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Estimating the Magnitude of Capital Flight Due To Abnormal Pricing in International Trade: The Russia-USA Case

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Russian Caviar at \$3/KG?

1999 Russia's Export to the U.S. - Abnormally Low Priced

Item	Value	Quantity		Price	Median Price	District	MO
CAVIAR	\$19,048	5,642	KG	\$3	\$260	LA	05
COOKING STOVES, Industrial	\$2,400	400	NO	\$6	\$2,281	LA	05
MOWERS, Tractor drawn or for Tractor mounting, not Rotary cutter type	\$11,469	122	NO	\$94	\$3,682	HSTN	11
GEAR BOXES for Passenger Car	\$37,320	6,496	NO	\$6	\$818	HSTN	12

Bicycle Tires at \$364/tire from the U.S. ?

1999 Russia's Import from the US - abnormally high priced

Item	Value	Quantity		Price	Median Price	District	MO
BICYCLES TIRES	\$2,548	7	NO	\$364	\$3.09	DETROIT	02
MEN'S OR BOYS' RAINCOATS - cotton	\$116,592	322	DOZ	\$362	\$40.46	NY CITY	03
WORN CLOTHING and OTHER WORN ARTICLES	\$150,000	347	KG	\$432	\$0.80	GTFALLS	05
BURGLAR ALARMS, Electric	\$105,954	7	NO	\$15,136	\$193.68	NY CITY	01
SWITCHES, PUSH-BUTTON, rated at < 10A, 1,000 V	\$179,080	10	NO	\$17,908	\$1.47	SEATTLE	07

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Abnormal Pricing in International Trade

- **May be related to:**
 - Capital flight
 - Import duty fraud
 - Income tax evasion / Transfer Pricing
 - Money laundering
- **Other Explanations:**
 - Clerical/Recording Errors
 - Product Heterogeneity for a given HS10 code
 - \$25,000 fax machine from Japan – prototype industrial sample

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Our Research

- Estimate the amount of capital flight from Russia to the U.S. through under-invoiced export and over-invoiced import during 1995 ~ 1999
- An empirical test: Is the capital flight due to a portfolio consideration in search of higher returns on wealth?
- Suggest an efficient Method of Inspection / Audit of Export and Import Transactions

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Effects of Abnormally Low Priced Export

(Russian Caviar at \$3/KG)

- Exporter (Russian):
 - Lower revenue and
 - Lower taxable income
- Importer (American):
 - Lower import duty
- Transfer wealth through excessively Low Priced goods
 - Capital outflow from Russia, the exporting country
 - Money laundering

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Effects of Abnormally High Priced Import

(Bicycle tires at \$364 from the U.S.)

- **Importer (Russian):**
 - Higher COG and higher import duty
 - Income tax saving > Increased import duty
 - Chen-Sunrider v. the U.S.
- **Exporter (American):**
 - Higher revenue & higher taxable income
 - May offset against negative profit
 - In some countries: Higher Export subsidy
 - Medical equipment export from Pakistan to the U.S.
- **Transfer wealth through Payments for excessively High Priced goods**
 - Capital outflow from Russia, the importing country
 - Money laundering

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Prior Estimates of Russian Capital Flight

- **Tikhomirov 1997**
 - Compared the Russian average contract prices with average world prices compiled by the gov't
 - Asserts that the actual capital flight is three to six time of \$35 ~ \$400 billion estimated for 1990 – 1995 by Russian Government
- **Abalkin & Whalley (1999)**
 - Used the balance of payment data
 - Estimated \$56-\$70 billion during 1992-93
 - Estimated \$17 billion/year during 1994 – 97

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Our Estimation: Data and Methodology

Direct estimate based on reported import & export transaction data

- Data Source
- Criteria for Price Abnormality
- Estimated Amount of Capital Flight / Income Shift
- Limitations of the Method

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DATA SOURCE

- U.S. Merchandise Trade Data from U.S. Census Bureau
- Two CD's each, monthly:

	Exports	Imports
Disk size (Dec 1999)	371 MB	641MB
Transactions(1999)	20,420,064	30,173,714
Records(Dec 1999)	1.1 million	1.5 million

- All Import (>\$1,250) and Export (>\$2,500) Transactions
 - Ten digit harmonized commodity code
 - 8,635 export codes in 1999
 - 17,179 import codes
 - Country – 233 countries in 1999
 - Customs district – 44 customs districts
 - Month
 - Quantity & Dollar value

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Criteria for Price Abnormality A Price Filter – Global Price Matrix

- Global Price Matrix is constructed from the data:
 - For each commodity code and each country
 - The average price, the standard deviation, upper- and lower quartile prices
- Upper bound = the mean + a x STD or **Upper Quartile Price**
 Lower bound = the mean - a x STD or **Lower Quartile Price**
- Total Number of Cells in 1999
 - = (8,635 + 17,179) x (233+1) = 6.04 million cells
 - Why use Upper- and Lower Quartiles?
 - IRS Reg 482 on transfer pricing
 - Price Matrix for Mexico: **Import** and **Export**

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Estimation of Income Shifted from Russia to the US

- Abnormality Criteria
 - imports at prices exceeding the import **upper** quartile price;
 - exports at prices below the export **lower** quartile price
- Dollar value of over or under invoicing
 - Dollar value of deviations from the inter-quartile prices
 - $\text{Max}(0, (\text{Import Price} - \text{upper quartile price}) \times \text{Qty})$
 - $\text{Max}(0, (\text{Lower quartile price} - \text{Export Price}) \times \text{Qty})$
 - 60 monthly data sets during 1995 -1996
 - Every import and export transaction between Russia and the United States for every month

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Estimated Income Shifted from Russia to the US

**All Items - based on
US-World Upper/Lower Quartile Prices**
(\$ million)

	Exports	Imports	Total
1995	736	292	1,028
1996	632	380	1,012
1997	662	364	1,026
1998	679	331	1,010
1999	4,533	313	4,847
Five Year Total	7,242	1,681	8,923

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Estimated Income Shifted from Russia to the US

**All Items - based on
US-Russia Upper/Lower Quartile Prices**
(\$ million)

	Exports	Imports	Total
1995	131	129	260
1996	262	166	428
1997	99	146	245
1998	164	213	377
1999	495	55	551
Five Year Total	1,152	709	1,861

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Income Shifted from Russia to the US

TOP 25 ITEMS IN RUSSIA-US TRADE (\$ million)

	US-World Upper/Lower Quartile Prices			US-Russia Upper/Lower Quartile Prices		
	Exports	Imports	Total	Exports	Imports	Total
1995	\$457	\$128	\$585	\$107	\$72	\$179
1996	\$397	\$222	\$619	\$235	\$110	\$345
1997	\$416	\$149	\$565	\$73	\$101	\$174
1998	\$388	\$154	\$543	\$123	\$158	\$281
1999	\$4,251	\$230	\$4,481	\$459	\$36	\$495
Five Year Total	\$5,909	\$884	\$6,793	\$997	\$477	\$1,475
	<i>Under Invoiced</i>	<i>Over Invoiced</i>		<i>Under Invoiced</i>	<i>Over Invoiced</i>	

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Income Shifted from Russia to the US

TOP 25 ITEMS IN RUSSIA-US TRADE (%)

(The Income shifted through the top 25 items as a percent
OF THE INCOME SHIFTED THROUGH ALL ITEMS)

	US-World Upper/Lower			US-Russia Upper/Lower		
	Exports	Imports	Total	Exports	Imports	Total
1995	62%	44%	57%	82%	56%	69%
1996	63%	58%	61%	90%	66%	81%
1997	63%	41%	55%	74%	69%	71%
1998	57%	47%	54%	75%	74%	75%
1999	94%	74%	92%	93%	65%	90%
Five Year Total	82%	53%	76%	87%	67%	79%

TOP 25 ITEMS account for over 75% of Total
Income Shifted

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Limitations

- Heterogeneity for a given HS10
- Aggregated data:
 - By HS10, Month, Country, and Customs District
- No distinction between
 - Related party transactions vs unrelated party transactions
- Current pilot research project:
 - Examines each transaction - no aggregation
 - Use information on related party vs. unrelated party transactions

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Expected Outcome of the Pilot Project

- Profiles of Importers and/or Exporters with a high degree of abnormal pricing
- Identify Commodity or Commodity groups with a high degree of abnormal pricing
- Difference in the degree of abnormal pricing between related-party transactions and unrelated-party transactions
- Policy recommendations based on the findings
 - Uniform commodity classification for both imports and exports?
 - Auditing procedure for inbound and outbound cargos?
 - Effective use of the Exp/Imp data in tax audits ?

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Why Capital Flight?

- Money laundering
- Tax evasion
- Higher Returns on Wealth Portfolio

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In Search of Higher Returns on Wealth?

- Intuitively one might move wealth to foreign countries due to:
 - Higher foreign interest rates
 - Lower domestic interest rates
 - Overvalued domestic currency
 - Higher domestic inflation
- Two portfolio models for capital flights
 - **Pastor model (1990):** Pastor, Manuel Jr, 1990, "Capital Flight from Latin America," *World Development*, 18, 1, 1-18.
 - **Cuddington model (1986):** Cuddington, John T., 1986, *Capital Flight: Estimates, Issues, and Explanations*, Princeton Studies in International Finance (Princeton, New Jersey).

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Capital Flight – Pastor Model

- Capital Flight: Investors' transfer of domestic assets to foreign assets
 - Financial Assets or
 - investments in real productive activity
- Explanatory Variables
 - change in inflation rate
 - financial incentive for capital flight: (Interest rate differential adj'd for FX rate change)
 - degree of overvaluation: (Avg REER) – (Equil. REER)

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Pastor Model and Variables def's

$$CF = f(CHINF, FINC^1, OVAL) \quad (1)$$

$$CF = f(CHINF, FINC^2, OVAL) \quad (2)$$

CF = Capital Flight

CHINF = Change in inflation rate, calculated as the difference in logarithms of consumer price indexes.

FINC = Financial incentive for capital flight measured as

$FINC^1 = (i^{US} - (i - \dot{e}))$ following Pastor's definition and

$FINC^2 = \ln(1 + i^{US}) - \ln(1 + i) + \ln(e) - \ln(e^-)$ following Dolley's definition

i^{US} = The rate paid on US Treasury bills

i = Domestic interest rate, Deposit rate

e = Ratio of local currency to dollar

\dot{e} = Rate of change of the exchange rate (local currency to dollar)

OVAL = The degree of overvaluation measured as the average real exchange rate for the current year relative to an equilibrium value (please see the definition for R in Cuddington's model)

e^r = Real exchange rate

P = Domestic price level – producer price index for Russia

P^{US} = US Price level - producer price index for the US

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Capital Flight – Cuddington Model

- a “standard three-asset portfolio adjustment model”
 - domestic financial assets
 - domestic inflation hedges- land, consumer durables
 - foreign financial assets.
- defines capital flight "the year-to-year increase in domestic holdings of foreign financial assets
- The explanatory variables:
 - domestic interest rate,
 - domestic inflation rate, and
 - foreign interest rate augmented by the expected rate of depreciation of the domestic currency.

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Cuddington Model and Var's def's

$$KF_t = a_0 + a_1\pi_t + a_2r_t + a_3(r_t^* + x_t) \quad (3)$$

KF = Capital Flight

π = Domestic inflation rate, calculated as the ratio of the logarithms of consumer price indexes (i.e., $\log(CPI / CPI^1)$).

r = Domestic interest rate, Deposit rate

r^* = Foreign interest rate, T-bill rate

x = Expected rate of depreciation of the domestic currency, calculated as $x = a(REER_t - R)$

REER = Real effective exchange rate. Since IMF- International Statistics does not publish the real effective exchange rate for Russia we estimated this variable using Pastor's definition, i.e., $e^r = \frac{P}{e \times P^{US}}$

R = Equilibrium rate. We are using the value of the real effective exchange rate for 1995 as the equilibrium rate. This is the year IMF-International Statistics uses as its index year.

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Additional Data Source

International Financial Statistics (IFS)

- Monthly data from January 1995 to December 1999
- The variables utilized include
 - interest rate (i.e., deposit rate)
 - exchange rate
 - consumer price index and
 - the producer price index for Russia and the United States.

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Regression Results

The Determinants of Capital Flight for Russia

- Regressions using both models
 - Dependent Variables: Capital flight in (\$ amount) & (% of Trade Volume)
 - Independent Variables: No lag, lagged one period, lagged two periods
 - Total of 18 equations estimated
- Most Equations – statistically insignificant
 - The regression results do not support the hypothesis that Capital Flights are due to a portfolio consideration
- A few equations with significant variables
 - But wrong signs!
 - Overvalued Currency in Pastor model – negative sign
 - Expected Rate of Currency Depreciation in Cuddington Model – negative sign

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Regression Results

The Determinants of Capital Flight from Russia

Specification	Variables								
	CHINF	FINC1	FINC2	OVAL	r	B	r*	x	R2/R2 Adj.
4 Pastor's Model 1 month lag	0.2234 (1.59)	-0.0474 (-1.40)‡		-0.2148 (-2.10)§					0.111/ 0.053
5 Pastor's Model 1 month lag	0.199 (1.49)‡		-0.0489 (-1.42)‡	-0.2105 (-2.07)§					0.111/ 0.053
9 Cuddington's Model 2 month lag					0.0003 (0.96)	-0.2327 (-1.34)‡	0.0802 (1.52)‡	-0.4805 (-2.38)§	0.129/ 0.052

Note: Specifications 4 & 5 are obtained using Pastor's definition. Specification 9 is obtained using Cuddington's model. The dependent variable is defined as a percentage of total trade.

t-values are reported in parentheses below the coefficient estimated, *d.f.* = 50.

§ Significant at the 2% level (two-tailed test)

‡ Significant at the 5% level (two-tailed test)

‡ Significant at the 10% level (two-tailed test)

FINC1 = FINC using Pastor's definition

FINC2 = FINC using Dooley's definition

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Regression Results

- It appears the capital flight from Russia to the U.S. is motivated by:
 - Income Tax avoidance and/or
 - Money Laundering

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How can Abnormal Pricing be Detected?

- Optimal level of inspection/audit may be determined by comparing
 - the expected marginal benefit
 - the expected marginal cost
- Possible Approach:
 - No inspection? – zero cost and zero benefit
 - Inspection of all transactions?
 - Random inspection?
 - Use of Systematic Filters such as the price filter
 - EG: Top 25 items: over 75% of capital flight between 1995 and 1999

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CONCLUSION

- Capital Flight from Russia to the U.S.
 - Based on transaction data in the U.S. Merchandise Trade Database
 - Estimated amount: \$1.86 billion ~ \$8.92 billion during 1995 ~ 1999
 - Regression results indicate capital flight may be motivated:
 - Other than by portfolio consideration
 - Such as by income tax avoidance and money laundering
- Extension of the study:
 - Estimate capital flight through trade **from Russia to ALL countries** using Russian import and export database

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