# Currency Misalignments in emerging and developing countries: reassessing the role of Exchange Rate Regimes

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# Background

- Macroeconomic policy framework in emerging and developing countries
  - Financial crises in the 1990s and early 2000s (e.g. Mexico 1994-5, East Asia 1997-98, Russia and Brazil in the late 1990s, Argentina 2002)
  - and more recently greater dispersion in net foreign asset positions (Lane and Milesi-Ferretti, 2002).
- **What is often argued?** an unwinding of real exchange rate misalignments would contribute to sustaining growth and resolving current account imbalances;
- **But** a question remains unanswered – theoretically and empirically: **which monetary regime offers a better insulation to such currency misalignments?**

# A controversial issue on the theoretical side

- **Main arguments and concerns**
  - Fathers of Bretton Woods : a centrally supervised system of fixed exchange rates, key for postwar prosperity, as it would shield international trade both from exchange rate volatility and from exchange rate manipulation by individual countries.
  - Against this view, argument of Milton Friedman (1953) : flexible exchange rates provided a mechanism for adjustment on an ongoing basis
  - "New Open Economy Macroeconomics" : for relative price adjustment via exchange rate to be efficient, a high pass-through on import prices and complete financial markets are required (Corsetti et al., 2010; Berka et al., 2012).

# Also on the empirical side

- **An issue non intensively studied**
  - Surprising omission taking into account the enormous empirical literature on the implications of the exchange rate regime for other aspects of macroeconomic performance and policy-making.
- **No consensus**
  - Dubas (2009) : currency misalignments are weaker in countries with intermediate ERR ;
  - Caputo (2005) : real exchange rates of developing countries in floating regimes exhibit significantly greater mean reversion – i.e. lower currency misalignments – than in fixed regimes.
- **No robustness check**
  - In particular, **the issue of regime classification in the empirical strategy is simply ignored.**

# In light of these considerations

- This paper has two **related goals:**
  - To determine which ERR category performs the best in minimizing such currency misalignments in developing and emerging economies;
  - To address the problem of differences across classifications schemes omitted by this literature.
- **Our general approach:** we follow Dubas (2009), i.e.:
  - We look at the size of currency misalignments across regimes;
  - We estimate currency misalignments using the Behavioral Equilibrium Exchange Rate (Clark and MacDonald, 1998)
- **Two well-established and familiar *de facto* classifications schemes:**
  - The "natural" classification proposed by Reinhart and Rogoff (2004, thereafter *RR*);
  - The classification of Levy-Yeyati and Sturzenegger (2003, thereafter *LYS*).
- **Sample**: 73 developing and emerging countries over the period 1980-2012.

# Measuring exchange rate misalignments

- **Behavioural Equilibrium Exchange Rate Approach**
  - Estimation of a cointegration relationship between the REER and a set of *fundamentals* ;
  - Fundamentals : productivity differential (*rprod*), terms of trade (*tot*), net foreign assets position (*nfa*).
- **Specification**

$$reer_{i,t} = \alpha_i + \beta_1\ rprod_{i,t} + \beta_2\ tot_{i,t} + \beta_3\ nfa_{i,t} + \epsilon_{i,t}$$

$$\text{with } Mis_{i,t} = reer_{i,t} - reer^*_{i,t}$$

$$\text{If } Mis_{i,t} < 0 \text{ (i.e. } reer_{i,t} < reer^*_{i,t}) \Rightarrow \textbf{undervaluation}$$

$$\text{If } Mis_{i,t} > 0 \text{ (i.e. } reer_{i,t} > reer^*_{i,t}) \Rightarrow \textbf{overvaluation}$$

# Empirical relationship between regime and mesalignment

- **Prerequisite**
  - Real undervaluations and overvaluations might compensate each other, we focus on the **absolute values of currency misalignments.**
  - We define dummy variables to capture the effect of the various regime categories.
  - To avoid multicollinearity, we exclude one category (flexible regime) which is thus considered as the reference regime.
- **Specification**

$$|Mis_{i,t}| = \mu_i + \eta_t + \Phi_j \sum_{j=1}^{m-1} Dum_j * ERR_{i,t} + X_{i,t} + u_{i,t}$$

where:

$|Mis_{i,t}|$, the absolute value of currency misalignments;

$Dum_j$, a dummy variable scoring 1 for regime $j$ (0 otherwise);

$m$, the number of categories considered in the *de facto* ERR classification;

$X_{i,t}$, a set of control variables;

$\mu_i$ and $\eta_t$, the country-fixed effects and year-fixed effects.

# Imterpretation and empirical strategy

$$|Mis_{i,t}| = \mu_i + \eta_t + \Phi_j \sum_{j=1}^{m-1} Dum_j * ERR_{i,t} + X_{i,t} + u_{i,t}$$

If one regime category is associated with lower currency misalignments (compared to the flexible one), then the coefficient on the exchange rate regime, $\Phi_j$, should be negative and statistically significant.

- **Control variables**
  - Crises
  - Openness in capital account transactions
- **Samples**
  - Whole sample
  - Developing and emerging countries
  - Sample which excludes countries that have maintained their exchange rate regime during the period under consideration

# Sources

- **Currency misalignments**
  - **reer**: Real Effective Exchange Rate; source: Bruegel's database
  - **rprod**: Relative productivity, proxied by the relative real GDP per capita (in PPP terms)
  - **tot**: terms of trade; source: World Development Indicators (World Bank)
  - **nfa**: net foreign asset positions; source: Lane and Milesi-Ferretti + *IFS*.
- **ERR classifications**
  - ***RR***: Reinhart & Rogoff classification, both *three-* and *six-way* class.;
  - ***LYS***: Levy-Yeyati & Sturzenegger classification, both *three-* and *five-way* class.
- **Control variables**
  - **kaopen**: Chinn-Ito financial openness index;
  - **Crisis**: dummy variable for crises, based on the Laeven & Valencia (2012) database.

# *RR* classification

| *Six-way clas.* Regime | Code | *Three-way clas.* Regime |
|---|---|---|
| No separate legal tender | 1 | |
| Pre announced peg or currency board arrangement | 1 | |
| Pre announced horizontal band that is narrower than or equal to +/-2% | 1 | |
| De facto peg | 1 | Fixed ERR |
| Pre announced crawling peg | 2 | |
| Pre announced crawling band that is narrower than or equal to +/-2% | 2 | |
| De facto crawling peg | 2 | |
| De facto crawling band that is narrower than or equal to +/-2% | 2 | |
| Pre announced crawling band that is wider than or equal to +/-2% | 3 | |
| De facto crawling band that is narrower than or equal to +/-5% | 3 | Intermediate |
| Moving band that is narrower than or equal to +/-2% (i.e., allows for both appreciation and depreciation over time) | 3 | ERR |
| Managed floating | 3 | |
| Freely floating | 4 | |
| Freely falling | 5 | Flexible ERR |
| Dual market in which parallel market data is missing | 6 | |

# *LYS* classification

| ***Five-way clas.*** **Regime** | **Code** | ***Three-way clas.*** **Regime** |
|---|---|---|
| Inconclusive determination | 1 | |
| Free float | 2 | Flexible ERR |
| Dirty float | 3 | Intermediate |
| Dirty float/Crawling peg | 4 | ERR |
| Fix | 5 | Fixed ERR |

# Estimation of the long-run relationship (CPMG estimator)

| ***Long-run dynamic*** | | | ***Short-run dynamic*** | | |
|---|---|---|---|---|---|
| | Coef. | $Z$ | | Coef. | $Z$ |
| *rprod* | 0.332*** | 7.28 | $\Delta$*rprod* | -0.026 | -0.23 |
| *tot* | 0.141*** | 3.82 | $\Delta$*tot* | -0.075 | -1.53 |
| *nfa* | 0.231*** | 7.44 | $\Delta$*nfa* | 0.198*** | 5.17 |
| $L.\overline{reer}$ | 0.622*** | 4.31 | $\Delta\overline{reer}$ | 0.261*** | 3.38 |
| $\overline{rprod}$ | -0.438*** | -4.00 | $\Delta\overline{rprod}$ | 0.077 | 1.62 |
| $\overline{tot}$ | 0.673*** | 3.18 | $\Delta\overline{tot}$ | -0.081 | -0.91 |
| $\overline{nfa}$ | 0.040 | 0.83 | $\Delta\overline{nfa}$ | 0.021 | 0.62 |
| | | | *ec.* | -0.188*** | -8.43 |
| | | | *Constant* | -0.493*** | -8.21 |
| ***Specification test*** | | | | 11.43 | |
| Joint Hausman test [a] | | | | [*p.value*=0.12] | |
| No. Countries / No. Observations: | | | | 73 / 2360 | |

# *RR three-way* classification

| *Three-way classification* | | | | | | |
|---|---|---|---|---|---|---|
| | Whole sample | | LDCs | | EMEs | |
| Panel | A | B | A | B | A | B |
| | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 |
| ***ERR*** | | | | | | |
| *Fixed* | -0.159** | -0.135* | -0.165** | -0.161** | -0.105 | -0.089 |
| | (-2.12) | (-1.79) | (-2.04) | (-2.00) | (-0.66) | (-0.49) |
| *Interm.* | 0.094 | 0.111 | -0.127* | -0.131* | 0.389 | 0.397 |
| | (0.52) | (0.53) | (-1.80) | (-1.68) | (0.90) | (0.88) |
| *Flexible* | — | — | — | — | — | — |

# *RR six-way* classification

| | *Six-way classification* | | | | | |
|---|---|---|---|---|---|---|
| | Whole sample | | LDCs | | EMEs | |
| | A | B | A | B | A | B |
| | 1.7 | 1.8 | 1.9 | 1.10 | 1.11 | 1.12 |
| *RR* 1 | -0.103 | -0.092 | -0.258** | -0.291** | 0.234 | 0.268 |
| | (-1.17) | (-0.79) | (-1.96) | (-2.12) | (0.72) | (0.72) |
| *RR* 2 | -0.212* | -0.203* | -0.223* | -0.248* | -0.304 | -0.286 |
| | (-1.89) | (-1.82) | (-1.66) | (-1.74) | (-0.96) | (-0.89) |
| *RR* 3 | 0.080 | 0.082 | -0.197* | -0.233* | 0.489 | 0.528 |
| | (0.40) | (0.36) | (-1.64) | (-1.75) | (0.94) | (0.93) |
| *RR* 4 | -0.041 | -0.104 | -0.179 | -0.313 | 0.667 | 0.782 |
| | (-0.29) | (-0.59) | (-1.01) | (-1.40) | (0.92) | (0.91) |
| *RR* 5 | — | — | — | — | — | — |
| *RR* 6 | -0.102 | -0.147 | -0.132 | -0.197 | 0.614 | 0.746 |
| | (-0.82) | (-0.82) | (-093) | (-1.11) | (0.91) | (0.92) |

# *LYS three-way* classification

| *Three-way classification* | | | | | | |
|---|---|---|---|---|---|---|
| | Whole sample | | LDCs | | EMEs | |
| Panel | A | B | A | B | A | B |
| | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 |
| ***ERR*** | | | | | | |
| *Flexible* | — | — | — | — | — | — |
| *Interm.* | 0.043 | 0.041 | 0.011 | 0.010 | 0.037 | 0.022 |
| | (0.70) | (0.68) | (0.37) | (0.34) | (0.30) | (0.20) |
| *Fixed* | 0.301 | 0.296 | -0.014 | -0.015 | 1.070 | 1.071 |
| | (0.98) | (0.99) | (-0.46) | (-0.50) | (1.05) | (1.05) |

# *LYS five-way* classification

| *Five-way classification* | | | | | | |
|---|---|---|---|---|---|---|
| | Whole sample | | LDCs | | EMEs | |
| | A | B | A | B | A | B |
| | 2.7 | 2.8 | 2.9 | 2.10 | 2.11 | 2.12 |
| *LYS* 1 | -0.007 | -0.007 | -0.014 | -0.013 | -0.501 | -0.503 |
| | (-0.10) | (-0.09) | (-0.41) | (-0.38) | (-1.54) | (-1.53) |
| *LYS* 2 | — | — | — | — | — | — |
| *LYS* 3 | 0.121 | 0.117 | 0.070** | 0.068** | 0.099 | 0.083 |
| | (1.10) | (1.09) | (2.18) | (2.15) | (0.56) | (0.51) |
| *LYS* 4 | 4E-4 | -0.002 | -0.021 | -0.021 | 0.013 | 4E-4 |
| | (0.01) | (-0.04) | (-0.57) | (-0.58) | (0.12) | (0.00) |
| *LYS* 5 | 0.305 | 0.301 | -0.006 | -0.007 | 1.076 | 1.077 |
| | (0.99) | (1.00) | (-0.20) | (-0.24) | (1.05) | (1.05) |

# Overall

- **Developing countries**
  - The *RR* classification suggests that fixed ERR perform the best in limiting currency misalignments,
  - but this finding is not confirmed when the *LYS* classification is used.
- **Emerging countries**
  - Both *RR* and *LYS* classifications agree: the ERR choice does not seem to matter at all
- **Possible explanation**
  - Methodological limitations
  - Necessity of conducting additional tests.

# A variety of additional tests

- **Differences between the two classifications in terms of cross-country and time coverage**
  - Re-estimate our benchmark specification using the *RR* classification for the sample of countries and over the shorter period covered by the *LYS* classification.
- **Currency misalignments**
  - New assessments of currency misalignments from an alternative estimation-based approach, the Atheoretical Permanent Equilibrium Exchange Rate (APEER) approach
  - Asymmetric effects: re-estimate our benchmark equation by considering alternatively undervaluations and overvaluations as the dependent variable
  - Outliers: re-estimate benchmark equation after having winsorised the tails of the distribution of currency misalignments to correct for the highest values.

# Additional tests, results

| Test | Impact on *RR* results | Impact on *LYS* results |
|---|---|---|
| Sample | Unchanged results | Unchanged results |
| New currency misalignments | Less misalignements in the fixed ERR, also in emerging coutries | Unchanged results |
| Asymetric effects | No more effect of the fixed ERR | Unchanged results |
| Outliers | Unchanged results, but lower coefficients for the fixed ERR | Coefficients no more significant |

# Addtional usual checks

- **The omitted variable bias: inflation**
  - Fixed exchange rates can allow countries to record lower inflation rates and countries with lower inflation rates are also more prone to have smaller currency misalignments
  - Extend our baseline specification by adding the inflation rate, measured as the log difference in the CPI
- **Endogeneity**
  - Currency misalignments may be driven by the choice of the exchange rate regime, but this latter may depend itself on currency misalignments.
  - Wu-Hausman test of exogeneity: rejection in almost all cases of the null hypothesis of exogeneity of the ERR.
    - Substitute in our baseline specification the actual exchange rate regime by the one-year lagged exchange rate regime.
    - Two-stage procedure: estimate a multinomial probit model and then perform regressions by replacing each ERR dummy by its fitted value derived from the multinomial probit model.

# Additional usual tests, results

| Test | Impact on *RR* results | Impact on *LYS* results |
|---|---|---|
| Omitted variable bias | Unchanged results | Coefficients no more significant |
| Endogeneity bias (One-year lagged ERR) | Unchanged results | Coefficients no more significant |
| Endogeneity bias (Predicted ERR) | Unchanged results | Unchanged results |

# A lack of agreement

- **Differences between ERR classifications**
  - Not ontly in terms of cross-country and time coverage,
  - but also in terms of **classification schemes**.
- **Type of policies underlying each exchange rate regime**
  - *RR* classification: based upon the black market rate, hence **merging both exchange rate choices and capital control choices.**
  - *LYS* classification: accounts for official exchange rate movements as well as **exchange market intervention.**
- **Alternative classification**
  - The Obstfeld, Shambaugh, and Taylor (2010; thereafter *OST*) *de facto* classification.
  - differentiates the fixed, intermediate and flexible exchange rate regime on the sole basis of **the exchange rate volatility.**

# *OST three-way* classification

| *Three-way classification* | | | | | | |
|---|---|---|---|---|---|---|
| | Whole sample | | LDCs | | EMEs | |
| Panel | A | B | A | B | A | B |
| | B.2.1 | B.2.2 | B.2.3 | B.2.4 | B.2.5 | B.2.6 |
| ***ERR*** | | | | | | |
| *Fixed* | 0.111 | 0.111 | 0.025 | 0.024 | 0.432 | 0.439 |
| | (1.07) | (1.07) | (0.92) | (0.85) | (0.95) | (0.95) |
| *Interm.* | -0.013 | -0.011 | 0.001 | 0.001 | 0.023 | 0.030 |
| | (-0.54) | (-0.46) | (0.05) | (0.06) | (0.36) | (0.43) |
| *Flexible* | — | — | — | — | — | — |

# *OST seven-way* classification

| | *Seven-way classification* | | | | | |
|---|---|---|---|---|---|---|
| | Whole sample | | LDCs | | EMEs | |
| | A | B | A | B | A | B |
| | B.2.7 | B.2.8 | B.2.9 | B.2.10 | B.2.11 | B.2.12 |
| *OST* 1 | 0.415 | 0.421 | 0.043 | 0.047 | 1.532 | 1.532 |
| | (1.05) | (1.06) | (0.89) | (0.95) | (1.00) | (1.00) |
| *OST* 2 | 0.177 | 0.180 | 0.030 | 0.33 | 0.461 | 0.465 |
| | (1.06) | (1.06) | (1.03) | (1.09) | (0.87) | (0.87) |
| *OST* 3 | -0.202 | -0.201 | 0.032 | 0.033 | -0.515 | -0.510 |
| | (-0.95) | (-0.95) | (1.47) | (1.50) | (-1.04) | (-1.04) |
| *OST* 4 | -0.059 | -0.059 | -0.127* | -0.129* | -0.103 | -0.099 |
| | (-1.06) | (-1.03) | (-1.78) | (-1.79) | (-0.48) | (-0.46) |
| *OST* 5 | -0.036 | -0.037 | 0.032* | 0.031 | -0.086 | -0.084 |
| | (-0.62) | (-0.63) | (1.71) | (1.62) | (-0.61) | (-0.59) |
| *OST* 6 | 0.006 | 0.007 | -0.228 | -0.230 | 0.093 | 0.095 |
| | (0.08) | (0.09) | (-1.59) | (-1.57) | (0.53) | (0.53) |
| *OST* 7 | — | — | — | — | — | — |

# Differences across classification schemes

- **Distribution across regime categories**
  - *LYS* classification: records many more intermediate regimes than the *RR* and *OST* classifications for both developing and emerging countries. Use of reserve changes which allows to better identify intermediate from floats.
  - *OST* classification: compared to the *RR* and *LYS* classifications, a greater share to flexible ERR and a lower share to fixed ERR, for both developing and emerging countries. Due the way pegged countries are classified.
- **Correlation across classification schemes**
  - Observations differ from one classification to another,
  - but **the *RR* classification appears more idiosyncratic than the others.**

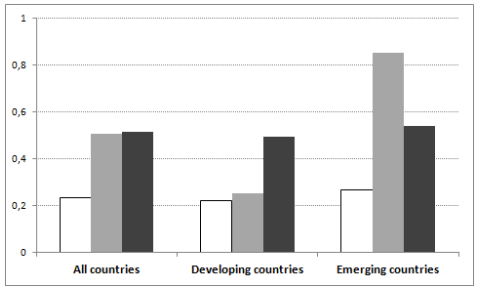
# Identifying idiosyncrasies in the classification schemes

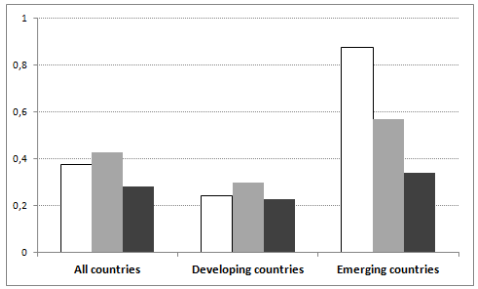
- **The flexible ERR**
  - is the category for which the results differ most across classification schemes.
  - *RR* classification: identifies the highest currency misalignments (in absolute value) for developing countries in the flexible ERR, comparatively to the others classification schemes.
- **"Freely falling" category in the *RR* classification**
  - Countries with inflation rates over 40% classified as countries that have opted for a flexible regime (69% of observations when considering the flexible regimes).
  - Countries in the "freely falling" category are characterized by dysfunctional monetary regimes, and then more prone to exhibit higher currency misalignments.

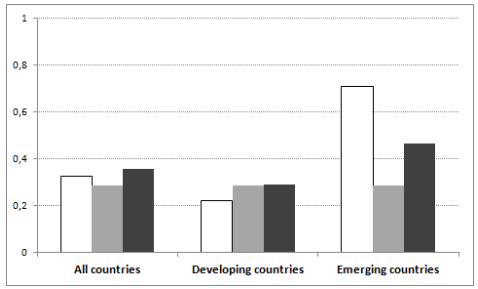
# Misalignments across classification schemes

*RR* classification | *LYS* classification | *OST* classification

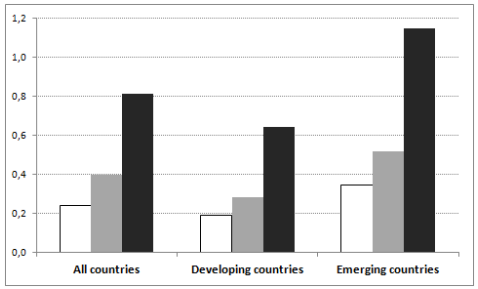
Absolute value

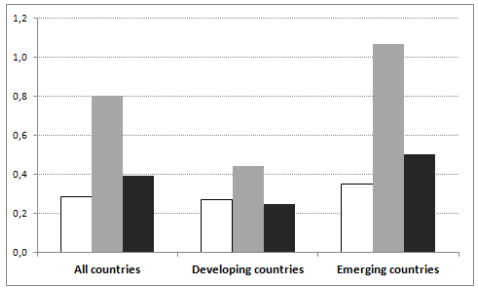


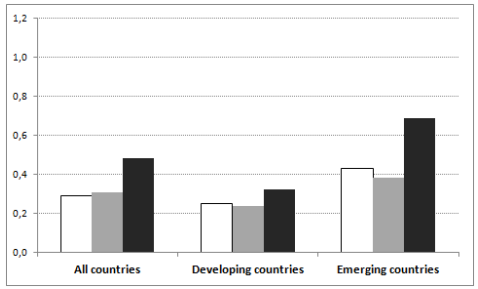



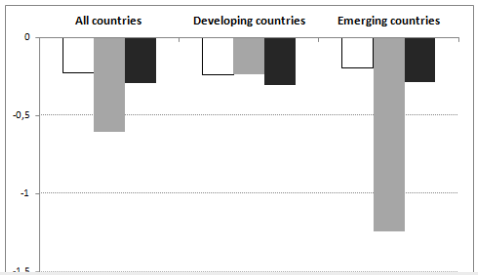

Overvaluations

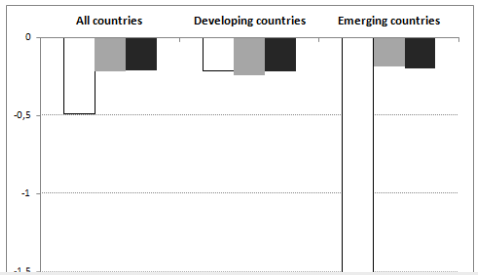


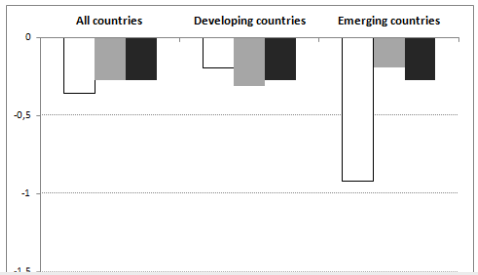




Undervaluations



# "Consensus" classification

- **Definition**
  - Based on the similarities between the *RR*, *LYS*, and *OST* coarser classifications
  - Two regime categories: fixed vs. flexible regimes.
- **Main results**
  - Absence of a significant relationship between exchange rate regimes and currency misalignments.
  - The estimated coefficients of the fixed ERR derived from the *RR* classification are no longer significant;

# "Consensus" classification, results

| | *Misalignments from the BEER approach* | | | | | |
|---|---|---|---|---|---|---|
| | Whole sample | | LDCs | | EMEs | |
| Panel | A | B | A | B | A | B |
| ***Basic specification*** | | | | | | |
| *Fixed* | -0.004 | -0.003 | -0.028 | -0.027 | 0.039 | -0.052 |
| | (-0.08) | (-0.05) | (-0.46) | (-0.46) | (0.29) | (-0.41) |
| *Crisis* | 0.042* | 0.039 | 0.030 | 0.031 | 0.083*** | 0.097** |
| | (1.88) | (1.50) | (1.05) | (0.91) | (4.44) | (2.80) |
| *kaopen* | -0.096* | -0.100* | -0.137** | -0.140** | -0.015 | 0.053 |
| | (-1.79) | (-1.76) | (-2.43) | (-2.41) | (-0.11) | (0.31) |
| *Constant* | 0.345*** | 0.360*** | 0.367*** | 0.383*** | 0.296* | 0.331 |
| | (4.69) | (4.71) | (4.55) | (4.65) | (1.92) | (1.58) |
| $R-sq.$ | 0.16 | 0.15 | 0.18 | 0.19 | 0.17 | 0.19 |
| Obs./Countries | 576/55 | 470/50 | 442/39 | 370/36 | 134/16 | 100/14 |

# Conclusion

- **Discrepancy across results provided by ERR classifications**
  - has proven to be robust to various robustness checks.
  - Not surprising: **classifications are *"simply measuring different things"*!**
  - Results are then likely to be sensitive to the classification scheme.
  - Using a consensus classification removes the discrepancy across classifications' results.
- **Currency misalignments**
  - are not related to the trade-off between floating and fixed exchange rates,
  - neither to the use foreign exchange reserves which do not adequately capture policy intervention,
  - but are mainly the **result of dysfunctional monetary regimes.**