Dollarization of deposits in the short and long run: evidence from CESE countries

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Agenda

- Introduction
- Background on dollarization
- A model of deposit dollarization
- Empirical results
- Robustness checks
- Concluding remarks

Objective & Results (1)

- People of Central, Eastern and Southeast European (CESE) as well as many other emerging markets often save in foreign currencies.
- For countries with inf. targeting regime, financial dollarization renders traditional monetary policy less effective.
- We investigate deposit dollarization in CESE countries in short and long run.
- Construct a version of the Minimal Variance Portfolio model that helps distinguish between factors that determine short run and long run dynamics of deposit dollarization.
- Test it on a balanced panel of six CESE countries with flexible exchange rates, with monthly data from January 2008 to December 2013.
- Error-correction model in a dynamic panel context in order to test if MVP drives the long-run dynamics of deposit dollarization; dynamic panel data regression with country specific fixed effects for modeling short-run dynamics.

Objectives & Results (2)

- There exists a cointegration relationship between permanent component of deposit dollarization and MVP share :
  - In the long run deposit dollarization is increasing in inflation volatility and exchange rate pass-through and decreasing in volatility of depreciation.
- Transitory component of deposit dollarization displays high persistence in the short-run:
  - In contrast to long-run, inflation and its volatility seem to have little effect on deposit dollarization in the short-run.
  - Instead, depreciation and its volatility seem to be the main drivers (they work in opposition to each other).

Contribution to the existing literature

We contribute to the existing literature in the following ways:

- We find a simple way to model distinction between the short and long run dynamics of deposit dollarization.
- We apply a novel econometric technique to testing the determinants of dollarization based on panel cointegration and establish cointegrated relationship between the level of dollarization and MVP.
- Demonstrate that exchange rate volatility works in opposition of the level of FX depreciation in the short run.
- In contrast to most of the existing literature, we excluded from consideration transactional deposits that do not reflect optimizing behavior of agents.

Definition of dollarization

- Alongside the local currency FX used as a means of payments, store of value or unit of account.

- Different forms of dollarization:
  1. Official (*de iure*)
  2. Unofficial (*de facto*) (De Nicolo, Honohan & Ize (2005))
     - **Financial dollarization** (asset substitution) - use of FX as a store of value
     - **Real dollarization** - prices and wages indexed to FX, FX as a unit of account
     - **Payments dollarization** (currency substitution) - use of FX as a means of payment

Financial dollarization → Real dollarization → Payments dollarization

- The paper is concerned with financial dollarization, or, more precisely, deposit dollarization.

Stylized facts about financial dollarization in CESE (1)

- Financial dollarization common for countries suffering from history of macroeconomic instability (high and persistent inflation, episodes of currency crises).
- Reflects lack of confidence in domestic currency.
- Driven also by import of foreign savings
- Countries with underdeveloped financial markets borrow in foreign currency, since borrowing in local currency is not possible abroad *(Original sin).*
- Economies frequently hit by sudden crises tend to be more dollarized *(Safe-haven effect).*

Positive sides of dollarization:

- Increases financial depth
- Motivates savings inside the banking sector

Negative sides of dollarization:

- Weakens monetary transmission mechanism
- Balance sheet effects (currency mismatch and loan default risk)
- Fear of floating (highly dollarized countries are more prone to intervene on FX market in order to prevent sharp depreciations)

Stylized facts about financial dollarization in CESEC

- Banks in the region mostly match currency composition of assets and liabilities.
- Exposed to the currency risk mostly indirectly through default risk.

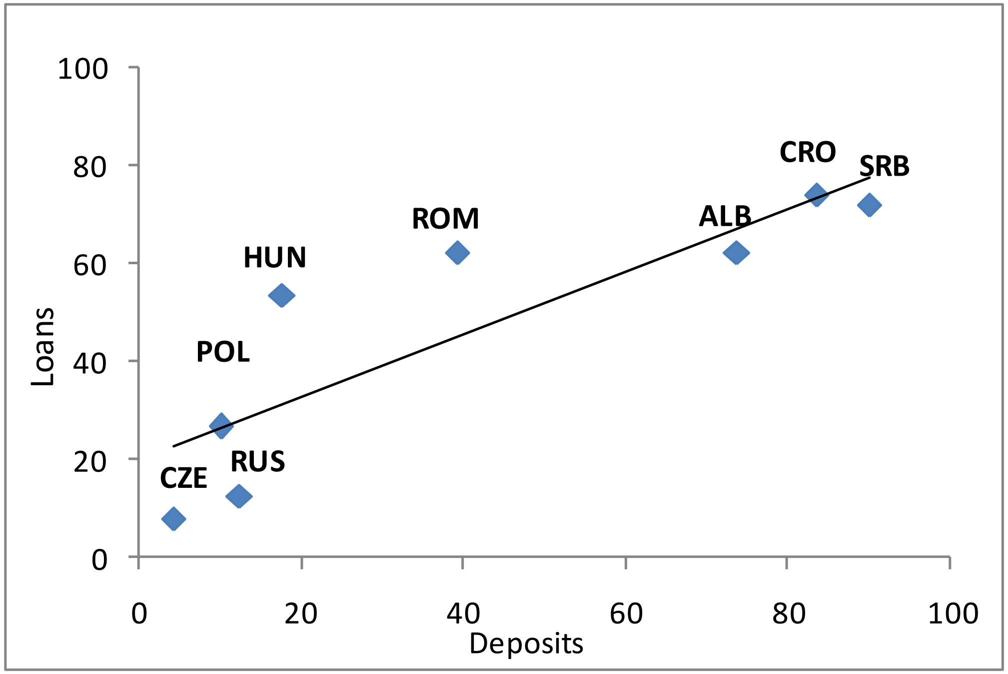


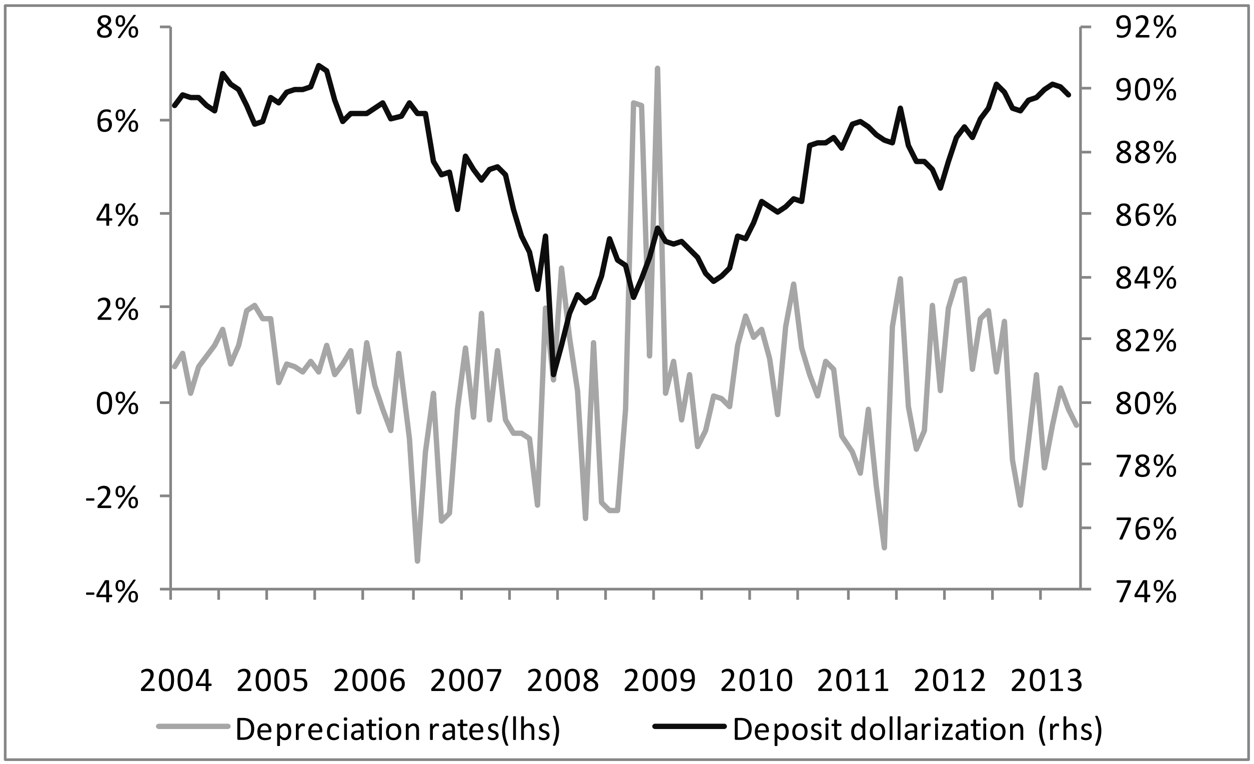
Figure1: The share of FX-denominated and FX-indexed interest-baring deposits and loans of households and enterprises in CESE countries, end of April 2013 (in %)

Source: BoA, CNB, CNB, MNB, NBP, NBR, CBR, NBS, authors' calculations

- Positive correlation between deposit and loan dollarization for banks in the region.

Relationship between deposit dollarization and depreciation and its volatility – the case of Serbia (1)

Figure 2: Deposit dollarization ratio and exchange rate changes in Serbia from January 2004 to December 2013 (in %)



Source: NBS, authors' calculations

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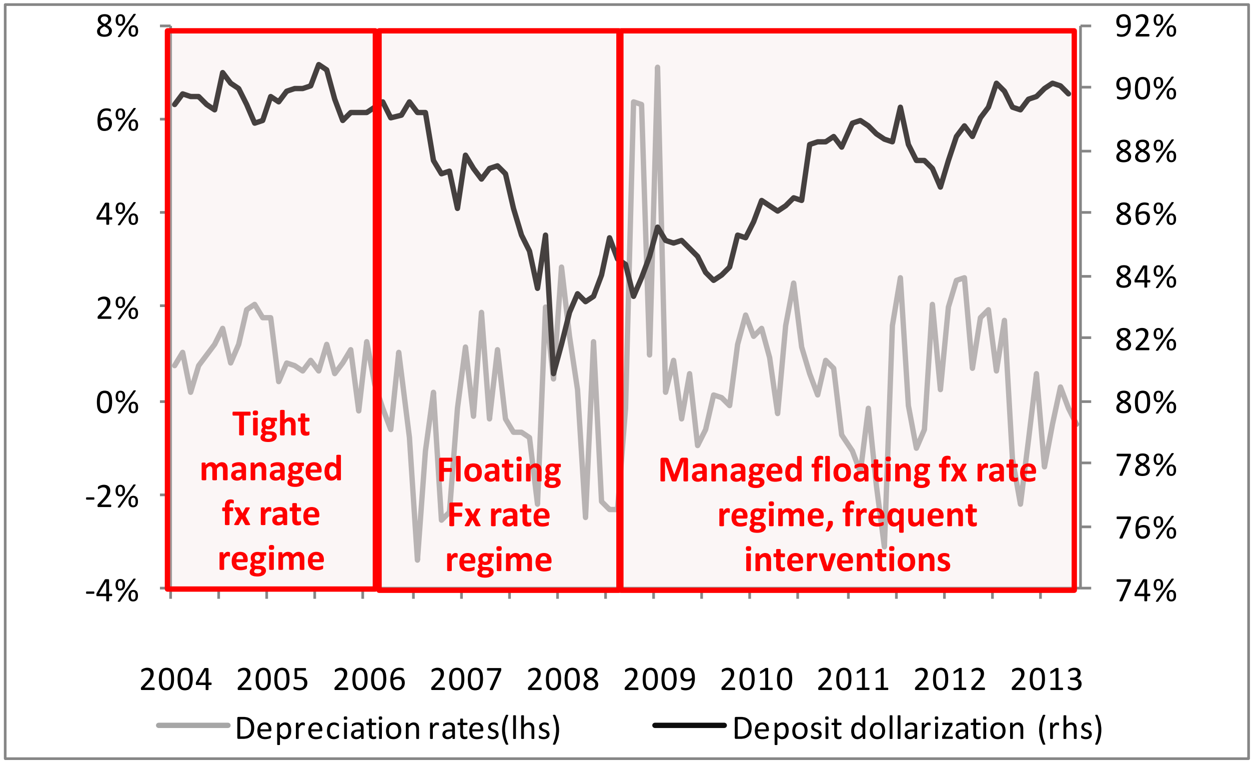

Source: NBS, authors' calculations

Relationship between deposit dollarization and depreciation and its volatility – the case of Serbia (2)

- From 2004 to 2006 - tight managed exchange rate regime, low exchange rate volatility (unconditional volatility of exchange rate of 0.01) and high but relatively stable level of deposit dollarization (between 89% and 91%).
- From 2006 to the beginning of the crisis in late 2008 - more flexible exchange rate regime (unconditional volatility increased to the level of 0.21), deposit dollarization ratio started to decrease and achieved its minimum value of 81% in December 2007.
- A decline in dollarization in 2006 and 2007 may also be explained with exchange rate appreciation that was caused by speculative actions on FX market and huge foreign capital inflow in the previous period.
- Late 2008 and the beginning of 2009 - exchange rate depreciations followed by the return to tight managed exchange rate regime that resulted in a less volatile exchange rate depreciations and increasing level of deposit dollarization.

Why do we focus on deposit dollarization?

- Some empirical findings that increase in deposit dollarization likely drives loan dollarization (but not necessarily the opposite)
- Given history of macroeconomic instabilities in many CESE counties savings in foreign currency more attractive to people
- Austrian banks asked by OeNB to primarily use deposits in host countries as sources of funding loans. Thus, structure of deposits largely determines FX structure of loans.

Related literature (1)

Ize & Yeyati, Journal of International Economics, 2003

- This paper uses minimum variance portfolio approach to explain long term dollarization of deposits and loans.
- They find that main drivers in steady state is relationship between volatility of inflation and volatility of real depreciation.
- The model assumes that there exists only financial dollarization (no real dollarization as measured by the pass-through coefficient of exchange rate changes on prices).
- UIP holds

Related literature (2)

Winkelried and Castillo, Journal of International Money and Finance, 2010

- Dynamic model of deposit dollarization.
- Try to explain high dollarization persistence in countries that achieved a satisfactory level of macroeconomic stability (Peru and Poland).
- Assumptions:
  - Agents optimize Markowitz utility function
  - Fixed real interest rates on HCD and variable real interest rates on FCD (UIP does not hold)
  - Agents differ in their ability to process available information
- The share of FCD in agents' portfolio depends on the expected excess return on FCD relative to HCD and on volatility of excess return.
- A core mechanism for dollarization persistence is heterogeneity among agents, i.e. the difference in how they extract information

Related literature (3)

Neanidis & Savva, (WP, 2009)

- Empirical study of determinants of deposit and loan dollarization in the short run for 11 transition economies from February 1993 to July 2005.
- Short-run loan dollarization is mainly driven by banks matching of domestic loans and deposits (positive correlation between deposit and loan dollarization).
- Depreciation positively affects deposit dollarization, while the effect is absent in the case of loan dollarization.

De Nicolo, Honohan & Ize, JBF 2004

- Panel regression on a large sample of about one hundred economies, yearly data from 1990 to 2001.
- Average deposit dollarization (ratio of onshore FCD to total bank deposits) serves as dependent variable.
- Do not sigle out effects on interest-bearing deposits.
- Focus on long-run drivers, include both MVP and factors that enter into it such as inflation.

Our model assumptions

- Borrows several key assumptions from I & Y:
  - Agents maximize quadratic utility function
  - Short selling not allowed
  - Agents do not hold cash
  - Nominal interest rates fixed during the life of the contract
- In contrast to I and Y:
  - Agents can save either in domestic or foreign currency but only in domestic banks
  - UIP holds in the long, but not in the short run

The model (1)

Real returns on the home-currency deposits: $r_{t+1}^{H} = i^{H} - \pi_{t+1}$

Real return on foreign-currency deposits: $r_{t+1}^{F} = i^{F} - \pi_{t+1} + e_{t+1}$

i^{H} Nominal return on the home-currency deposits (fixed during the life of the contract)

i^{F} Nominal return on the foreign-currency deposits (fixed during the life of the contract)

π_{t+1} Inflation rate in *t+1*

e_{t+1} Nominal depreciation rate in *t+1*

Minimum Variance Portfolio Model (2)

Agents maximize quadratic utility function:

$$U_t = E_t(r_{t+1}) - \frac{c}{2} Var_t(r_{t+1})$$

Expected real return on the deposit portfolio based on information available up to period t

$$E_t(r_{t+1}) = r_{t+1}^H + x_t^F E_t(r_{t+1}^F - r_{t+1}^H)$$

The share of foreign currency deposits in the portfolio: x_t^F

Variance of portfolio returns

$$Var_t(r_t) = Var_t(r_{t+1}^H) + (x_t^F)^2 Var_t(r_{t+1}^F - r_{t+1}^H) + 2x_t^F Cov_t(r_{t+1}^H, r_{t+1}^F - r_{t+1}^H)$$

Minimum Variance Portfolio Model (3)

Optimal share of FCD:

$$x_t^{F*} = \frac{E_t(r_{t+1}^F - r_{t+1}^H)}{c\sigma_{et+1}^2} + \frac{\rho_{\pi et+1}\sigma_{\pi t+1}}{\sigma_{et+1}}$$

UIP does hold in the short run (carry trade (Menkhoff et al., JF, 2012)):

$$E_t(r_{t+1}^F - r_{t+1}^H) \neq 0$$

In the long run, UIP is expected to hold:

$$x_t^{F*} = MVP_t = \frac{\rho_{\pi et+1}\sigma_{\pi t+1}}{\sigma_{et+1}}$$

Data description (1)

- Table 1: Country coverage and deposit dollarization data availability

Country	Data availability	Number of observations
Albania	2007:12 – 2013:12	73
Czech Republic	1997:3 – 2013:12	204
Hungary	2001:5 – 2013:12	152
Poland	1996:12 – 2013:12	205
Romania	2007:1 – 2013:12	84
Serbia	2004:1 – 2013:12	120

- Baseline: balanced monthly panel of 6 CESE countries for the period from February 2008 to December 2013.
- Robustness checks conducted based on different samples of countries and time periods and estimates of exchange rate pass-through

Data description (2)

Table 2 Summary statistics of most important variables from February 2008 to December 2013

Deposit dollarization in %			Monthly inflation rates in %			Monthly home currency depreciation rates in %			Exchange rate pass-through* in %		
Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
40.0	31.9	46.1	0.2	-1.2	2.2	0.2	-1.9	2.8	16.9	11.3	42.1
6.2	4.00	9.4	0.1	-0.7	1.8	0.1	-4.4	4.7	1.8	0.0	2.9
20.6	16.8	25.8	0.3	-0.8	2.1	0.23	-5.6	6.9	2.6	2.1	3.4
39.7	35.6	45.6	0.4	-0.4	2.6	0.4	-2.2	7.8	4.8	0.8	9.1
10.1	9.3	12.1	0.3	-0.5	1.2	0.3	-4.6	9.6	1.4	1.2	1.9
88.3	84.7	91.0	0.6	-1.1	2.9	0.5	-3.2	6.9	13.1	0.1	22.1

*Estimated using ADL methodology

Data Description (3)

Table 3: Definition of variables

DOL	Share of fx-indexed and fx-denominated interest-bearing deposits in total interest bearing deposits for households and enterprises
DOL_PERM	Permanent component of deposit dollarization obtained using Beveridge Nelson-methodology (log values)
DOL_TRANS	Transitory component of deposit dollarization obtained using Beveridge-Nelson methodology (log values)
DEP	Nominal depreciation rate (differenced logarithm of nominal exchange rates)
INF	Monthly inflation rate (differenced logarithm of CPI)
VOL_INF	Volatility of inflation calculated using GARCH and EGARCH methodology
VOL_DEP	Volatility of nominal depreciation calculated using GARCH and EGARCH methodology
PASS	Exchange rate pass-through calculated using autoregressive distributed lag (ADL) methodology
MVP	Share of deposit dollarization calculated as $\frac{VOL\ INF \times PASS}{VOL\ DEP}$

Methodology (3)

- Pass-through estimation
- In our basic model, exchange rate pass-through estimated by Autoregressive Distributed Lag (ADL) methodology:

$$\pi_t = \alpha + \beta e_t + \sum_{i=1}^{k} \gamma_i \pi_{t-i} + \varepsilon_t$$

- Where π_t stands for inflation rate, e_t for nominal depreciation rate, and β is estimated short-term exchange rate pass-through coefficient.

- In order to perform robustness checks we estimated exchange rate pass-through using Kalman Filter methodology:

$$\pi_t = c_t + b_t e_t + p_t \pi_{t-1} + v_{t,}\, v_t \sim N(0, R)$$
$$\Phi_t = \Phi_{t-1} + z_{t,}\, z_t \sim N(0, Q)$$
$$\Phi_t = \{c_t\,, b_t, p_t\}$$

Empirical results: panel unit root tests

- Several panel unit root tests are applied to test the stationarity of panels :
  - Levin-Lin-Chu test assumes **homogeneity** of all individual panels and heterogeneity of deterministic component. The hypothesis of nonstationarity of all panels is tested against the alternative of stationarity of all panels.
  - Im-Pesaran-Shin test is appropriate for dynamic **heterogeneous** panels and is based on the average of ADF statistics calculated for each cross-section in the panel. It test tests the null of a unit root in the entire panel against the alternative that some panels are stationary.
  - Fisher type tests (combined panel unit root test) test the hypothesis of nonstationarity of all panels against alternative that at least one panel is stationary. Unit-root tests for each panel conducted individually, and then p-values from these tests are combined to produce an overall test. Uses the inverse chi-squared, inverse normal, inverse logit transformations and modified version of the inverse chi-squared transformation proposed by Choi.

Empirical results

- Prior to estimation of long-run and short-run dynamics of deposit dollarization, we test for the presence of unit roots in the panel data set
- According to every applied criteria, DOL_PERM and MVP contain panel unit root, while DOL_TRANS, VOL_DEP, INF, VOL_INF and DEP are stationary.

Table 6: Results of Panel unit root tests:

		DOL_PERM	DOL_TRANS	MVP	VOL_INF	VOL_DEP	INF	DEP
Levin, Lin & Chu t		-0.58 (0.28)	-3.40*** (0.00)	-0.56 (0.29)	-1.32* (0.09)	-2.44 ***(0.01)	-8.24 ***(0.00)	-0.02*** (0.00)
Im, Pesaran and Shin		-0.90 (0.18)	-4.98 ***(0.00)	-1.17 (0.12)	-1.26* (0.10)	-3.31*** (0.00)	-9.95*** (0.00)	-9.52 ***(0.00)
Fisher type	P	15.44 (0.22)	36.93*** (0.00)	14.89 (0.25)	69.91*** (0.00)	35.46 ***(0.00)	200.37*** (0.00)	179.29 ***(0.00)
	Z	-0.88 (0.19)	-3.95*** (0.00)	-1.47 (0.13)	-5.92*** (0.00)	-3.80 ***(0.00)	-12.72*** (0.00)	-11.98 ***(0.00)
	L	-0.89 (0.19)	-4.11*** (0.00)	-1.09 (0.14)	-7.82*** (0.00)	-3.91 ***(0.00)	-22.90*** (0.00)	-20.49 ***(0.00)
	Pm	0.70 (0.24)	-5.10*** (0.00)	0.59 (0.28)	-11.82 ***(0.00)	4.79*** (0.00)	38.45*** (0.00)	34.15 ***(0.00)

Sample: Albania, Czech Republic, Hungary, Poland, Romania and Serbia
Sample period: April 2008 – April 2013
Note: ***, **, * indicate statistical significance of 1%, 5% and 10% respectivelly

Estimated short-run dynamics of deposit dollarization (1)

- In the short run we tested several hypothesis based on expression: $x_t^{F*} = \frac{E_t(r_{t+1}^F - r_{t+1}^H)}{c\sigma_{et+1}^2} + \frac{\rho_{\pi et+1}\sigma_{\pi t+1}}{\sigma_{et+1}}$ with included dynamics

H1: Transitory dollarization exhibits persistence, i.e. agents' decisions on dollarization rely on past dollarization ratio.

H2: Deposit dollarization is increasing in interest rate spread between foreign and local-currency deposits and MVP in the short-run, i.e, transitory dollarization is increasing in real interest rate and MVP share and decreasing in volatility of nominal depreciation.

Table 7: CESE Panel regression for short-run dynamics of deposit dollarization

Dependent variable: DOL_TRANS						
	(1)		(2)		(3)	
Method	DPD		DPD		DPD	
Variable	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
CONST	0. 00	0.15	0.00	0.14	0.00	0.14
DOL_TRANS_{t-1}	0.69***	0.00	0.69***	0.00	0.69***	0.00
DEP_{t-1}	0.08**	0.04	0.07**	0.04	0.07**	0.04
VOL_DEP_{t-3}	-0.05*	0.07	-0.05**	0.04	-0.05**	0.05
VOL_INF_{t-3}	0.05	0.63	0.02	0.79	0.02	0.79
INF_{t-1}	-0.06	0.45				
	Wald $chi^2(3)$	=156.9	Wald $chi^2(3)$	=139.8	Wald $chi^2(3)$	=141.2
	p-value	=0.00	p-value	=0.00	p-value	=0.00

Estimated short-run dynamics of deposit dollarization - results

- Transitory component of deposit dollarization exhibits high degree of persistence (i.e. high and significant coefficient of the lagged dependent variable).
- Inflation and its volatility do not have statistically significant impact on deposit dollarization in the short run (equation 1 and equation 2).
- Depreciation and its volatility statistically significantly determine deposit dollarization in the short run.
- Sign of volatility negative: to the best of our knowledge, first to establish that volatility of nominal exchange rate depreciation works in opposition with the level of depreciation in the short run.
- Findings robust with respect to different specifications of the model.

Long run: Panel cointegration

- Since variables DOL_PERM and MVP contain unit root, we estimate panel cointegration relationship for long run dynamics.
- Westerlund tests are applied to test for the presence of cointegration by determining whether there exists error correction for individual panel members or for the panel as a whole .
- It starts from the error-correction model where all variables in level are assumed to be I(1) and where $\boldsymbol{a_i}$ is an estimate of the speed of error correction towards the long run equilibrium:

$$\Delta y_{it}=ci+a_{i1}\Delta y_{it-1}+a_{i1}\Delta y_{it-1}+....+ b_{i0}\Delta x_{it} + b_{i1}\Delta x_{it-1}+...+b_{ip}0\Delta x_{it-p}+\boldsymbol{a_i}(y_{it-1}-b_i x_{it-1})+\varepsilon_{it}$$

Westerlund test comprises of four tests:

- Ga and Gt statistics test if $\boldsymbol{a_i}$ = 0 for all *i*, versus H_1 $\boldsymbol{a_i}$ < 0 for at least one *i*.
- Pa and Pt statistics test if $\boldsymbol{a_i}$ = 0 for all *i* versus $\boldsymbol{a_i}$ < 0 for all *i*, which means that there is evidence of cointegration for the panel as a whole.

Estimation of long run dynamics of dollarization, Panel cointegration tests

Table 8: Summary of panel cointegration tests

	Test	Statistics	p-value
Westerlund ECM panel cointegration tests	Gt	-2.99**	0.03
	Ga	-17.26**	0.02
	Pt	-8.30***	0.00
	Pa	-18.92***	0.00

Note: ***, **, * indicate statistical significance of 1%, 5% and 10% respectivelly

Conclusion: According to all four Westerlund tests, we can reject null hypothesis of no cointegration between permanent component of dollarization and estimated MVP share. New result

Estimation of panel cointegration coefficients (1)

- In order to estimate long-run coefficients, we assume the following long-run deposit dollarization function:

$$DOL\_PERM_{it}=c_{0i}+c_{1i}LOG(MVP)_{it}+u_{it},\ i=1,..,6,\ t=1,\ldots,63$$

- Depending whether lag-differenced explanatory variable is included in the model, two different error-correction equations are estimated :

$$Eq1:\ \Delta DOL\_PERM_{it}=\phi i(DOL\_PERM_{it-1}-c_{0i}-c_{1i}LOG(MVP)_{it})+b_{11i}\Delta LOG(MVP)_{it-1}+\varepsilon_{it}$$

and

$$Eq2:\ \Delta DOL\_PERM=\phi i(DOL\_PERM_{it-1}-c_{0i}-c_{1i}LOG(MVP)_{it})+\ \varepsilon_{it}$$

- Coefficients are estimated by applying PMG and MG method:
  - PMG: long run coefficients are considered to be equal across all panels (c_1), while the short run coefficients and error variances are allowed to differ across panels.
  - MG: coefficients of the model are calculated from the unweighted average of the unconstrained , fully heterogeneous model (long-run coefficients are heterogeneous as well).

- Consistency of estimators is then tested with the Hausman test.

Estimation of panel cointegration coefficients (2)

- First test the model that includes lag differenced log(MVP), ie. Eq1:

$$\Delta DOL\_PERM_{it}=\phi i(DOL\_PERM_{it-1}-c_{0i}-c_{1i}LOG(MVP)_{it})+b_{11i}\Delta LOG(MVP)_{it-1}+\varepsilon_{it}$$

- Coefficient of lag of differenced Log(MVP) although positive is not statistically significant

Table 9: MG and PMG estimation of the long-run coefficients of the determinants of deposit dollarization when lagged difference of log(MVP) is included (2008:2 – 2013:12)

Dependent variable: DOL_PERM				
Method	MG		PMG	
Variable	Coefficient	p-value	Coefficient	p-value
Log(MVP)	0. 08*	0.10	0.06**	0.04
Error-correction term	-0.11***	0.00	-0.08***	0.00
d.Log(MVP)	0.00	0.29	0.00	0.78
Constant	-0.13***	0.00	-0.11***	0.00

Note: ***, **, * indicate statistical significance of 1%, 5% and 10% respectivelly

- We establish **positive** cointegrating relationship between permanent component of deposit dollarization and MVP that sets I&Y claim on firmer ground

Estimation of panel cointegration coefficients(3)

- After excluding log difference of MVP, we estimated Eq 2:

$$\Delta DOL\_PERM = \phi i(DOL\_PERM_{it-1} - c_{0i} - c_{1i} LOG(MVP)_{it}) + \varepsilon_{it}$$

Table 10: MG and PMG estimation of the long-run coefficients of the determinants of deposit dollarization (2008:2 – 2013:12)

Dependent variable: DOL_PERM				
Method	MG		PMG	
Variable	Coefficient	p-value	Coefficient	p-value
Log(MVP)	0.07*	0.10	0.05*	0.08
Error-correction term	-0.10***	0.00	-0.08***	0.00
Constant	-0.12**	0.01	-0.11***	0.00

Note: ***, **, * indicate statistical significance of 1%, 5% and 10% respectivelly

- Estimated coefficients remained of expected sign and significance.

Estimation of panel cointegration coefficients(4)

Hausman test

- The consistency of estimators is tested by applying Hausman test that assumes that difference in coefficients is not systematic.
- Obtained Hausman test statistics of 0.34 (p-value=0.56) suggests that PMG estimators are preferred to MG, since they are consistent and efficient under the null hypothesis.
- Thus, there is no reason to assume that estimated coefficients significantly differ across countries (same forces at play across the region).

Estimation of long run dynamics of dollarization – main results

- There exists a positive and statistically significant relationship between permanent component of deposit dollarization and MVP share, which means that volatility of inflation and pass-through positively affect deposit dollarization, while volatility of depreciation negatively affects it in the long run.
- The coefficient on the error-correction term across all empirical specifications is statistically significant at the 1% level suggesting that the selected variables in the model show a return to a long-run equilibrium.

Concluding remarks

- Our results indicate that policymakers interested in containing and, perhaps, reversing dollarization need to distinguish between short and long run effects.
- In the short run people seem to care relatively less about inflation than about exchange rate moves since UIP does not hold and:
  - inflation does not enter into real interest rate spread between FCD and HCD
  - real interest rate spread is increasing in nominal depreciation.
- Appreciation of the domestic currency (resulting, also, in increased volatility) may, at least temporarily, reduce the level of dollarization.
- However, according to our findings, due to strong long-term relation between the level of dollarization and MPV, in the long run inflation targeting combined with freely floating exchange rate seems more desirable monetary policy if one is to contain dollarization
- Favoring local-currency deposits by offering higher interest rates and subsequent decline in interest rate spread may result in lower dollarization of deposits only in the short run. In the long run, when real interest rates are equaled due to UIP condition, only credible inflation targeting policy combined with floating exchange rate will result in lower dollarization ratios.

Robustness check

To test if the results are robust to the applied estimation technique in exchange rate pass-through, we estimate pass-through using Kalman Filter methodology

Table 13: MG and PMG estimation of the long-run coefficients of the determinants of deposit dollarization (2008:2 – 2013:12)

Dependent variable: DOL_PERM				
Method	MG		PMG	
Variable	Coefficient	p-value	Coefficient	p-value
Log(MVP)	0. 05*	0.08	0.03*	0.09
Error-correction term	-0. 10***	0.00	-0.09***	0.00
Constant	-0.12**	0.03	-0.13**	0.03

Note: ***, **, * indicate statistical significance of 1%, 5% and 10% respectivelly

- Hausman test of 3.01 (p-value=0.10) suggest an 10% significance that PMG estimators are preferred

Appendix
Beveridge-Nelson decomposition

- Permanent and transitory component of deposit dollarization are estimated using Beveridge-Nelson method of time-series decomposition which assumes that integrated time series consist of trend and cycle components.
- Given a forecasting model for the first-differences of the series, the Beveridge–Nelson (BN) trend is the long-run forecast of the level of the series (minus any deterministic drift) and the BN cycle is the gap between the present level of the series and its long-run forecast.
- Trend component is given with:

$$\mathrm{BN_T} = \lim_{\mathrm{M} \to \propto} \mathrm{E}[\mathrm{y_{t+M}} - \mathrm{M}\mu | \Omega_\mathrm{t}]$$

- Here $\mu = \mathrm{E}[\Delta \mathrm{y_t}]$ is deterministic drift and Ω_t is the information set used to calculate the conditional equation.
- BN cycle (transitory component) is difference between the series and the BN trend.
- Beveridge-Nelson decomposition is performed under the assumption that the first difference of logarithm of deposit dollarization level follows an ARMA process