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**Wirtschaftswissenschaftliche Fakultät  
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**The Theory of Optimum  
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Emerging Markets**

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# The Theory of Optimum Currency Areas and Growth in Emerging Markets

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## **Abstract**

We test for the impact of exchange rate volatility on growth in emerging market economies based on the theory of optimum currency areas. Our findings provide evidence for a positive impact of exchange rate stability on growth.

*Keywords:* OCA, growth.

*JEL classification:* F31.

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## **1. Introduction**

The 1997/98 Asian crisis and the obligation of 12 new EU member states to join the European Monetary Union have triggered a controversial discussion about the costs and benefits of stable exchange rates in emerging market economies. Because the theoretical literature on the impact of fixed exchange rates on the growth performance of emerging market economies has not provided clear evidence, the answer to this question has remained an empirical matter.

Most previous empirical studies on the impact of the exchange rate regime on growth have used (neo-classical) growth models as a theoretical framework (e.g. Aghion et al., 2006 and Ghosh et al., 2003). In addition to (inter alia) investment per gdp, input per worker, secondary education and inflation, proxies for exchange rate volatility have been added as explanatory variables of growth. While these studies have provided useful insights on the impact of the exchange rate stability on growth, they have neglected the theory of optimum currency areas which provides important information about the motivation of fixing exchange rates (irrevocably).

Building upon Schnabl (2009) the paper intends to close this gap for a sample of East Asian, Emerging European and Latin American countries, which are the most prominent groups of emerging market economies.

## **2. The Theory of Optimum Currency Areas**

The theory of optimum currency areas has provided important insights concerning the adoption of a common currency or fixing exchange rates. The seminal paper of Mundell (1961) links the choice of a common currency to heterogeneity. Monetary and exchange rate policies are regarded as (Keynesian) tools to cope with idiosyncratic real shocks. This implies that emerging market economies which are at a different stage of economic development than their potential anchor country should not peg their exchange rates or would otherwise face losses in terms of their growth performance. McKinnon (1963) responded that for the choice of the exchange rate regime of small open economies nominal shocks matter: by stabilizing exchange rates emerging market economies can stabilize the domestic price level, create certainty for domestic investment and reduce the transaction costs for international trade.

Later contributions by Mundell (1973) stressed that capital market integration can contribute to the absorption of asymmetric shocks as international borrowing and lending helps to smooth consumption. In contrast to Mundell

(1961), monetary and exchange rate policies were understood as an independent source of volatility because foreign exchange markets are not efficient. Furthermore, in many emerging market economies monetary policies have tended to be sources of instability. Moving into a monetary union would be equivalent to eliminating instability related to undisciplined macroeconomic policies.

Implicitly or explicitly the OCA theory as discussed above has defined the costs and benefits of a common currency or a fixed exchange rate in terms of the growth performance under a specific monetary arrangement. This motivates us to use real growth on the left side of our econometric framework.

### **3. Data and Estimation Framework**

To identify the effect of exchange rate stability on growth in emerging market economies in the light of the OCA theory, we specify a cross-country panel model for 17 Emerging European, 9 East Asian and 10 Latin American countries which mostly have dismantled capital controls during the observation period. The data sources are IMF International Financial Statistics, IMF World Economic Outlook and the national central banks. We use yearly data from 1990 to 2007. For Emerging Europe the sample periods start in 1994 because the pre-1994 data of the former transition economies are unstable and fragmented.

We explain economic growth by exchange rate volatility and a set of control variables that represent the transmission channels from exchange rate volatility to growth as discussed by the OCA literature:

$$w_{it} = \gamma_i + \phi b_{it} + v_{it}' \delta_i + \varepsilon_{it} \quad (1)$$

where  $w_{it}$  is the vector of yearly real growth rates from 1990 to 2007 for the countries  $i$ . The explanatory variables consist of indicators for exchange rate volatility  $b_{it}$  ( $\sigma, z$ ) and the matrix of control variables  $v_{it}$ .

The volatility measures are calculated for every calendar year based on monthly averages. First, the standard deviation of percent exchange rate changes ( $\sigma$ ) can be seen as a proxy for uncertainty and transactions costs. Second, we use the z-score ( $z_i = \sqrt{\mu_i^2 + \sigma_i^2}$ ) as proposed by Ghosh et al. (2003) that additionally includes the arithmetic average of percent exchange rate changes ( $\mu$ ), which can be seen as a proxy for gradual depreciations or appreciations.

As most countries in Emerging Europe have redirected their exchange rate policies towards the euro, their volatility measures refer to the euro. For the East Asian and Latin American countries exchange rate volatility is measured with regard to the dollar. The exchange rate volatility proxy is nested in a set

of control variables coming from the augmented OCA framework as described in section 2. First, Mundell's (1961) asymmetric shocks are represented by ten-year rolling backward-looking correlation coefficients of growth rates with the anchor country. Additionally, one time asymmetric shocks are approximated by crisis in emerging market economies which have proved to be more vulnerable to economic turmoil than industrialized countries.

Second, following McKinnon (1963) inflation is used as a proxy for macroeconomic stability and growth rates of dollar exports are used as a proxy for trade. Based on Mundell (1973) the interest rate differential calculated as the interest rate differential corrected by exchange rate changes versus the anchor country is used as a proxy for capital market integration. Alternatively, interest rates are used instead assuming that high interest rates represent fragmented capital markets and low interest rates represent integrated capital markets. A dummy for depreciations larger than ten percent per year, used as interaction term, controls for uncertainty originating in instable macroeconomic policies and inefficient foreign exchange markets.

#### **4. Estimation Results**

A dynamic GMM model as proposed by Arellano and Bond (1991) and Arellano and Bover (1995) is used for the estimations because in particular the



control variables (inflation, interest rate, exports) are likely to be subject to endogeneity.

Table 1 reports the results for the whole sample. There is strong evidence that exchange rate volatility affects growth negatively, if exchange rate volatility is measured in terms of both standard deviations and z-scores. All respective coefficients have the expected negative signs indicating that higher volatility is linked to less growth. In four out of six specifications the volatility measures are highly significant.

[Table 1]

The OCA proxies have the expected signs, mostly at highly significant levels. Business cycle correlation has a positive impact on growth. The crisis dummy takes the expected negative signs and is highly significant. Inflation turns out negative as projected by McKinnon (1963). More exports contribute to higher growth. Only the interest rate variable representing capital market integration is not significant or has the wrong sign.

As stressed by Mundell (1973) instability originating in undisciplined macroeconomic policies implies a negative impact of exchange rate volatility. To control for a weak institutional environment, we want to isolate it from the

other types of exchange rate volatility. We capture this effect by an interaction term that takes the value 1 for yearly depreciation against its anchor currency by more than ten percent<sup>2</sup>. Otherwise the dummy is 0. We multiply this term with the volatility variable and add it as additional explanatory variable to the model.

Table 2 reports the results for the pooled sample. The coefficients representing exchange rate volatility remain mostly significant with a negative sign. Additionally, in periods of macroeconomic instability the coefficients turn out highly significant with negative signs confirming the assumption that strong depreciations are associated with less growth.

[Table 2]

Except of inflation, the OCA-proxies have the expected signs and are highly significant. Business cycle correlations promote growth at highly significant levels. The crisis dummies turn out to have a negative impact on growth. Export growth and capital market integration have seemed to promote growth at highly significant levels.

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<sup>2</sup> Frankel and Rose (1995) define currency crashes for yearly nominal depreciations of 25%.

## **5. Conclusion**

We tested for the impact of exchange rate volatility on growth for emerging market economies nested in an OCA framework. Our sample of emerging market economies in Europe, East Asia and Latin America confirms the transmission channels as identified by the OCA theory as an aggregated measure of all different strands of the OCA theory. The paper provides strong evidence in favor of a negative impact of exchange rate volatility on growth. Importing stability via an exchange rate peg seems to be the adequate policy solution for emerging market economies.

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**Table 1: GMM - Estimation Results: Emerging Europe, East Asia and Latin America**

	(1)	(2)	(3)	(4)	(5)	(6)
Growth (-1)	0.265*** (0.019)	0.262*** (0.019)	0.236*** (0.022)	0.236*** (0.022)	0.301*** (0.005)	0.301*** (0.005)
Standard deviation	-0.011 (0.009)		-0.018** (0.008)		-0.016*** (0.002)	
Z-score		-0.014 (0.010)		-0.018** (0.009)		-0.017*** (0.002)
Business cycle correlation	0.015*** (0.005)	0.015*** (0.005)	0.009* (0.005)	0.009* (0.005)		
Crisis	-0.011*** (0.001)	-0.011*** (0.001)	-0.012*** (0.002)	-0.012*** (0.002)		
Inflation	-0.001 (0.001)	-0.000 (0.001)	-0.004*** (0.001)	-0.004*** (0.000)		
Export growth	0.125*** (0.007)	0.124*** (0.007)	0.122*** (0.008)	0.122*** (0.007)		
Interest rate parity	-0.000 (0.000)	0.000 (0.000)				
Interest rate			0.002*** (0.000)	0.002*** (0.000)		
Constant	-0.001*** (0.000)	-0.001*** (0.000)	-0.000* (0.000)	-0.000* (0.000)	-0.000 (0.000)	-0.000 (0.000)
Observations	478	478	469	469	505	505
Number of id	35	35	35	35	36	36
Sargan test Chi <sup>2</sup>	30.46	30.66	31.53	31.52	35.87	35.86
AR(2)	0.825	0.818	0.859	0.849	0.184	0.187

Data source: IMF, national central banks. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level. The Sargan test verifies the validity of instruments.

**Table 2: GMM – Estimation Results: Controlling for Strong Depreciations**

	(1)	(2)	(3)	(4)	(5)	(6)
Growth (-1)	0.209*** (0.028)	0.199*** (0.025)	0.237*** (0.031)	0.221*** (0.039)	0.259*** (0.009)	0.259*** (0.012)
Standard deviation	-0.007 (0.005)		-0.009** (0.004)		-0.006*** (0.002)	
Depreciation dummy* Standard deviation	-0.448*** (0.020)		-0.333*** (0.019)		-0.284*** (0.042)	
Z-score		-0.007 (0.005)		-0.009** (0.004)		-0.006** (0.003)
Depreciation dummy* Z-score		-0.389*** (0.016)		-0.401*** (0.019)		-0.264*** (0.030)
Business cycle correlation	0.013*** (0.004)	0.011*** (0.004)	0.008 (0.005)	0.010** (0.004)		
Crisis	-0.009*** (0.001)	-0.010*** (0.001)	-0.010*** (0.002)	-0.009*** (0.001)		
Inflation	0.025*** (0.001)	0.021*** (0.001)	0.011*** (0.001)	0.018*** (0.001)		
Export growth	0.109*** (0.007)	0.112*** (0.005)	0.113*** (0.006)	0.104*** (0.007)		
Interest rate parity	-0.008*** (0.000)	-0.005*** (0.000)				
Interest rate			-0.004*** (0.000)	-0.006*** (0.000)		
Constant	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
Observations	478	478	469	469	505	505
Number of id	35	35	35	35	36	36
Sargan test Chi <sup>2</sup>	32.19	31.75	32.06	29.83	35.02	35.69
AR(2)	0.672	0.610	0.924	0.821	0.245	0.253

Data source: IMF, national central banks. \*Significant at the 10% level. \*\*Significant at the 5% level. \*\*\*Significant at the 1% level. The Sargan test verifies the quality of instruments used. Results remain stable for different definitions of strong depreciation periods, e.g. 20% and 25%.

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