Currency Substitution in the Economies of Central Asia: How Much Does it Cost?

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Presentation Outline

- Introduction and Motivation
- Literature Review
- Theoretical Model
- Estimation Methodology and Data
- Empirical Results
- Seigniorage and Welfare
- Conclusion

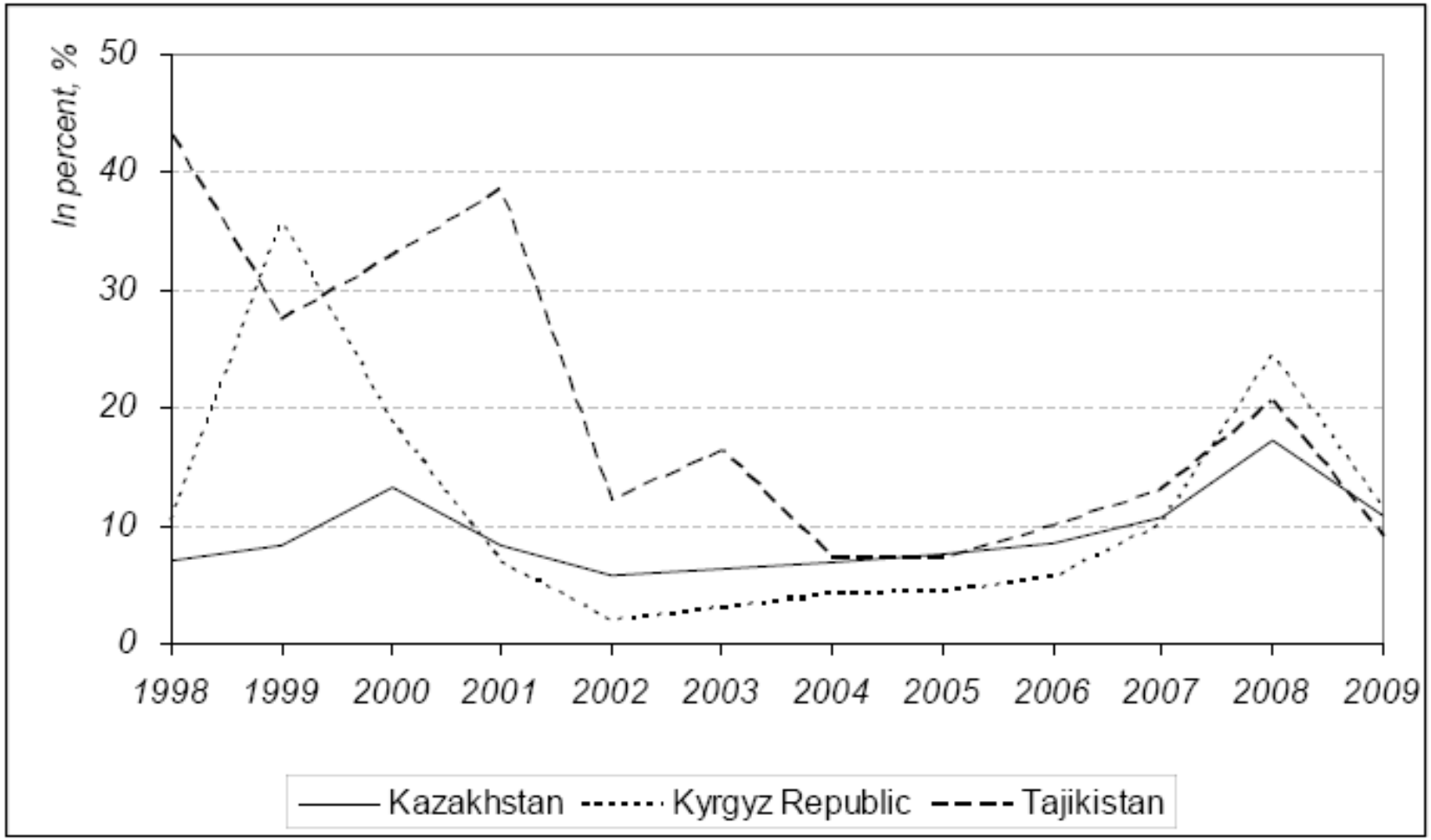
Introduction

- What do currency substitution and dollarization mean?
- A study on currency substitution and dollarization in Central Asia: Kazakhstan, Kyrgyz Republic and Tajikistan
- Money-in-the-Utility (MIU) model optimization
- Estimation with Generalized Method of Moments (GMM)
- A study of steady state implications for seigniorage revenue and welfare

Motivation

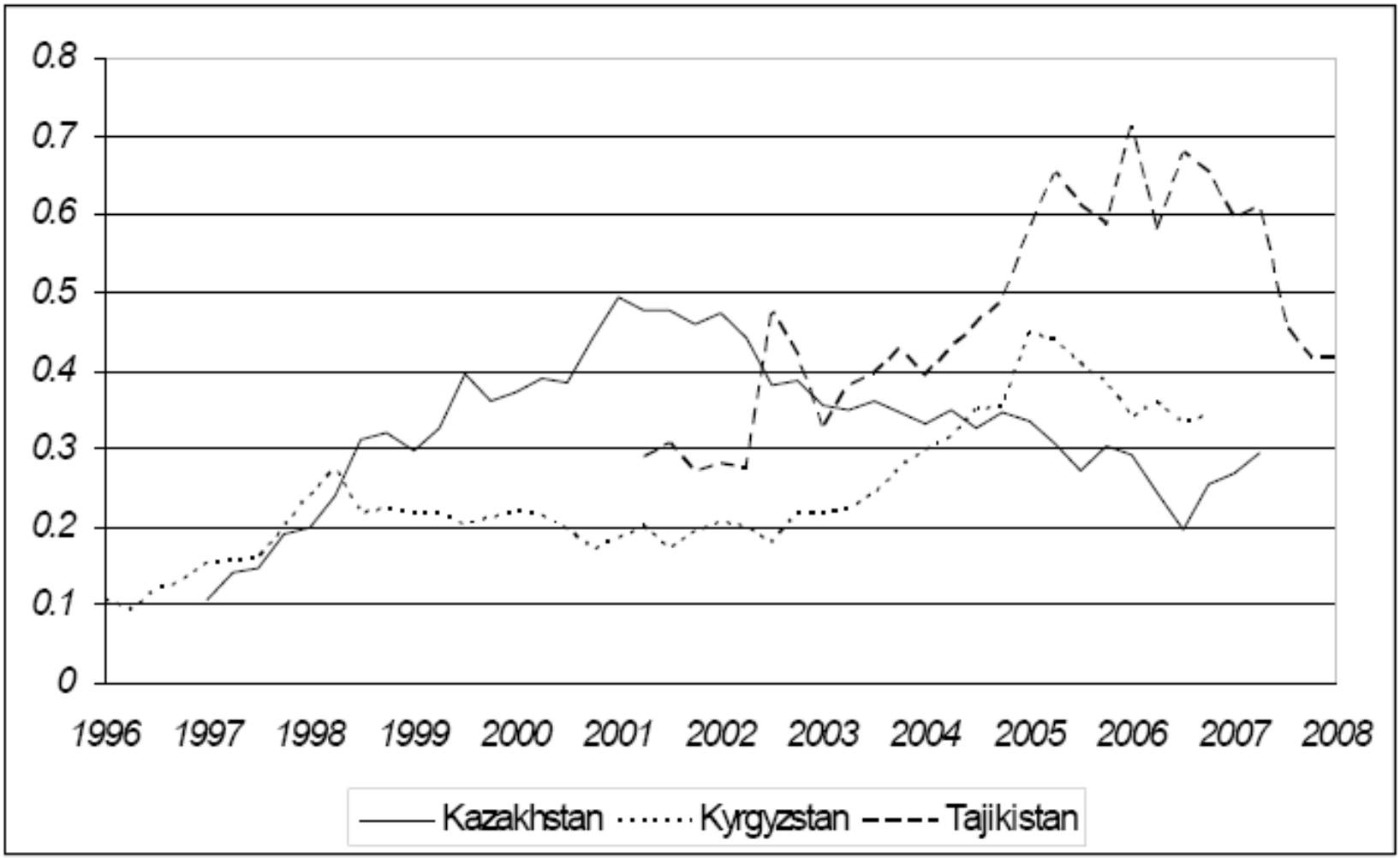
- Hyperinflation and national currencies depreciation have brought about currency substitution and dollarization
- Currency substitution and dollarization have had an important magnitude in CA over the whole period of transition
- These phenomena might affect financial stability and effects of monetary policy

Inflation in Central Asia



Notes: Data for 2008 are estimates, data for 2009 - projections
Source: EBRD Transition Report 2008

Dollarization Indices in CA



Source: Data from National banks, IMF.

Foreign exchange inflows

Remittances* (mln. USD)	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008 estim.
Kazakhstan	64	122	171	205	147	166	178	187	223	250
Kyrgyzstan	18	9	11	37	78	189	322	481	715	715
Tajikistan	...	...	...	79	146	252	467	1019	1691	1750
FDI (mln. USD)**										
Kazakhstan	1468	1278	2861	2164	2213	5436	2123	6630	6900	10732
Kyrgyzstan	38	-7	-1	5	46	132	43	182	208	265
Tajikistan	21	24	10	36	32	272	55	66	160	190

Source: * World Bank Migration and Remittances Factbook, 2008

** EBRD Transition Report, 2008

Monetary policy framework

- Fiscal dominance has reduced as budget deficits have been brought under control
- Exchange rate regimes are officially regulated (managed) floats with interventions aiming at eliminating excessive volatility of the rate
- Monetary policy instruments: open market operations, reserve requirements, policy rates and foreign exchange interventions

Literature Review

- General studies on currency substitution in transition economies: Havrylyshyn and Beddies (2003), Feige (2003)
- Currency substitution in transition economies: Mongardini and Mueller (1999), Verbetski and Friedman (2001), Selçuk (2006)
- MIU framework and GMM estimation: Imrohoroglu (1994), Verbetski and Friedman (2001), Selçuk (2006)
- Seigniorage and welfare implications: Bufman and Leiderman (1993), Eckstein and Leiderman (1992), Verbetski and Friedman (2001)

Model of Currency Substitution

A representative agent maximizes his lifetime utility:

$$E_0 \sum_{t=0}^{\infty} \beta^t U(c_t, x_t),$$

where

$$x = [(1-\alpha)m^{-\rho} + \alpha m^{*-\rho})]^{-\frac{1}{\rho}}$$

s.t.

$$c_t + m_t + m_t^* + b_t = y_t + \tau_t + \frac{m_{t-1}}{(1+\pi_t)} + \frac{m_{t-1}^*(1+\epsilon_t)}{(1+\pi_t)} + \frac{b_{t-1}(1+r_{t-1})}{(1+\pi_t)}$$

y- endowment, τ – transfer, c – consumption, m – domestic money balances, m* - foreign money balances, b – nominal bond, π – inflation rate, r – nominal interest rate, ε – depreciation rate

Optimality conditions

$$\beta E_t \left[\frac{u_{c_{t+1}}}{u_{c_t}} \frac{1 + r_t}{(1 + \pi_{t+1})} \right] = 1, \tag{1}$$

$$\frac{u_{m_t}}{u_{c_t}} = 1 - \beta E_t \left[\frac{u_{c_{t+1}}}{u_{c_t}} \frac{1}{(1 + \pi_{t+1})} \right], \tag{2}$$

$$\frac{u_{m_t^*}}{u_{c_t}} = 1 - \beta E_t \left[\frac{u_{c_{t+1}}}{u_{c_t}} \frac{1 + \epsilon_{t+1}}{(1 + \pi_{t+1})} \right] \tag{3}$$

Utility function specifications

- CRRA utility function:

$$U(c_t, x_t) = \frac{(c_t^{1-\gamma} x_t^{\gamma})^{1-\sigma} - 1}{1-\sigma}$$

- Habit formation:

$$U(c_t, x_t) = \frac{[(c_t - \delta c_{t-1})^{1-\gamma} x_t^{\gamma}]^{1-\sigma} - 1}{1-\sigma}$$

Estimation Methodology

- GMM is used to estimate the model's parameters – *α, β, σ, ρ, γ, δ.*

  - allows estimation of all the parameters in the model

  - allows further analysis of seigniorage and welfare implications

- Instruments used are:

$$I_t = \left\{ 1, \frac{m_{t-p+1}}{m_{t-p}}, \frac{m^*_{t-p}}{m_{t-p}}, \frac{c_{t-p+1}}{c_{t-p}}, \frac{c_{t-p}}{m_{t-p}}, 1 + r_{t-p} \right\}$$

Data description

- *m* – deposits denominated in local currency
- *m** - deposits denominated in foreign currency
- *c* – industrial production volume, average wage
- *p* – Consumer Price Index
- *e* – nominal exchange rate to US dollar
- *r* – nominal interest rates: deposit rates, refinance rates, repo rate, interbank rates, etc.

- Time span: 2000:1 to 2008:12 (from 2002:1 for Tajikistan)

- Data sources: IMF, national banks, statistical offices

Results: Kyrgyzstan

	Repo rate	MMR	Deposit Rate	FFR
β	0.96*** (0.00)	0.96***(0.01)	0.95***(0.00)	0.99***(0.00)
α	0.55***(0.01)	0.55***(0.02)	0.56***(0.01)	0.59***(0.04)
γ	0.05*** (0.00)	0.06***(0.00)	0.06***(0.00)	0.02***(0.00)
σ	0.05 (0.12)	0.06 (0.20)	0.05 (0.09)	-0.03 (0.02)
ρ	-0.77***(0.10)	-0.81*** (0.10)	-0.68***(0.06)	-0.47*(0.23)
$J-statistics$	4.43 [0.73]	5.16 [0.52]	5.00 [0.66]	5.69 [0.68]
$No.obs$	94	90	95	94

Results: Tajikistan

	Refinance rate	Interbank Rate	Deposit Rate	FFR
β	0.90***(0.00)	0.89***(0.00)	0.93***(0.00)	0.98***(0.00)
α	0.54***(0.01)	0.53***(0.00)	0.54***(0.01)	0.46***(0.02)
γ	0.09***(0.00)	0.09***(0.00)	0.05***(0.00)	0.01***(0.00)
σ	0.04 (0.05)	0.04 (0.03)	0.07* (0.04)	-0.00 (0.01)
ρ	-0.74*** (0.01)	-0.68*** (0.02)	-0.71*** (0.01)	-1.02***(0.04)
$J-statistics$	5.23 [0.86]	4.90 [0.90]	5.10 [0.89]	5.86 [0.84]
$No.obs$	71	61	71	71

Results: Kazakhstan

	Refinance rate	Treasury Bill	Deposit Rate	FFR
β	0.92***(0.00)	0.95***(0.00)	0.97***(0.00)	0.98***(0.00)
α	0.50***(0.00)	0.50***(0.00)	0.50***(0.00)	0.50***(0.00)
γ	0.22***(0.00)	0.14***(0.00)	0.10***(0.00)	0.08***(0.00)
σ	-0.25***(0.01)	-0.14***(0.00)	-0.10***(0.01)	-0.08***(0.00)
δ	0.78***(0.00)	0.78***(0.01)	0.78***(0.00)	0.78***(0.00)
ρ	-0.89***(0.01)	-0.91***(0.01)	-0.75***(0.01)	-0.80***(0.01)
$J-statistics$	8.40 [0.75]	8.14 [0.77]	8.41 [0.75]	8.28 [0.76]
$No.obs$	104	104	104	104

Discussion of GMM results

- Share of foreign currency real balances in providing monetary services is high – 0.5 and more
- Elasticity of substitution between currencies: $s=1/(1+\rho)$ exceeds 1
- Estimates of discount factor β are economically meaningful and imply “present-oriented” households
- Estimates of RRA coefficient σ are imprecise and sometimes negative

Seigniorage revenue analysis

- Steady state demand for domestic money balances is derived
- Monetary concept of seigniorage is used
- The parameter values are assumed as follows: $\beta = 0.98$, $\rho = -0.7$, $\gamma = 0.08$, $\sigma = 0$, $c/y = 0.8$
- Steady states with different levels of dollarization α and different inflation rates π are considered
- Two scenarios of depreciation rate determination are considered

Seigniorage-to-GDP ratios (%)

a) Scenario 1: $\epsilon = \pi(\pi^* = 0\%)$

π, %	α			
	0.4	0.5	0.6	0.7
0.2	0.48	0.28	0.11	0.03
0.5	0.98	0.53	0.19	0.05
1.0	1.42	0.67	0.22	0.05
2.0	1.58	0.61	0.18	0.04
3.0	1.41	0.48	0.14	0.03
4.0	1.19	0.38	0.10	0.02
5.0	0.98	0.30	0.08	0.02
6.0	0.82	0.24	0.06	0.014
8.0	0.59	0.16	0.04	0.010
10	0.44	0.12	0.03	0.007
20	0.16	0.04	0.01	0.003
30	0.09	0.02	0.006	0.001
50	0.05	0.01	0.003	0.0008

Seigniorage-to-GDP ratios (%)

b) $Scenario2 : \pi^* = 5\%$

$\pi, \%$	α			
	0.4	0.5	0.6	0.7
0.2	0.62	0.59	0.49	0.28
0.5	1.36	1.27	1.01	0.52
1.0	2.25	2.03	1.48	0.66
2.0	3.30	2.75	1.67	0.60
3.0	3.83	2.91	1.51	0.48
4.0	4.07	2.81	1.28	0.37
5.0	4.15	2.61	1.07	0.29
6.0	4.11	3.37	0.90	0.24
8.0	3.86	1.91	0.65	0.16
10	3.51	1.53	0.48	0.12
20	2.03	0.65	0.18	0.04
30	1.31	0.38	0.10	0.02
50	0.76	0.21	0.06	0.01

Implications for seigniorage revenue

- Seigniorage revenue is a decreasing function of dollarization

- If inflation rate abroad > 0, seigniorage revenues of the local government are higher for every level of dollarization

Welfare analysis

- Dollarization affects welfare:

  - through transfer rebates of the government

  - motives to hold foreign currency are related to welfare

- Computation of the consumption compensation needed to return consumers to initial level of utility: $u(c, \alpha_0) = u(c + \Delta c, \alpha_1)$

where $\alpha_0 < \alpha_1$ and $u(\alpha_0) > u(\alpha_1)$

Welfare implications

α_0 =0.45 to α_1 =0.55

π, %	ΔC/GDP, %	
	Scenario 1: $\epsilon = \pi$	*Scenario 2*: $\pi^* = 5\%$
0.2	-0.56	1.56
0.5	-0.77	1.42
1	-1.01	1.17
2	-1.28	0.68
3	-1.42	0.24
4	-1.49	-0.11
5	-1.53	-0.40
6	-1.56	-0.62
8	-1.59	-0.93
10	-1.61	-1.12
20	-1.639	-1.47
30	-1.644	-1.56
50	-1.647	-1.61

Welfare implications

- Dollarization can be welfare generating: welfare gain from holding foreign currency exceed the amount of transfers lost

- If inflation is higher abroad, holding dollars by households brings welfare loss

Some concluding remarks

- Currency substitution and dollarization have important magnitude in the economies of CA
- Monetary authorities lose seigniorage revenue when dollarization is present
- Welfare of households is affected by holding foreign money: this effect might be negative as well as positive
- Currency substitution should be discouraged gradually