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Money, Interest Rates and Inflation in Kazakhstan, 1996–2025: An Extreme Bounds Analysis of Specification Uncertainty During Remonetisation

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Research Article

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RESEARCH ARTICLE

Money, Interest Rates and Inflation in Kazakhstan, 1996–2025: An Extreme Bounds Analysis of Specification Uncertainty During Remonetisation

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Abstract

Between 1999 and 2007 Kazakhstan's broad money grew at an average of 38 per cent a year while inflation averaged 8 per cent, lower than in the rest of the sample. The oil boom, the restoration of confidence in the banking system after the 1998–99 crisis and a large rise in the demand for tenge deposits meant that most of that money growth was absorbed by a rising ratio of money to output rather than by prices. This paper asks what an extreme bounds analysis reports when the largest movements in the focus variable are shifts in money demand.

Log inflation f is the dependent variable, log broad-money growth q the focus variable, and six doubtful variables — real output growth, unemployment, tenge depreciation, terms-of-trade growth, the overall budget balance and the log policy rate — generate $L = 2^6 - 1 = 63$ specifications per configuration. The sample begins in 1996, after the hyperinflation of 1994–95. Significance is reported at the 1%, 5% and 10% levels for every parameter, together with Leamer's extreme bounds and the specification band of mean ± 1 and ± 2 standard deviations.

No configuration is robust on either criterion at any of the three levels. Contemporaneously no estimate is significant even at 10% and twenty-five of sixty-three carry the wrong sign. At a one-year lag the robustness share is $\Delta = 0.127$, 0.302 and 0.587 at 1%, 5% and 10%, just short of the threshold at the widest level, with a mean coefficient of 0.068. The correlation between money growth and inflation over the sample is +0.027, the lowest recorded in this research programme.

Two results explain the absence. The remonetisation years 1999–2007 supply 60 per cent of the variation in money growth from 30 per cent of the observations; excluding them more than doubles the lagged coefficient, to 0.154, and doubles its correlation with inflation, but leaves too few observations for any estimate to reach 5%. And the policy rate, uncorrelated with money growth at +0.013 but correlated with inflation at +0.822, sharpens rather than attenuates the money coefficient: at one lag, significance at 5% rises from none of thirty-one specifications without the rate to nineteen of thirty-two with it.

Keywords: *Kazakhstan; extreme bounds analysis; specification uncertainty; quantity theory of money; remonetisation; money demand; oil; significance levels; National Bank of Kazakhstan*

Data note. The empirical results below were computed from an annual series set assembled offline. The inflation, real output and unemployment series follow published Bureau of National Statistics and National Bank of Kazakhstan aggregates; the broad-money, exchange-rate, terms-of-trade, fiscal and interest rate series are reconstructed approximations, and the 2025 observations are

preliminary. The sample begins in 1996: the tenge was introduced in November 1993, inflation exceeded 1,800 per cent in 1994 and 176 per cent in 1995, and including those years would make every nominal series a transformation of the same episode. The policy rate is the refinancing rate to 2012 and the base rate from 2013. The budget balance includes the National Fund. All rate variables including the policy rate are log-transformed as $100 \times \ln(1 + r/100)$. The estimation script, raw console output, per-specification results, the dataset and an eighteen-sheet workbook of every intermediary result accompany this paper.

1. Introduction

In the nine years from 1999 to 2007 Kazakhstan’s broad money grew at an average annual rate of 38 per cent, reaching 84 per cent in 1999 and 78 per cent in 2006. Inflation over the same years averaged 8 per cent, lower than its average in the rest of the sample. Oil output and prices rose together, confidence in the banking system returned after the 1998–99 crisis, and households and firms moved savings out of dollars and cash into tenge deposits. The ratio of broad money to output roughly quadrupled over the decade.

Leamer (1983) argued that disagreement about estimated coefficients is a property of non-experimental inference rather than a failure of individual researchers: investigators search across specifications, report the survivor, and publish standard errors that take no account of the search. The remedy developed in Leamer and Leonard (1983) and Leamer (1985) is to estimate every defensible specification and report the extreme values the coefficient of interest can take.

The quantity-theoretic relationship that the procedure tests is a relationship between excess money growth and inflation. Where most of the observed variation in money growth reflects shifts in the demand for money, the regressor measures something the theory does not predict to be inflationary, and the estimated coefficient will be small whatever the underlying relationship is. Kazakhstan in the 2000s is a clear case of such shifts, and the question is how the model space records it.

It records it as absence. No configuration reaches the 0.60 threshold at 1%, 5% or 10%. Contemporaneously no estimate is significant at any level and twenty-five of sixty-three carry the wrong sign. At one lag every estimate is positive but the mean is 0.068, and the share reaches 0.587 only at 10%. Money growth and inflation are correlated at +0.027 over the sample.

Two results explain the pattern. Excluding the remonetisation years more than doubles the lagged coefficient and its correlation with inflation, which is what one would expect if those years contaminate the regressor with money demand. And conditioning on the policy rate increases the precision of the money coefficient instead of reducing it, because the rate is almost uncorrelated with money growth and removes inflation variance from the residual without absorbing money’s own variation.

2. The Kazakh Framework and Its Instruments

The tenge was introduced in November 1993 and inflation fell from over 1,800 per cent in 1994 to 39 per cent in 1996 and 7 per cent by 1998. The Russian crisis and the fall in oil prices led the National Bank of Kazakhstan to float the currency in April 1999, when it lost about a third of its value. From then until 2015 the tenge was managed against the dollar, with step devaluations in February 2009 and February 2014, each following an oil price fall.

In August 2015 the National Bank moved to a free float and announced a transition to inflation targeting, with the base rate, introduced in 2013, as the operational instrument. The tenge lost about half its value between August 2015 and early 2016 and inflation reached 14.6 per cent in 2016. The medium-term target has been set in low single digits and has not been met; inflation was 15.0 per cent in 2022 and 14.6 per cent in 2023.

Oil revenue above a budgeted price is saved in the National Fund, established in 2000. The Fund’s transfers to the budget rose sharply in 2009, 2015–2016 and 2020, so the overall balance swings from surpluses of six or seven per cent of output in oil-boom years to deficits of similar size in oil-price collapses.

Table 1

Kazakh Studies of Money, Prices and the Policy Framework

Study	Period / focus	Principal finding for Kazakhstan
Taylor (1993)	Policy rules	Specifies the reaction function that makes an instrument a function of inflation
Clarida, Galí & Gertler (2000)	Reaction functions	Estimating rules requires instrumenting because the instrument responds to the target
Pastor & Damjanovic (2001)	1990s; stabilisation	Tight money and the float deliver disinflation after the 1990s crisis

Study	Period / focus	Principal finding for Kazakhstan
Romer & Romer (2004)	Narrative shocks	Constructs policy shocks from the record to avoid an endogenous instrument
Kalra (2008)	2000s; oil boom	Surging money and credit alongside moderate inflation during the boom
Esanov, Merkl & de Souza (2005)	Resource economies	Monetary policy rules for oil-exporting transition economies
Kemme & Roy (2006)	1990s–2000s; dollarisation	De-dollarisation and money demand in Kazakhstan
IMF (2014)	Selected issues	The February 2014 devaluation and its causes
NBK (2015)	Framework	Free float and the transition to inflation targeting
Adrian et al. (2016)	2015–2016; float	Pass-through after the 2015 float
Jaffar & Neuenkirch (2019)	2000s–10s; oil	Oil prices dominate the Kazakh macroeconomic cycle
Kemme, Mallick & Sergi (2020)	2000s–10s; transmission	Weak interest rate channel under high dollarisation
Leamer (1983, 1985)	Specification search	The framework applied here
Leamer & Leonard (1983)	Fragility	Introduces the extreme bounds computation used throughout
Sala-i-Martin (1997)	Specification search	Demonstrates the instability of coefficients across large model spaces
Hendry (1980)	Method	States the case against undisciplined specification search

Note. Compiled by the author from the cited sources.

Table 2

Kazakh Monetary Regimes, the Policy Rate and Inflation, 1996–2025

Period	Regime	Inflation	Policy rate	Dominant mechanism
1996–1998	Post-hyperinflation stabilisation	7.3–39.1%	20–42%	Tight money; inflation falls from 39 to 7 per cent
April 1999	Float after the Russian crisis	8.4%	22%	Tenge loses about a third of its value
1999–2007	Oil boom and remonetisation	5.9–13.3%	7–22%	Money grows 38 per cent a year on average; inflation lower
2000	National Fund established	13.3%	15%	Oil revenue above a budgeted price saved abroad
2008	Banking crisis	17.1%	10.5%	Credit boom ends; inflation peaks
February 2009	Devaluation	7.3%	7.5%	Tenge devalued about 20 per cent
2010–2013	Managed float; recovery	5.1–8.4%	5.5–7.5%	Base rate introduced in 2013
February 2014	Devaluation	6.7%	5.5%	Tenge devalued about 19 per cent
August 2015	Free float; inflation targeting	6.7%	13.0%	Tenge halves over the following months
2016–2019	Disinflation under the target	5.2–14.6%	9.1–13.5%	Inflation falls from 14.6 to 5.2 per cent
2020–2021	Pandemic	6.8–8.0%	9.4–9.5%	National Fund transfers finance the deficit
2022–2025	Global inflation	8.7–15.0%	14.0–16.5%	Inflation above the target range throughout

Note. Inflation figures are annual averages of the consumer price index. The policy rate is shown in raw per cent; in the estimation it is log-transformed. The 2025 figures are preliminary.

3. Theoretical Framework

3.1 The estimating equation

The framework is the equation of exchange. The identity is

$$MV = PQ \ (1)$$

with M the broad money stock, V its income velocity, P the price level and Q real output. In logarithms and first differences,

$$f = q + v - y \ (2)$$

where f, q, v and y are the growth rates of prices, broad money, velocity and real output. The estimating equation conditions equation (2) on a set of doubtful variables:

$$f_t = k_0 + \psi \, q_{t-n} + \Sigma_i \, \sigma_i \, h_{i,t} + \omega_t \ (3)$$

3.2 Remonetisation and the velocity term

Equation (2) makes inflation equal to money growth only where velocity is stable. Where the demand for money rises, velocity falls and absorbs money growth without any effect on prices. Writing μ for the part of money growth that reflects rising money demand and ε for the excess-supply part,

$$q_t = \mu_t + \varepsilon_t,\ f_t = \beta\,\varepsilon_t + \ldots,\ plim\ \hat{\psi} = \beta \cdot var(\varepsilon) / [var(\mu) + var(\varepsilon)] \quad (4)$$

Equation (4) is the classical errors-in-variables result applied to money demand. The larger the share of money growth that is demand-driven, the more the estimated coefficient is attenuated toward zero. The attenuation does not depend on how many conditioning variables are added, so no specification search can remove it.

Section 6.4 measures it directly. The nine remonetisation years supply 59.9 per cent of the variation in money growth, and in those years money grew three times as fast as in the rest of the sample while inflation was lower. Removing them should raise the estimated coefficient if equation (4) is operating, and it does.

3.3 Conditioning on a policy rate uncorrelated with money

Let r denote the correlation between money growth and the policy rate. The coefficient on q conditional on the rate is

$$\hat{\psi}_{\cdot i} = [cov(f, q) - cov(f, i)\cdot cov(q, i)/var(i)] / [var(q)(1 - r^2)] \quad (5)$$

For Kazakhstan r = +0.013. The subtraction in the numerator and the reduction in the denominator are both negligible, so conditioning on the rate leaves the point estimate almost unchanged. But the rate is correlated with inflation at +0.822, so including it removes a large part of the residual variance and shrinks the standard error of $\hat{\psi}$. Equation (5) therefore predicts that admitting the rate will sharpen the money coefficient rather than attenuate it, and Section 6.5 finds that it does.

4. Data and Variable Construction

The sample is annual Kazakh data for 1996–2025 (T = 30; T = 29 and T = 27 in the lagged and averaged variants; T = 26 for the sub-sample from 2000). All rate variables, including the policy rate, are log-transformed as 100 × ln(1 + r/100), which keeps money growth of 84 per cent in 1999, 78 per cent in 2006 and −14 per cent in 1998 from dominating the sums of squares.

Table 3

Variable Definitions, Notation and Sources

Symbol	Code	Variable	Construction	Source
f	INF	Inflation (dependent)	100 ln(1 + CPI inflation/100)	Bureau of National Statistics
q	MON	Broad money growth (focus)	100 ln(1 + M2 growth/100)	National Bank of Kazakhstan
h_1	GRW	Real output growth	100 ln(1 + real GDP growth/100)	BNS; World Bank WDI
h_2	UNE	Unemployment	Unemployment rate, %	Bureau of National Statistics
h_3	DEP	Tenge depreciation	100 ln(1 + tenge/USD depreciation/100)	National Bank of Kazakhstan
h_4	TOT	Terms-of-trade growth	100 ln(1 + terms-of-trade change/100)	BNS; World Bank
h_5	FIS	Budget balance	Overall balance incl. National Fund, % of GDP; positive = deficit	Ministry of Finance
h_6	INT	Policy interest rate	100 ln(1 + rate/100); refinancing rate to 2012, base rate after	National Bank of Kazakhstan

Note. The terms of trade are dominated by oil and move by 20 per cent or more in ten of the thirty years. The budget balance swings with oil revenue into and out of the National Fund.

Table 5 contains the result in outline. Inflation is correlated with the policy rate at +0.822 and with money growth at +0.027. Money growth is correlated with the policy rate at +0.013. The policy rate is associated with the budget balance at +0.613 and with unemployment at +0.593; money growth is associated instead with output growth (+0.456) and unemployment (+0.391), the pattern of a series driven by the real cycle and the oil boom rather than by monetary policy.

Table 4

Descriptive Statistics, Transformed Series, 1996–2025

Variable	Mean	Std. dev.	Minimum	Maximum
f inflation	9.43	5.47	4.97	33.00
q broad money growth	20.12	16.44	−15.08	60.98
h_1 real output growth	4.94	3.68	−2.53	12.66
h_2 unemployment	7.29	3.06	4.60	13.50
h_3 tenge depreciation	6.95	11.84	−9.43	41.21
h_4 terms-of-trade growth	1.56	16.96	−43.08	26.24
h_5 budget balance	0.17	4.38	−7.00	8.00
h_6 policy interest rate	11.42	6.11	5.35	35.07

Note. All rates are log-transformed as 100 × ln(1 + r/100); unemployment and the budget balance are in levels. The standard deviation of money growth is three times that of inflation.

Table 5

Correlation Matrix, Transformed Series

	f	q	GRW	UNE	DEP	TOT	FIS	INT
f inflation	1.000	0.027	−0.255	0.377	0.155	0.153	0.287	0.822
q money growth	0.027	1.000	0.456	0.391	0.115	0.301	−0.240	0.013
GRW output growth	−0.255	0.456	1.000	0.060	−0.465	0.487	−0.769	−0.404
UNE unemployment	0.377	0.391	0.060	1.000	0.189	0.153	0.217	0.593
DEP depreciation	0.155	0.115	−0.465	0.189	1.000	−0.323	0.505	0.343
TOT terms of trade	0.153	0.301	0.487	0.153	−0.323	1.000	−0.444	−0.046
FIS budget balance	0.287	−0.240	−0.769	0.217	0.505	−0.444	1.000	0.613
INT policy rate	0.822	0.013	−0.404	0.593	0.343	−0.046	0.613	1.000

Note. The money–inflation correlation of +0.027 and the money–rate correlation of +0.013 are both indistinguishable from zero.

5. Methodology

Let H = {h_1, …, h_6} be the doubtful set. The model space is every non-empty subset of H:

$$L = 2^{|H|} - 1 = 2^6 - 1 = 63 \quad (6)$$

Specification j contains f, the focus variable q, and one subset of H:

$$f_t = k_{0j} + \psi_j q_t + \Sigma_{i \in S_j} \sigma_{ij} h_{i,t} + \omega_{jt}, \; j = 1, \ldots, L \quad (7)$$

The robustness share is computed at each of three conventional significance levels,

$$\Delta(\alpha) = \#\{ j : sign(\psi_j) = sign(\bar{\psi}) \text{ and } p_j < \alpha \} / L, \; \alpha \in \{0.01, 0.05, 0.10\} \quad (8)$$

with the relationship judged robust if Δ > 0.60. Leamer's criterion computes

$$\psi_{max} = max_j(\psi_j + 2 \cdot se_j), \; \psi_{min} = min_j(\psi_j - 2 \cdot se_j) \quad (9)$$

and declares robustness only if the bounds share a sign. Over the significant, same-signed estimates the specification band is

$$\bar{\psi} \pm c \cdot sd(\psi), \; c = 1, 2 \quad (10)$$

Every specification table marks significance with *** for p < 0.01, ** for p < 0.05 and * for p < 0.10, and every summary table reports counts at all three levels. Each configuration is also partitioned into the thirty-one specifications excluding the policy rate and the thirty-two including it, and the lagged configuration is re-estimated without the remonetisation years 1999–2007.

6. Results

6.1 The contemporaneous configuration

Table 6 reports every specification in the full space with money growth entered contemporaneously.

Table 6

Full Model Space, Contemporaneous Broad Money Growth, 1996–2025

#	Doubtful variables included	Reg.	ψ	SE	t	p	Sig.	Adj. R^2	ψ ± 2SE
1	GRW	2	0.0604	0.0686	0.88	.387	–	0.024	[-0.077, 0.198]
2	UNE	2	-0.0473	0.0638	-0.74	.465	–	0.097	[-0.175, 0.080]
3	DEP	2	0.0031	0.0637	0.05	.962	–	-0.048	[-0.124, 0.131]
4	TOT	2	-0.0070	0.0664	-0.10	.917	–	-0.048	[-0.140, 0.126]
5	FIS	2	0.0340	0.0629	0.54	.594	–	0.025	[-0.092, 0.160]
6	INT	2	0.0054	0.0365	0.15	.883	–	0.651	[-0.068, 0.078]
7	GRW, UNE	3	0.0001	0.0711	0.00	.998	–	0.130	[-0.142, 0.142]
8	GRW, DEP	3	0.0652	0.0769	0.85	.404	–	-0.013	[-0.089, 0.219]
9	GRW, TOT	3	0.0489	0.0667	0.73	.470	–	0.089	[-0.084, 0.182]
10	GRW, FIS	3	0.0520	0.0708	0.73	.469	–	0.001	[-0.090, 0.194]
11	GRW, INT	3	-0.0115	0.0426	-0.27	.789	–	0.646	[-0.097, 0.074]
12	UNE, DEP	3	-0.0489	0.0648	-0.75	.458	–	0.072	[-0.178, 0.081]
13	UNE, TOT	3	-0.0609	0.0667	-0.91	.370	–	0.083	[-0.194, 0.073]
14	UNE, FIS	3	-0.0228	0.0685	-0.33	.742	–	0.097	[-0.160, 0.114]
15	UNE, INT	3	0.0351	0.0405	0.87	.395	–	0.668	[-0.046, 0.116]
16	DEP, TOT	3	-0.0262	0.0677	-0.39	.701	–	-0.031	[-0.162, 0.109]
17	DEP, FIS	3	0.0356	0.0668	0.53	.598	–	-0.012	[-0.098, 0.169]
18	DEP, INT	3	0.0109	0.0364	0.30	.767	–	0.659	[-0.062, 0.084]
19	TOT, FIS	3	0.0105	0.0624	0.17	.868	–	0.087	[-0.114, 0.135]
20	TOT, INT	3	-0.0152	0.0367	-0.41	.682	–	0.680	[-0.089, 0.058]
21	FIS, INT	3	-0.0258	0.0340	-0.76	.455	–	0.727	[-0.094, 0.042]
22	GRW, UNE, DEP	4	0.0097	0.0774	0.12	.902	–	0.099	[-0.145, 0.164]
23	GRW, UNE, TOT	4	-0.0050	0.0692	-0.07	.943	–	0.176	[-0.143, 0.133]
24	GRW, UNE, FIS	4	0.0004	0.0725	0.01	.996	–	0.095	[-0.145, 0.145]
25	GRW, UNE, INT	4	0.0150	0.0436	0.34	.734	–	0.673	[-0.072, 0.102]
26	GRW, DEP, TOT	4	0.0437	0.0754	0.58	.568	–	0.053	[-0.107, 0.194]
27	GRW, DEP, FIS	4	0.0603	0.0781	0.77	.448	–	-0.036	[-0.096, 0.217]
28	GRW, DEP, INT	4	0.0060	0.0462	0.13	.898	–	0.646	[-0.087, 0.098]
29	GRW, TOT, FIS	4	0.0360	0.0684	0.53	.603	–	0.082	[-0.101, 0.173]
30	GRW, TOT, INT	4	-0.0155	0.0414	-0.37	.712	–	0.668	[-0.098, 0.067]
31	GRW, FIS, INT	4	-0.0017	0.0365	-0.05	.963	–	0.741	[-0.075, 0.071]
32	UNE, DEP, TOT	4	-0.0703	0.0678	-1.04	.310	–	0.075	[-0.206, 0.065]
33	UNE, DEP, FIS	4	-0.0224	0.0726	-0.31	.760	–	0.060	[-0.168, 0.123]
34	UNE, DEP, INT	4	0.0435	0.0401	1.08	.289	–	0.681	[-0.037, 0.124]
35	UNE, TOT, FIS	4	-0.0326	0.0677	-0.48	.634	–	0.126	[-0.168, 0.103]
36	UNE, TOT, INT	4	0.0163	0.0391	0.42	.681	–	0.707	[-0.062, 0.094]
37	UNE, FIS, INT	4	0.0070	0.0355	0.20	.844	–	0.759	[-0.064, 0.078]
38	DEP, TOT, FIS	4	0.0050	0.0671	0.07	.941	–	0.053	[-0.129, 0.139]
39	DEP, TOT, INT	4	-0.0093	0.0382	-0.24	.809	–	0.673	[-0.086, 0.067]
40	DEP, FIS, INT	4	-0.0250	0.0361	-0.69	.496	–	0.716	[-0.097, 0.047]
41	TOT, FIS, INT	4	-0.0299	0.0349	-0.86	.398	–	0.722	[-0.100, 0.040]
42	GRW, UNE, DEP, TOT	5	-0.0036	0.0760	-0.05	.963	–	0.142	[-0.156, 0.148]
43	GRW, UNE, DEP, FIS	5	0.0095	0.0790	0.12	.905	–	0.062	[-0.149, 0.167]
44	GRW, UNE, DEP, INT	5	0.0311	0.0468	0.67	.512	–	0.672	[-0.062, 0.125]

#	Doubtful variables included	Reg.	ψ	SE	t	p	Sig.	Adj. R^2	ψ ± 2SE
45	GRW, UNE, TOT, FIS	5	-0.0056	0.0706	-0.08	.938	–	0.143	[-0.147, 0.136]
46	GRW, UNE, TOT, INT	5	0.0111	0.0421	0.26	.794	–	0.697	[-0.073, 0.095]
47	GRW, UNE, FIS, INT	5	0.0213	0.0371	0.57	.571	–	0.764	[-0.053, 0.096]
48	GRW, DEP, TOT, FIS	5	0.0360	0.0763	0.47	.641	–	0.044	[-0.117, 0.189]
49	GRW, DEP, TOT, INT	5	-0.0029	0.0457	-0.06	.949	–	0.660	[-0.094, 0.088]
50	GRW, DEP, FIS, INT	5	0.0071	0.0400	0.18	.861	–	0.734	[-0.073, 0.087]
51	GRW, TOT, FIS, INT	5	-0.0048	0.0366	-0.13	.897	–	0.742	[-0.078, 0.068]
52	UNE, DEP, TOT, FIS	5	-0.0381	0.0722	-0.53	.602	–	0.093	[-0.183, 0.106]
53	UNE, DEP, TOT, INT	5	0.0237	0.0406	0.58	.565	–	0.702	[-0.058, 0.105]
54	UNE, DEP, FIS, INT	5	0.0089	0.0376	0.24	.815	–	0.750	[-0.066, 0.084]
55	UNE, TOT, FIS, INT	5	0.0030	0.0360	0.08	.934	–	0.757	[-0.069, 0.075]
56	DEP, TOT, FIS, INT	5	-0.0307	0.0374	-0.82	.420	–	0.710	[-0.106, 0.044]
57	GRW, UNE, DEP, TOT, FIS	6	-0.0033	0.0776	-0.04	.966	–	0.106	[-0.158, 0.152]
58	GRW, UNE, DEP, TOT, INT	6	0.0223	0.0459	0.49	.632	–	0.689	[-0.070, 0.114]
59	GRW, UNE, DEP, FIS, INT	6	0.0295	0.0403	0.73	.471	–	0.757	[-0.051, 0.110]
60	GRW, UNE, TOT, FIS, INT	6	0.0184	0.0370	0.50	.624	–	0.766	[-0.056, 0.092]
61	GRW, DEP, TOT, FIS, INT	6	0.0018	0.0406	0.05	.964	–	0.733	[-0.079, 0.083]
62	UNE, DEP, TOT, FIS, INT	6	0.0030	0.0385	0.08	.938	–	0.747	[-0.074, 0.080]
63	GRW, UNE, DEP, TOT, FIS, INT	7	0.0243	0.0406	0.60	.555	–	0.757	[-0.057, 0.106]

Note. Reg. = number of regressors. Sig.: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. GRW = real output growth; UNE = unemployment; DEP = tenge depreciation; TOT = terms-of-trade growth; FIS = budget balance; INT = policy interest rate. T = 30. Dependent variable: log CPI inflation.

Not one of the sixty-three estimates is significant at 1%, 5% or 10%, so $\Delta = 0.000$ at all three levels. Twenty-five carry the wrong sign, fourteen of them in specifications without the policy rate and eleven in specifications with it. The mean across all sixty-three is 0.005, the point estimates range from −0.07 to +0.07, and the Leamer bounds of [−0.206, 0.219] are almost symmetric about zero.

The specification band cannot be computed, because there is no significant estimate to compute it over. Adjusted R^2 nonetheless reaches 0.766 in the best specification: the doubtful variables, and in particular the policy rate, explain Kazakh inflation well, and contemporaneous money growth contributes nothing to that explanation.

6.2 The instrument across three regimes

Table 7

The Policy Rate and Inflation Under the Managed Tenge, the Managed Float and Inflation Targeting

Period	Observations	Correlation of rate with inflation	Mean log rate	Mean log inflation
Whole sample, 1996–2025	30	0.822	11.42	9.43
Managed tenge, 1996–2008	13	0.819	13.65	11.15
Managed float, 2009–2014	6	0.844	6.22	6.51
Inflation targeting, 2015–2025	11	0.735	11.61	8.98

Note. All figures in log-transformed units. The managed-float row contains six observations.

The correlation between the policy rate and inflation is high in every regime: +0.819 under the managed tenge, +0.844 in the managed float and +0.735 under inflation targeting. The rate tracked inflation closely whatever the framework, which is the reaction function of Section 3.3 operating throughout. Its correlation with money growth, by contrast, is +0.013 over the sample: the National Bank’s rate responded to inflation and not to the growth of broad money.

6.3 All four configurations at three significance levels

Table 8

Both Robustness Criteria at Three Significance Levels, All Four Configurations

Configuration	T	Δ 1%	Δ 5%	Δ 10%	Sig. 1%	Sig. 5%	Sig. 10%	Mean ψ (all)	Leamer bounds	Wrong sign	Verdict at 5%
Contemporaneous	30	0.000	0.000	0.000	0 of 63	0 of 63	0 of 63	0.005	[-0.206, 0.219]	25	Fragile
Lagged one year	29	0.127	0.302	0.587	8 of 63	19 of 63	37 of 63	0.068	[-0.051, 0.169]	0	Fragile
Three-year average	27	0.016	0.206	0.349	1 of 63	13 of 63	22 of 63	0.081	[-0.097, 0.259]	0	Fragile
After the 1999 float, 2000–2025	26	0.000	0.206	0.556	0 of 63	13 of 63	35 of 63	0.079	[-0.058, 0.260]	0	Fragile

Note. Each row is a complete 63-specification analysis. The decision threshold is Δ > 0.60 and is not reached at any level in any configuration.

No configuration reaches the threshold at any of the three levels, and every Leamer interval contains zero. The lagged configuration comes closest, with Δ = 0.587 at 10%, and the floating-era sub-sample follows at 0.556. Both are fragile at 5% and 1%.

The three lagged configurations share one feature the contemporaneous lacks: not one of their 189 estimates is negative. The sign of the lagged relationship is settled; what is missing is magnitude and precision. Mean coefficients of 0.068, 0.081 and 0.079 imply that a ten-point rise in log money growth is associated with a rise in log inflation of under one point.

Table 9

Specification Band and Leamer Bounds

Configuration	Specifications in the band	Mean ψ	SD ψ	Band ± 1 SD	Band ± 2 SD	Leamer bounds	Ratio of widths
Contemporaneous	0 of 63	—	—	not defined	not defined	[-0.206, 0.219]	—
Lagged one year	19 of 63	0.084	0.0090	[0.075, 0.093]	[0.066, 0.102]	[-0.051, 0.169]	6.08
Three-year average	13 of 63	0.127	0.0116	[0.115, 0.139]	[0.104, 0.150]	[-0.097, 0.259]	7.66
After the 1999 float, 2000–2025	13 of 63	0.100	0.0263	[0.074, 0.127]	[0.048, 0.153]	[-0.058, 0.260]	3.03

Note. The band is computed over the specifications significant at the five per cent level and same-signed. It is undefined for the contemporaneous configuration, in which none is significant.

Where the band is defined it is narrow and entirely above zero: [0.066, 0.102] at one lag, [0.104, 0.150] at three years and [0.048, 0.153] after 2000. The Leamer intervals are three to eight times wider and cross zero. The surviving specifications agree that the coefficient is small and positive; the full space does not exclude that it is zero.

6.4 The remonetisation years

Table 10

The Lagged Money Coefficient With and Without the Remonetisation Years 1999–2007

Sample	T	Min. d.o.f.	Δ 1%	Δ 5%	Δ 10%	Mean ψ	Leamer bounds	Wrong sign	Adj. R^2 range
All years	29	21	0.127	0.302	0.587	0.068	[-0.051, 0.169]	0	[-0.042, 0.567]
Excluding 1999–2007	20	12	0.000	0.000	0.302	0.154	[-0.133, 0.427]	0	[-0.052, 0.559]

Note. Lagged configuration. The nine excluded years contain 59.9 per cent of the variation in money growth and 30 per cent of the observations. The correlation between lagged money growth and inflation is 0.209 over all years and 0.408 without the remonetisation years.

The remonetisation years contain 59.9 per cent of the variation in money growth. In those nine years money grew at an average of 38.0 log points a year against 12.5 in the rest of the sample, while inflation averaged 8.1 against 10.0. The largest movements in the regressor coincided with lower rather than higher inflation.

Removing them more than doubles the mean lagged coefficient, from 0.068 to 0.154, and doubles the correlation between lagged money growth and inflation, from 0.209 to 0.408. No estimate becomes negative. This is equation (4) observed: the years in which money growth was dominated by rising money demand pull the coefficient toward zero, and the coefficient estimated without them is closer to what an excess-supply relationship would produce.

The cost is precision. Twenty observations and a minimum of twelve residual degrees of freedom leave no specification significant at 5%, and the share is 0.302 only at 10%. The Leamer interval widens to [−0.133, 0.427]. The remonetisation years are the ones that contaminate the coefficient and the ones that supply most of the variation from which it is estimated, and the data cannot be made to supply one without the other.

6.5 The policy rate sharpens rather than attenuates

Table 11

The Money Coefficient With and Without the Policy Rate, at Three Significance Levels

Configuration	Subspace	n	Mean ψ	Positive	Negative	Sig. 1%	Sig. 5%	Sig. 10%	Leamer bounds	Verdict at 5%
Contemporaneous	Excluding INT	31	0.004	17	14	0	0	0	[-0.206, 0.219]	Fragile
	Including INT	32	0.005	21	11	0	0	0	[-0.106, 0.125]	Fragile
Lagged one year	Excluding INT	31	0.064	31	0	0	0	11	[-0.051, 0.169]	Fragile
	Including INT	32	0.072	32	0	8	19	26	[-0.022, 0.161]	Fragile
Three-year average	Excluding INT	31	0.065	31	0	0	0	0	[-0.097, 0.259]	Fragile
	Including INT	32	0.098	32	0	1	13	22	[-0.061, 0.252]	Fragile
After the 1999 float, 2000–2025	Excluding INT	31	0.099	31	0	0	9	21	[-0.042, 0.260]	Fragile
	Including INT	32	0.059	32	0	0	4	14	[-0.058, 0.196]	Fragile

Note. Each row is a complete extreme bounds analysis on the stated subspace. Counts of significant estimates are out of 31 excluding the policy rate and 32 including it.

At one lag, excluding the policy rate, no specification is significant at 1% or 5% and eleven are at 10%. Including it, eight are significant at 1%, nineteen at 5% and twenty-six at 10%. The mean coefficient is almost unchanged, 0.064 without the rate and 0.072 with it. The rate does not change what the money coefficient is; it changes how precisely it is estimated.

The three-year configuration repeats the pattern: none significant at any level without the rate, thirteen at 5% with it. Equation (5) accounts for both. The rate is uncorrelated with money growth, so it removes none of money's variation and leaves the point estimate intact; it is correlated with inflation at +0.822, so it removes a large part of the residual variance and shrinks the standard error. The partition therefore runs in the opposite direction to the one usually observed, in which admitting an instrument collinear with the focus variable weakens the focus coefficient.

After 2000 the direction reverses modestly. Without the rate nine specifications are significant at 5% and the mean is 0.099; with it four are and the mean is 0.059. Over that sub-sample the correlation between the rate and lagged money growth is +0.104, against −0.132 over the full sample, and the attenuation channel of equation (5) begins to operate.

6.6 Every parameter at three significance levels

Table 12

All Variable Coefficients With Significance at 1, 5 and 10 Per Cent — Contemporaneous Configuration

Variable	Specs	Mean	SD	Min	Max	p < .01	p < .05	p < .10	Reading
MON broad money growth (focus)	63	0.005	0.029	-0.070	0.065	0	0	0	Never significant; sign unstable
INT policy interest rate	32	0.923	0.117	0.736	1.103	32	32	32	Significant everywhere at every level
FIS budget balance	32	-0.140	0.442	-0.704	0.558	9	16	18	Significant almost only with INT; sign unstable
UNE unemployment	32	0.103	0.580	-0.501	0.774	0	8	26	Marginal; sign unstable
GRW real output growth	32	-0.331	0.267	-0.733	0.244	0	1	6	Negative; rarely significant
TOT terms-of-trade growth	32	0.072	0.031	0.027	0.121	0	1	6	Stable, positive, rarely significant
DEP tenge depreciation	32	-0.010	0.043	-0.076	0.115	0	0	0	Never significant at any level

Note. Contemporaneous configuration, T = 30. Counts are out of 63 for MON and 32 for each doubtful variable.

The policy rate is significant in all thirty-two specifications at every level with a mean coefficient of +0.923. It is by a wide margin the variable that explains Kazakh inflation in this model space, and Section 6.2 has shown that it does so because it tracked inflation in every regime. The coefficient is the reaction function read backwards, not a transmission estimate.

The budget balance is significant in nine specifications at 1% and sixteen at 5%, and fifteen of the sixteen contain the policy rate. The two are correlated at +0.613 because oil-price collapses produced both deficits and higher rates, and the balance's coefficient changes sign across specifications, from −0.70 to +0.56. It is reported and not interpreted.

Tenge depreciation is significant in no specification at any level despite devaluations of 51 per cent in 1999 and 50 per cent in 2016. The terms of trade, dominated by oil, are significant in one specification at 5%. Neither channel is detectable at annual frequency once the policy rate is in the space, because the rate itself rose after each devaluation and each oil-price fall.

Table 13

Significance at 1, 5 and 10 Per Cent for Every Parameter in Every Configuration

Configuration	Variable	Specs	Mean coefficient	p < .01	p < .05	p < .10
Contemporaneous	MON	63	0.0046	0 of 63	0 of 63	0 of 63
	GRW	32	-0.3313	0 of 32	1 of 32	6 of 32
	UNE	32	0.1035	0 of 32	8 of 32	26 of 32
	DEP	32	-0.0096	0 of 32	0 of 32	0 of 32
	TOT	32	0.0719	0 of 32	1 of 32	6 of 32
	FIS	32	-0.1403	9 of 32	16 of 32	18 of 32
	INT	32	0.9228	32 of 32	32 of 32	32 of 32
Lagged one year	MON	63	0.0683	8 of 63	19 of 63	37 of 63
	GRW	32	-0.2611	0 of 32	3 of 32	10 of 32
	UNE	32	-0.2448	2 of 32	16 of 32	16 of 32
	DEP	32	0.0261	0 of 32	0 of 32	0 of 32
	TOT	32	0.0550	0 of 32	3 of 32	15 of 32
	FIS	32	-0.0378	0 of 32	5 of 32	13 of 32
	INT	32	0.6484	32 of 32	32 of 32	32 of 32
Three-year average	MON	63	0.0813	1 of 63	13 of 63	22 of 63
	GRW	32	-0.2388	0 of 32	4 of 32	5 of 32
	UNE	32	-0.3450	2 of 32	9 of 32	13 of 32
	DEP	32	0.0286	0 of 32	0 of 32	1 of 32
	TOT	32	0.0535	0 of 32	3 of 32	9 of 32
	FIS	32	-0.0293	0 of 32	0 of 32	4 of 32
	INT	32	0.6725	32 of 32	32 of 32	32 of 32
After the 1999 float, 2000–2025	MON	63	0.0791	0 of 63	13 of 63	35 of 63
	GRW	32	-0.3906	8 of 32	10 of 32	11 of 32
	UNE	32	-0.3881	0 of 32	0 of 32	0 of 32
	DEP	32	0.0271	0 of 32	0 of 32	0 of 32
	TOT	32	0.0558	0 of 32	8 of 32	11 of 32
	FIS	32	-0.1131	8 of 32	8 of 32	9 of 32
	INT	32	0.7666	32 of 32	32 of 32	32 of 32

Note. MON appears in all 63 specifications of each configuration; each doubtful variable in 32. Twenty-eight parameter-configuration cells.

The INT rows are identical in every configuration: 32 of 32 at 1%, 5% and 10%, with means between +0.648 and +0.923. No other parameter in any configuration is significant in more than half its specifications at 5%. The MON rows show the focus variable reaching 19 of 63 at 5% at one lag and 13 in the other two lagged configurations, and none contemporaneously.

At one lag unemployment is significant in sixteen specifications at 5%, all of them containing the policy rate, with a mean of −0.245 — the conventional Phillips sign. After 2000 output growth is significant in eight specifications at 1% with a mean of −0.391. Tenge depreciation is significant in one specification of 128 across the four configurations, at 10%.

6.7 Sensitivity to the significance level

Table 14

Robustness Share Δ at Four Significance Levels

Configuration	α = 0.01	α = 0.05	α = 0.10	α = 0.20	Verdict range
Contemporaneous	0.000	0.000	0.000	0.000	Fragile throughout
Lagged one year	0.127	0.302	0.587	0.905	Robust only at 20%
Three-year average	0.016	0.206	0.349	0.429	Fragile throughout
After the 1999 float, 2000–2025	0.000	0.206	0.556	0.825	Robust only at 20%

Note. The decision threshold is Δ > 0.60 throughout.

The contemporaneous configuration is zero at every level including 20%. The lagged and post-2000 configurations cross the threshold only at 20%, at 0.905 and 0.825, a level at which one estimate in five would be significant by chance. No conventional convention returns a robust verdict for Kazakhstan.

7. Specification Uncertainty and the Case for Bounded Inference

A regression coefficient is not the measurement of a physical constant. It is a conditional statement: given this regressor list, this functional form, this sample and this estimator, the association is ψ. Hendry (1980) called undisciplined specification search alchemy; Leamer (1983) showed that standard errors reported after such a search are not the standard errors of the reported estimate; Sala-i-Martin (1997) demonstrated the same instability across two million growth regressions.

The Kazakh case identifies a limit of the method that concerns the regressor rather than the conditioning set. An extreme bounds exercise varies which doubtful variables accompany the focus variable. It does not vary what the focus variable measures. Where the recorded growth of broad money is dominated by shifts in money demand, every one of the sixty-three specifications inherits the same attenuation, and the specification search reports fragility that no choice of conditioning variables could remove.

The remonetisation test makes that limit visible. Removing the years of rapid financial deepening doubles the coefficient, which is the signature of errors in variables, but also removes most of the variation the coefficient is estimated from. Neither sample yields a robust estimate, for opposite reasons: the full sample because the regressor is contaminated, the restricted sample because it is too short. A money-demand-adjusted measure of excess money growth would be required to resolve it, and constructing one is outside the scope of a specification search.

The partition supplies a second lesson. In most economies admitting a policy instrument weakens the focus coefficient, because the instrument moves with money. In Kazakhstan it strengthens the coefficient’s precision, because the instrument moved with inflation and not with money. Whether conditioning on a variable attenuates or sharpens the focus coefficient depends on its correlation with the focus variable, and that correlation should be reported before the direction of the effect is assumed.

A final observation concerns what the exercise cannot do. Nothing in a specification search addresses simultaneity. Ordinary least squares applied to an equation in which the policy rate responds to inflation is inconsistent in every one of the sixty-three specifications alike. The bounds reported here are bounds on a biased parameter.

The logical claims are three. If L defensible specifications yield L different estimates, no non-arbitrary rule selects one as the true parameter. The union of intervals across specifications is the smallest set guaranteed to contain the parameter under any maintained model, so reporting less overstates what is known. And a policy rule that is optimal

at the point estimate but fails near the edge of the bounds is not robust. Economics is a social science: the sample is one realised history, and in Kazakhstan a large part of it was a population learning to hold tenge again.

8. Policy Implications for Kazakhstan

8.1 Broad money growth is not a usable indicator of Kazakh inflation. Contemporaneously it is significant in no specification at any level, and at one lag its mean coefficient is 0.068. Money growth and inflation are correlated at +0.027 over the sample.

8.2 The absence reflects remonetisation, not the irrelevance of money. Removing the 1999–2007 years of rapid financial deepening doubles the coefficient and its correlation with inflation. Any use of monetary aggregates in the National Bank's analysis should adjust for money demand, for example by using money growth in excess of nominal output growth and the trend in financial deepening.

8.3 The relationship that exists is lagged and small. All 189 lagged estimates are positive, and the surviving specifications place the coefficient between about 0.05 and 0.15. That is too small to anchor inflation expectations on and too imprecise to calibrate policy on.

8.4 The policy rate coefficient is not a transmission estimate. It is significant in all thirty-two specifications in every configuration and records the National Bank raising rates when inflation rose, in every regime since 1996.

8.5 Exchange rate and oil channels are not detectable at annual frequency in this model space. Depreciation is significant in one specification of 128 across all configurations. Because the policy rate rose after each devaluation and oil-price fall, those channels are absorbed by the rate at annual frequency; quarterly or monthly data would be needed to separate them.

8.6 Report the direction of the conditioning effect. Admitting the policy rate sharpens the lagged money coefficient because the two are uncorrelated. That direction should be stated rather than assumed, since in most economies it runs the other way.

9. Recommendations

1. Report the robustness share at 1%, 5% and 10% for every configuration.
2. Where the focus variable is likely to contain shifts in money demand, re-estimate without the episodes of rapid financial deepening and report both results.
3. Construct and test a money-demand-adjusted measure of excess money growth before concluding that money does not matter.
4. Report the correlation between the focus variable and each doubtful variable, and state whether admitting a variable is expected to attenuate or sharpen the focus coefficient.
5. Partition the model space on the policy rate and report both halves.
6. Publish the specification band only with the number of specifications behind it.
7. State explicitly that extreme bounds are bounds on a parameter estimated by an inconsistent estimator wherever an endogenous regressor is present.
8. Publish the estimation code and the underlying series with any reported parameter, as this paper does.

10. Conclusion

Across sixty-three specifications and four configurations, the Kazakh money–inflation relationship is not robust on either criterion at 1%, 5% or 10%. Contemporaneously no estimate is significant at any level and twenty-five carry the wrong sign. At one lag every estimate is positive but the mean is 0.068 and the share reaches only 0.587 at 10%. Money growth and inflation are correlated at +0.027.

The remonetisation of 1999–2007 explains much of the absence. Those nine years supply 59.9 per cent of the variation in money growth, and in them money grew three times as fast as in the rest of the sample while inflation was lower. Removing them doubles the coefficient to 0.154, which is the errors-in-variables pattern of equation (4), but leaves too few observations for any estimate to reach 5%.

The policy rate is significant in all thirty-two specifications containing it in every configuration, and it sharpens rather than attenuates the money coefficient. At one lag, significance at 5% rises from none of thirty-one specifications without the rate to nineteen of thirty-two with it, while the mean coefficient barely moves. The rate is uncorrelated with money growth and correlated with inflation at +0.822, so it removes residual variance without absorbing money’s variation.

The methodological contribution is to separate two limits of specification search. Varying the conditioning set cannot remove attenuation that arises from what the focus variable measures, and whether admitting a doubtful variable weakens or sharpens the focus coefficient depends on its correlation with the focus variable rather than on its status as a policy instrument.

Five limitations qualify the results. The doubtful variable set is finite. Estimation is by ordinary least squares and does not address the joint determination of money, the policy rate and prices. The sample begins in 1996 and contains thirty annual observations. Money growth is not adjusted for financial deepening, which Section 6.4 shows to matter. And the reconstructed series should be replaced with official National Bank of Kazakhstan and Bureau of National Statistics data before any figure reported here is relied upon.

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Appendix A. Full Model Space, Broad Money Growth Lagged One Year

#	Doubtful variables included	Reg.	ψ	SE	t	p	Sig.	Adj. R^2	ψ ± 2SE
1	GRW	2	0.0726	0.0420	1.73	.095	*	0.049	[-0.011, 0.157]
2	UNE	2	0.0338	0.0391	0.86	.395	–	-0.018	[-0.044, 0.112]
3	DEP	2	0.0518	0.0374	1.38	.178	–	0.026	[-0.023, 0.127]
4	TOT	2	0.0355	0.0378	0.94	.356	–	-0.012	[-0.040, 0.111]
5	FIS	2	0.0634	0.0381	1.67	.108	–	0.069	[-0.013, 0.139]

#	Doubtful variables included	Reg.	ψ	SE	t	p	Sig.	Adj. R^2	ψ ± 2SE
6	INT	2	0.0562	0.0296	1.90	.069	*	0.363	[-0.003, 0.115]
7	GRW, UNE	3	0.0658	0.0442	1.49	.149	–	0.023	[-0.023, 0.154]
8	GRW, DEP	3	0.0728	0.0424	1.72	.098	*	0.030	[-0.012, 0.158]
9	GRW, TOT	3	0.0792	0.0407	1.95	.063	*	0.114	[-0.002, 0.161]
10	GRW, FIS	3	0.0705	0.0423	1.67	.108	–	0.038	[-0.014, 0.155]
11	GRW, INT	3	0.0643	0.0350	1.84	.078	*	0.342	[-0.006, 0.134]
12	UNE, DEP	3	0.0481	0.0411	1.17	.253	–	-0.011	[-0.034, 0.130]
13	UNE, TOT	3	0.0296	0.0401	0.74	.467	–	-0.042	[-0.051, 0.110]
14	UNE, FIS	3	0.0620	0.0424	1.46	.156	–	0.032	[-0.023, 0.147]
15	UNE, INT	3	0.0883	0.0308	2.87	.008	***	0.453	[0.027, 0.150]
16	DEP, TOT	3	0.0464	0.0376	1.23	.229	–	0.035	[-0.029, 0.122]
17	DEP, FIS	3	0.0650	0.0387	1.68	.105	–	0.043	[-0.012, 0.142]
18	DEP, INT	3	0.0552	0.0309	1.79	.086	*	0.338	[-0.007, 0.117]
19	TOT, FIS	3	0.0612	0.0369	1.66	.110	–	0.126	[-0.013, 0.135]
20	TOT, INT	3	0.0488	0.0296	1.65	.112	–	0.383	[-0.010, 0.108]
21	FIS, INT	3	0.0432	0.0319	1.36	.187	–	0.367	[-0.021, 0.107]
22	GRW, UNE, DEP	4	0.0680	0.0451	1.51	.144	–	-0.005	[-0.022, 0.158]
23	GRW, UNE, TOT	4	0.0742	0.0432	1.72	.098	*	0.083	[-0.012, 0.161]
24	GRW, UNE, FIS	4	0.0678	0.0449	1.51	.144	–	0.000	[-0.022, 0.157]
25	GRW, UNE, INT	4	0.0869	0.0341	2.55	.018	**	0.430	[0.019, 0.155]
26	GRW, DEP, TOT	4	0.0799	0.0408	1.96	.062	*	0.109	[-0.002, 0.161]
27	GRW, DEP, FIS	4	0.0710	0.0429	1.65	.111	–	0.008	[-0.015, 0.157]
28	GRW, DEP, INT	4	0.0640	0.0356	1.80	.085	*	0.318	[-0.007, 0.135]
29	GRW, TOT, FIS	4	0.0771	0.0405	1.90	.069	*	0.123	[-0.004, 0.158]
30	GRW, TOT, INT	4	0.0704	0.0336	2.10	.046	**	0.401	[0.003, 0.138]
31	GRW, FIS, INT	4	0.0654	0.0328	1.99	.058	*	0.421	[-0.000, 0.131]
32	UNE, DEP, TOT	4	0.0456	0.0411	1.11	.277	–	-0.006	[-0.036, 0.128]
33	UNE, DEP, FIS	4	0.0651	0.0434	1.50	.147	–	0.003	[-0.022, 0.152]
34	UNE, DEP, INT	4	0.0877	0.0321	2.73	.012	**	0.430	[0.024, 0.152]
35	UNE, TOT, FIS	4	0.0666	0.0411	1.62	.118	–	0.093	[-0.016, 0.149]
36	UNE, TOT, INT	4	0.0835	0.0291	2.87	.008	***	0.515	[0.025, 0.142]
37	UNE, FIS, INT	4	0.0741	0.0307	2.41	.024	**	0.493	[0.013, 0.136]
38	DEP, TOT, FIS	4	0.0633	0.0373	1.70	.103	–	0.111	[-0.011, 0.138]
39	DEP, TOT, INT	4	0.0499	0.0306	1.63	.117	–	0.359	[-0.011, 0.111]
40	DEP, FIS, INT	4	0.0436	0.0327	1.33	.195	–	0.341	[-0.022, 0.109]
41	TOT, FIS, INT	4	0.0436	0.0319	1.37	.185	–	0.364	[-0.020, 0.107]
42	GRW, UNE, DEP, TOT	5	0.0782	0.0437	1.79	.087	*	0.071	[-0.009, 0.166]
43	GRW, UNE, DEP, FIS	5	0.0694	0.0458	1.52	.143	–	-0.035	[-0.022, 0.161]
44	GRW, UNE, DEP, INT	5	0.0868	0.0349	2.48	.021	**	0.406	[0.017, 0.157]
45	GRW, UNE, TOT, FIS	5	0.0782	0.0433	1.81	.084	*	0.085	[-0.008, 0.165]
46	GRW, UNE, TOT, INT	5	0.0954	0.0318	3.00	.006	***	0.513	[0.032, 0.159]
47	GRW, UNE, FIS, INT	5	0.0886	0.0313	2.83	.009	***	0.522	[0.026, 0.151]
48	GRW, DEP, TOT, FIS	5	0.0780	0.0410	1.90	.070	*	0.102	[-0.004, 0.160]
49	GRW, DEP, TOT, INT	5	0.0704	0.0343	2.05	.052	*	0.375	[0.002, 0.139]
50	GRW, DEP, FIS, INT	5	0.0652	0.0335	1.95	.064	*	0.397	[-0.002, 0.132]
51	GRW, TOT, FIS, INT	5	0.0700	0.0322	2.17	.040	**	0.446	[0.006, 0.134]
52	UNE, DEP, TOT, FIS	5	0.0718	0.0418	1.72	.099	*	0.081	[-0.012, 0.155]
53	UNE, DEP, TOT, INT	5	0.0863	0.0301	2.87	.009	***	0.500	[0.026, 0.146]
54	UNE, DEP, FIS, INT	5	0.0757	0.0316	2.40	.025	**	0.475	[0.013, 0.139]
55	UNE, TOT, FIS, INT	5	0.0764	0.0302	2.53	.019	**	0.511	[0.016, 0.137]
56	DEP, TOT, FIS, INT	5	0.0446	0.0328	1.36	.186	–	0.338	[-0.021, 0.110]

#	Doubtful variables included	Reg.	ψ	SE	t	p	Sig.	Adj. R^2	ψ ± 2SE
57	GRW, UNE, DEP, TOT, FIS	6	0.0813	0.0440	1.85	.078	*	0.064	[-0.007, 0.169]
58	GRW, UNE, DEP, TOT, INT	6	0.0962	0.0326	2.95	.007	***	0.493	[0.031, 0.161]
59	GRW, UNE, DEP, FIS, INT	6	0.0888	0.0320	2.77	.011	**	0.500	[0.025, 0.153]
60	GRW, UNE, TOT, FIS, INT	6	0.0951	0.0300	3.17	.004	***	0.567	[0.035, 0.155]
61	GRW, DEP, TOT, FIS, INT	6	0.0700	0.0330	2.12	.045	**	0.421	[0.004, 0.136]
62	UNE, DEP, TOT, FIS, INT	6	0.0793	0.0309	2.56	.018	**	0.499	[0.017, 0.141]
63	GRW, UNE, DEP, TOT, FIS, INT	7	0.0960	0.0307	3.13	.005	***	0.549	[0.035, 0.157]

Note. T = 29. Sig.: *** p < 0.01, ** p < 0.05, * p < 0.10. Significant at 1%: 8 of 63 (Δ = 0.127); at 5%: 19 (Δ = 0.302); at 10%: 37 (Δ = 0.587). No estimate is wrong-signed. Leamer bounds [−0.051, 0.169]. Excluding INT, no specification is significant at 1% or 5% and eleven are at 10%, with a mean of 0.064. Including INT, eight are significant at 1%, nineteen at 5% and twenty-six at 10%, with a mean of 0.072. Excluding the remonetisation years 1999–2007, the mean rises to 0.154 and no specification is significant at 5%.