consumer prices (HICP) and the nominal exchange rate with the euro for each country from January 1999 through August 2013. All data was collected from the Euro stat database.

To estimate the variability and adjustment period, it is necessary to calculate the real exchange rate relative to the euro for each country. Lets$_{it}$ be the logarithm of the nominal exchange rate between country i and the euro, $_{pit}$ be the logarithm of the harmonized indices of consumer prices for the non-euro country i and p$_{€}$ be the logarithm of the harmonized indices of consumer prices for the euro. The real exchange rate between country i and Euro is

$Q_{i,€} = p_{it} + s_{it} - p_{€}$

where $Q_{i,€}$ is the real exchange rate for country i currency per euro at time t.

Given the geographical, cultural, regulatory and economic differences, the HICP includes seasonal conditions that are likely different across the countries. To estimate the real exchange rates shocks, $Q_{i,€}$, is regressed on a set of twelve month dummies using the using the Newey-West (1987) variance estimator. This approach estimates coefficients in the presence of heteroskedasticity and corrects for autocorrelation so that the error term, $r^1_{iG,t}$, reflects real exchange rate shocks.

$\Delta Q_{i,€} = \sum \beta D_m + r^1_{i€t}$

As suggested by Von Hagen and Neumann, the variability of exchange rate changes may be different over a short-run period (monthly) and a longer-run period (quarterly). They argue that monthly seasonally adjusted real exchange rate changes likely measures short-run variability while the quarterly data measures long-run real exchange rate variability. To measure the long-run variability, the quarterly seasonally adjusted real exchange rate changes is calculated by adding three consecutive non-overlapping changes,

$r^3_{i€t} = \sum_{m=0,2} r^1_{i€3t-m}$

To measure relative real exchange rate variability and changes in variability over time, the data are divided into two time periods. The first time period is January 1999 through December 2006. This time period covers the introduction of the euro and period leading up to the Great Recession. The second time period is January 2007 through August 2013. This time period covers the Great Recession and recent financial market turmoil.

4. Results

4.1 Real Exchange Rate Variability Results

Table 1 reports the monthly and quarterly seasonally adjusted real exchange rate variability results for the two time periods. Columns 1 and 2 of the monthly and quarterly results report the standard deviation or variability of the real exchange rate shocks. Column 3 of the monthly and quarterly results reports the test statistic for the null hypothesis that adopting the euro does not reduce the variability of real exchange rate shocks.

The results in Column 3 report whether or real exchange rate variability with the Euro has declined. For Bulgaria, the Czech Republic, Lithuania, Romania, and Turkey, real exchange rate volatility declined. While real exchange rate volatility increased for Croatia, Hungary, Iceland, and Poland, the increase was not significantly different between the two time periods. Being a member of the European Union does not guarantee a reduction in short-run real exchange rate variability. The quarterly results measuring long-run variability support similar results for all countries with Croatia, Hungary, Iceland, and Poland failing to reject the null hypothesis. These results align with Tori and Tori (2012) conclusions that joining a monetary union reduces exchange rate variability for the majority of euro member countries.

For a common currency area to be viable, the variability of real exchange rate shocks should be similar across countries. A small standard deviation suggests stable real exchange rate shocks and a smaller cost for a country that gives up its nominal exchange rate flexibility. Results in Table 1 columns 1 and 2 suggest that except for Romania and Turkey, real exchange rate variability was relatively low for all countries..

For the period 1999 through 2006, Croatia had the lowest variability, which was significantly different from the other countries.. This suggests that over this time period, Croatia experienced relatively stable real exchange rate shocks. The real exchange rate variability for the remaining eight countries was significantly higher than Croatia. Real exchange rate variability for Bulgaria, Czech Republic, Hungary, Lithuania, Poland and Iceland was significantly higher and four times more volatile than Croatia.

Real exchange rate variability for Romania and Turkey was significantly higher than all other countries.The significantly lower real exchange rate variability for Croatia is unexpected given Croatia is the newest member of the European Union.

For the period 2007 through 2013, the real exchange rate variability decline was significant for Bulgaria, the Czech Republic, Lithuania, Romania and Turkey. Despite the repercussions of the Great Recession, challenging economic conditions and Middle East unrest, real exchange rate variability has declined for five countries and has not changed significantly for the other four countries.

4.2 Persistence of Real Exchange Rate Changes Results

To measure the persistence of real shocks, the seasonally adjusted real exchange rate changes are regressed on the AR coefficients. The more economically integrated the economies, the less likely real exchange rate fluctuations will persist over time. A significantly positive autocorrelation coefficient shows that the real exchange rate changes do not tend to revert over time and therefore do not satisfy the conditions to have a viable currency area. A significantly negative autocorrelation coefficient signifies a self-reverting tendency of real exchange rate changes, indicating the convergence of the country's real exchange rate with Euro.

Of the European Union member countries, only the results for Lithuania indicate a convergence with the euro. During both time periods, the results are negative and significant. The only other country that showed convergence was Croatia during the post-Great Recession period. These results suggest that of the non-euro European Union members, real exchange rate changes did not persist for Lithuania and Croatia suggesting that adopting the Euro is a viable option for these countries. While during the pre-Great recession period the results for Hungary suggest convergence, the post-Great Recession findings show a significantly positive autocorrelation coefficient indicating that the real exchange rate changes did not revert over time. Bulgaria, the Czech Republic and Poland also had significantly positive autocorrelation coefficients. The results for the Czech Republic and Turkey suggest a movement in the wrong direction. The adjustment time for real exchange rate shocks were slower during the second time period indicating that real exchange rate changes were more persistent. These results suggest greater regional integration is needed for these countries or their viability within the euro zone is in question.

4.3 Implications of the Results

For countries to form a common currency area that will be viable over time real exchange rate shock variability must be low and the adjustment to real exchange rate changes should be fast. High variability and slow adjustment to real exchange rate changes indicate that the countries are not good candidates for a common currency area. Chart 1 combines the previous results and classifies the countries by variability and adjustment time.

The chart results indicate that Austria is the only country that meets the criteria of low variability and fast adjustment time. The results suggest that Cypress, France, Italy, Luxembourg, Portugal, Slovakia and Spain together with Austria and Germany form a viable and sustainable euro zone. The persistence of real exchange rate changes and slow adjustment time for The Netherlands, Belgium and Finland indicate that the countries do not satisfy the criteria for a viable common currency area. Since Estonia, Malta and Slovenia only recently joined the euro zone and economic conditions have been weak, it is too early to conclude that their euro zone membership is not viable. If they had not already joined the euro zone, the results suggest that membership would not be advisable at this time.

High variability and slow adjustment time suggest that Greece and Ireland should exit the euro zone. The cost associated with relinquishing nominal exchange rate flexibility as an instrument for real exchange rate adjustment between countries is great. Without greater integration, euro zone membership for Greece and Ireland is not viable.

5. Conclusion

This paper estimated the real exchange rate variability and the adjustment time for real exchange rate changes for the nine European countries that have not adopted the Euro to assess the viability of adopting the euro. A common currency area is viable as long as the real exchange rate variability is low and adjustment time for real exchange rate changes is fast. While none of the nine countries met this standard, Lithuania and Croatia show the greatest promise for euro expansion.

The persistence of real exchange rate changes and slow adjustment times suggest that viability of euro zone membership for Bulgaria, the Czech Republic, Hungary, Poland and Iceland requires greater integration. Without improvements, the persistence of the real exchange rate shocks may lead to distortions in the markets that could be reduced with flexible exchange rate. The results also indicate that the costs associated with euro zone membership are great for Romania and Turkey, and greater integration will be necessary for a common currency to be viability for these countries.

6. References

Haug, A., J. MacKinnon, and L. Michelis (2000). European Monetary Union: A Co integration Analysis, Journal of International Money and Finance, 19; 419-432.

Kenen, P. (1969). The Theory of Optimal Currency Areas: An Eclectic View, in R. Mundell and Swoboda (eds.), Monetary Problems of the International Economy.

Kutan, A. and S. Zhou (2008). The Enlargement of the European Union and the Behavior of Real Exchange Rates, Review of Development Economics, 12(3): 550-561.

McKinnon, R. (1963). Optimal Currency Areas, American Economic Review. 53: 717-725.

Meltzer, A.H. (1986). Size, Persistence, and Interrelation of Nominal and Real Shocks, Journal of Monetary Economics, 17: 161-194.

Mussa, M. (1986). Nominal Exchange Rate Regimes and the Behavior of Real Exchange Rates: Evidence and Implications, Real Business Cycles, Real Exchange Rates, and Actual Policies, Carnegie Rochester Convergence Series 25, Amsterdam: North Holland.

Newey, W.K. and K.D. West. (1987). A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix. Econometrica 55:705-708.

Rose (2000). One Money, One Market? The Effects of Common Currencies on International Trade, Economic Policy, 15.

Sachs, J and A. Warner (1995). Economic Reform and the Process of Global Integration, Brookings Papers on Economic Activity, 0:1-19.

Tori, C. R., Tori, S. L. (2012). Real Exchange Rate Stability and Adjustment for Non-Euro European Union Countries. Journal of International Finance and Economics, 12(2), 126-131.

Tori, C. R., Tori, S. L. (2012). What variability of real exchange rates implies about the success of the Euro. International Journal of Business and Social Sciences, 3(6), 278-283.

Vaubel, R. (1976). Real Exchange Rate Changes in European Community: The Empirical Evidence and Its Implications for Currency Unification, Weltwirtschaftliches Archiv 112: 423-470.

Vaubel, R. (1978). Real Exchange Rate Changes in the European Community: A New Approach to the Determination of Optimum Currency Areas, Journal of International Economics, 8: 319-339.

Von Hagen, J. and M. Neumann (1994). Real Exchange Rates Within and Between Currency Areas: How Far Away is EMU?, The Review of Economics and Statistics. 76: 236 - 244.

Weber, A. (1991). European Economic and Monetary Union and Asymmetries and Adjustment Problems in the EMS: Some Empirical Evidence, European Economy, 44(2) Special Edition.

Table 1: Standard Deviation and Constant Covariance Test of Real Exchange Rate Shocks

Country	Monthly results				Quarterly results		
	1999-2006	2007-2013	Constant covariance t-statistic		1999-2006	2007-2013	Constant covariance t-statistic
Bulgaria	.0864	.0433	3.988***		.0871	.0502	3.756***
Croatia	.0162	.0268	0.366		.0187	.0279	0.356
Czech Republic	.0868	.0388	5.001***		.0879	.0424	4.978***
Hungary	.0929	.1106	0.706		.0931	.1153	0.701
Iceland	.1081	.3745	0.083		.1046	.4130	0.121
Lithuania	.0962	.0441	4.756***		.0884	.0509	4.624***
Poland	.0742	.0995	0.556		.0724	.1107	0.534
Romania	.6849	.1675	16.721***		.6672	.1808	15.957***
Turkey	1.080	.2148	25.266***		1.098	.2128	24.354***

* Reject the null hypothesis at 10 percent
** Reject the null hypothesis at 5 percent
*** Reject the null hypothesis at 1 percent

Table 2: First-Order Autocorrelation of Monthly Real Exchange Rate Changes

Country	1999-2006		2007-2011	
	Average AR(1) Coefficient	z-test	Average AR(1) Coefficient	z-test
Bulgaria	0.7547	3.65***	0.9501	4.78***
Croatia	0.5443	1.68*	-0.9376	-10.60***
Czech Republic	-0.4919	-0.74	0.7829	5.79***
Hungary	-0.6771	-5.70***	0.7637	2.84***
Iceland	0.8648	11.77***	0.6946	1.04
Lithuania	-0.9828	-41.63***	-0.9999	-55.96***
Poland	-0.1379	-0.49	0.5245	3.23***
Romania	0.9863	28.27***	0.6338	1.33
Turkey	-0.0355	-0.01	0.8087	3.63***

* Reject the null hypothesis at 10 percent
** Reject the null hypothesis at 5 percent
*** Reject the null hypothesis at 1 percent

Chart 1: Classification of Countries Based Upon Variability and Adjustment Time

Adjustment time	Variability		
	Low	Medium	High
Fast		Lithuania	
Improving	Croatia		
No Change		Iceland	Romania
Slower		Czech Republic Hungary Poland	Turkey
Slow		Bulgaria	