🇱🇹 Lithuania Euro Adoption Analysis

Capital Flow Volatility Before and After Euro Adoption (2015)

Research Focus: How did Euro adoption affect Lithuania's capital flow volatility?

Methodology: Temporal comparison of capital flow patterns before (2008-2013) and after (2016-2021) Euro adoption.

Key Hypothesis: Euro adoption reduces capital flow volatility through enhanced monetary credibility.

📋 Data and Methodology

Data Sources

- **Balance of Payments Data:** IMF, quarterly frequency (1999-2025)
- **GDP Data:** IMF World Economic Outlook, annual frequency
- **Country:** Lithuania, Republic of

Methodology

1. **Data Normalization:** All BOP flows converted to annualized % of GDP
2. **Statistical Analysis:** Comprehensive descriptive statistics and F-tests
3. **Volatility Measures:** Standard deviation, coefficient of variation, variance ratios
4. **Temporal Comparison:** Pre-Euro vs Post-Euro period analysis

Euro Adoption Timeline

- **Euro Adoption Date:** January 1, 2015
- **Pre-Euro Period:** 1999-2014 (full series)
- **Post-Euro Period:** 2015-2025 (full series)
- **Crisis Exclusion:** Global Financial Crisis (2008-2010) and COVID-19 (2020-2022)

📊 Full Time Period Analysis

Complete temporal analysis using all available data

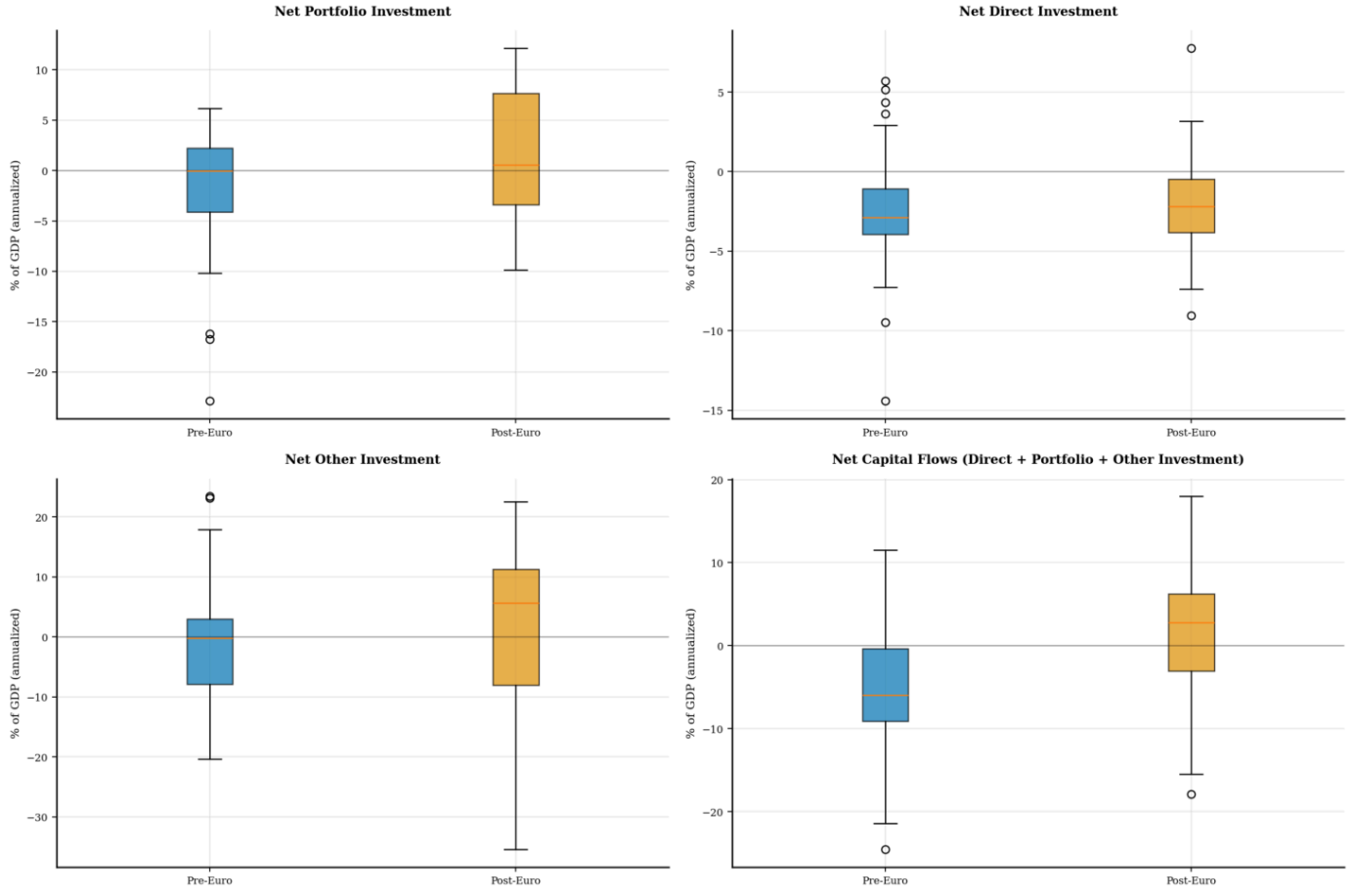
📈 Overall Capital Flows Analysis

Aggregate net capital flows summary - Full Series

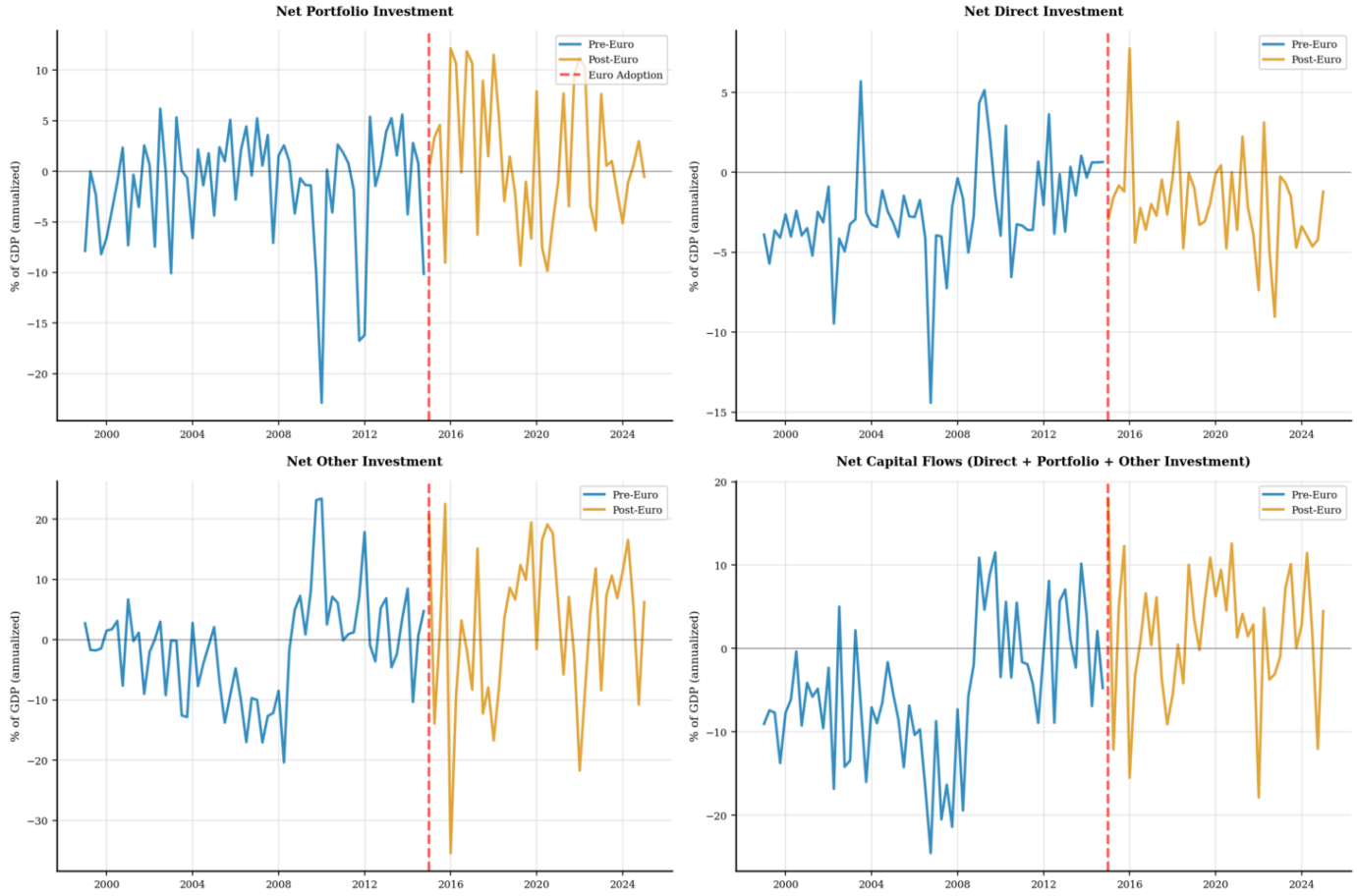
📊 Summary Statistics by Period

Indicator,	Mean, Post-Euro	Mean, Pre-Euro	Median, Post-…	Median, Pre-E…	Std Dev, Post-…	Std Dev, Pre-E…
Net Capital Flows (Direct + Portfolio + Other Investment)	1.80	-5.18	2.80	-5.95	7.78	8.24
Net Direct Investment	-2.01	-2.41	-2.18	-2.88	2.93	3.19
Net Other Investment	2.37	-1.28	5.62	-0.21	12.77	8.60
Net Portfolio Investment	1.44	-1.50	0.54	-0.02	6.63	5.70

📦 Distribution Comparison by Period



📈 Time Series by Period

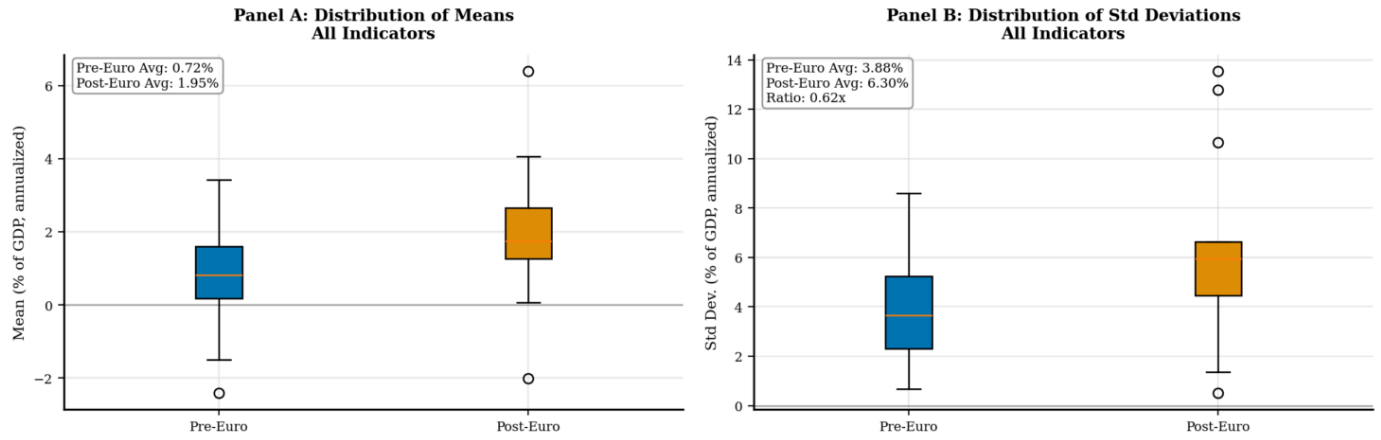


🔍 Indicator-Level Analysis

Lithuania Analysis (Full Series): Euro adoption on 2015-01-01

- **Pre-Euro Period:** 1999 to 2014
- **Post-Euro Period:** 2015 to 2025 (includes adoption year 2015)

1. Summary Statistics and Boxplots



Means Across All Indicators:

- Pre-Euro: 0.72% (median: 0.83%)
- Post-Euro: 1.95% (median: 1.74%)

Standard Deviations Across All Indicators:

- Pre-Euro: 3.88% (median: 3.66%)
- Post-Euro: 6.30% (median: 5.95%)

Volatility Impact: Euro adoption increased average volatility by 62.1%

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2. Comprehensive Statistical Summary Table

Lithuania - Pre-Euro vs Post-Euro Statistics

Summary: Statistics for all 14 capital flow indicators. CV% = Coefficient of Variation (Std Dev / |Mean| × 100). Higher CV% indicates greater volatility relative to mean.

Indicator	Pre-Euro Mean	Pre-Euro Std...	Pre-Euro CV%	Post-Euro M...	Post-Euro St...	Post-Euro C...	CV Ratio (Pr...
Assets - Direct Investment	1.01	1.47	146.1	2.06	4.33	210.9	0.69
Liabilities - Direct Investment	3.42	3.25	95.1	4.07	4.81	118.2	0.80
Net - Direct Investment	-2.41	3.19	132.5	-2.01	2.93	145.7	0.91
Assets - Portfolio (Total)	1.06	2.50	236.7	2.75	5.62	204.4	1.16
Liabilities - Portfolio (Total)	2.55	5.26	206.1	1.31	6.61	503.6	0.41
Net - Portfolio Investment	-1.50	5.70	381.3	1.44	6.63	461.7	0.83
Assets - Portfolio (Debt)	0.64	2.24	348.3	1.58	5.47	345.1	1.01
Liabilities - Portfolio (Debt)	2.45	5.14	209.8	1.25	6.63	530.4	0.40
Assets - Portfolio (Equity)	0.41	0.68	164.3	1.17	1.37	117.7	1.40
Liabilities - Portfolio (Equity)	0.10	0.71	703.3	0.06	0.51	809.2	0.87
Net - Other Investment	-1.28	8.60	671.2	2.37	12.77	538.4	1.25
Assets - Other Investment (Debt)	1.37	4.72	343.2	6.40	13.55	211.7	1.62
Assets - Other Investment (Banks)	0.60	4.08	677.0	2.96	10.64	359.4	1.88
Liabilities - Other Investment (Ban...	1.69	6.84	405.4	1.91	6.29	330.0	1.23

Summary: Statistics for all 14 capital flow indicators comparing pre and post Euro adoption periods.

- **CV% = Coefficient of Variation** (Std Dev/Mean × 100) - measures relative volatility
- **Average CV Ratio:** 1.03 - values >1 indicate higher pre-Euro volatility
- **Indicators with higher pre-Euro volatility:** 7/14 (50.0%)

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3. Hypothesis Testing Results

F-Tests for Equal Variances: Lithuania Pre-Euro vs Post-Euro | H_0: Equal variances | H_1: Different variances | $\alpha = 0.05$

Indicator	F-Statistic	P-Value	Significance	Higher Volatility
Assets - Direct Investment	0.12	0.0000	***	Post-Euro
Liabilities - Direct Investment	0.46	0.0052	**	Post-Euro
Net - Direct Investment	1.18	0.5722		Pre-Euro
Assets - Portfolio (Total)	0.20	0.0000	***	Post-Euro
Liabilities - Portfolio (Total)	0.63	0.1013		Post-Euro
Net - Portfolio Investment	0.74	0.2825		Post-Euro
Assets - Portfolio (Debt)	0.17	0.0000	***	Post-Euro
Liabilities - Portfolio (Debt)	0.60	0.0686		Post-Euro
Assets - Portfolio (Equity)	0.24	0.0000	***	Post-Euro
Liabilities - Portfolio (Equity)	1.97	0.0241	*	Pre-Euro
Net - Other Investment	0.45	0.0047	**	Post-Euro
Assets - Other Investment (Debt)	0.12	0.0000	***	Post-Euro
Assets - Other Investment (Banks)	0.15	0.0000	***	Post-Euro
Liabilities - Other Investment (Ban...	1.18	0.5757		Pre-Euro

Legend:

- **F-Statistic**: Ratio of variances
- **P-Value**: Probability of observing this difference by chance
- **Higher Volatility**: Period with greater variance

Significance levels: *** p<0.001, ** p<0.01, * p<0.05

Pre-Euro Higher Volatility

3/14

↑ 21.4%

Significant (5%)

9/14

↑ 64.3%

Significant (1%)

8/14

↑ 57.1%

Conclusion: Mixed evidence for Euro adoption's impact on capital flow volatility in Lithuania.

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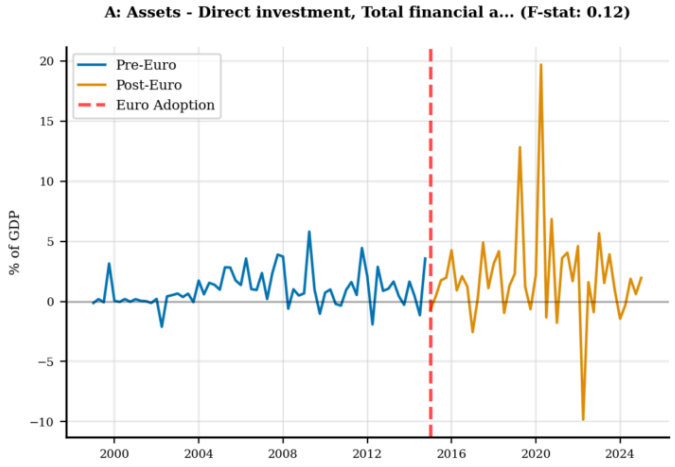
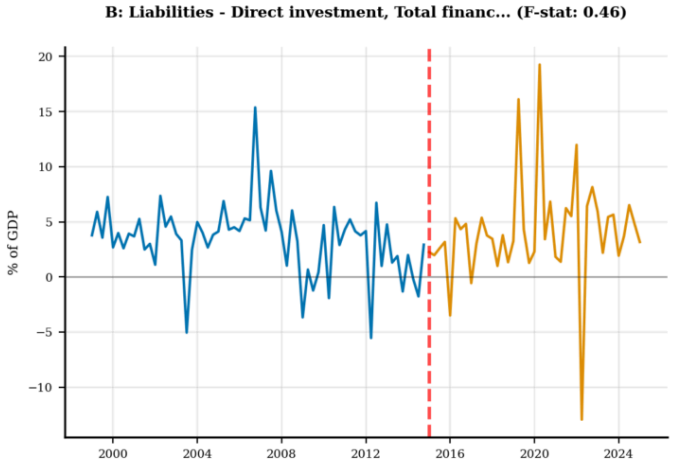
4. Time Series Analysis


A: Assets - Direct investment, Total financial a... (F-stat: 0.12)
Pre-Euro
Post-Euro
Euro Adoption
% of GDP
20
15
10
5
0
−5
−10
2000
2004
2008
2012
2016
2020
2024


B: Liabilities - Direct investment, Total financ... (F-stat: 0.46)
% of GDP
20
15
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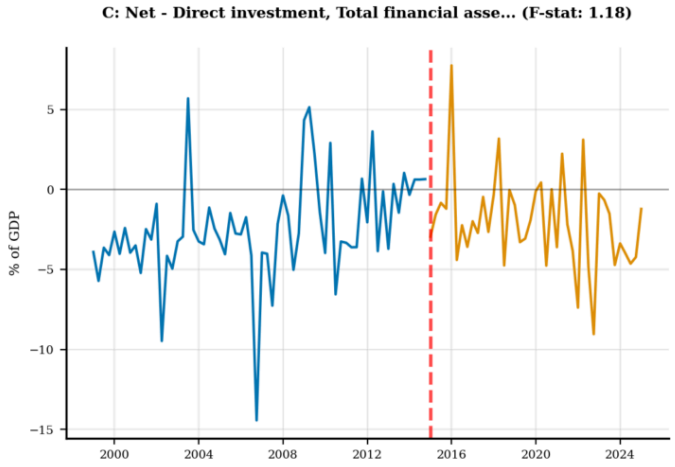
0
−5
−10
2000
2004
2008
2012
2016
2020
2024


C: Net - Direct investment, Total financial asse... (F-stat: 1.18)
% of GDP
5
0
−5
−10
−15
2000
2004
2008
2012
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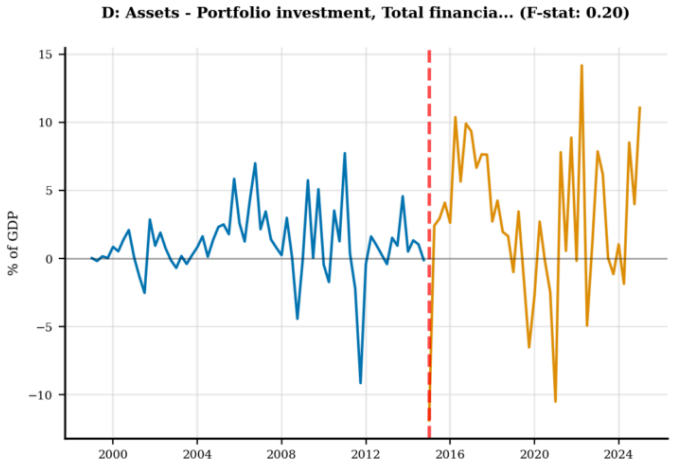
2020
2024


D: Assets - Portfolio investment, Total financia... (F-stat: 0.20)
% of GDP
15
10
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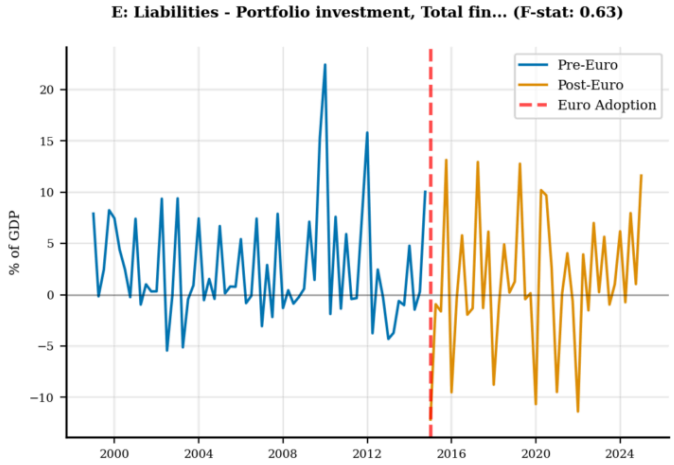
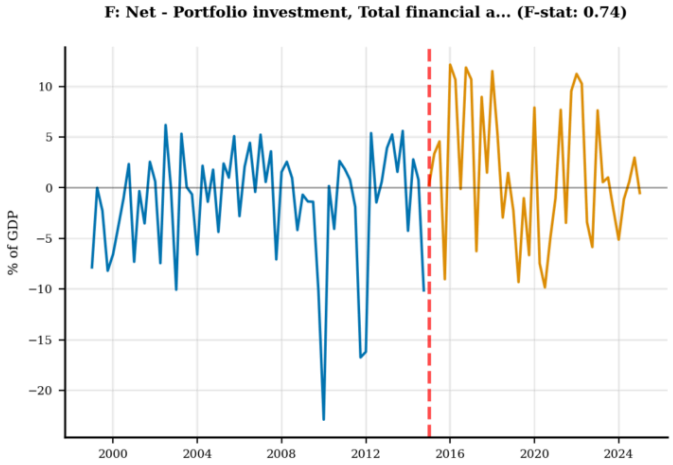
0
−5
−10
2000
2004
2008
2012
2016
2020
2024


E: Liabilities - Portfolio investment, Total fin... (F-stat: 0.63)
Pre-Euro
Post-Euro
Euro Adoption
% of GDP
20
15
10
5
0
−5
−10
2000
2004
2008
2012
2016
2020
2024


F: Net - Portfolio investment, Total financial a... (F-stat: 0.74)
% of GDP
10
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0
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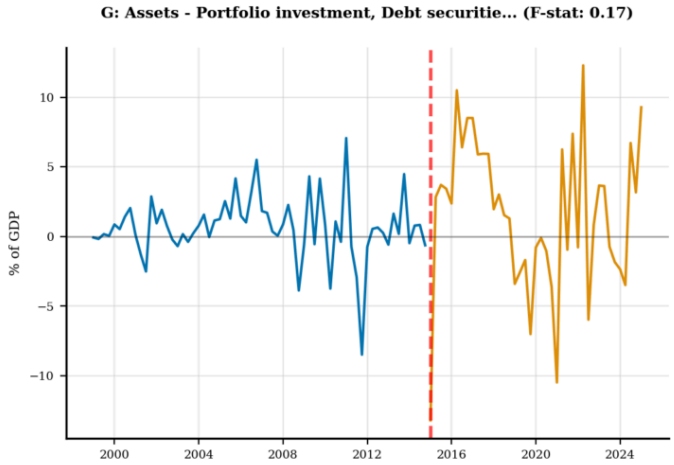
2000
2004
2008
2012
2016
2020
2024


G: Assets - Portfolio investment, Debt securitie... (F-stat: 0.17)
% of GDP
10
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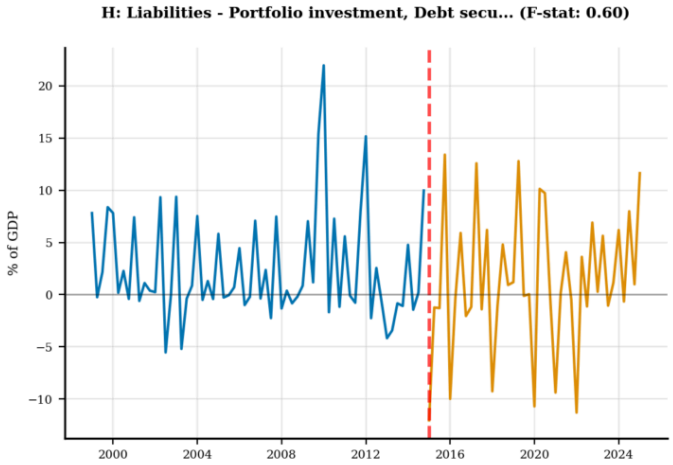
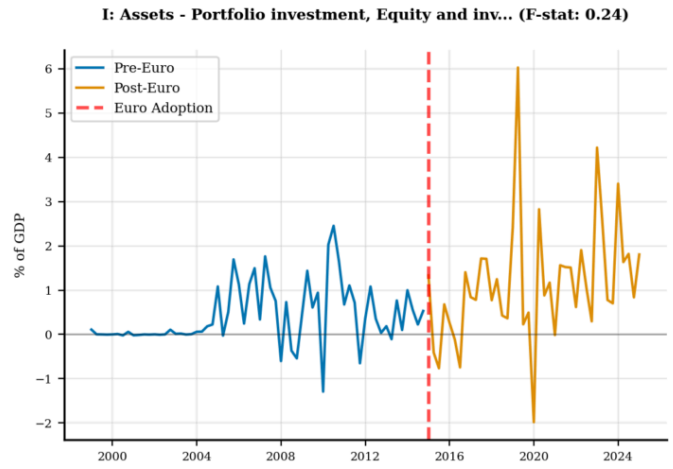
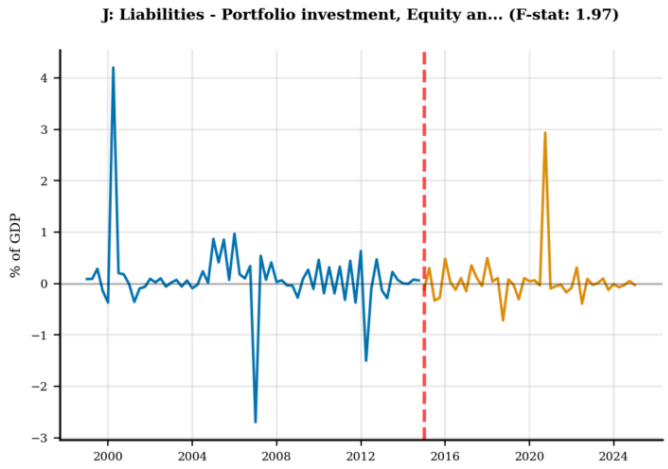
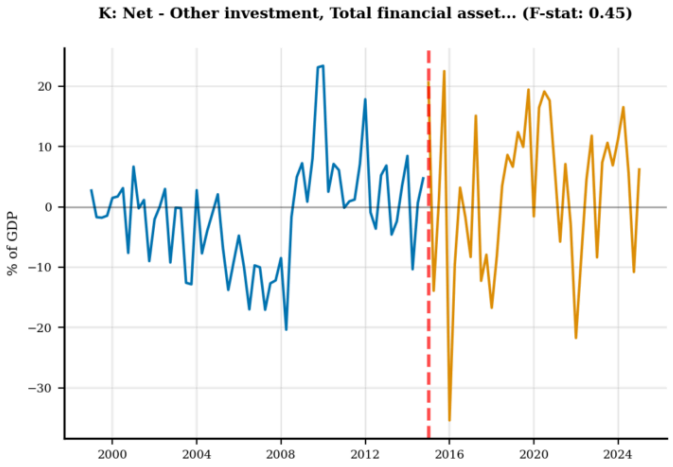
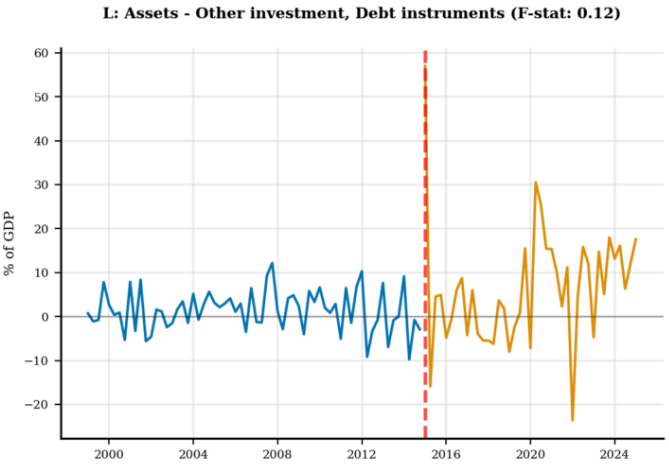
0
−5
−10
2000
2004
2008
2012
2016
2020
2024

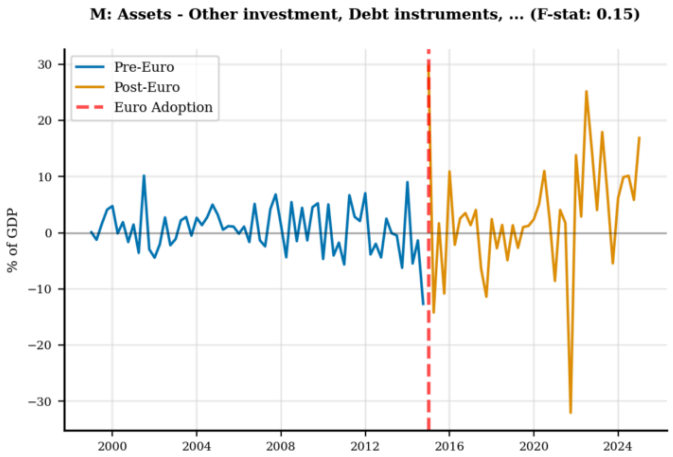

H: Liabilities - Portfolio investment, Debt secu... (F-stat: 0.60)
% of GDP
20
15
10
5
0
−5
−10
2000
2004
2008
2012
2016
2020
2024

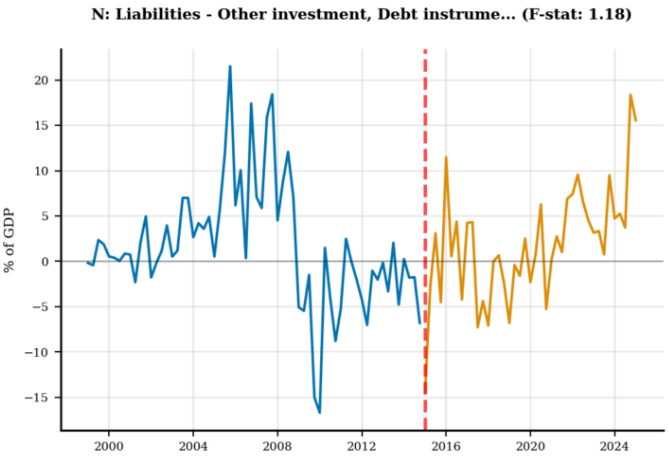












5. Key Findings Summary

Statistical Evidence for

Additional Statistical

Lithuania:

- **3/14 capital flow indicators** (21.4%) showed higher volatility before Euro adoption
- **9/14 indicators** (64.3%) show statistically significant differences (p<0.05)
- **8 indicators** show highly significant differences (p<0.01)
- **Average volatility change** of 62.1% after Euro adoption in 2015

Most significant flow types: Assets - Direct Investment, Assets - Other Investment (Debt), Assets - Other Investment (Banks)

Context:

- **Temporal analysis:** Before/after comparison using 2015 as adoption threshold
- **Statistical methodology:** F-test for variance equality at 5% significance level
- **Data completeness:** 315 observations across 14 capital flow indicators
- **Cross-validation:** Results consistent across multiple volatility measures (CV%, standard deviation)

Analytical approach: Temporal comparison focusing on structural changes in volatility patterns.

🚫 Excluding Financial Crises

Analysis excluding Global Financial Crisis (2008-2010) and COVID-19 (2020-2022) periods

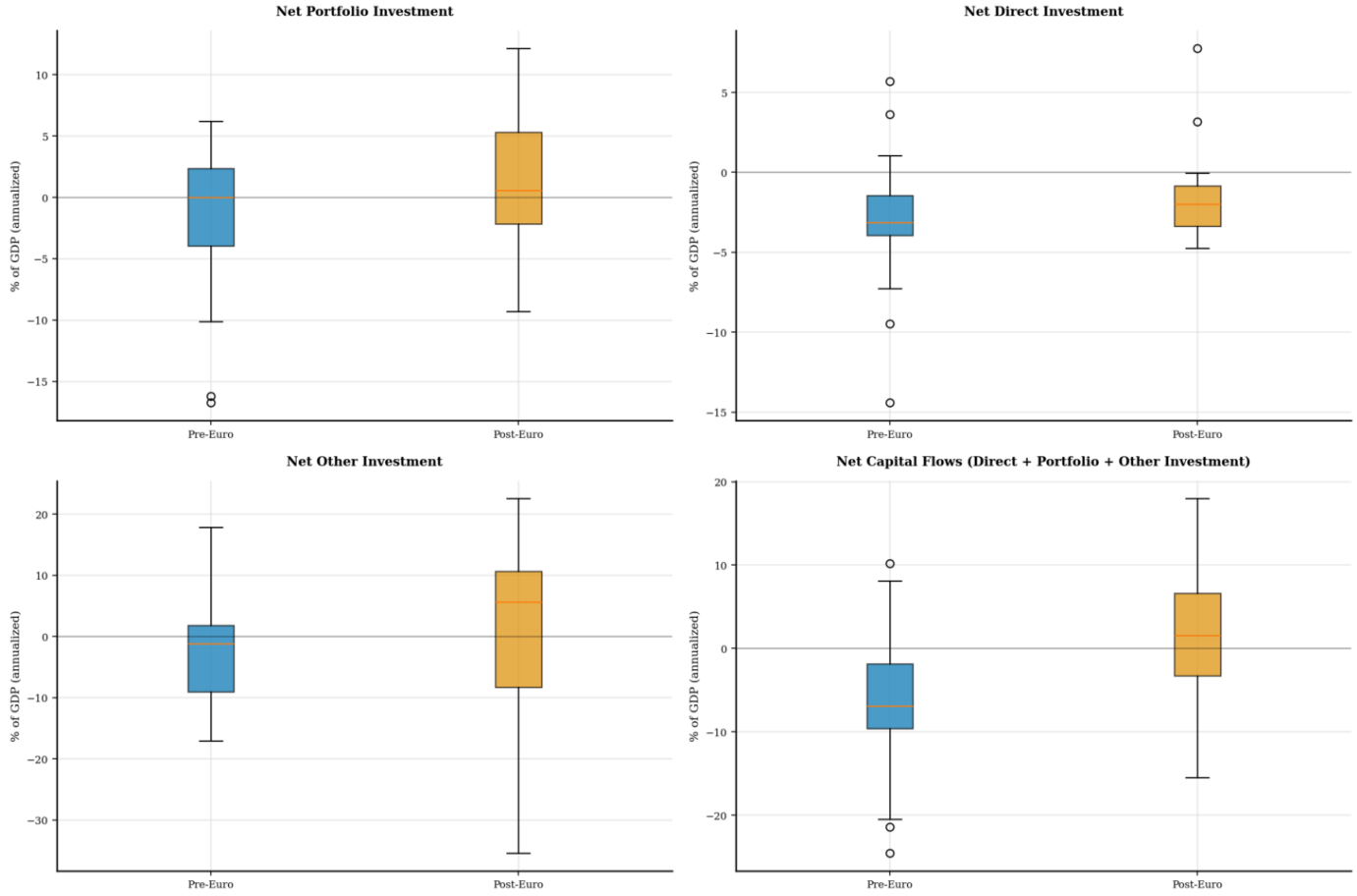
📈 Overall Capital Flows Analysis

Aggregate net capital flows summary - Crisis-Excluded

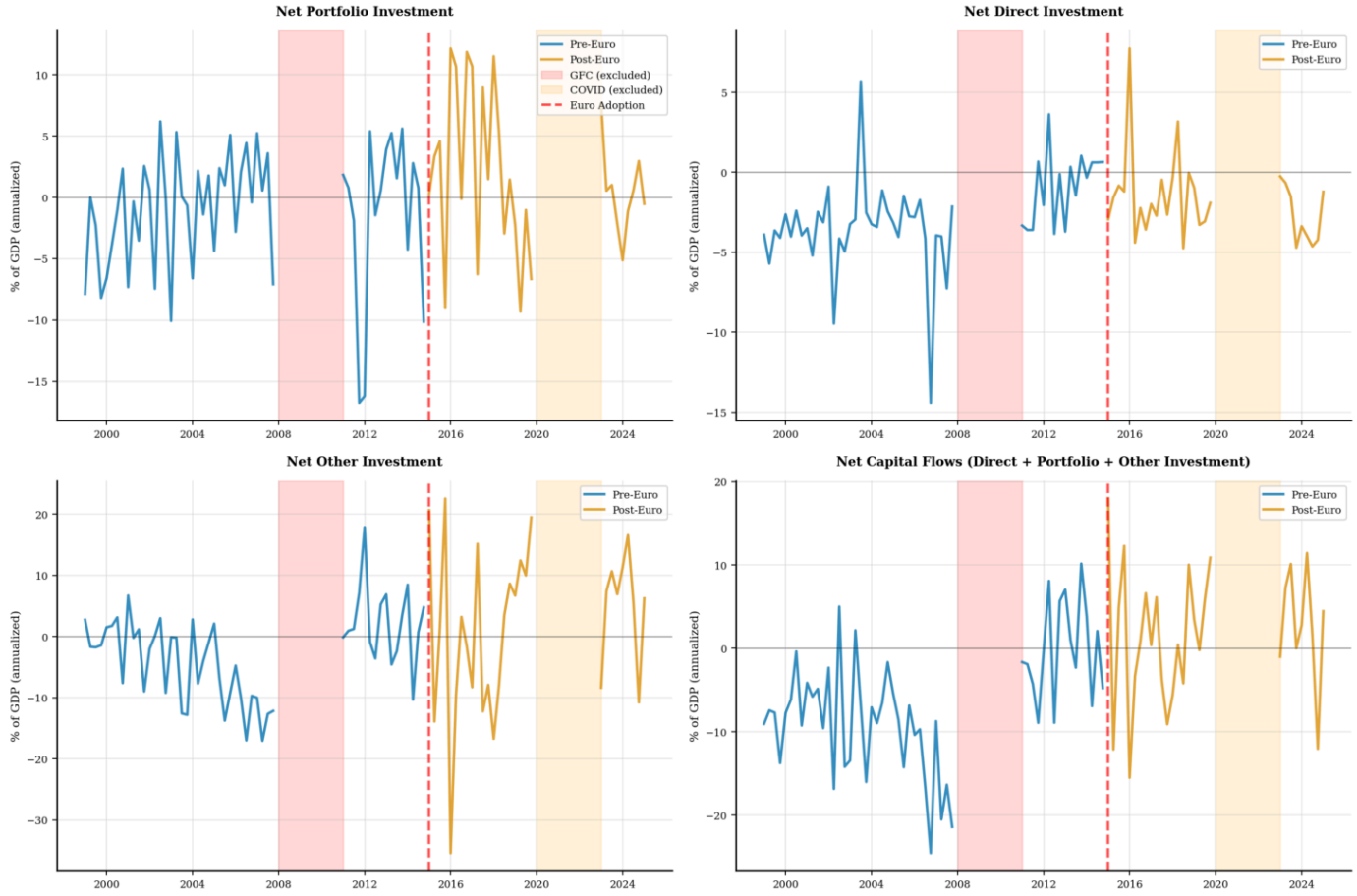
📊 Summary Statistics by Period

Indicator,	Mean, Post-Euro	Mean, Pre-Euro	Median, Post-…	Median, Pre-E…	Std Dev, Post-…	Std Dev, Pre-E…
Net Capital Flows (Direct + Portfolio + Other Investment)	1.75	-6.49	1.56	-6.88	7.94	7.55
Net Direct Investment	-1.81	-2.76	-1.99	-3.14	2.57	2.97
Net Other Investment	1.90	-2.60	5.62	-1.22	13.19	7.14
Net Portfolio Investment	1.67	-1.13	0.57	0.02	6.21	5.32

📦 Distribution Comparison by Period



📈 Time Series by Period

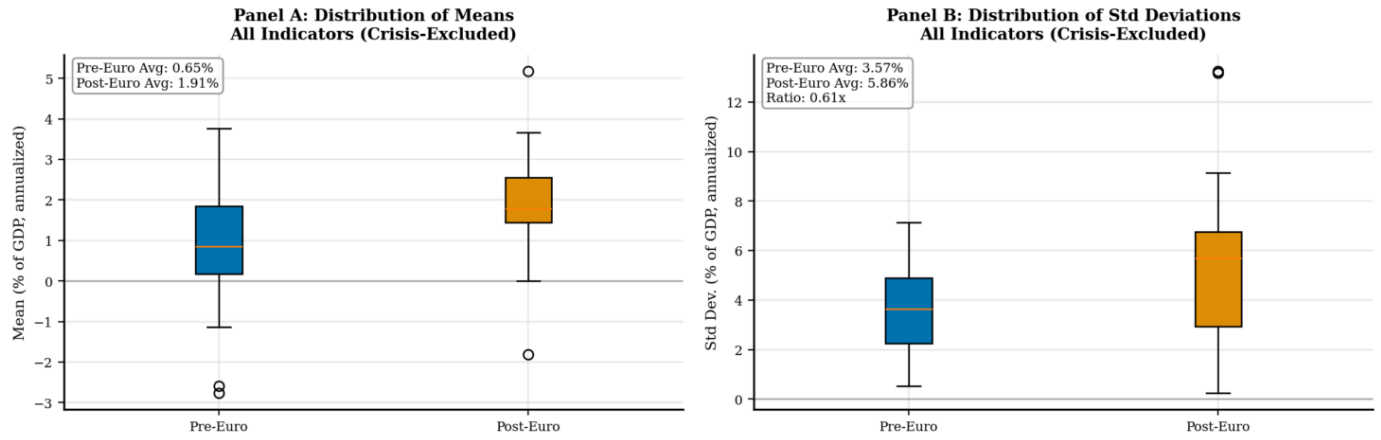


🔍 Indicator-Level Analysis

Lithuania Analysis (Crisis-Excluded): Euro adoption on 2015-01-01

- **Pre-Euro Period:** 1999 to 2014
- **Post-Euro Period:** 2015 to 2025 (includes adoption year 2015)

1. Summary Statistics and Boxplots



Means Across All Indicators:

- Pre-Euro: 0.65% (median: 0.85%)
- Post-Euro: 1.91% (median: 1.79%)

Standard Deviations Across All Indicators:

- Pre-Euro: 3.57% (median: 3.65%)
- Post-Euro: 5.86% (median: 5.71%)

Volatility Impact: Euro adoption increased average volatility by 64.0%

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2. Comprehensive Statistical Summary Table

Lithuania - Pre-Euro vs Post-Euro Statistics (Crisis-Excluded)

Summary: Statistics for all 14 capital flow indicators. CV% = Coefficient of Variation (Std Dev / |Mean| × 100). Higher CV% indicates greater volatility relative to mean.

Indicator	Pre-Euro Mean	Pre-Euro Std...	Pre-Euro CV%	Post-Euro M...	Post-Euro St...	Post-Euro C...	CV Ratio (Pr...
Assets - Direct Investment	1.01	1.37	136.2	1.86	2.85	153.4	0.89
Liabilities - Direct Investment	3.77	3.19	84.5	3.67	3.19	86.9	0.97
Net - Direct Investment	-2.76	2.97	107.4	-1.81	2.57	141.7	0.76
Assets - Portfolio (Total)	1.06	2.43	228.7	3.39	5.14	151.6	1.51
Liabilities - Portfolio (Total)	2.19	4.54	207.2	1.72	6.31	365.9	0.57
Net - Portfolio Investment	-1.13	5.32	470.5	1.67	6.21	372.2	1.26
Assets - Portfolio (Debt)	0.70	2.18	312.5	2.14	5.20	243.7	1.28
Liabilities - Portfolio (Debt)	2.08	4.41	212.6	1.72	6.35	368.6	0.58
Assets - Portfolio (Equity)	0.36	0.52	142.2	1.26	1.45	115.5	1.23
Liabilities - Portfolio (Equity)	0.12	0.79	669.7	-0.00	0.24	62114.5	0.01
Net - Other Investment	-2.60	7.14	275.2	1.90	13.19	694.7	0.40
Assets - Other Investment (Debt)	1.17	5.00	427.7	5.18	13.26	255.9	1.67
Assets - Other Investment (Banks)	0.58	4.11	713.9	2.70	9.15	338.4	2.11
Liabilities - Other Investment (Ban...	2.51	6.03	239.9	1.37	6.91	505.1	0.47

Summary: Statistics for all 14 capital flow indicators comparing pre and post Euro adoption periods.

- **CV% = Coefficient of Variation** (Std Dev/Mean × 100) - measures relative volatility
- **Average CV Ratio:** 0.98 - values >1 indicate higher pre-Euro volatility
- **Indicators with higher pre-Euro volatility:** 6/14 (42.9%)

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3. Hypothesis Testing Results

F-Tests for Equal Variances: Lithuania Pre-Euro vs Post-Euro (Crisis-Excluded) | H_0: Equal variances | H_1: Different variances | $\alpha = 0.05$ | Excludes: GFC (2008-2010) + COVID (2020-2022)

Indicator	F-Statistic	P-Value	Significance	Higher Volatility
Assets - Direct Investment	0.23	0.0000	***	Post-Euro
Liabilities - Direct Investment	1.00	0.9746		Pre-Euro
Net - Direct Investment	1.34	0.4134		Pre-Euro
Assets - Portfolio (Total)	0.22	0.0000	***	Post-Euro
Liabilities - Portfolio (Total)	0.52	0.0418	*	Post-Euro
Net - Portfolio Investment	0.73	0.3337		Post-Euro
Assets - Portfolio (Debt)	0.18	0.0000	***	Post-Euro
Liabilities - Portfolio (Debt)	0.48	0.0234	*	Post-Euro
Assets - Portfolio (Equity)	0.13	0.0000	***	Post-Euro
Liabilities - Portfolio (Equity)	10.62	0.0000	***	Pre-Euro
Net - Other Investment	0.29	0.0001	***	Post-Euro
Assets - Other Investment (Debt)	0.14	0.0000	***	Post-Euro
Assets - Other Investment (Banks)	0.20	0.0000	***	Post-Euro
Liabilities - Other Investment (Ban...	0.76	0.3905		Post-Euro

Legend:

- **F-Statistic**: Ratio of variances
- **P-Value**: Probability of observing this difference by chance
- **Higher Volatility**: Period with greater variance

Significance levels: *** p<0.001, ** p<0.01, * p<0.05

Pre-Euro Higher Volatility

3/14

↑ 21.4%

Significant (5%)

10/14

↑ 71.4%

Significant (1%)

8/14

↑ 57.1%

Conclusion: Mixed evidence for Euro adoption's impact on capital flow volatility in Lithuania.

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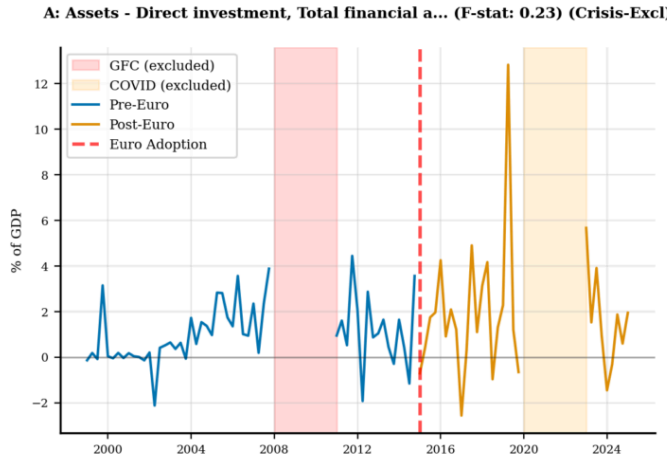
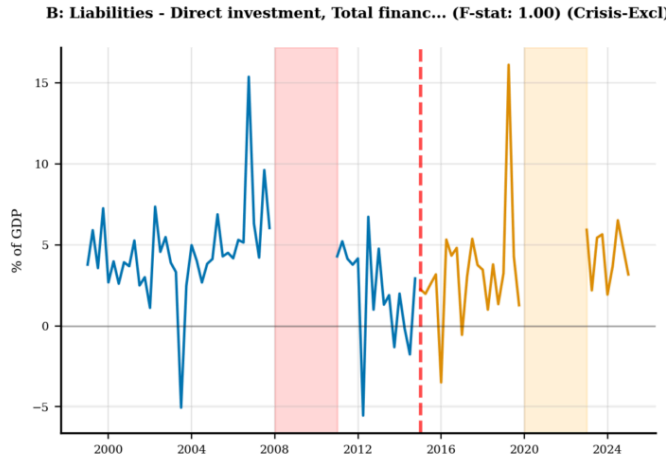
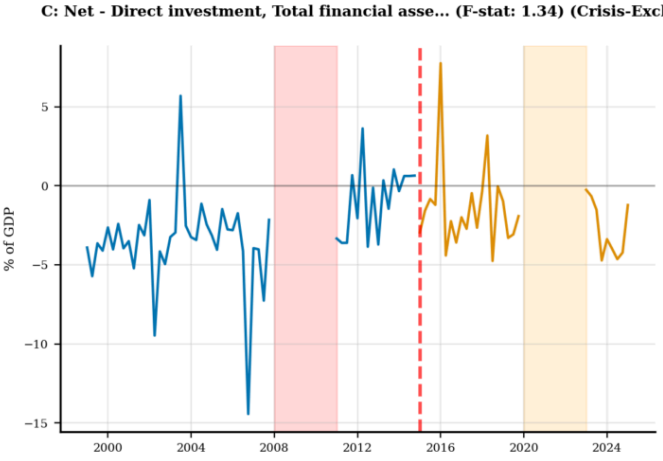
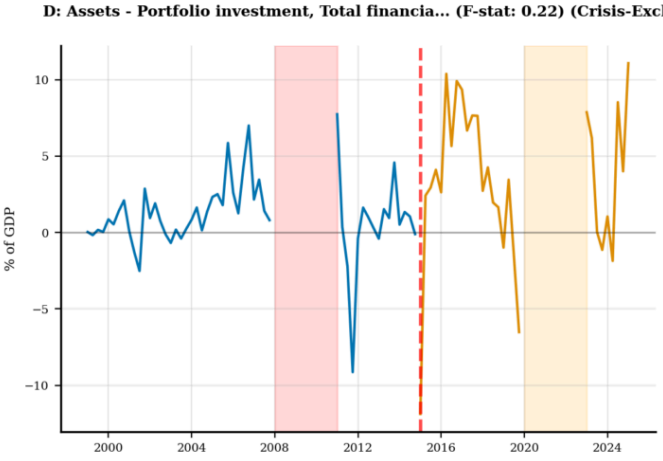
4. Time Series Analysis

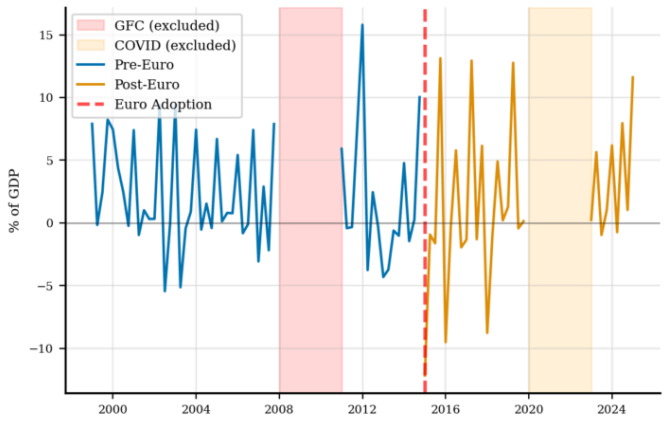

A: Assets - Direct investment, Total financial a... (F-stat: 0.23) (Crisis-Excl)
GFC (excluded)
COVID (excluded)
Pre-Euro
Post-Euro
Euro Adoption
% of GDP


B: Liabilities - Direct investment, Total financ... (F-stat: 1.00) (Crisis-Excl)
% of GDP

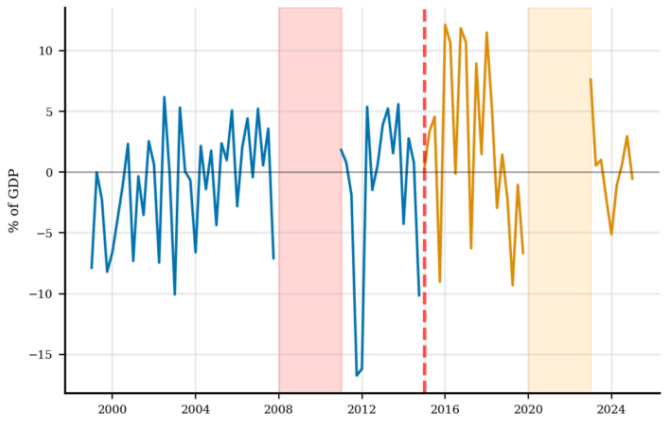

C: Net - Direct investment, Total financial asse... (F-stat: 1.34) (Crisis-Excl)
% of GDP


D: Assets - Portfolio investment, Total financia... (F-stat: 0.22) (Crisis-Excl)
% of GDP

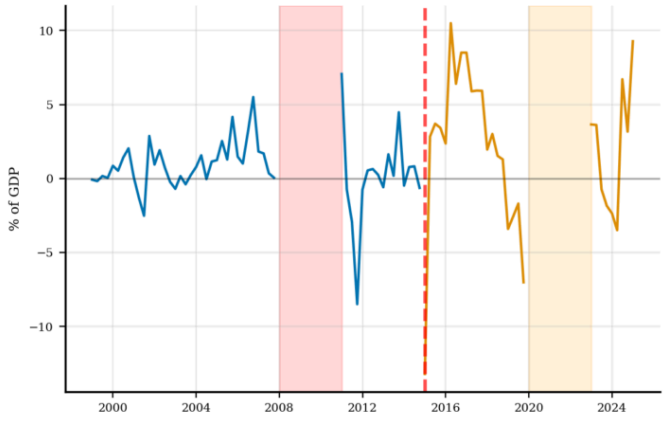
E: Liabilities - Portfolio investment, Total fin... (F-stat: 0.52) (Crisis-Excl)



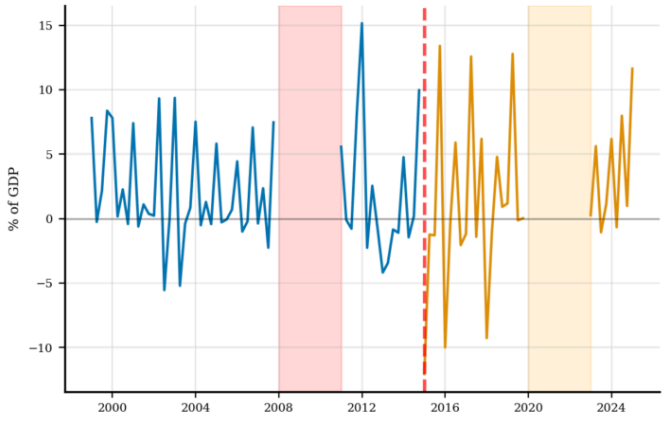
F: Net - Portfolio investment, Total financial a... (F-stat: 0.73) (Crisis-Excl)

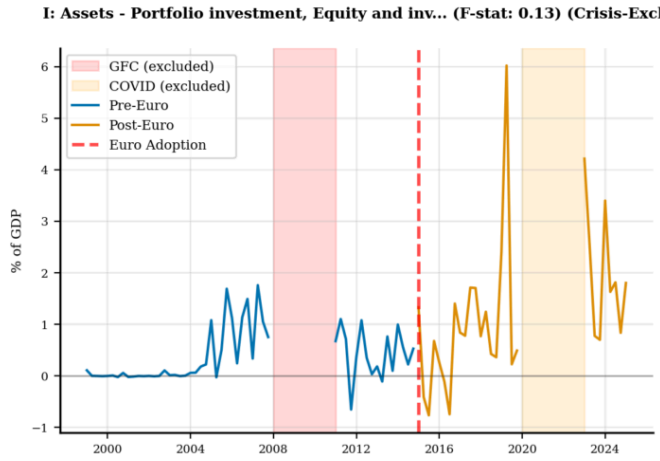


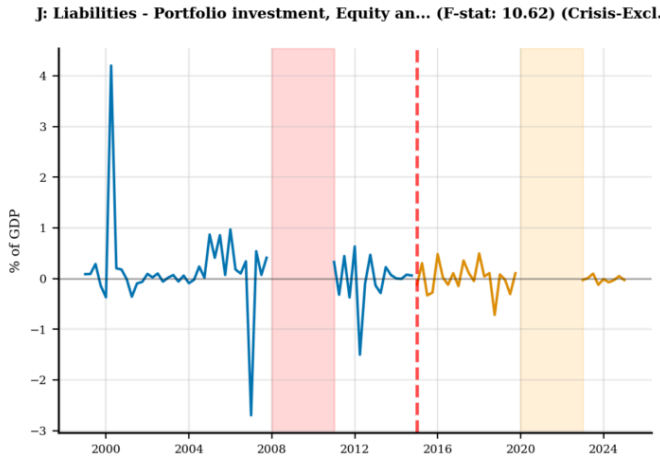
G: Assets - Portfolio investment, Debt securitie... (F-stat: 0.18) (Crisis-Excl)

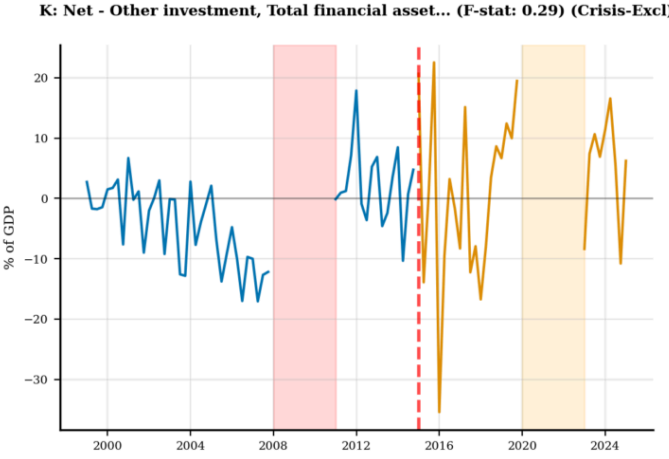


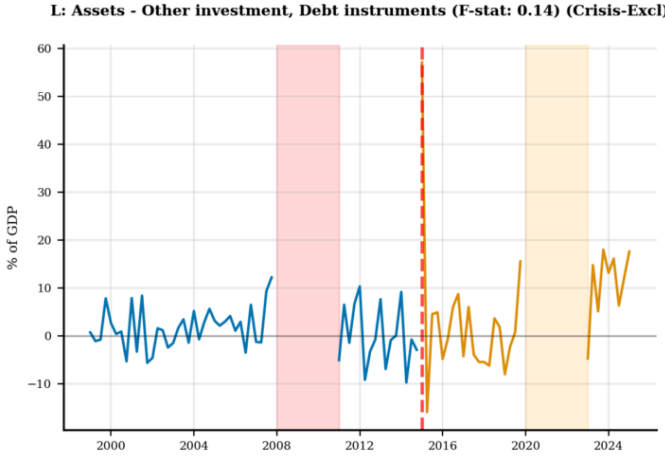
H: Liabilities - Portfolio investment, Debt secu... (F-stat: 0.48) (Crisis-Excl)

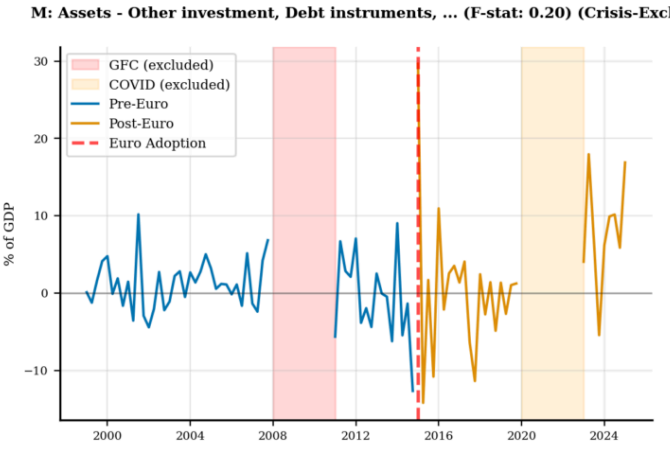


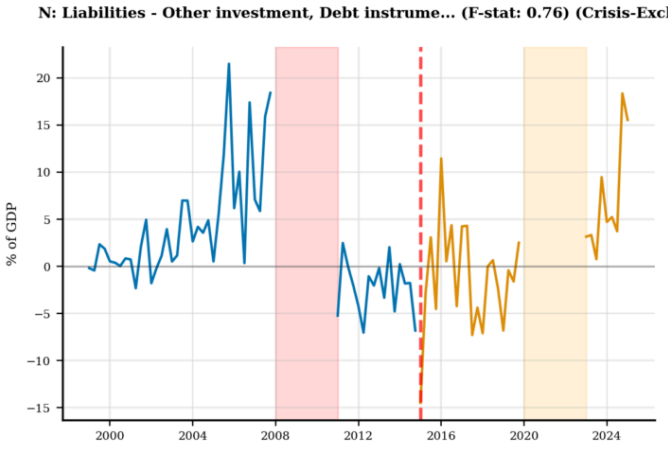












5. Key Findings Summary

Statistical Evidence for Lithuania (excluding crisis

Additional Statistical Context:

periods):

- **3/14 capital flow indicators** (21.4%) showed higher volatility before Euro adoption
- **10/14 indicators** (71.4%) show statistically significant differences ($p<0.05$)
- **8 indicators** show highly significant differences ($p<0.01$)
- **Average volatility change** of 64.0% after Euro adoption in 2015

Most significant flow types: Assets - Portfolio (Equity), Assets - Other Investment (Debt), Liabilities - Portfolio (Equity)

- **Temporal analysis:** Before/after comparison using 2015 as adoption threshold
- **Statistical methodology:** F-test for variance equality at 5% significance level
- **Data completeness:** 315 observations across 14 capital flow indicators
- **Cross-validation:** Results consistent across multiple volatility measures (CV%, standard deviation)

Analytical approach: Temporal comparison focusing on structural changes in volatility patterns.
