HOW STRONG IS THE CASE FOR DOLLARIZATION IN COSTA RICA? A NOTE ON THE BUSINESS CYCLE COMOVEMENTS WITH THE UNITED STATES

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A Note on the Business Cycle Comovements with the United States

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Abstract

We evaluate the proposal for official dollarization in Costa Rica by applying a new approach to measure the business cycle comovements with the United States. While the literature often focuses on the correlation of shocks, we point out that the response of each country to the shocks is also an important aspect of stabilization policy. We analyze whether Costa Rica and the United States share a common synchronized response to shocks, i.e. a common business cycle, using the Engle and Kozicki (1993) and Cubadda (1999, 2007) serial correlation common features tests, in a quarterly GDP data set from 1991 to 2008. Although we find some tendency towards common AR(p) structures and common long run trends, we reject the hypothesis that the two countries share a common business cycle. Based on this evidence, we conclude that official dollarization in Costa Rica would impede the efforts of its stabilization policy, despite the relatively high contemporaneous correlation of shocks.

Keywords: Dollarization, Business Cycle Comovement, Serial Correlation Common Feature, Central America, Costa Rica

JEL: E32, F36, O54

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1 Introduction

In Costa Rica both, deposit and credit dollarization, have increased to shares of about 50% over the past decade.[1] The topic of official dollarization has therefore become an important part of the discussion on stabilization policy. Recently, in October 2008, the participant experts of an international seminar[2], among others several ex presidents of Latin American central banks, agreed on the recommendation that Costa Rica should officially introduce the dollar as valuta. Also, ex president of the Costa Rican Central Bank, Eduardo Lizano, argued that only a bill was needed for official dollarization. Furthermore, the issue is discussed regularly by academics in Costa Rica, e.g. in March 2009 during a forum that was organized by the Costa Rican University (UCR)[3].

Despite the intense political discussion, there is so far only little empirical evidence on the economic cost (and benefit) of a dollarization policy in Costa Rica and other Latin American countries.[4] Partly, this may be due to the lack of an easy to use comprehensive empirical framework to address the issue of dollarization and its implications for stabilization policy. Although it is clear that one of the main costs - giving up an individual monetary policy to smooth the business cycle - is reduced substantially when business cycles are synchronized and the correlation of shocks is high, the empirical literature so far has mostly focused on the latter of the two.

In a seminal paper Bayoumi and Eichengreen (1993) have proposed a method to empirically address the issue of optimum currency areas that can also be used for fixed exchange rate regimes or full dollarization. Applying the Blanchard and Quah (1989) procedure to decompose temporary and permanent shocks in a time series, the authors identify demand shocks as the transitory component of GDP. They find that the correlation among the demand shocks is not very high in the European Union and conclude that Europe might not be an optimum currency area (OCA), according to the OCA model of Mundell (1961).[5] Related trend/cycle decompositions have been used for Costa Rica by Fiess (2007), who focuses on the contemporaneous correlation of shocks in a study on regional business cycle integration.

In our view, this approach provides only incomplete information to policy makers for the following two reasons. On the one hand, it is well known that there may also be permanent demand shocks or temporary supply shocks. It is therefore helpful to also investigate the full time series in growth rates. More importantly, on the other hand, the contemporaneous correlation of the transitory component (or the full time series) may not be sufficient, as a basis for a common monetary policy. Even when the correlation of shocks between

[1] See figure A.1 in the appendix.
[2] The seminar was titled "Reforma monetaria urgente, con o sin el Banco Central" and organized by the Instituto Libertad.
[3] The topic of the forum, where one of the principal speakers, Dr. Luis Loría Rojas, recommended official dollarization, was "Causas, dimensiones y consecuencias previsibles de la crisis financiera global y su impacto para Costa Rica".
[4] For a theoretical model of a small open economy and the costs of dollarization see Schmitt-Grohe and Uribe (2001); Levy Yeyati and Sturzenegger (2002) give a review of the issue of dollarization; and Mishkin and Savastano (2001) give an overview of monetary policy options for Latin America, including currency boards and dollarization.
[5] An analysis of exchange rate regime choice, based on the correlation of shocks, is also given in Berger, Jensen, and Schjelderup (2001).

two countries is high, the response of each country to a shock - often interpreted as a business cycle - can be very different. When one country reacts to and absorbs the shock more quickly than the other, it is still difficult to implement a common monetary policy.

In order to address this issue, we investigate whether there exist common reactions to a standard shock in Costa Rica and the USA, using the test for common serial correlation that was first developed by Engle and Kozicki (1993) and Vahid and Engle (1993) and later extended by Cubadda (1999, 2007).[6] The authors show that it is possible to test for common serial correlation (i.e. a common business cycle) by constructing a linear combination of the two time series (that each follow an AR(p)-process) that is free of autocorrelation. If it is feasible to construct such a linear combination, it implies that there exists a common AR(p)-structure, as well as a perfectly collinear response of two time series to a standard shock.

The existence of such a common reaction to shocks would be an ideal precondition for official dollarization. For Costa Rica, however, we will show that this precondition is not met. We find that although in recent years there is some tendency towards common AR(p) structures and towards common long run trends, we reject the hypothesis that Costa Rica and the USA share a common business cycle. Thus, from a perspective of macroeconomic stabilization, Costa Rica appears to be better off not abandoning its - only recently gained[7]- scope of independent monetary policy by officially dollarizing the economy.[8]

The next section contains the data description. In section three, we start by estimating the AR(p)-process of each time series, that best fits the data. We then, after testing for unit roots and cointegration, conduct the test for common feature using both the Engle and Kozicki (1993) two stage least squares procedure and the Cubadda (1999, 2007) GMM approach. Section 4 gives a review of the related literature and the last section concludes.

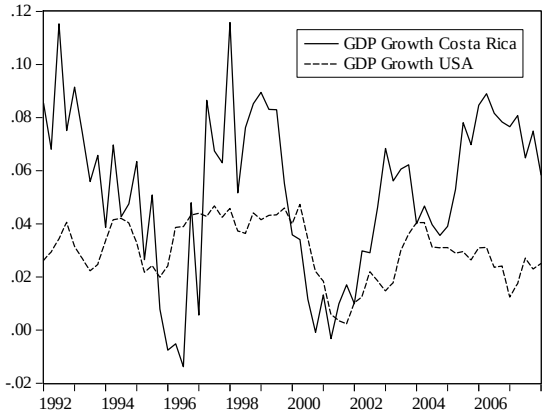
2 Data

The time series for Costa Rica, quarterly GDP from 1991:1 to 2008:1 in constant prices, seasonally adjusted and in millions of domestic currency, was obtained from the *Latin American and Caribbean Macro Watch* of the *Inter-American Development Bank*. Equivalent data for the USA were retrieved from the *International Financial Statistics* Database of the *International Monetary Fund*. The growth rates of GDP are displayed in figure 1.

In Costa Rica two stagnation periods stand out: the first in the mid- to late 1990s, a period in which many countries in Latin America experienced financial crisis[9], and the second the world wide slowdown in

[6] See Urga (2007) for an overview of recent developments in the literature of common features in time series.
[7] In 1984 Costa Rica had implemented a crawling peg system ("minidevaluaciones") that was transformed into a crawling band on October 17, 2006. The exchange rate anchor has been the US$ (see IMF - Staff Report (2009)).
[8] An optimal monetary and fiscal policy for a small open economy with a flexible exchange rate has recently been proposed by Ball (2009).
[9] Laeven and Valencia (2008) date a systemic banking crisis to 1994 in Costa Rica.

Figure 1: GDP growth rates of Costa Rica and the USA



Note: GDP growth rates of Costa Rica and the USA are displayed.
Source: IADB and IMF (see table A.1 in the appendix).

the beginning of the 21st century. The latter period has also been a time of slow growth in the United States. Over the sample period, it appears that the volatility of output has declined in Costa Rica. The relatively high volatility at the beginning of the sample, however, is not due to remaining seasonal components of the data as the peaks occur very irregularly. Possibly the decline in volatility in the mid-90s can be ascribed to the change in the Central Bank's policy: Until the end of 1995 inflation was only a secondary objective, though from 1996 onwards the main objectives for monetary policy have been price and exchange rate stability.

Table 1: Contemporaneous correlations between the GDP cycles of Central American countries and the USA

Contemporaneous Correlations between the Growth Rates of GDP

	Belize	Costa Rica	Dominican Republic	El Salvador	Nicaragua	Panama	USA
Belize	1						
Costa Rica	0.050	1					
Dominican Republic	-0.375	0.273	1				
El Salvador	-0.353	0.502	0.245	1			
Nicaragua	-0.067	0.153	-0.032	0.236	1		
Panama	-0.304	0.606	0.415	0.688	0.143	1	
USA	-0.142	0.299	0.052	0.108	0.301	0.218	1

Note: Contemporaneous correlations (in pairwise samples) are displayed for the Central American countries and the USA.

The contemporaneous correlations of the GDP growth rates of Central American countries and the USA

are displayed in table 1. The GDP growth rate of Costa Rica is positively correlated with the GDP growth rates of all other Central American countries and also with the one of the USA. However, the contemporaneous correlation with the latter is with 0.299 relatively small.[10] Still, among Central American countries, only Nicaragua and Panama have likewise high correlations: Nicaragua's contemporaneous correlation with the USA is slightly higher (0.301) and Panama has even a somewhat smaller correlation (0.218). Though, in Nicaragua the issue of dollarization is not relevant due to the political situation in the country, and Panama has already adopted full dollarization in 1904.[11]

3 Business Cycle Synchronization

3.1 AR(p)-Process

In this section, we conduct our analysis of common business cycles. Although the contemporaneous correlation is not very high, it may still be the case that the two countries respond similarly to shocks. We start by identifying the AR(p)-processes of our GDP data. We estimate AR representations for each variable with the following equation:

$$y_t = \mu + \sum_{i=1}^{p} \beta_i y_{t-i} + \epsilon_t,$$

with y_t = GDP at time t, p = lag parameter and ϵ_t = an innovation term. We then select the most parsimonious AR(p)-process[12] by identifying the minimum lag length that is needed to remove all autocorrelation from the residuals.

Table 2 shows the identified AR(p)-structures of the American and the Costa Rican GDPs for 10 different sub-samples. Each sample starts at the indicated date and ends in 2008:1. The American GDP is always optimally specified as an AR(1)-process, in all samples. The Costa Rican GDP however, is characterized by different AR(p)-processes depending on the chosen sub-sample. In the two largest sub-samples, starting in the early 1990s, the data is best described by an AR(4)-process; in the following two sub-samples, starting 1994 and 1995, as AR(3); then, in the sub-samples starting 1996 to 1998 as AR(2); and finally, from 1999 onwards, the data follow an AR(1)-process. This finding, can be interpreted as a first indication that the Costa Rican cycle has become more similar to the US cycle in recent years.[13] In addition, this implicates that synchronized common serial correlation patterns (that we will later interpret as common business cycles)

[10] Note that the correlation of the shocks, after fitting an AR(1) process, is somewhat lower in Costa Rica, with a value of 0.094.

[11] Goldfajn, Olivares, Frankel, and Milesi-Ferretti (2001) analyze the disadvantages and advantages of dollarization on the example of Panama, one of the largest dollarized economies in the world, comparing the country especially with Costa Rica and Argentina to control for idiosyncratic effects.

[12] In order to generate the best condition for finding cyclical comovement, we choose the most parsimonious model. However, using the AIC or SIC criterion to choose the lag length does not change the results qualitatively (see also table 6 where the common feature test is conducted with different lag length).

[13] Note that, the convergence of the Costa Rican GDP data towards an AR(1)-representation is not trivially caused by the simple reduction of the number of observations as the sub-samples become smaller. Conducting the same analysis with rolling windows of each 33 observations, i.e. the first sub-sample is 1992:1 - 2000:1, the second 1993:1 - 2001:1, and so on, yields similar results: only the first two sub-samples are described by different AR(p)-processes (AR(3)); for the remaining sub-samples we get the same results.

Table 2: AR(p) representations of GDP-series

	AR(p) - Process Q-Statistics (5 respectively 10 lags)									
	1992:1	1993:1	1994:1	1995:1	1996:1	1997:1	1998:1	1999:1	2000:1	2001:1
Costa Rica										
optimal lag length	4	4	3	3	2	2	2	1	1	1
Q(5)	1.072	1.086	5.266	3.932	8.395	8.871	5.666	3.317	3.123	2.201
Q(10)	4.986	5.755	10.920	8.580	13.171	13.996	9.260	11.101	8.527	7.192
USA										
optimal lag length	1	1	1	1	1	1	1	1	1	1
Q(5)	4.272	4.307	3.783	4.029	3.932	3.204	3.563	2.263	1.395	3.645
Q(10)	5.956	5.795	8.133	8.542	7.701	7.710	8.433	6.095	3.702	6.812

Note: AR representations of the process of the time series of national GDP data are reported for different sub-samples, which differ in their starting point. Each sample ends in 2008:1. Under the restriction that the residual is free of autocorrelation, the specification with the smallest number of AR terms is selected. Q-Statistics of 5 and 10 lags are reported beneath.

can only be found in the last three sub-samples (1999 onwards). In the following section, we will test this hypothesis more formally.

3.2 Stationarity

In this section, we test for the stationarity of the time series in those sub-samples, where both, Costa Rica and the USA, follow a common AR(p)-process, using the Augmented-Dickey-Fuller (ADF) test:

$$\Delta y_t = \mu + \gamma y_{t-1} + \sum_{j=1}^{p} \phi_j \Delta y_{t-j} + \epsilon_t,$$

where Δ is the first difference operator. The lag parameter p is determined by the Akaike information criterion (AIC) and the finite sample critical values from Cheung and Lai (1995) are used.

The results of the ADF test are displayed in table 3. In the first sub-sample, 1999:1 - 2008:1, both series are non stationary in growth rates.[14] Thus, even if they follow both AR(1)-processes, it is not possible to formally test for common cycles, as the test for common serial correlation requires stationarity. However, in the other two sub-samples, starting 2000 and 2001, the American and the Costa Rican GDP are stationary in growth rates and it is possible to test for common cycles in theses two sub-samples.

[14] Using the SIC criterion does not yield I(1) series either.

Table 3: Results of ADF-test for GDP data

ADF-Test - t-Statistic

	1999:1		2000:1		2001:1	
	level	1st diff.	level	1st diff.	level	1st diff.
Costa Rica	1.794	-2.789	2.649	-3.174 **	1.709	-2.947 **
USA	-0.769	-1.926	0.420	-3.244 **	0.551	-3.209 **

Note: ADF-test statistics are reported for three different sub-samples, all ending in 2008:1. For both, GDP data of Costa Rica and the USA, the ADF-test was conducted in level and in logarithmized growth rates. The lag length was selected by the AIC criterion. Critical values of Cheung and Lai (1995) were applied. ** indicate rejection of the existence of both, stochastic and deterministic, trends with a significance of 5%.

3.3 Common Stochastic Trend

As another preliminary exercise, we test for cointegration using the Johansen (1988, 1991) maximum likelihood approach, allowing for an intercept in the cointegrating equations:

$$Y_t = \mu + \sum_{i=1}^{p-1} \Gamma_i Y_{t-i} + \epsilon_t$$

where Y_t is a 2×1 vector of the GDP series, μ is an intercept vector and ϵ_t is a vector of innovation terms.

The canonical correlations between the least squares residuals of the two subsequent regressions are calculated in order to deduce the maximum eigenvalue test statistic:

$$\Delta Y_t = \mu_1 + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \epsilon_{1t}$$

$$\text{and} \quad Y_{t-p} = \mu_2 + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \epsilon_{2t}.$$

The null hypothesis of the maximum eigenvalue statistic claims that there are r, and the alternative hypothesis that there are $r+1$ cointegrating vectors:

$$\text{Maximum Eigenvalue Statistic} = -T\, ln(1 - \lambda_{r+1}).$$

The critical values of Osterwald-Lenum (1992), corrected with the scaling factor of Cheung and Lai (1993) to control for a possible finite-sample bias, are then compared with the calculated test statistics.

The results of the Johansen test are shown in table 4. We find that, except for the 1998 sub-sample, the American and the Costa Rican GDP are cointegrated in all sub-samples from 1996 onwards. Again, this result supports the view that a process of convergence has taken place. In all recent sub-samples, GDP data

Table 4: Results of Johansen cointegration test for GDP of Costa Rica and the USA

Johansen Test (Maximum Eigenvalue Statistic) - Costa Rica and USA										
	1992:1	1993:1	1994:1	1995:1	1996:1	1997:1	1998:1	1999:1	2000:1	2001:1
r=0	13.637	11.376	11.776	10.627	27.849 ***	25.604 ***	15.716	52.122 ***	49.100 ***	49.408 ***
r=1	3.429	3.673	6.020	5.212	8.917	5.257	4.307	7.195	5.973	2.346

Note: Results of testing for cointegration between the GDPs of Costa Rica and the USA are shown for different sub-samples. All samples end in 2008:1. The table contains the Maximum Eigenvalue statistics for r=0 and r=1. The critical values of Osterwald-Lenum (1992) were scaled with the scaling factor of Cheung and Lai (1993) to adjust for finite samples. *** indicates the rejection of the null hypothesis with a significance of 1%.

of both countries share a common stochastic trend. Thus, in the subsequent analysis of common cycles, an error-correction term will be included in the test for common cycles in both sub-samples (2000 and 2001).

3.4 Common Cycle

We can now analyze whether the US and the Costa Rican GDPs share a common serial correlation pattern in the two sub-samples 2000 - 2008 and 2001 - 2008. We start with the two-stage least squares (TSLS) approach of Engle and Kozicki (1993). The first regression

$$x_t = c + \beta y_t + \epsilon_t \tag{1}$$

is estimated with TSLS, including as instruments all lagged variables of x and y, i.e. x_{t-k} and y_{t-k} for $k = 1, ..., p$ as well as the lagged error correction terms, ec_{t-k}. $(1, \beta)$ is the normalized common feature vector.

Then, we analyze whether the estimated residual $\hat{\epsilon_t}$ still contains autocorrelation that affects the present values through the same channels as x_t and y_t by estimating the following equation:

$$\hat{\epsilon_t} = c + \sum_{k=1}^{p} \delta_k x_{t-k} + \sum_{k=1}^{p} \gamma_k y_{t-k} + \sum_{k=1}^{p} \phi_k ec_{t-k} + u_t. \tag{2}$$

The null hypothesis is defined as all parameters being not statistically different from zero. If all lagged variables do not explain the estimated residual, the common AR(p)-pattern has been removed in the first regression. H_0 is tested with the F-statistic:

$$F_{k-1,T-k} = \frac{R^2}{1-R^2} \frac{T-k}{k-1},$$

where T denotes the number of observations and k refers to the number of restrictions, i.e. the number of

exogenous variables including the constant. R^2 is the R-squared of regression 2. Thus, if the null hypothesis cannot be rejected, evidence in favor of a common cycle is established.

Table 5: Results of serial correlation common feature tests for Costa Rica and the USA

Serial Correlation Common Feature Tests - Costa Rica and USA

	2000:1		2001:1	
	test statistic	vector	test statistic	vector
TSLS	32.697 ***	0.906 [i]	12.626 ***	1.522
GMM	19.772 ***	-0.785	5.451 **	-2.612 [i]

Note: Results of the TSLS estimation and GMM estimation of serial correlation common features between the GDP growth rates of Costa Rica and the USA are reported for the sample 2000:1 - 2008:1 and 2001:1 - 2008:1. In the columns *test statistic* F-statistics are reported for the TSLS and X^2-statistics for the GMM approach. The columns titled *vector* report the coefficient β of the common feature vector. ***, ** indicates the rejection of the null hypothesis with a significance of 1%, 5%; i implies that the coefficient β of the common feature vector is insignificant.

Results of the serial correlation common feature test (with TSLS estimation) are displayed in the first row of table 5. Our results clearly indicate that the null hypothesis of a common cycle is rejected at conventional levels.

Cubadda (1999, 2007) argues that an optimal general method of moments (GMM) estimation is more appropriate than a TSLS estimation for testing for common cycles, due to its relative efficiency. As table 5 shows, our results are also unchanged, when using the optimal GMM test proposed by Cubadda (1999, 2007).

Additionally, as a robustness check, we disregard the question of stationarity and the requirement of common lag structures and conduct the same serial correlation common feature test for all sub-samples including from one to four lags in the estimation equations. Results are reported in table 6 and confirm our previous finding that the series under consideration do not share a common AR(p)-structure.

Graphically our main finding is also confirmed when plotting the autocorrelation functions of the Costa Rican and the US GDP growth rates. A common feature (i.e. common reactions to a standard shock) would also imply a perfect collinearity between the two autocorrelation functions. As figure 2 shows, this is clearly not the case. The US GDP reacts to a shock much faster than the Costa Rican GDP does.

4 Related Literature

Over the last ten years, some authors have given a cautious recommendation for dollarization in Central America. Berg, Borensztein, and Mauro (2002) and Salvatore (2001) both discuss the issue of dollarization

Table 6: Comprehensive serial correlation common feature tests (TSLS)

Serial Correlation Common Feature Tests (TSLS) - Costa Rica and USA

	1992:1		1993:1		1994:1		1995:1	
lags	F-statistic	vector	F-statistic	vector	F-statistic	vector	F-statistic	vector
1	14.8504 ***	0.8285	15.5193 ***	0.7112 [i]	14.6203 ***	0.7254 [i]	14.7326 ***	0.7657 [i]
2	13.5584 ***	0.8222	10.2725 ***	0.7125	9.91173 ***	0.7451	9.85820 ***	0.8290
3	8.16529 ***	0.7421	7.01634 ***	0.7157	7.01969 ***	0.7751	6.88728 ***	0.7579
4	13.0250 ***	0.9319	12.1673 ***	0.9126	11.8940 ***	0.9528	11.4703 ***	0.8496

	1996:1		1997:1		1998:1		1999:1	
lags	F-statistic	vector	F-statistic	vector	F-statistic	vector	F-statistic	vector
1	14.0395 ***	0.6851 [i]	9.26704 ***	1.0723	22.7820 ***	0.9978	33.6471 ***	0.9187
2	8.50670 ***	0.7682	9.42200 ***	1.1425	13.0782 ***	1.1332	15.9624 ***	0.8214 [i]
3	4.60262 ***	0.8842	5.67469 ***	1.1642	9.39087 ***	1.0393	12.2153 ***	0.6768 [i]
4	8.12200 ***	1.0329	8.15277 ***	1.2606	9.47803 ***	1.0443	12.5931 ***	0.7945 [i]

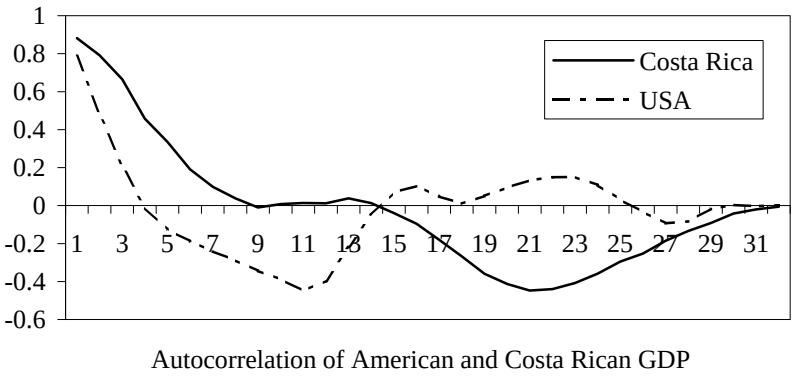
	2000:1		2001:1	
lags	F-statistic	vector	F-statistic	vector
1	32.6967 ***	0.9056 [i]	12.6264 ***	1.5220
2	12.2079 ***	1.2102	5.95512 ***	1.1975
3	6.3466 ***	1.4664	4.08710 ***	0.8351 [i]
4	4.78911 ***	1.4742	5.18653 ***	0.4094 [i]

Note: Results of the TSLS estimation of the serial correlation common features between the GDP cycles of Costa Rica and the USA are reported for all samples, including from 1 to 4 lags in the regression equations. In the first columns F-statistics are reported. The columns titled *vector* report the coefficient β of the common feature vector. *** indicates the rejection of the null hypothesis with a significance of 1%; i implies that the coefficient β of the common feature vector is insignificant.

in Latin America and conclude that the Central American countries might be good candidates for a fixed exchange rate with the USA. Alesina, Barro, and Tenreyro (2002), who test in a large set of countries whether they should belong to a dollar-, a euro-, or a yen-area, assign the Central American countries clearly to the dollar-area.

A recent study about the costs of dollarization for Central America was conducted in Fiess (2007). Using

Figure 2: Autocorrelation function of growth rates of American and Costa Rican GDP



Note: The Autocorrelation functions of the growth rates of the GDP of Costa Rica and the USA are displayed for the sample 2000:1 - 2008:1.

different filters to identify the cyclical component of GDP, he analyzes business cycle synchronization of Central America and the USA - measured by the contemporaneous correlations between the cycles - and calculates the degree of trade integration in DR-CAFTA with annual GDP data from 1965 - 2005 and monthly data on economic activity from 1995 - 2005. He finds that Costa Rica has the highest business cycle synchronization with the USA of the Central American countries, and that all of them have become more sensitive to developments of the American economy in recent years, an observation that is consistent with our findings. Nevertheless, Fiess (2007) concludes that his evidence does not make a good case for macroeconomic coordination between Central America and the United States.

Also Schmitt-Grohe and Uribe (2001) are sceptical of a policy of dollarization. Focusing on Mexico and using a calibrated general equilibrium model, they conclude that dollarization is the least preferable option among different monetary policy regimes, from a welfare point of view.

Finally, Ahmed (2003) points out that external shocks only play a limited role for business cycle fluctuations. He concludes that fixed exchange rates in Latin America may not be as costly as theory predicts.

The common cycle approach of Vahid and Engle (1993) has also been applied to (annual) output data in Central America in Roache (2008), although not in the context of dollarization. The author analyzes annual real GDP from 1950 to 2006 in a multivariate framework including both Central American countries and the United States. For the purpose of addressing the policy issue of dollarization, the bivariate framework, and the extension of Cubadda (2007), allows us to clearly attribute the common cycle (or the lack of it) to specific individual countries, such as Costa Rica and the US. The multivariate framework is, however, useful for addressing the issue of a potential monetary union among several countries. This has been done for instance by Cheung and Yuen (2005) in the context of a policy debate of a potential currency union in Northeast Asia. Using the approach of Vahid and Engle (1993), the authors reject that China, Japan and Korea form an optimum currency area. In an analysis of the introduction of the Euro as a single currency,

Westermann (1998) reported that Germany, France and Italy share a common business cycle, also applying the Vahid and Engle (1993) procedure.

5 Conclusions

The contribution of this note is to analyze the issue of dollarization by focusing on the business cycle synchronization and its implications for stabilization policy. We emphasize that in addition to the correlation of shocks the reaction of each country to a shock is of high relevance for a common monetary policy. Even if the growth rates of the GDP are highly correlated, the reaction to a shock - that can be interpreted as the business cycle - may differ significantly across countries. We apply the test for common serial correlation to a data set from Costa Rica, where the topic of dollarization has been - and still is - an important part of the discussion on stabilization policy. Although we find some evidence for a convergence process in the last years, with respect to a common autoregressive structure and a common stochastic trend, we can not confirm the existence of a common business cycle between the GDP growth rates of Costa Rica and the USA. This finding is likely to hold also for the other Central American countries, as Costa Rica was the most promising candidate for the analysis of a common serial correlation with the US.[15]

We focused on the synchronization of business cycles. For a complete analysis, further research remains to be done. For instance, if other instruments, such as remittances, were important to stabilize the home economy, the costs of a fixed exchange rate would be reduced.[16] Further issues are the degree of capital market integration and the potential for fiscal transfers that play an important role. Finally, it remains an open issue how official dollarization would affect the magnitude of the business cycle in the domestic country itself. All countries that presently consider dollarization, including Costa Rica, already have a relatively high degree of unofficial dollarization. Edwards (2008) considers the degree of dollarization as one of the sources of macroeconomic vulnerability and financial crisis. The potential output cost of currency or twin crisis, that can result from only partial dollarization have been estimated by Hutchison and Noy (2006).[17] Further, Tornell, Westermann, and Martinez (2003) have shown that highly dollarized middle income countries experience pronounced boom-bust cycle episodes. In addition to the classical issue of monetary policy coordination that we focus on, further research would be needed to understand how partial vs. full dollarization affects the link between regular business cycle fluctuations and the vulnerability to financial crisis and pronounced boom-bust cycles.

[15] We have also tried to apply the analysis for other Central American countries. However, often the growth rates of the GDP are non stationary or the AR(p)-structure differs from the American equivalent.

[16] Freund and Spatafora (2008) show that reductions in transaction costs (e.g. by reducing the exchange rate volatility) increase remittance flows. Thus, one hypothesis to test would be that dollarization leads to an increase in remittances and thus to a stabilization of the domestic economy.

[17] The link between dollarization and systemic risk is also explored in Bacha, Holland, and Gonçalves (2009).

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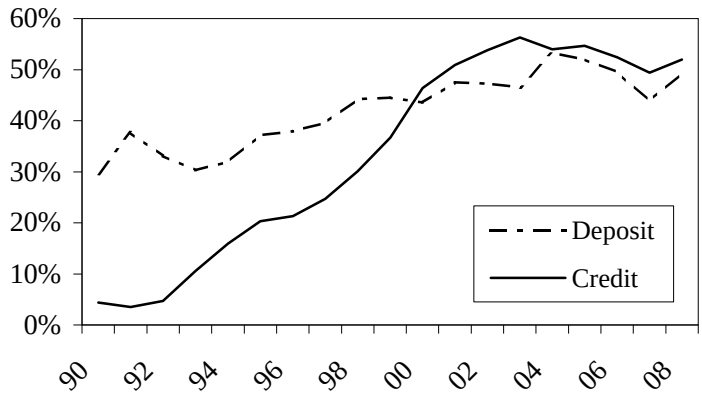
Appendix

Table A.1: Data sources

Data Sources			
Country	Data	Source	Max. Sample
Belize	GDP, constant prices, seasonally adjusted, millions of domestic currency	Latin American and Caribbean Macro Watch Research Department, Inter-American Development Bank http://www.iadb.org/res/lmw.cfm	01:1 - 08:4
Costa Rica			91:1 - 08:4
Dominican Republic			92:1 - 08:4
El Salvador			90:1 - 08:4
Nicaragua			94:1 - 08:1
Panama			96:1 - 08:4
USA	GDP Volume, 2000 reference year (chained), seasonally adjusted, millions of national currency	IFS, 11199B.RZF… International Monetary Fund http://www.imfstatistics.org/imf/	90:1 - 08:4

Note: Data sources and the maximal availability are displayed.

Figure A.1: Unofficial dollarization in Costa Rica



Unofficial Dollarization in Costa Rica

Note: The degree of deposit and credit dollarization (in %- end of period) in Costa Rica are displayed.
Source: Latin American and Caribbean Macro Watch, Inter-American Development Bank