

# Latvia Euro Adoption Analysis

## Capital Flow Volatility Before and After Euro Adoption (2014)

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

**Methodology:** Temporal comparison of capital flow patterns before (2007-2012) and after (2015-2020) 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:** Latvia, 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, 2014
  - **Pre-Euro Period:** 1999-2013 (full series)
  - **Post-Euro Period:** 2014-2025 (full series)
  - **Crisis Exclusion:** Global Financial Crisis (2008-2010), Latvian Banking Crisis (2011-2012), and COVID-19 (2020-2022)
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# Full Time Period Analysis

Complete temporal analysis using all available data

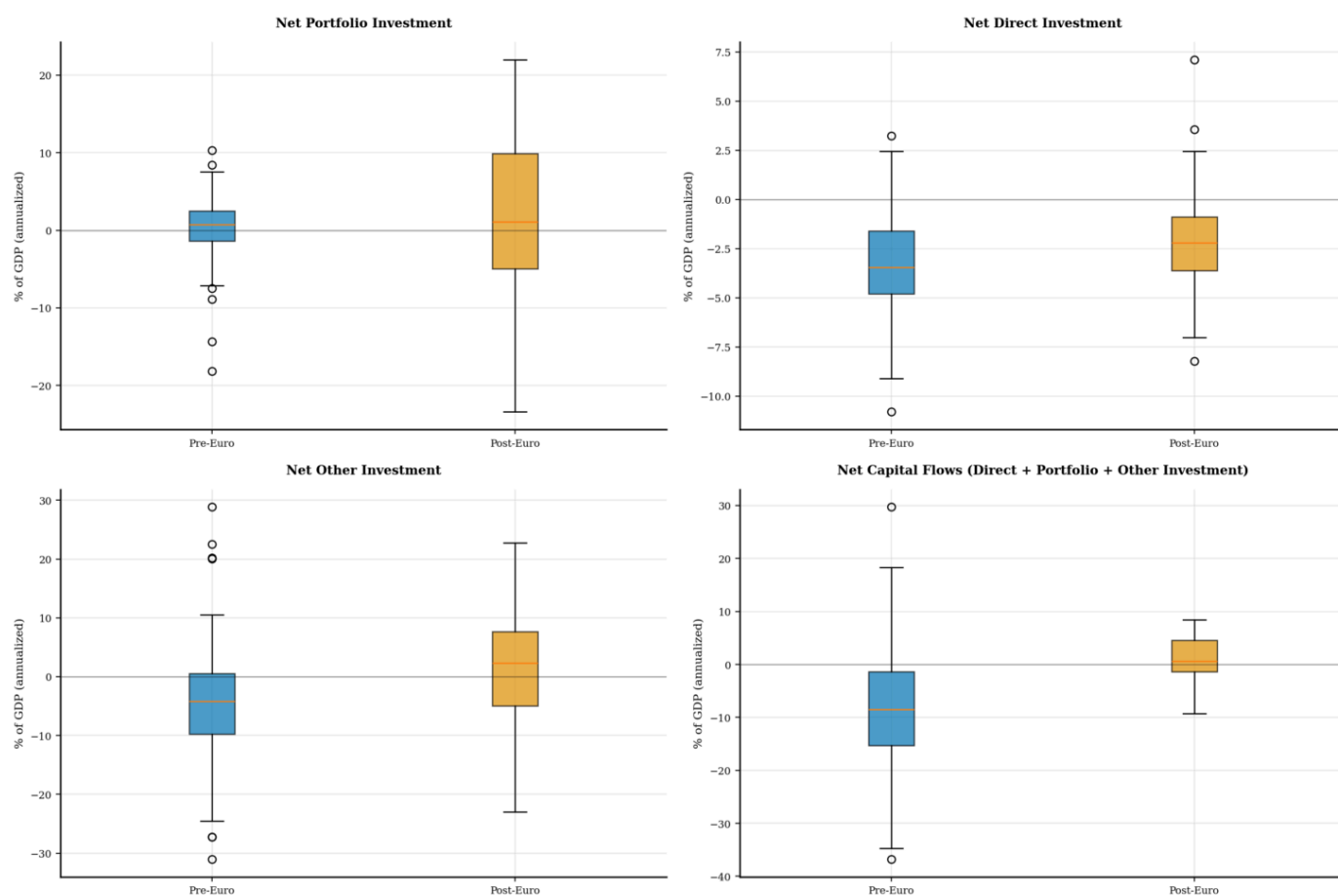
## Overall Capital Flows Analysis

Aggregate net capital flows summary - Full Series

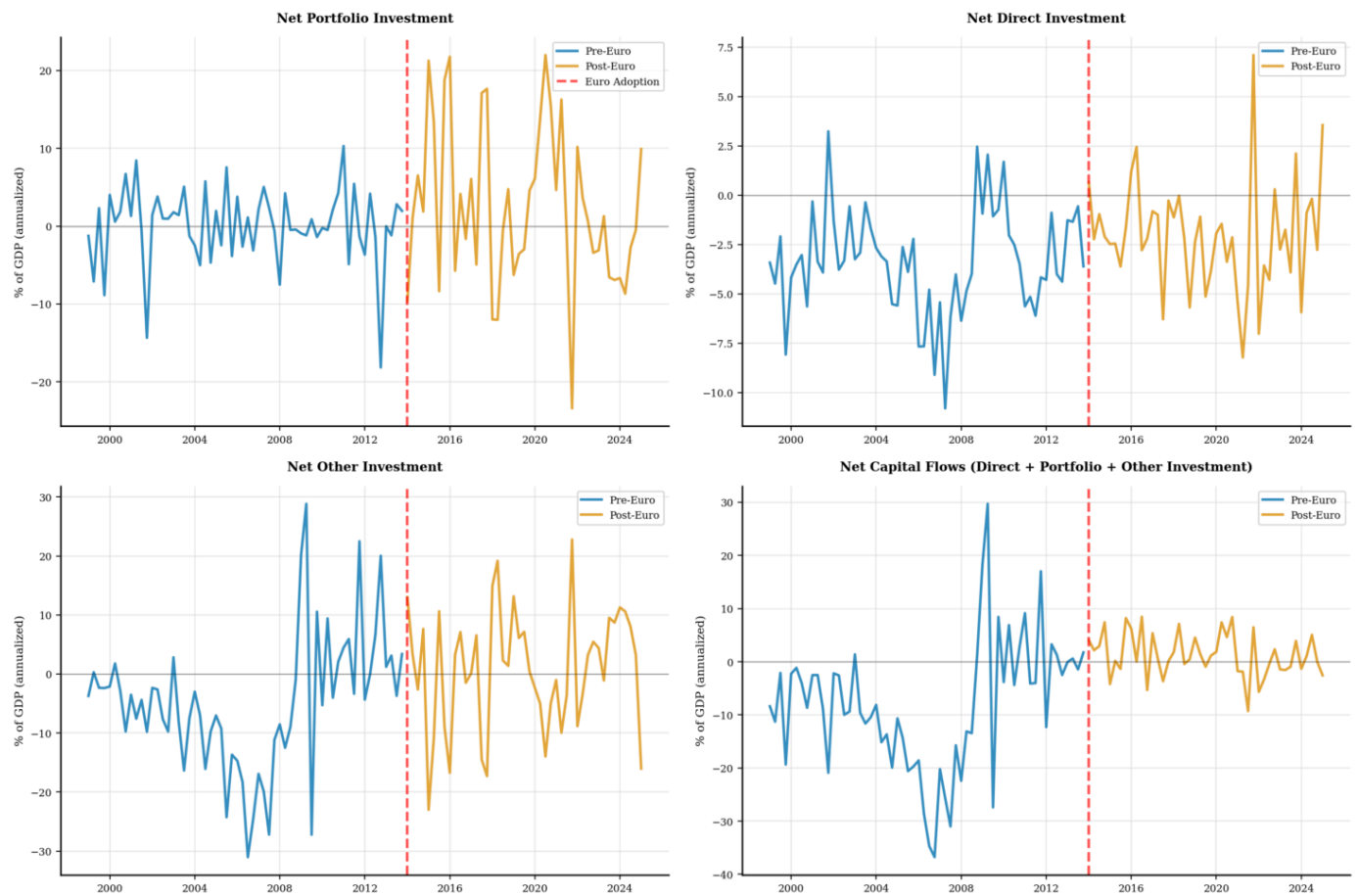
## Summary Statistics by Period

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)	1.26	-8.15	0.62	-8.54	4.13	12.58
Net Direct Investment	-2.07	-3.36	-2.20	-3.45	2.82	2.68
Net Other Investment	0.84	-4.87	2.29	-4.18	10.20	11.69
Net Portfolio Investment	2.49	0.08	1.07	0.73	10.39	4.88

## Distribution Comparison by Period



## Time Series by Period

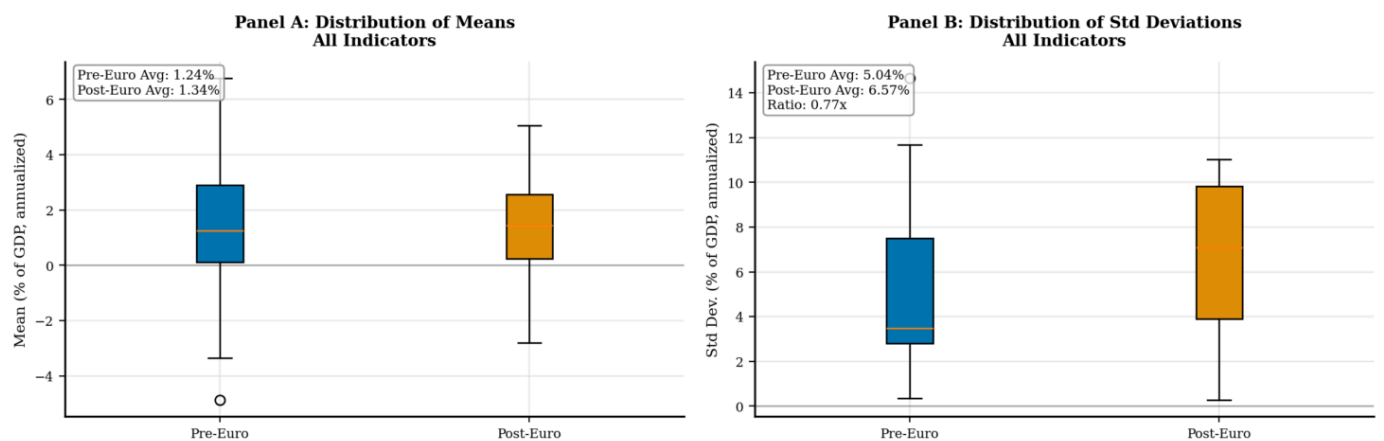


## Indicator-Level Analysis

Latvia Analysis (Full Series): Euro adoption on 2014-01-01

- **Pre-Euro Period:** 1999 to 2013
- **Post-Euro Period:** 2014 to 2025 (includes adoption year 2014)

# 1. Summary Statistics and Boxplots



Means Across All Indicators:

- Pre-Euro: 1.24% (median: 1.25%)
- Post-Euro: 1.34% (median: 1.45%)

Standard Deviations Across All Indicators:

- Pre-Euro: 5.04% (median: 3.47%)
- Post-Euro: 6.57% (median: 7.08%)

**Volatility Impact:** Euro adoption increased average volatility by 30.4%

## 2. Comprehensive Statistical Summary Table

Latvia - 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	0.71	1.22	172.7	1.27	4.51	355.1	0.49
Liabilities - Direct Investment	4.07	3.21	78.9	3.34	3.68	110.3	0.72
Net - Direct Investment	-3.36	2.68	79.7	-2.07	2.82	136.6	0.58
Assets - Portfolio (Total)	1.44	3.40	235.8	5.06	8.29	163.8	1.44
Liabilities - Portfolio (Total)	1.36	3.58	263.8	2.57	6.13	238.4	1.11
Net - Portfolio Investment	0.08	4.88	5811.9	2.49	10.39	417.2	13.93
Assets - Portfolio (Debt)	1.22	3.16	258.6	3.45	8.03	232.8	1.11
Liabilities - Portfolio (Debt)	1.28	3.55	277.6	2.53	6.12	241.9	1.15
Assets - Portfolio (Equity)	0.22	1.01	456.4	1.61	1.62	100.2	4.56
Liabilities - Portfolio (Equity)	0.08	0.33	433.6	0.04	0.27	666.8	0.65
Net - Other Investment	-4.87	11.69	239.8	0.84	10.20	1213.2	0.20
Assets - Other Investment (Debt)	4.93	8.76	177.9	1.29	11.03	854.0	0.21
Assets - Other Investment (Banks)	3.39	8.37	246.9	-0.85	10.23	1196.4	0.21
Liabilities - Other Investment (Ban...	6.78	14.66	216.4	-2.80	8.66	309.2	0.70

**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: 1.93** - values >1 indicate higher pre-Euro volatility
- **Indicators with higher pre-Euro volatility: 6/14 (42.9%)**

### 3. Hypothesis Testing Results

F-Tests for Equal Variances: Latvia 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	0.07	0.0000	***	Post-Euro
Liabilities - Direct Investment	0.76	0.3272		Post-Euro
Net - Direct Investment	0.90	0.6964		Post-Euro
Assets - Portfolio (Total)	0.17	0.0000	***	Post-Euro
Liabilities - Portfolio (Total)	0.34	0.0001	***	Post-Euro
Net - Portfolio Investment	0.22	0.0000	***	Post-Euro
Assets - Portfolio (Debt)	0.15	0.0000	***	Post-Euro
Liabilities - Portfolio (Debt)	0.34	0.0001	***	Post-Euro
Assets - Portfolio (Equity)	0.39	0.0009	***	Post-Euro
Liabilities - Portfolio (Equity)	1.55	0.1329		Pre-Euro
Net - Other Investment	1.31	0.3475		Pre-Euro
Assets - Other Investment (Debt)	0.63	0.0984		Post-Euro
Assets - Other Investment (Banks)	0.67	0.1499		Post-Euro
Liabilities - Other Investment (Ban...	2.87	0.0004	***	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%)

8/14

↑ 57.1%

Significant (1%)

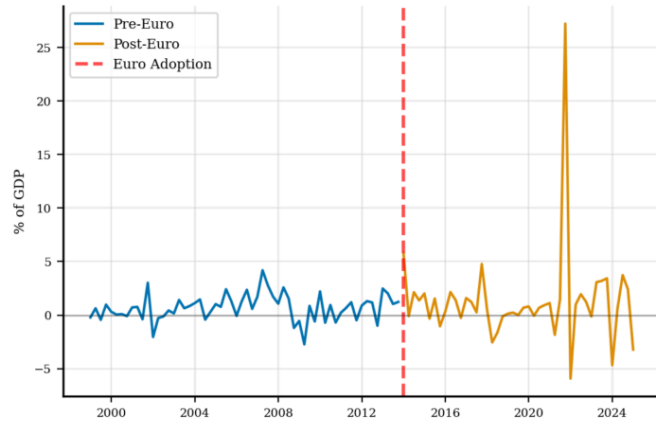
8/14

↑ 57.1%

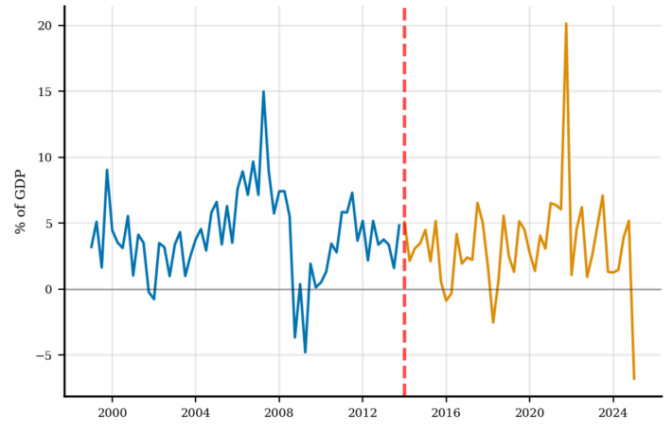
**Conclusion:** Mixed evidence for Euro adoption's impact on capital flow volatility in Latvia.

### 4. Time Series Analysis

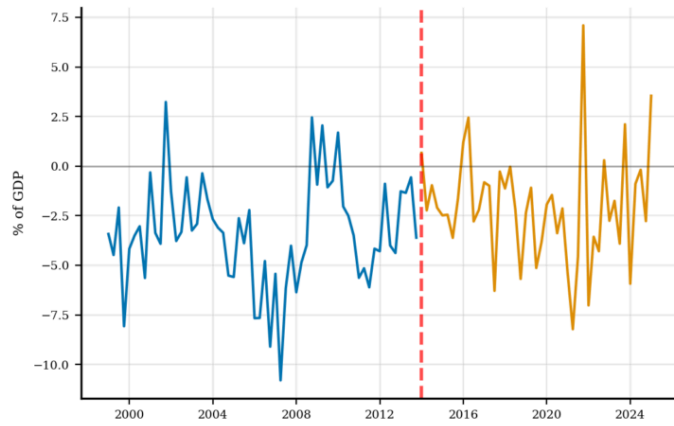
**A: Assets - Direct investment, Total financial a... (F-stat: 0.07)**



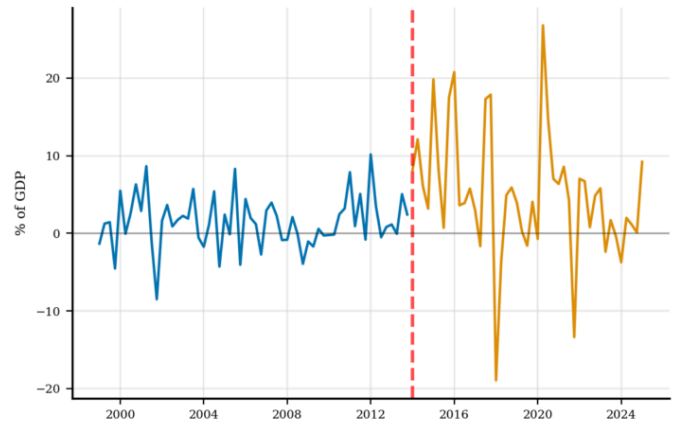
**B: Liabilities - Direct investment, Total financ... (F-stat: 0.76)**



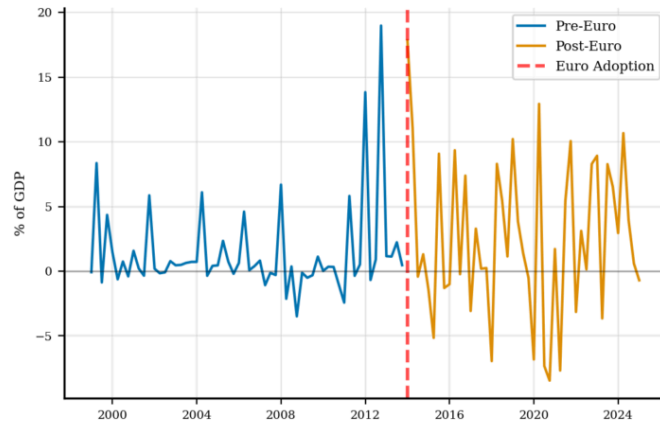
**C: Net - Direct investment, Total financial asse... (F-stat: 0.90)**



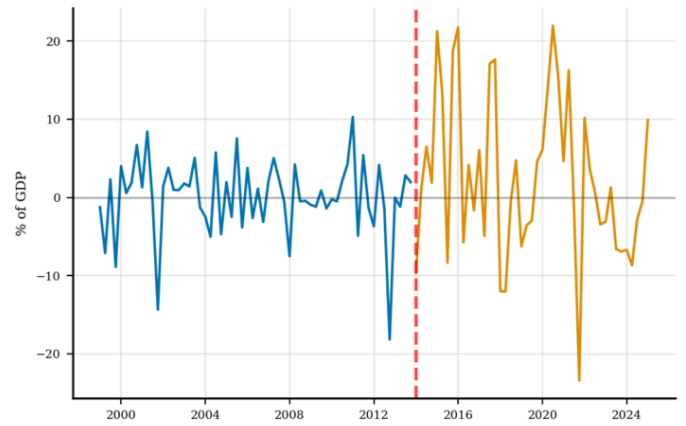
**D: Assets - Portfolio investment, Total financia... (F-stat: 0.17)**



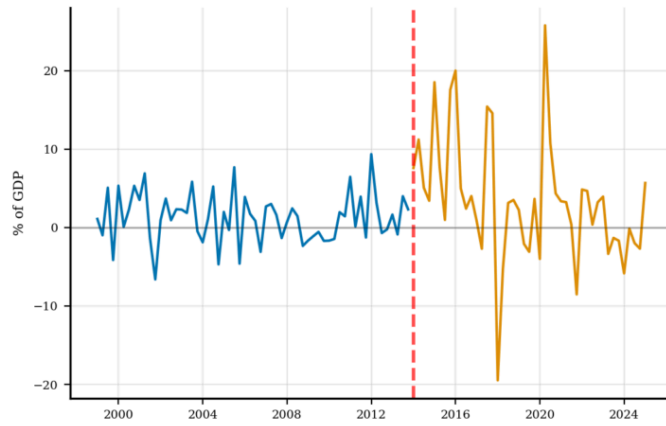
**E: Liabilities - Portfolio investment, Total fin... (F-stat: 0.34)**



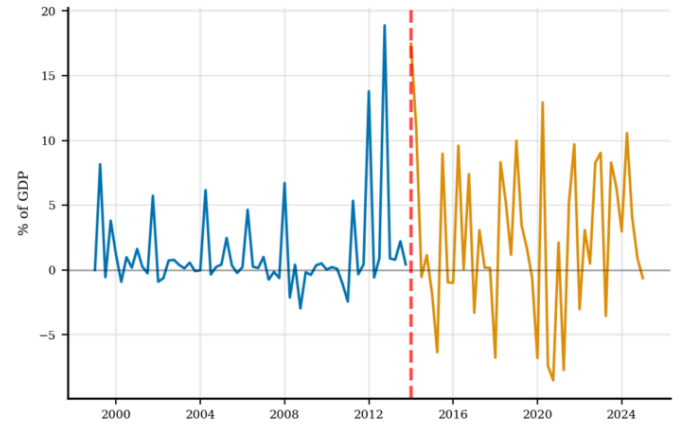
**F: Net - Portfolio investment, Total financial a... (F-stat: 0.22)**



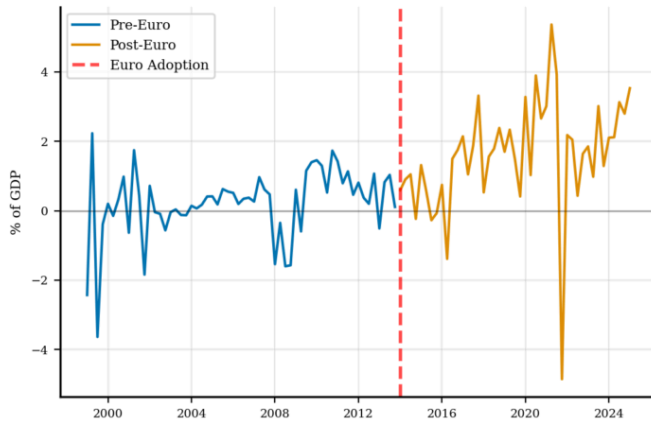
**G: Assets - Portfolio investment, Debt securitie... (F-stat: 0.15)**



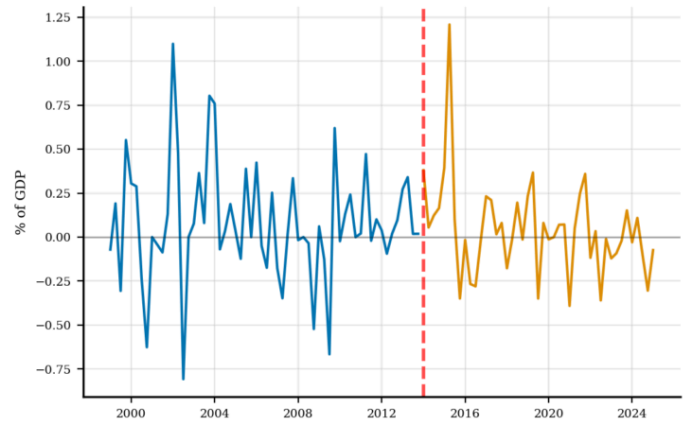
**H: Liabilities - Portfolio investment, Debt secu... (F-stat: 0.34)**



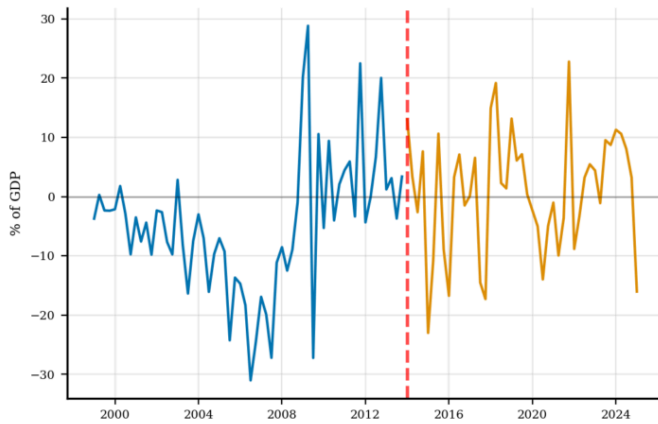
**I: Assets - Portfolio investment, Equity and inv... (F-stat: 0.39)**



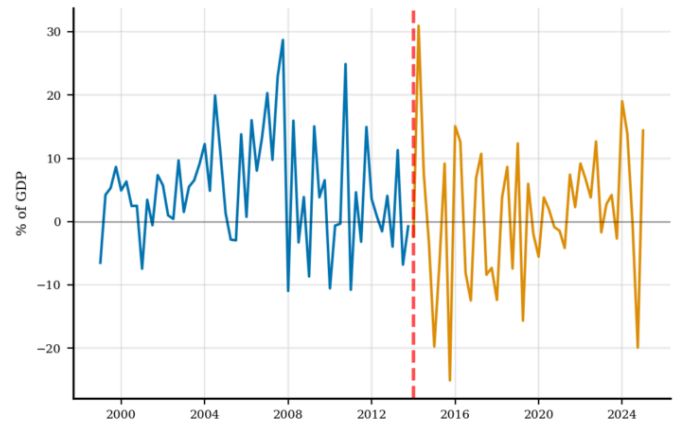
**J: Liabilities - Portfolio investment, Equity an... (F-stat: 1.55)**



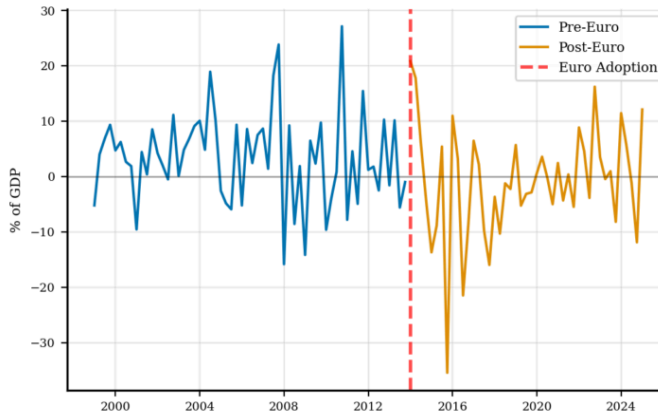
**K: Net - Other investment, Total financial asset... (F-stat: 1.31)**



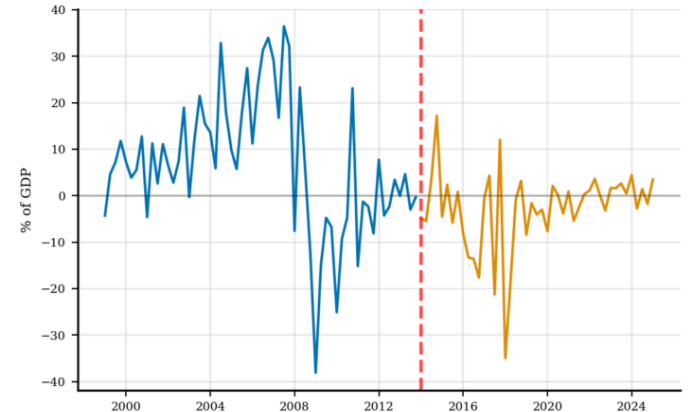
**L: Assets - Other investment, Debt instruments (F-stat: 0.63)**



**M: Assets - Other investment, Debt instruments, ... (F-stat: 0.67)**



**N: Liabilities - Other investment, Debt instrume... (F-stat: 2.87)**



## 5. Key Findings Summary

Statistical Evidence for

Additional Statistical



## Latvia:

- **3/14 capital flow indicators** (21.4%) showed higher volatility before Euro adoption
- **8/14 indicators** (57.1%) show statistically significant differences ( $p<0.05$ )
- **8 indicators** show highly significant differences ( $p<0.01$ )
- **Average volatility change** of 30.4% after Euro adoption in 2014

**Most significant flow types:** Assets - Direct Investment, Assets - Portfolio (Debt), Assets - Portfolio (Total)

## Context:

- **Temporal analysis:** Before/after comparison using 2014 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), Latvian Banking Crisis (2011-2012), and COVID-19 (2020-2022) periods

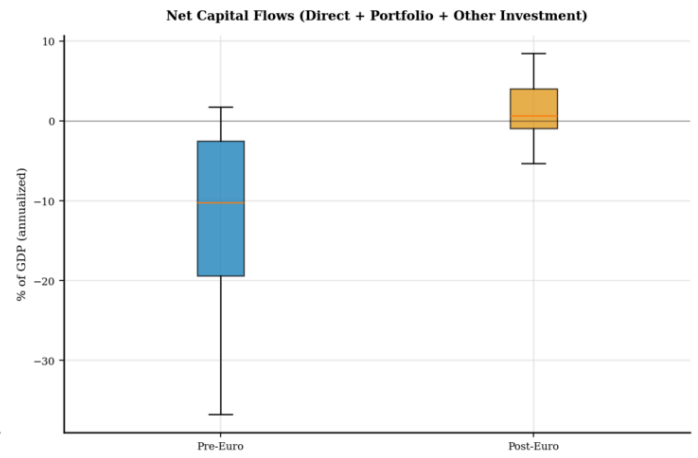
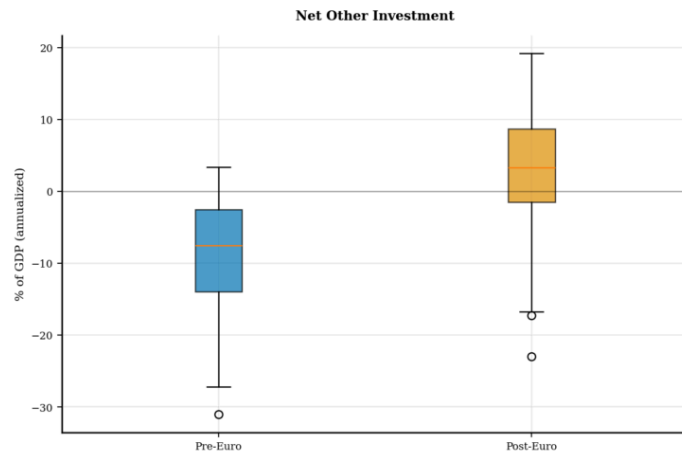
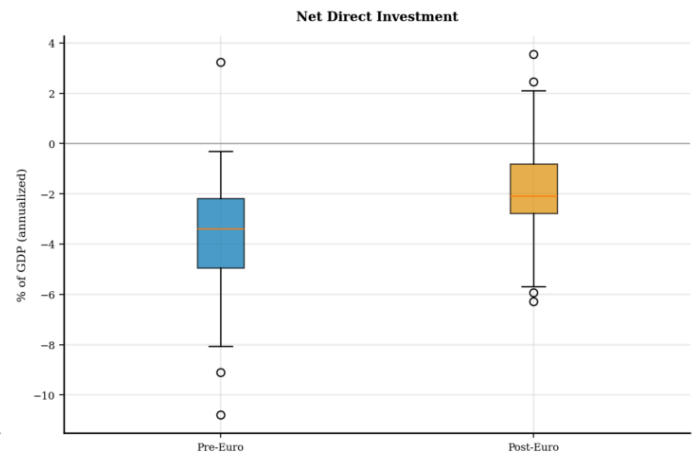
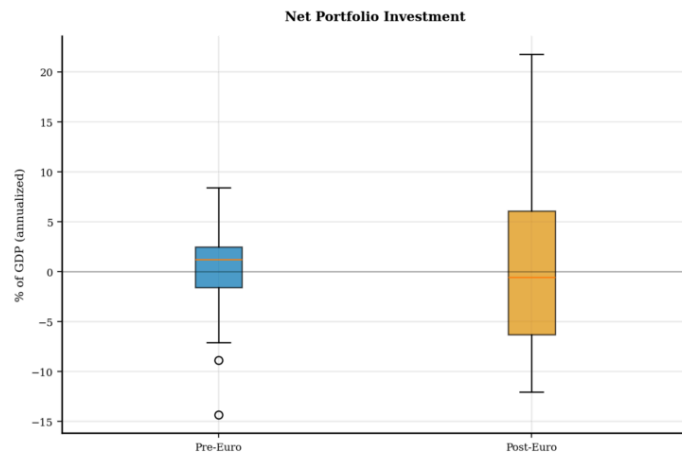
## Overall Capital Flows Analysis

Aggregate net capital flows summary - Crisis-Excluded

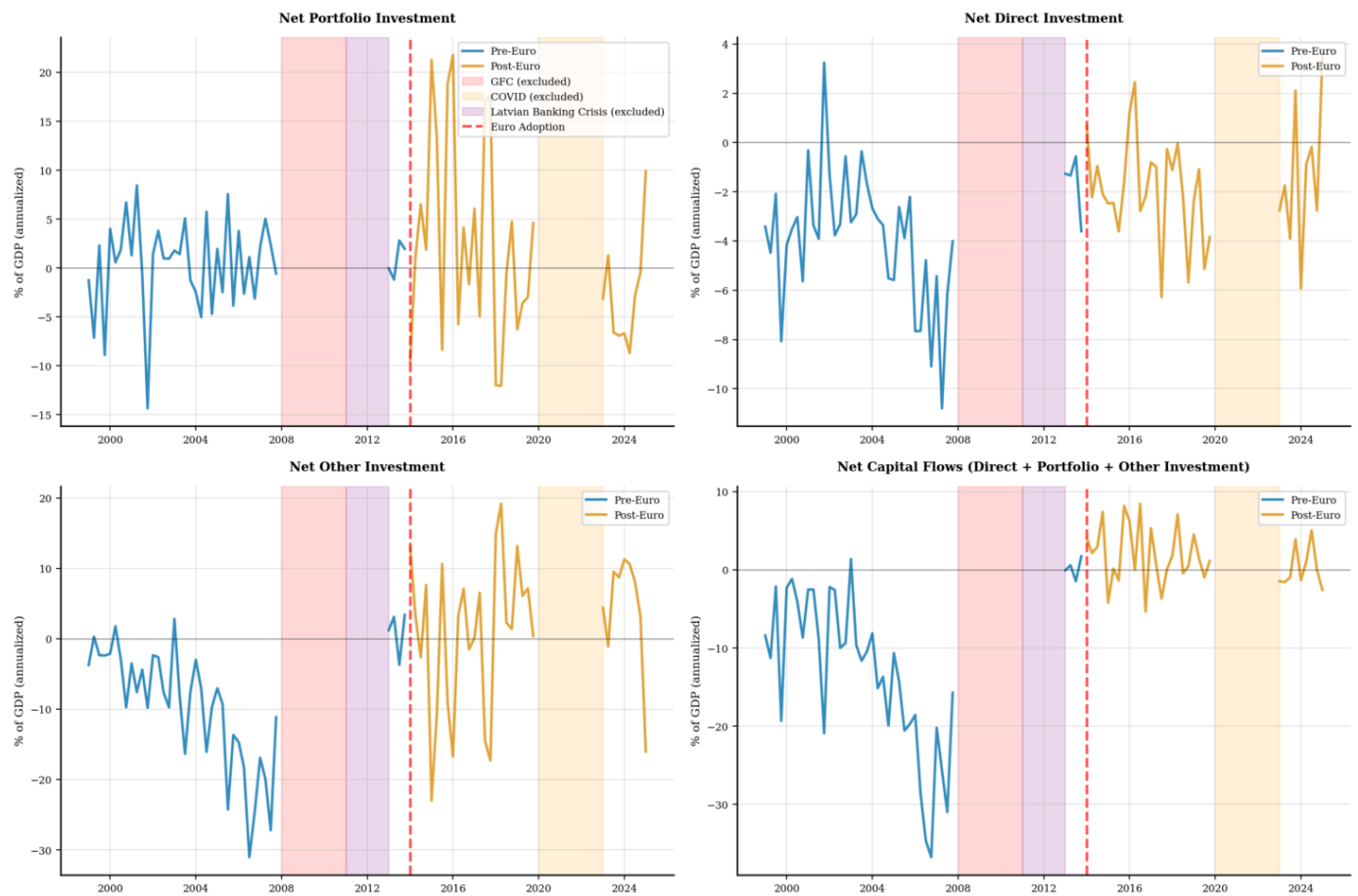
## Summary Statistics by Period

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)	1.46	-11.98	0.62	-10.22	3.61	10.14
Net Direct Investment	-1.77	-3.68	-2.10	-3.39	2.30	2.64
Net Other Investment	1.80	-8.70	3.31	-7.53	10.45	8.60
Net Portfolio Investment	1.43	0.39	-0.53	1.21	9.75	4.46

## Distribution Comparison by Period



## Time Series by Period

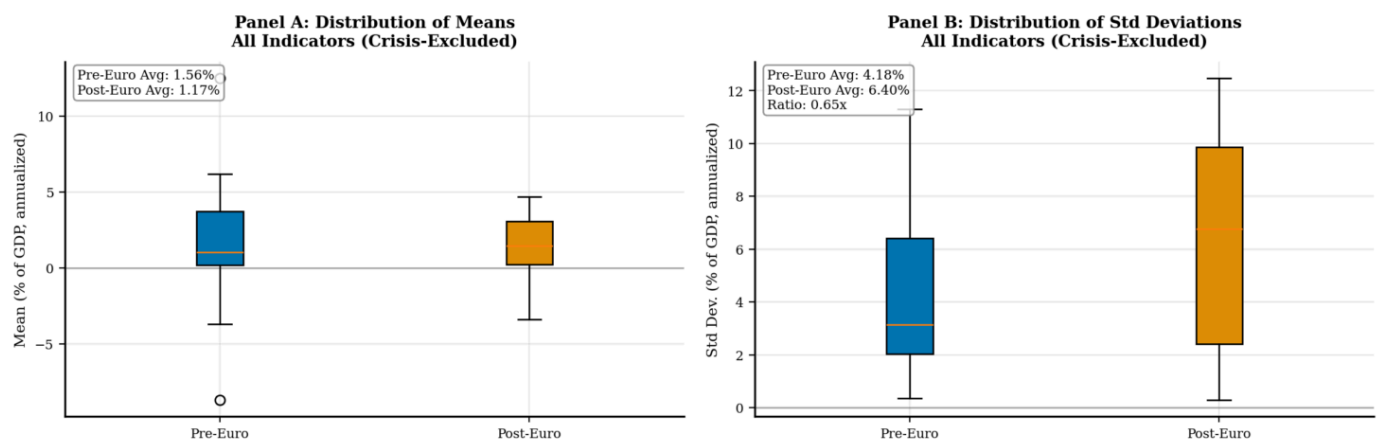


## Indicator-Level Analysis

Latvia Analysis (Crisis-Excluded): Euro adoption on 2014-01-01

- **Pre-Euro Period:** 1999 to 2013
- **Post-Euro Period:** 2014 to 2025 (includes adoption year 2014)

## 1. Summary Statistics and Boxplots



Means Across All Indicators:

- Pre-Euro: 1.56% (median: 1.03%)
- Post-Euro: 1.17% (median: 1.44%)

Standard Deviations Across All Indicators:

- Pre-Euro: 4.18% (median: 3.14%)
- Post-Euro: 6.40% (median: 6.76%)

**Volatility Impact:** Euro adoption increased average volatility by 53.2%

## 2. Comprehensive Statistical Summary Table

Latvia - 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	0.90	1.16	129.3	0.86	2.17	250.6	0.52
Liabilities - Direct Investment	4.58	3.02	66.0	2.64	2.77	105.0	0.63
Net - Direct Investment	-3.68	2.64	71.8	-1.77	2.30	129.8	0.55
Assets - Portfolio (Total)	1.48	3.47	234.3	4.69	7.98	170.3	1.38
Liabilities - Portfolio (Total)	1.09	2.03	186.4	3.26	5.54	170.0	1.10
Net - Portfolio Investment	0.39	4.46	1130.7	1.43	9.75	681.2	1.66
Assets - Portfolio (Debt)	1.37	3.26	237.1	3.23	8.02	248.1	0.96
Liabilities - Portfolio (Debt)	0.98	2.02	206.6	3.20	5.55	173.4	1.19
Assets - Portfolio (Equity)	0.11	0.99	882.5	1.45	1.11	76.5	11.54
Liabilities - Portfolio (Equity)	0.11	0.36	331.2	0.06	0.29	505.9	0.65
Net - Other Investment	-8.70	8.60	98.9	1.80	10.45	580.0	0.17
Assets - Other Investment (Debt)	6.18	8.11	131.2	0.68	12.48	1843.6	0.07
Assets - Other Investment (Banks)	4.49	7.07	157.4	-1.71	11.27	660.3	0.24
Liabilities - Other Investment (Ban...	12.51	11.29	90.3	-3.39	9.90	292.3	0.31

**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: 1.50** - values >1 indicate higher pre-Euro volatility
- **Indicators with higher pre-Euro volatility: 5/14 (35.7%)**

### 3. Hypothesis Testing Results

F-Tests for Equal Variances: Latvia Pre-Euro vs Post-Euro (Crisis-Excluded) |  $H_0$ : Equal variances |  $H_1$ : Different variances |  $\alpha = 0.05$  | Excludes: GFC (2008-2010) + Latvian Banking Crisis (2011-2012) + COVID (2020-2022)

Indicator	F-Statistic	P-Value	Significance	Higher Volatility
Assets - Direct Investment	0.29	0.0003	***	Post-Euro
Liabilities - Direct Investment	1.19	0.6129		Pre-Euro
Net - Direct Investment	1.32	0.4193		Pre-Euro
Assets - Portfolio (Total)	0.19	0.0000	***	Post-Euro
Liabilities - Portfolio (Total)	0.13	0.0000	***	Post-Euro
Net - Portfolio Investment	0.21	0.0000	***	Post-Euro
Assets - Portfolio (Debt)	0.16	0.0000	***	Post-Euro
Liabilities - Portfolio (Debt)	0.13	0.0000	***	Post-Euro
Assets - Portfolio (Equity)	0.79	0.4826		Post-Euro
Liabilities - Portfolio (Equity)	1.56	0.2007		Pre-Euro
Net - Other Investment	0.68	0.2459		Post-Euro
Assets - Other Investment (Debt)	0.42	0.0109	*	Post-Euro
Assets - Other Investment (Banks)	0.39	0.0059	**	Post-Euro
Liabilities - Other Investment (Ban...	1.30	0.4463		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

4/14  
↑ 28.6%

Significant (5%)

8/14  
↑ 57.1%

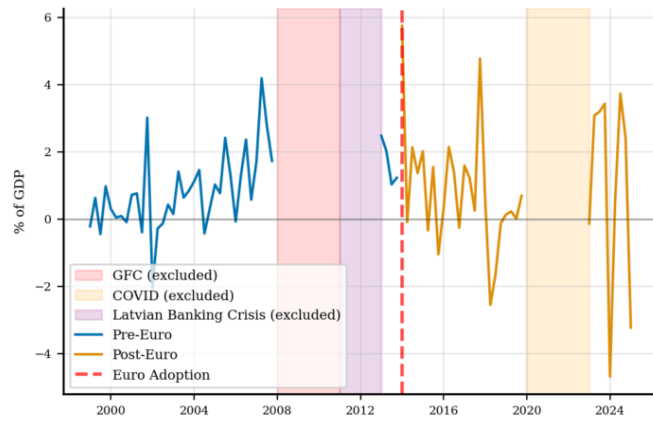
Significant (1%)

7/14  
↑ 50.0%

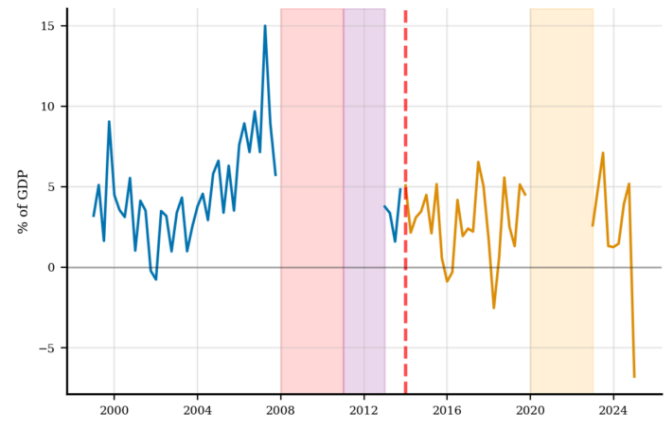
**Conclusion:** Mixed evidence for Euro adoption's impact on capital flow volatility in Latvia.

### 4. Time Series Analysis

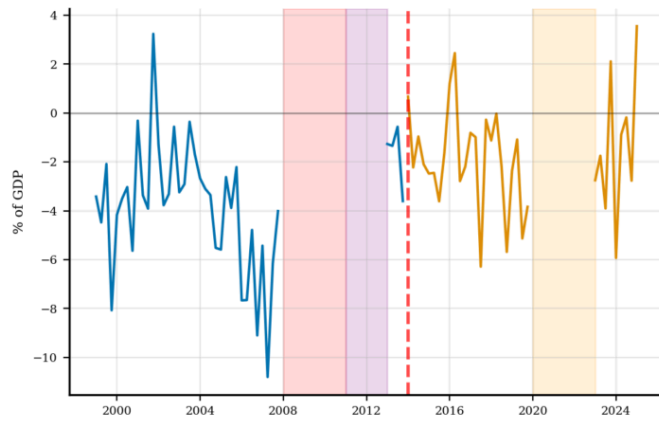
**A: Assets - Direct investment, Total financial a... (F-stat: 0.29) (Crisis-Excl)**



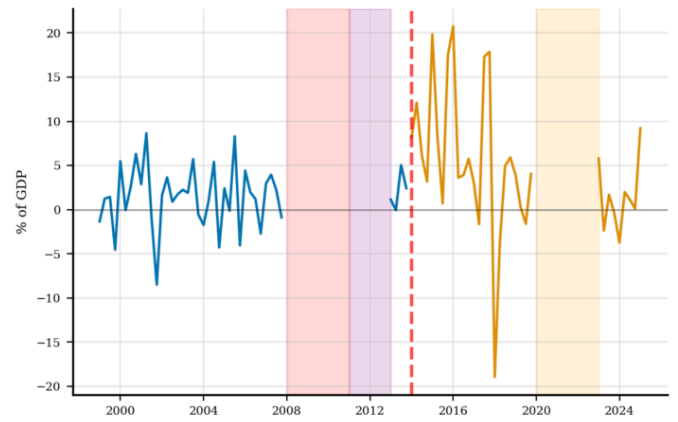
**B: Liabilities - Direct investment, Total financ... (F-stat: 1.19) (Crisis-Excl)**



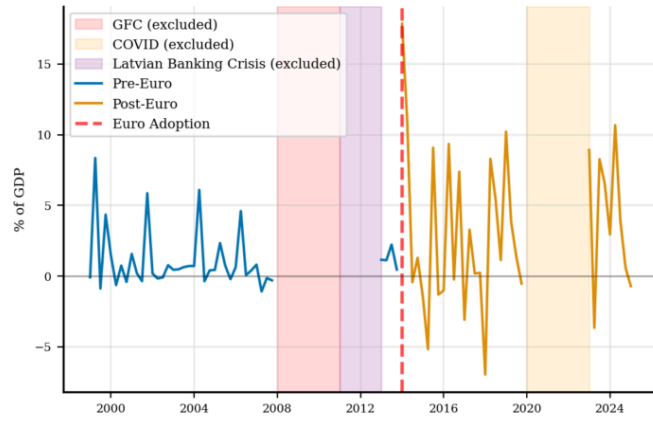
**C: Net - Direct investment, Total financial asse... (F-stat: 1.32) (Crisis-Excl)**



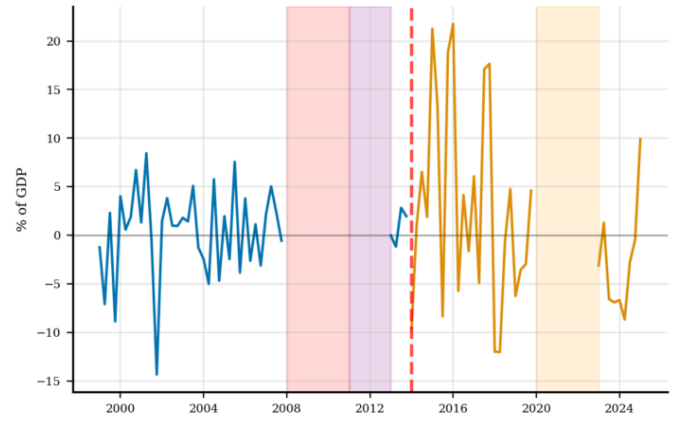
**D: Assets - Portfolio investment, Total financia... (F-stat: 0.19) (Crisis-Excl)**



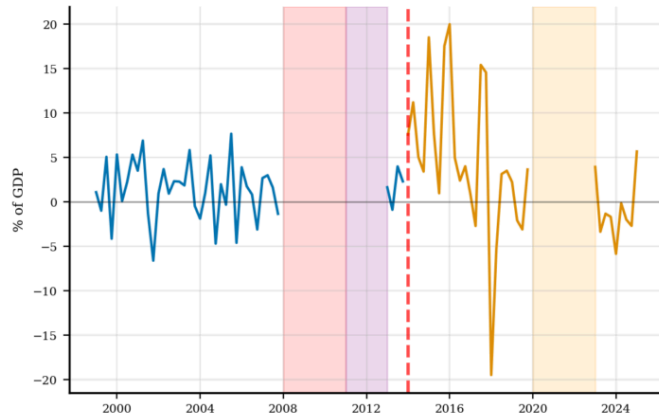
**E: Liabilities - Portfolio investment, Total fin... (F-stat: 0.13) (Crisis-Excl)**



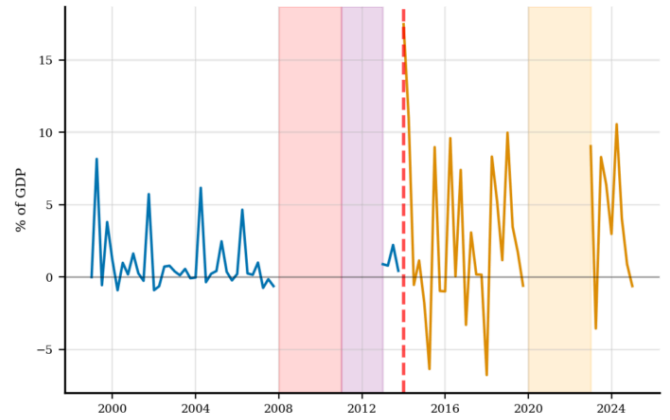
**F: Net - Portfolio investment, Total financial a... (F-stat: 0.21) (Crisis-Excl)**



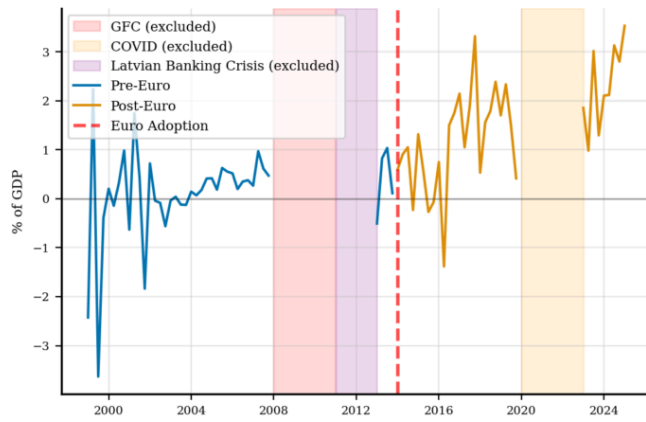
**G: Assets - Portfolio investment, Debt securitie... (F-stat: 0.16) (Crisis-Excl)**



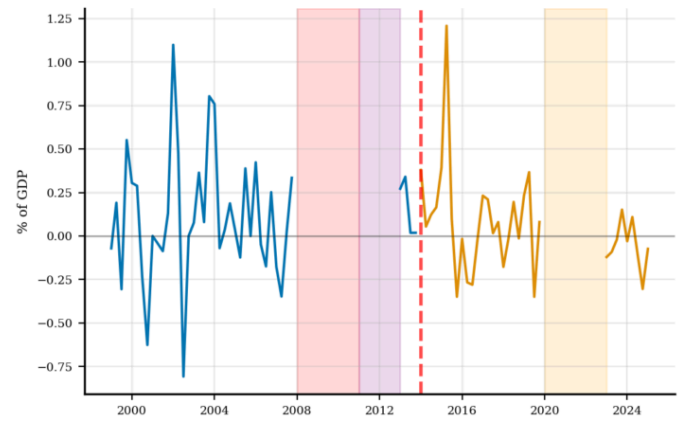
**H: Liabilities - Portfolio investment, Debt secu... (F-stat: 0.13) (Crisis-Excl)**



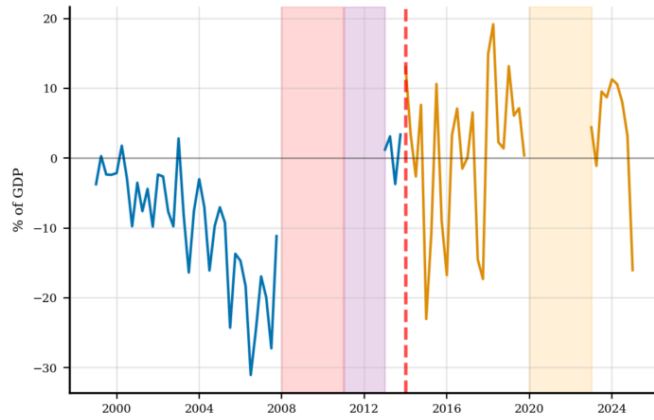
**I: Assets - Portfolio investment, Equity and inv... (F-stat: 0.79) (Crisis-Excl)**



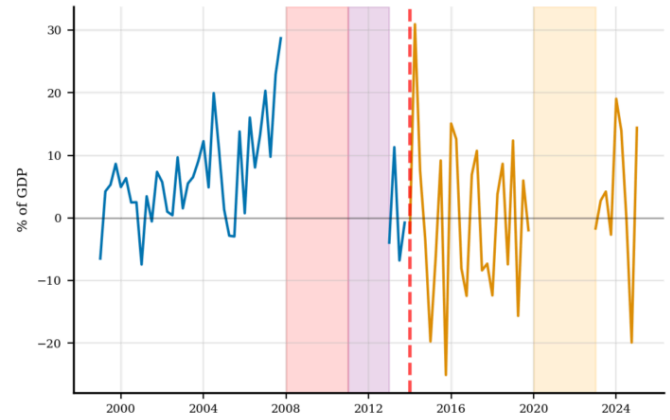
**J: Liabilities - Portfolio investment, Equity an... (F-stat: 1.56) (Crisis-Excl)**



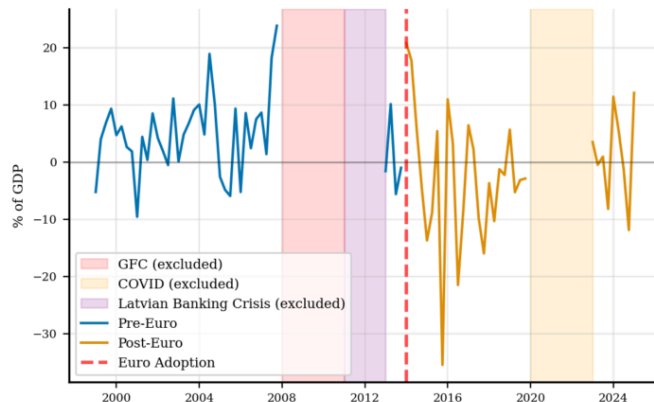
**K: Net - Other investment, Total financial asset... (F-stat: 0.68) (Crisis-Excl)**



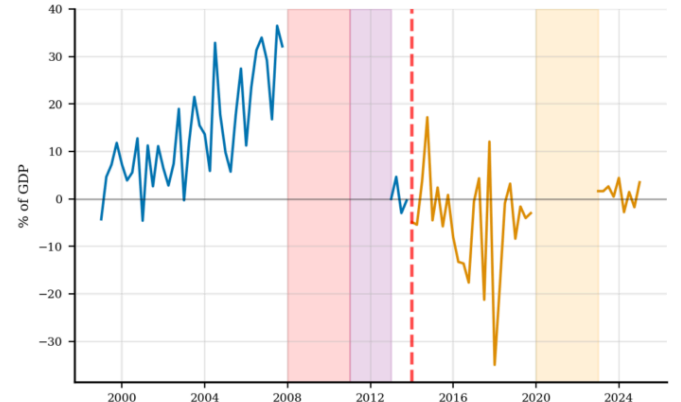
**L: Assets - Other investment, Debt instruments (F-stat: 0.42) (Crisis-Excl)**



**M: Assets - Other investment, Debt instruments, ... (F-stat: 0.39) (Crisis-Excl)**



**N: Liabilities - Other investment, Debt instrume... (F-stat: 1.30) (Crisis-Excl)**



## 5. Key Findings Summary

Statistical Evidence for Latvia  
(excluding crisis periods):

Additional Statistical  
Context:



- **4/14 capital flow indicators** (28.6%) showed higher volatility before Euro adoption
- **8/14 indicators** (57.1%) show statistically significant differences ( $p < 0.05$ )
- **7 indicators** show highly significant differences ( $p < 0.01$ )
- **Average volatility change** of 53.2% after Euro adoption in 2014
- **Temporal analysis:** Before/after comparison using 2014 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)

**Most significant flow types:** Liabilities - Portfolio (Debt), Liabilities - Portfolio (Total), Assets - Portfolio (Debt)

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

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