Foreign Reserve Accumulation and the Mercantilist Motive Hypothesis

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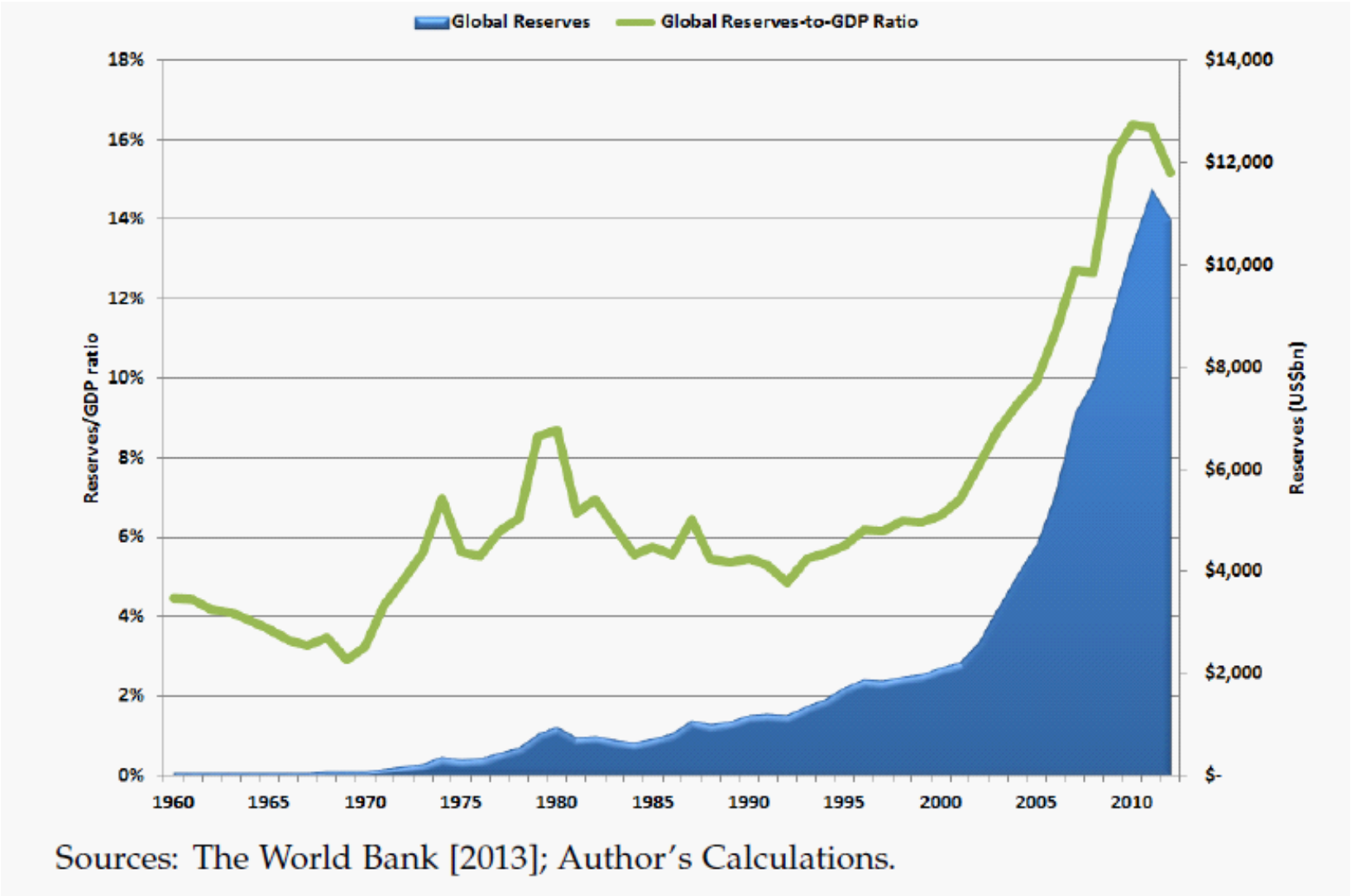
Introduction

Steep Increase in Global Foreign Reserves



Sources: The World Bank [2013]; Author's Calculations.

Introduction

Top 12 Foreign Reserve Holders in 2013

1. China US$3,312bn
2. Japan US$1,250bn
3. Eurozone US$836bn
4. Saudi Arabia US$627bn
5. Switzerland US$525bn
6. Russia US$518bn
7. Taiwan US$406bn
8. **Brazil US$374bn**
9. Korea US$328bn
10. Hong Kong US$306bn
11. India US$294bn
12. Singapore US$262bn

Global Reserves

US$ 11,990bn

Total 12 Share 68%

Introduction

Motives for Reserve Accumulation

- Precautionary
  - self insurance to prevent crises
  - Aizenman and Lee (2008), Calvo et al. (2012)
- Mercantilist
  - intervention and reserve accumulation to affect currency levels to support exports
  - Dooley et al. (2000's)
- Both concepts imply consequences for others

Introduction

Questions

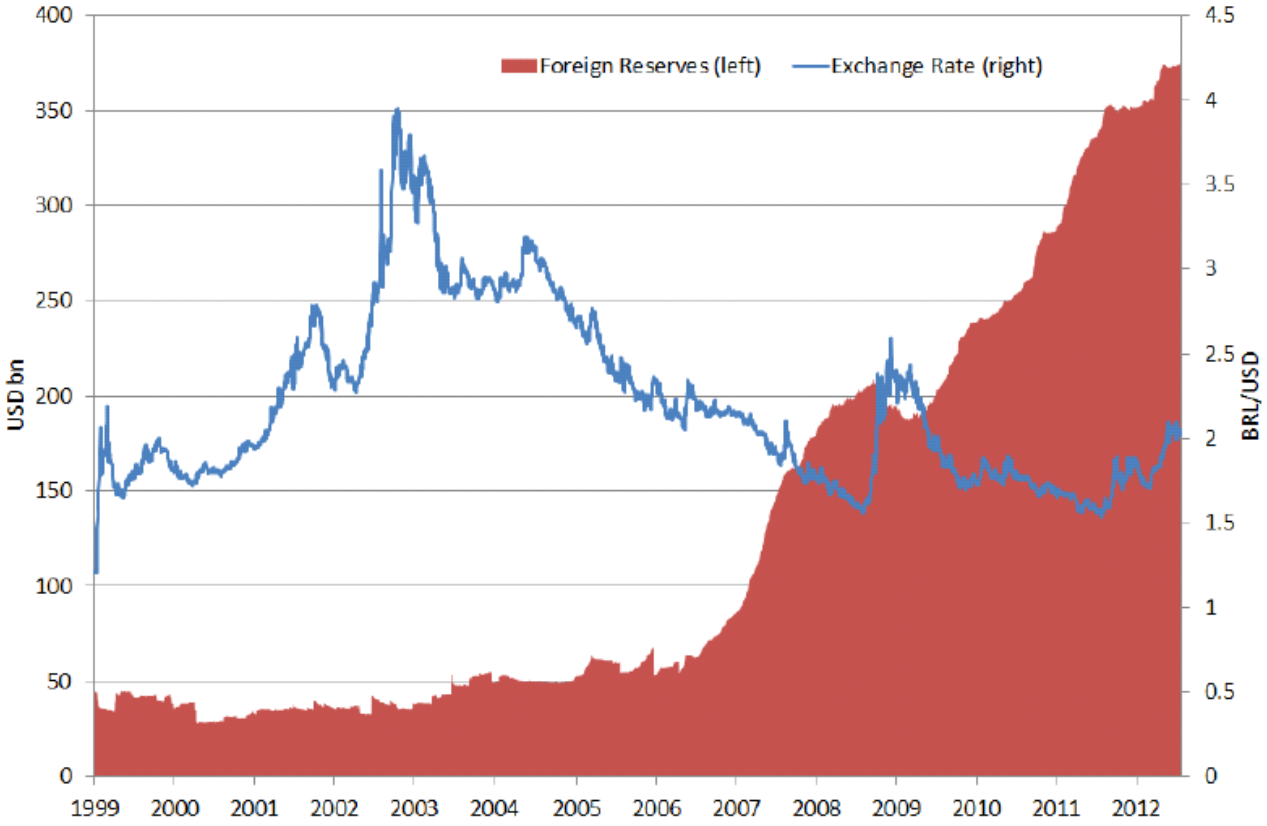
- How important is Brazilian intervention
  - for own currency market volatility
  - for regional currency market volatility
  - for regional reserve changes
- Within-regional spillovers of reserve accumulation
- Longer horizon strategic reserve accumulation relationships

Introduction

Why Brazil

- Data availability
  - central bank provided us with daily intervention data
  - 2009 - 2012
- Emerging Market
- Size matters:
  - Brazil's GDP is US$2.5 trillion (6th largest economy in the world)
  - 200 million residents (5th largest population)
  - 8.5million km2 territory (5th largest geographical area)
- Substantial reserve accumulation and strong local currency

Figure 1: Mercantilist Motives in Brazil



(a) Brazil's Foreign Reserve Stocks (US$bn) vs. Exchange Rate Levels (BRL/USD). Source: Central Bank of Brazil.

Introduction

Methods used to examine intervention

- Good summary of papers on EMEs in Menkhoff (2012)
  - OLS/2SLS
  - GARCH
  - Markovian Switching
  - Event studies
  - Panel fixed effects
- No focus on intervention spillovers
- This paper:
  - latent factor model commonly used in modelling a set of asset returns
  - decompose financial asset returns into specified sources of volatility
  - model spillovers of intervention

Introduction

Implications

- Inform policy debate on impact of domestic intervention policy
- Examine spillover effects to the currency markets of smaller neighbors when a major regional country intervenes
- Examine spillover effects of regional reserve changes when a major regional country intervenes
- Inform policy debate on the potential for cooperation
- Evidence on the nature of regional relationships, establishing the initial conditions if regional cooperation were to be strengthened

Introduction

Outline

- The data
- Model Specification - non intervention days and intervention days
- Regional effects of Brazilian intervention on regional currency markets
- Regional effects of Brazilian intervention on regional FX reserve markets
- Longer horizon regional reserve accumulation

The Data

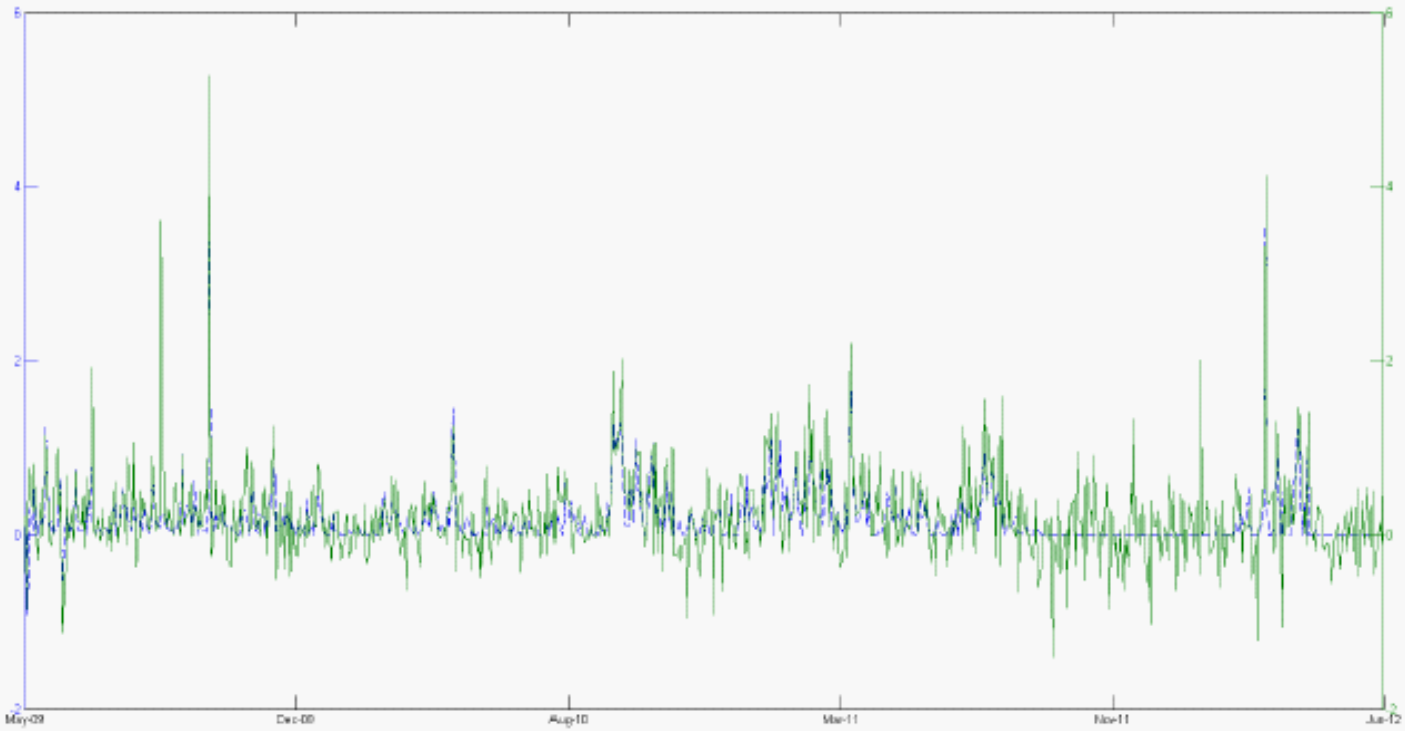
- Sample: May 2009 - June 2012 - 825 observations
- Variables
  - euro exchange rate returns
  - GBP exchange rate returns
  - Brazilian real exchange rate returns
  - regional country exchange rate returns (Argentina, Chile, Peru)
  - regional country foreign reserve stock changes
  - Brazilian intervention

The Data

- Brazilian intervention data
  - daily net foreign exchange purchases by the CB
- CB intervened on 585 out of 825 days
  - mostly net purchases of US dollars
  - net purchases amount US$ 145.5bn
  - increase of 79.3% of total net foreign reserves over the period

The Data

Intervention vs Reserve Changes



(b) Brazil's Currency Intervention, US$bn (left axis, dashed line) vs. Reserve Changes, US$bn (right axis, solid line). Source: Central Bank of Brazil.

Benchmark Factor Model

- Latent factor model

$$Y_t^j = \Lambda^j F_t$$

  - $j = 0$ non-intervention day
  - $j = 1$ intervention day

- Data (Y_t)
  - Euro USD returns (EUR_t)
  - British pound returns (GBP_t)
  - Argentinian peso returns (ARS_t)
  - Argentinian reserve changes $(Ares_t)$
  - Brazilian real returns (BRL_t)
  - Brazilian intervention $(Bint)$

- Factors: $F_t =$
  $\{$common, currency, Latin currency, Brazil, idiosyncratic, intervention $\}$

- Use the type of days $(j = 0, 1)$ to aid identification

Benchmark Latent Factor Model on Non-Intervention Days

- Model for variable $i, j = 0$

$$y^0_{i,t} = \lambda^0_{i,\omega}\omega_t + \lambda^0_{i,\kappa}\kappa_t + \lambda^0_{i,\kappa^{LA}}\kappa^{LA}_t + \lambda^0_{i,br}br_t + \lambda^0_{i,u}u_{i,t}$$

- Global factor w_t
- Currency market factor κ_t
- Latin American currency market factor κ^{LA}_t
- Brazilian factor br_t
- Idiosyncratic factor $u_{i,t}$

Benchmark Latent Factor Model - Non Intervention Days

Model A1: $(j = 0)$

$$\begin{bmatrix} EUR_t^0 \\ GBP_t^0 \\ ARS_t^0 \\ Ares_t^0 \\ BRL_t^0 \\ Bint_t^0 \end{bmatrix} = \begin{bmatrix} \lambda_{1,\omega}^0 \\ \lambda_{2,\omega}^0 \\ \lambda_{3,\omega}^0 \\ \lambda_{4,\omega}^0 \\ \lambda_{5,\omega}^0 \\ \lambda_{6,\omega}^0 \end{bmatrix} \omega_t + \begin{bmatrix} \lambda_{1,\kappa}^0 \\ \lambda_{2,\kappa}^0 \\ \lambda_{3,\kappa}^0 \\ 0 \\ \lambda_{5,\kappa}^0 \\ 0 \end{bmatrix} \kappa_t + \begin{bmatrix} 0 \\ 0 \\ \lambda_{3,\kappa^{LA}}^0 \\ 0 \\ \lambda_{5,\kappa^{LA}}^0 \\ 0 \end{bmatrix} \kappa_t^{LA} + \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ \lambda_{5,br}^0 \\ \lambda_{6,br}^0 \end{bmatrix} br_t$$

$$+ \begin{bmatrix} \lambda_{1,u}^0 & 0 & 0 & 0 & 0 & 0 \\ 0 & \lambda_{2,u}^0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \lambda_{3,u}^0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \lambda_{4,u}^0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \lambda_{5,u}^0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \lambda_{6,u}^0 \end{bmatrix} \begin{bmatrix} u_{1,t} \\ u_{2,t} \\ u_{3,t} \\ u_{4,t} \\ u_{5,t} \\ u_{6,t} \end{bmatrix}.$$

Benchmark Latent Factor Model - Intervention Days

- Model A1: $j = 1$
- Structural breaks on the factor loadings on $\omega_t, \kappa_t, \kappa_t^{LA}, u_{i,t}$
- E.g loading on global factor w_t with structural break is $\lambda_{i,\omega}^0 + \lambda_{i,\omega}^1$
- E.g loading on currency market factor κ_t with structural break is $\lambda_{i,\kappa}^0 + \lambda_{i,\kappa}^1$

Benchmark Latent Factor Model - Intervention Days

- Brazilian currency return equation on non-intervention days

$$BRL_t^0 = \lambda_{5,\omega}^0 \omega_t + \lambda_{5,\kappa}^0 \kappa_t + \lambda_{5,\kappa^{LA}}^0 \kappa_t^{LA} + \lambda_{5,br}^0 br_t + \lambda_{5,u}^0 u_{5,t}$$

- Brazilian currency return equation on intervention days

$$BRL_t^1 = \lambda_{5,\omega}^{1*} \omega_t + \lambda_{5,\kappa}^{1*} \kappa_t + \lambda_{5,\kappa^{LA}}^{1*} \kappa_t^{LA} + \lambda_{5,br}^{*} br_t + \lambda_{5,u}^{1*} u_{5,t} + \iota_{br} u_{6,t}$$

- Argentinian currency return equation on intervention days

$$ARS_t^1 = \lambda_{3,\omega}^{1*} \omega_t + \lambda_{3,\kappa}^{1*} \kappa_t + \lambda_{3,\kappa^{LA}}^{1*} \kappa_t^{LA} + \lambda_{3,br}^{*} br_t + \lambda_{3,u}^{1*} u3 + \iota_{ar} u_{6,t}$$

Volatility Decompositions to Interpret Results

- Factors are *iid* $(0, 1)$ random variables
- Express the volatility of each of the currency returns into its component factors.
- For intervention days the total volatility for i is

$$\begin{aligned} Var\left(y_{i,t}^{1}\right) &= E[(y^{1})_{i,t}^{2}] = (\lambda_{i\omega}^{0} + \lambda_{i\omega}^{1})^{2} + \left(\lambda_{1,\kappa}^{0} + \lambda_{1,\kappa}^{1}\right)^{2} \\ &\quad + (\lambda_{3,\kappa^{LA}}^{0} + \lambda_{3,\kappa^{LA}}^{1})^{2} + \left(\lambda_{5,br}^{0} + \lambda_{5,br}^{1}\right)^{2} \\ &\quad + \iota_{i}^{2} + (\lambda_{i,u}^{0} + \lambda_{i,u}^{1})^{2} \end{aligned}$$

Volatility Decompositions to Interpret Results

- Proportion of the volatility of the return of variable $i = 1$ when $j = 1$ explained by the global factor w_t, is:

$$\frac{(\lambda_{i\omega}^{0} + \lambda_{i\omega}^{1})^2}{Var\left(y_{i,t}^{1}\right)}$$

- Proportion of the volatility of the currency return for Brazil due to intervention is:

$$\frac{\iota_{br}^{2}}{Var\left(y_{5,t}^{1}\right)}$$

- Proportion of the volatility of the currency return for Argentina due to intervention in Brazil is:

$$\frac{\iota_{ar}^{2}}{Var\left(y_{3,t}^{1}\right)}$$

Estimation Method

- GMM estimator to compute the unknown parameters
- Equate
  - theoretical moments of the model
  - and empirical moments of the data
- Exploit the feature of the data that intervention did not occur on some days and did occur on others
- For the factor model of Brazilian intervention
  - $n = 6$ variables
  - 40 parameters to identify
  - 42 moment conditions
    - $((6 \times 7)/2) = 21$ moments from non-intervention day data,
    - $((6 \times 7)/2) = 21$ moments from the intervention day data.

The Models Estimated

- Effect of Brazilian intervention

Model A1 Argentina $Y_t = [EUR_t, GBP_t, ARS_t, Ares_t, BRL_t, Bint_t]'$
Model A2 Chile $Y_t = [EUR_t, GBP_t, CLP_t, Cres_t, BRL_t, Bint_t]'$
Model A3 Peru $Y_t = [EUR_t, GBP_t, PEN_t, Pres_t, BRL_t, Bint_t]'$

- Effects of Brazilian reserve changes

Model B1 Argentina $Y_t = [EUR_t, GBP_t, ARS_t, Ares_t, BRL_t, Bres_t]'$
Model B2 Chile $Y_t = [EUR_t, GBP_t, CLP_t, Cres_t, BRL_t, Bres_t]'$
Model B3 Peru $Y_t = [EUR_t, GBP_t, PEN_t, Pres_t, BRL_t, Bres_t]'$

Regional Effects of Brazilian Intervention

Effects on Brazil and Argentina

var	glob.	currency	Lat. currency	Brazil	Intervention	Idio
Non-intervention days $j = 0$						
Eur	12.45	64.35				23.20
GBP	11.84	53.15				35.01
ARS	4.59	2.49	45.44			47.47
Ares	29.84					70.16
BRL	13.04	32.99	0.27	0.24		53.46
int	1.26			1.25		97.49
intervention days $j = 1$						
Eur	62.92	37.08				23.20
GBP	46.01	2.58				51.41
ARS	0.15	2.46	57.09		2.79	37.57
Ares	0.80					99.20
BRL	46.81	0.07	0.01	0.35	52.76	0.00
int	44.86			0.37		54.77

Regional Effects of Brazilian Intervention

Effects on Brazil and Argentina - Wald Tests

Intervention Parameter	Estimate	Standard Deviation	p-value
ι_{br}	-0.681	0.112	0.00
ι_{ar}	-0.170	0.071	0.01
Wald Test Hypothesis	**DOF**	**Test Statistic**	**p-value**
Joint intervention parameters			
$H_0 : \iota_{br} = \iota_{ar} = 0$	2	36.93	0.00
$H_0 : \iota_{br} = \iota_{ar} = \lambda^1_{6,u} = 0$	3	43.40	0.00
Joint structural break parameters			
$H_0 : \iota_{br} = \iota_{ar} = \lambda^1_{i,f} = 0$	20	239.91	0.00

Regional Effects of Brazilian Intervention

Effects on Brazil and Argentina using reserve changes

var	glob.	currency	Lat. currency	Brazil	Intervention	Idio
Non-intervention days $j = 0$						
Eur	43.97	36.00				20.03
GBP	41.77	21.42				36.81
ARS	0.35	2.53	88.95			8.17
Ares	8.88					91.12
BRL	44.10	6.05	0.26	5.29		44.30
Bres	66.41			8.76		24.82
intervention days $j = 1$						
Eur	53.05	12.94				34.01
GBP	38.98	25.71				35.31
ARS	6.00	9.78	23.51		1.63	59.08
Ares	0.85					99.15
BRL	50.05	0.11	0.13	7.76	41.96	0.00
Bres	52.99			7.09		39.92

Regional Effects of Brazilian Intervention

Effects on Brazil and Argentina using reserve changes - Wald Tests

Intervention Parameter	Estimate	Standard Deviation	p-value
ι_{br}	-0.608	0.218	0.00
ι_{ar}	0.130	0.210	0.27
Wald Test Hypothesis	**DOF**	**Test Statistic**	**p-value**
Joint intervention parameters			
$H_0 : \iota_{br} = \iota_{ar} = 0$	2	12.36	0.00
$H_0 : \iota_{br} = \iota_{ar} = \lambda^1_{6,u} = 0$	3	13.47	0.00
Joint structural break parameters			
$H_0 : \iota_{br} = \iota_{ar} = \lambda^1_{i,f} = 0$	20	110.05	0.00

Regional Effects of Brazilian Intervention

Effects on Brazil and Chile

var	glob.	currency	Lat. currency	Brazil	Intervention	Idio
Non-intervention days $j = 0$						
Eur	5.44	72.40				22.16
GBP	4.21	59.87				35.92
CLP	2.44	29.10	68.44			0.02
Cres	3.80					96.20
BRL	25.16	69.09	3.77	0.55		1.48
int	0.01			2.55		97.49
intervention days $j = 1$						
Eur	78.81	3.45				17.74
GBP	60.11	7.59				32.30
CLP	19.14	0.01	38.47		5.69	36.69
Cres	0.01					99.99
BRL	34.96	0.00	0.00	0.73	64.31	0.00
int	34.95			0.73		64.32

Regional Effects of Brazilian Intervention

Effects on Brazil and Chile using reserve changes

var	glob.	currency	Lat. currency	Brazil	Intervention	Idio
Non-intervention days $j = 0$						
Eur	69.61	1.18				29.22
GBP	65.95	6.98				27.02
CLP	40.52	7.9	44.63			6.95
Cres	0.00					100
BRL	52.42	2.62	0.13	0.03		44.80
Bres	42.45			0.05		57.50
intervention days $j = 1$						
Eur	78.99	13.06				7.95
GBP	60.28	2.14				37.58
CLP	18.93	0.01	28.22		5.77	47.07
Cres	0.01					99.99
BRL	35.00	0.00	0.00	0.04	64.96	0.00
Bres	35.03			0.04		64.93

Regional Effects of Brazilian Intervention

Effects on Brazil and Chile using reserve changes

Case 2: Chile	Model A2		Model B2	
Intervention Parameter	Estimate	p-value	Estimate	p-value
ι_{br}	-0.754	0.00	0.756	0.00
ι_{ch}	-0.216	0.00	0.217	0.00
Wald Test Hypothesis	**Test Statistics**	**p-value**	**Test Statistics**	**p-value**
Joint intervention parameters				
$H_0 : \iota_{br} = \iota_{ch} = 0$	198.31	0.00	145.14	0.00
$H_0 : \iota_{br} = \iota_{ch} = \lambda^1_{6,u} = 0$	207.12	0.00	386.16	0.00
Joint structural break parameters				
$H_0 : \iota_{br} = \iota_{ch} = \lambda^1_{i,f} = 0$	782.78	0.00	1329.82	0.00

Regional Effects of Brazilian Intervention

Effects on Brazil and Peru

var	glob.	currency	Lat. currency	Brazil	Intervention	Idio
Non-intervention days $j = 0$						
Eur	99.33	0.67				0.00
GBP	52.54	3.89				43.57
PEN	18.93	4.94	44.55			31.58
Pres	7.29					92.71
BRL	39.43	21.15	0.81	0.15		38.47
int	0.14			0.71		99.51
intervention days $j = 1$						
Eur	65.27	11.72				23.10
GBP	49.04	5.10				45.87
PEN	37.10	62.89	0.00		0.01	0.00
Pres	1.51					98.49
BRL	41.96	0.00	0.00	0.21	57.81	0.00
int	41.93			0.21		57.86

Regional Effects of Brazilian Intervention

Effects on Brazil and Peru using reserve changes

var	glob.	currency	Lat. currency	Brazil	Intervention	Idio
Non-intervention days $j = 0$						
Eur	77.82	0.90				21.28
GBP	63.37	0.24				36.39
PEN	19.19	11.89	54.30			14.62
Pres	6.98					93.02
BRL	51.47	24.49	5.44	0.24		18.36
Bres	41.37			0.42		58.21
intervention days $j = 1$						
Eur	65.26	11.72				23.02
GBP	49.03	5.10				45.87
PEN	37.10	62.88	0.00		0.01	0.00
Pres	1.51					98.49
BRL	41.93	0.00	0.00	0.35	57.72	0.00
Bres	41.90			0.34		57.76

Regional Effects of Brazilian Intervention

Effects on Brazil and Peru

Case 3: Peru	Model A3		Model B3	
Intervention Parameter	Estimate	p-value	Estimate	p-value
ι_{br}	-0.714	0.00	-0.713	0.00
ι_{pe}	0.012	0.28	0.012	0.41
Wald Test Hypothesis	Test Statistics	p-value	Test Statistics	p-value
Joint intervention parameters				
$H_0 : \iota_{br} = \iota_{ch} = 0$	380.32	0.00	21.86	0.00
$H_0 : \iota_{br} = \iota_{ch} = \lambda^1_{6,u} = 0$	393.63	0.00	21.91	0.00
Joint structural break parameters				
$H_0 : \iota_{br} = \iota_{ch} = \lambda^1_{i,f} = 0$	976.22	0.00	254.93	0.00

Spillovers of Intervention on Regional Reserves

- Model

$$Y_t^j = [Ares_t^j, Cres_t^j, Pres_t^j, Bres_t^j, Bint_t^j]'$$

- Reserve changes of
  - Argentina
  - Chile
  - Peru
  - Brazil
- Brazilian intervention

Regional Reserve Stocks

- Brazil's reserve stocks
  - highest, starting at US$190.5bn and finishing at US$373.9bn
- Argentina
  - start second highest in the sample, at US$46.4bn
  - maximum of US$52.7bn in 2011
  - finishing in June 2012 at the same level of 2009
- Chile
  - lowest
  - double from US$23.6bn to US$40.3bn
- Peru
  - start at US$31.1bn increase to US$57.2bn, overtaking Argentina

Spillovers of Intervention on Regional Reserves

Intervention days

$$\begin{bmatrix} Ares_t^1 \\ Cres_t^1 \\ Pres_t^1 \\ Bres_t^1 \\ Bint_t^1 \end{bmatrix} = \begin{bmatrix} (\lambda_{1,\omega}^0 + \lambda_{1,\omega}^1) \\ (\lambda_{2,\omega}^0 + \lambda_{2,\omega}^1) \\ (\lambda_{3,\omega}^0 + \lambda_{3,\omega}^1) \\ (\lambda_{4,\omega}^0 + \lambda_{4,\omega}^1) \\ (\lambda_{5,\omega}^0 + \lambda_{5,\omega}^1) \end{bmatrix} \omega_t + \begin{bmatrix} 0 \\ 0 \\ 0 \\ \lambda_{4,br}^0 \\ \lambda_{5,br}^0 \end{bmatrix} br_t$$

$$+ \begin{bmatrix} (\lambda_{1,u}^0 + \lambda_{1,u}^1) & 0 & 0 & 0 & \iota_{ar} \\ 0 & \ddots & 0 & 0 & \iota_{ch} \\ 0 & 0 & \ddots & 0 & \iota_{pe} \\ 0 & 0 & 0 & \ddots & \iota_{br} \\ 0 & 0 & 0 & 0 & (\lambda_{5,u}^0 + \lambda_{5,u}^1) \end{bmatrix} \begin{bmatrix} u_{1,t} \\ u_{2,t} \\ u_{3,t} \\ u_{4,t} \\ u_{5,t} \end{bmatrix}$$

Spillovers of Intervention on Regional Reserves

Intervention days

var	glob.	Brazil	Intervention	Idio
Non-intervention days $j = 0$				
Ares	23.30			76.70
Cres	0.33			99.67
Pr *es*	12.53			87.47
Bres	23.67	19.15		57.18
int	0.83	98.67		0.5
intervention days $j = 1$				
Ares	2.07		0.30	97.63
Cres	0.21		0.42	99.37
Pr *es*	2.01		0.60	97.39
Bres	14.77	12.22	50.77	22.25
int	5.29	19.52		75.19

Long Horizon Strategic Reserve Accumulation

- Change data frequency to monthly
  - regional central banks react in a considered manner over time
  - countries signal economic strength through foreign reserve acquisitions
  - avoid potential currency speculative attacks
  - indirect collateral assets for foreign direct investments

Long Horizon Strategic Reserve Accumulation

var	glob.	Brazli	Intervention	Idio
Non-intervention days $j = 0$				
Ares	83.71			16.29
Cres	76.96			23.04
Pr *es*	100			0.00
Bres	99.78	0.22		0.00
int	29.32	70.68		0.00
intervention days $j = 1$				
Ares	12.58		57.84	29.57
Cres	22.44		53.14	24.43
Pr *es*	26.30		73.70	0.00
Bres	21.40	0.33	61.44	16.83
int	41.85	31.24		26.91

Long Horizon Strategic Reserve Accumulation

Wald tests

Intervention Parameter	Estimate	Standard Deviation	p-value
ι_{br}	-0.841	0.066	0.00
ι_{ar}	-0.702	0.062	0.00
ι_{ch}	-0.671	0.094	0.00
ι_{pe}	-0.817	0.072	0.00
Wald Test Hypothesis	**DOF**	**Test Statistic**	**p-value**
Joint intervention parameters			
$H_0 : \iota_{br} = \iota_{ar} = \iota_{ch} = \iota_{pe} = 0$	4	258.89	0.00
$H_0 : \iota_{br} = \iota_{ar} = \iota_{ch} = \iota_{pe} = \lambda^1_{5,u} = 0$	5	361.13	0.00
Joint structural break parameters			
$H_0 : \iota_{br} = \iota_{ar} = \iota_{ch} = \iota_{pe} = \lambda^1_{i,f} = 0$	14	1195.00	0.00

Conclusion: Foreign Reserve Accumulation and the Mercantilist Motive Hypothesis

- Investigate the mercantilist motive hypothesis in the case of Brazil
  - unique data set on daily FX intervention
  - factor model to decompose sources of volatility of currencies and reserves

Conclusion: Foreign Reserve Accumulation and the Mercantilist Motive Hypothesis

- Results support the effectiveness of Brazil's intervention
  - substantially explain the volatility of its exchange rate
  - some spillover effects to other Latin American currency markets
- Use of Brazil's reserve changes as a proxy for currency intervention closely mimics the qualitative benchmark results

Conclusion: Foreign Reserve Accumulation and the Mercantilist Motive Hypothesis

- Investigate regional spillover effects of reserve changes through central bank intervention
  - show the strength of Brazil's currency intervention in the volatility of its own reserve changes
  - fail to detect short-run co-movements on neighbour's foreign reserve markets
- In the long run, there is evidence of the impact of Brazil's CB intervention on neighboring countries' foreign reserves

Conclusion: Foreign Reserve Accumulation and the Mercantilist Motive Hypothesis

- Insights for domestic and regional policy settings
  - cost-benefit analysis for reserve accumulation should go beyond the self-insurance motive
  - account for possible trade and financial movements from impacts on exchange rates
- Evidence of currency intervention spillover effects and reserve accumulation co-movements
  - suggests that policy coordination among the countries in the Latin American region may be beneficial
  - some supports for regional coordination of a supranational foreign reserve fund
  - mitigate the costs of reserve carrying and smooths regional currency risks