



Outlier-Adjusted Capital Flow Volatility Analysis

Case Study 1: Iceland vs. Eurozone Comparison (Winsorized Data)

Research Question: Should Iceland adopt the Euro as its currency?

Hypothesis: Iceland's capital flows show more volatility than the Eurozone bloc average

Outlier-Adjusted Methodology: This analysis uses 5% symmetric winsorization to assess the robustness of statistical findings to extreme values. Data points below the 5th percentile are replaced with the 5th percentile value; data points above the 95th percentile are replaced with the 95th percentile value. This approach maintains the relative ordering of observations while reducing the influence of outliers on statistical conclusions.

Data and Methodology

Data Sources

- **Balance of Payments Data:** IMF, quarterly frequency (1999-2025)
- **GDP Data:** IMF World Economic Outlook, annual frequency
- **Countries:** Iceland vs. 10 initial Euro adopters (excluding Luxembourg)

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. **Hypothesis Testing:** F-tests for equality of variances between groups

Countries Analyzed

- **Iceland:** Independent monetary policy with floating exchange rate

- **Eurozone Bloc:** Austria, Belgium, Finland, France, Germany, Ireland, Italy, Netherlands, Portugal, Spain

Observations	Indicators	Countries	Time Period
1,093	14	11	1999-2025

Full Time Period Analysis

Complete temporal analysis using all available data

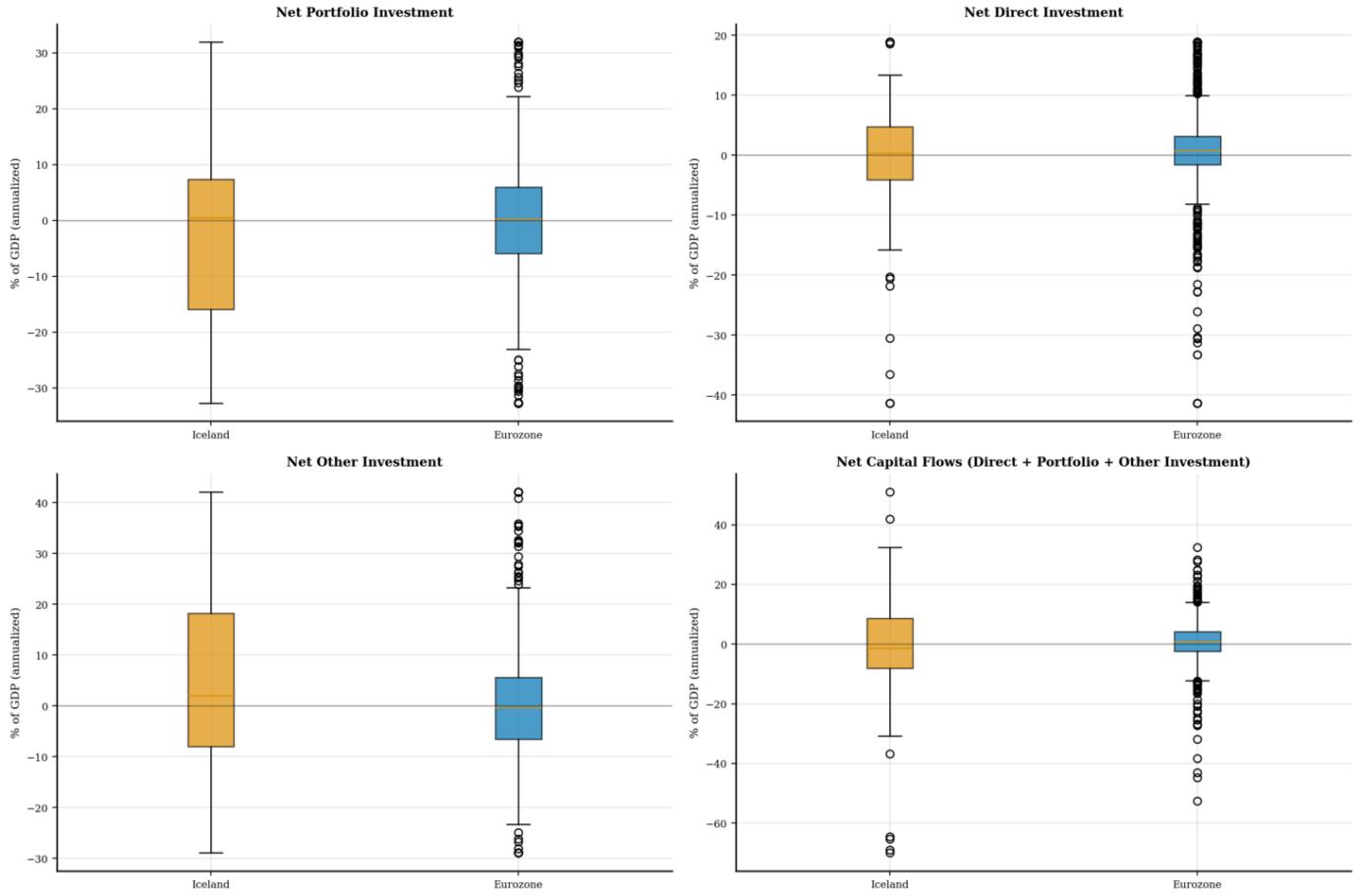
Overall Capital Flows Analysis

High-level summary of aggregate net capital flows before detailed disaggregated analysis

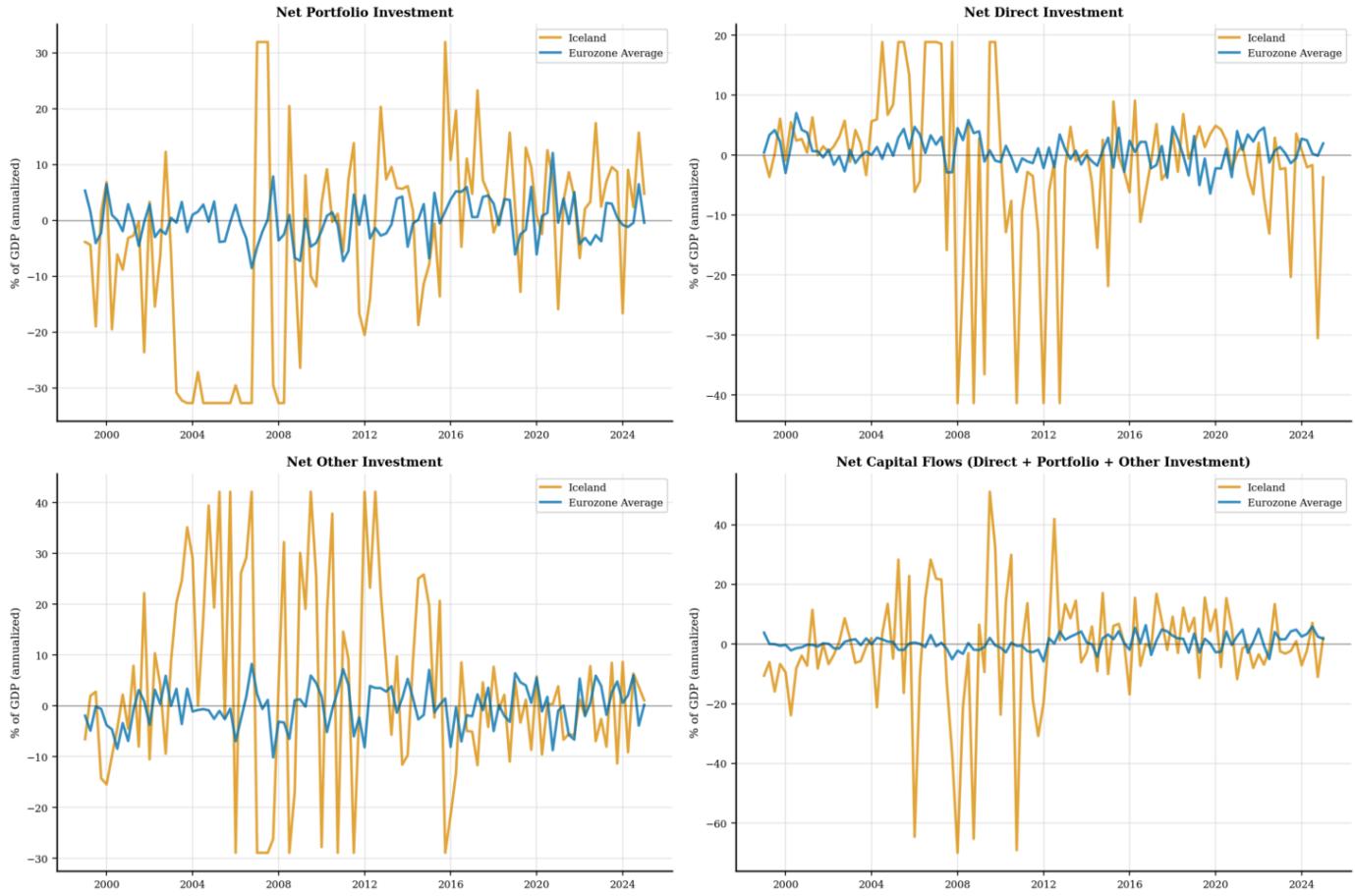
Summary Statistics by Group

Indicator,	Mean, Eurozone	Mean, Iceland	Median, Euroz...	Median, Iceland	Std Dev, Euroz...	Std Dev, Iceland
Net Capital Flows (Direct + Portfolio + Other Investment)	0.56	-1.54	0.75	-1.39	7.17	19.32
Net Direct Investment	0.67	-1.69	0.75	0.29	7.60	13.17
Net Other Investment	-0.09	3.97	-0.21	1.98	11.44	18.80
Net Portfolio Investment	-0.03	-3.82	0.19	0.49	11.32	17.22

Distribution Comparison by Group



↗ Time Series by Group



🔍 Key Insights

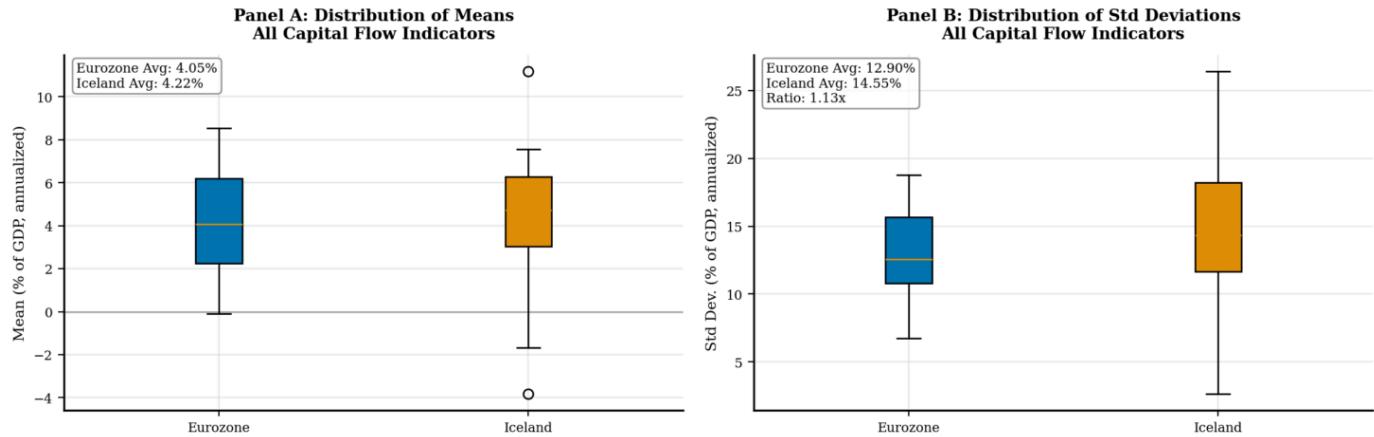
Volatility Comparison (Standard Deviation)

- **Net Portfolio Investment:** Iceland 1.5x more volatile
- **Net Direct Investment:** Iceland 1.7x more volatile
- **Net Other Investment:** Iceland 1.6x more volatile
- **Net Capital Flows (Direct + Portfolio + Other Investment):** Iceland 2.7x more volatile

Overall Pattern

- Iceland shows consistently higher volatility across most capital flow categories

1. Summary Statistics and Boxplots



Comprehensive Statistical Summary from Boxplots:

Means Across All Indicators:

- Eurozone: 4.05% (median: 4.09%)
- Iceland: 4.22% (median: 4.73%)

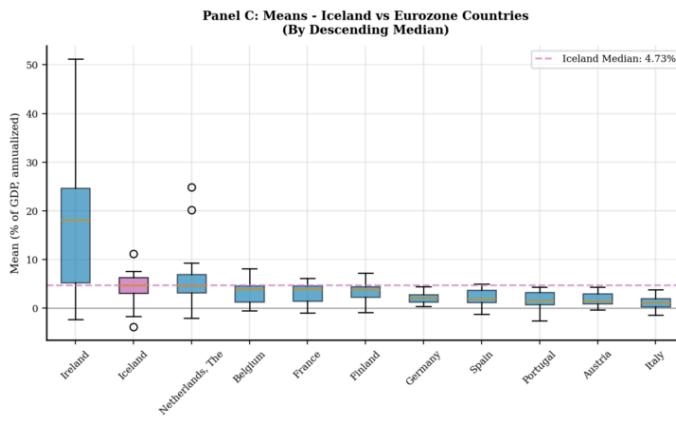
Standard Deviations Across All Indicators:

- Eurozone: 12.90% (median: 12.55%)
- Iceland: 14.55% (median: 14.33%)

Volatility Comparison: Iceland volatility is 1.13x higher than Eurozone on average

1b. Individual Country Comparisons: Iceland vs Each Eurozone Country

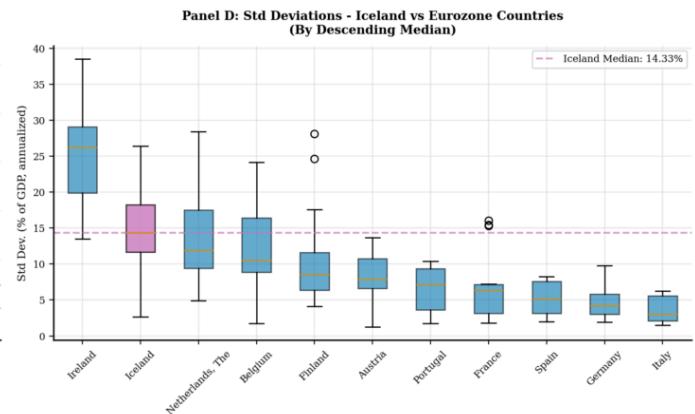
Enhanced Analysis: Rather than comparing Iceland to the Eurozone as an aggregate group, this section compares Iceland's values to each individual Eurozone country separately.



Iceland's Mean Rank

2 of 11

↑ Higher than average



Iceland's Volatility Rank

2 of 11

↑ More volatile than average

Individual Country Analysis Summary:

- **Means:** Iceland ranks #2 out of 11 countries by median mean across all indicators
 - **Volatility:** Iceland ranks #2 out of 11 countries by median standard deviation
 - **Key Insight:** This shows Iceland's position relative to each individual Eurozone member rather than the aggregate
-

2. Comprehensive Statistical Summary Table

All Indicators - Iceland vs Eurozone Statistics

Indicator	Iceland Mean	Iceland Std ...	Iceland CV%	Eurozone Me...	Eurozone St...	Eurozone CV%	CV Ratio (Ice...
Assets - Direct Investment	5.50	18.56	337.6	7.21	15.70	217.6	1.55
Liabilities - Direct Investment	5.04	12.55	249.1	6.63	15.65	236.0	1.06
Net - Direct Investment	-1.69	13.17	781.3	0.67	7.60	1126.3	0.69
Assets - Portfolio (Total)	6.77	14.04	207.5	8.54	17.96	210.3	0.99
Liabilities - Portfolio (Total)	11.19	21.64	193.3	8.08	15.44	191.1	1.01
Net - Portfolio Investment	-3.82	17.22	450.3	-0.03	11.32	37792.5	0.01
Assets - Portfolio (Debt)	2.74	9.35	341.8	4.69	10.65	227.2	1.50
Liabilities - Portfolio (Debt)	6.08	11.33	186.4	4.20	8.53	203.0	0.92
Assets - Portfolio (Equity)	4.41	7.47	169.3	3.34	6.72	201.0	0.84
Liabilities - Portfolio (Equity)	0.54	2.64	488.9	3.97	11.49	289.7	1.69
Net - Other Investment	3.97	18.80	474.1	-0.09	11.44	13428.0	0.04
Assets - Other Investment (Debt)	7.55	26.43	350.1	4.86	18.76	385.9	0.91
Assets - Other Investment (Banks)	6.35	15.85	249.4	2.46	13.61	554.3	0.45
Liabilities - Other Investment (Ban...	4.40	14.63	332.7	2.19	15.74	720.0	0.46

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

CV Ratio Summary (Iceland/Eurozone):

- Average CV Ratio: 0.87
 - Indicators where Iceland > Eurozone: 5/14 (35.7%)
-

3. Hypothesis Testing Results

F-Tests for Equal Variances (Iceland vs. Eurozone) | H_0 : Equal volatility | H_1 : Different volatility | $\alpha = 0.05$

Indicator	F-Statistic	P-Value	Significance	Higher Volatility
Assets - Direct Investment	1.40	0.0148	*	Iceland
Liabilities - Direct Investment	0.64	0.0050	**	Eurozone
Net - Direct Investment	3.01	0.0000	***	Iceland
Assets - Portfolio (Total)	0.61	0.0018	**	Eurozone
Liabilities - Portfolio (Total)	1.96	0.0000	***	Iceland
Net - Portfolio Investment	2.32	0.0000	***	Iceland
Assets - Portfolio (Debt)	0.77	0.0930		Eurozone
Liabilities - Portfolio (Debt)	1.76	0.0000	***	Iceland
Assets - Portfolio (Equity)	1.24	0.1256		Iceland
Liabilities - Portfolio (Equity)	0.05	0.0000	***	Eurozone
Net - Other Investment	2.70	0.0000	***	Iceland
Assets - Other Investment (Debt)	1.98	0.0000	***	Iceland
Assets - Other Investment (Banks)	1.36	0.0274	*	Iceland
Liabilities - Other Investment (Ban...)	0.86	0.3456		Eurozone

Legend:

- **F-Statistic:** Ratio of variances
- **P-Value:** Statistical significance
- **Higher Volatility:** Which group shows more volatility

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

Iceland Higher Volatility

9/14

↑ 64.3%

Significant (5%)

11/14

↑ 78.6%

Significant (1%)

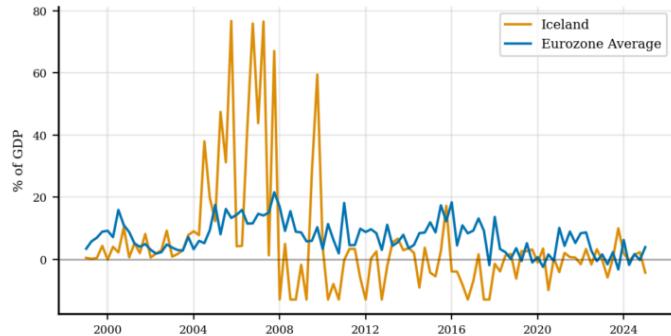
9/14

↑ 64.3%

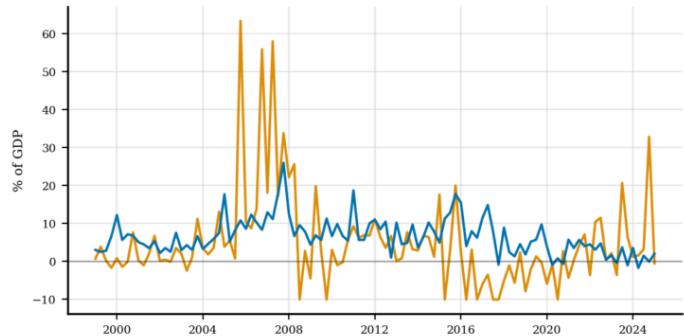
Conclusion: Strong evidence supports the hypothesis that Iceland has higher capital flow volatility.

4. Time Series Analysis

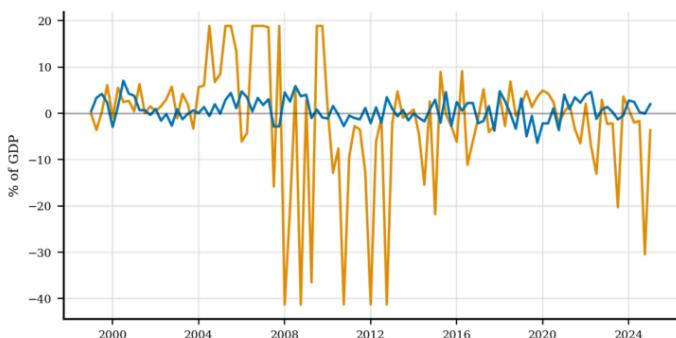
A: Assets - Direct Investment
(F-stat: 1.40)



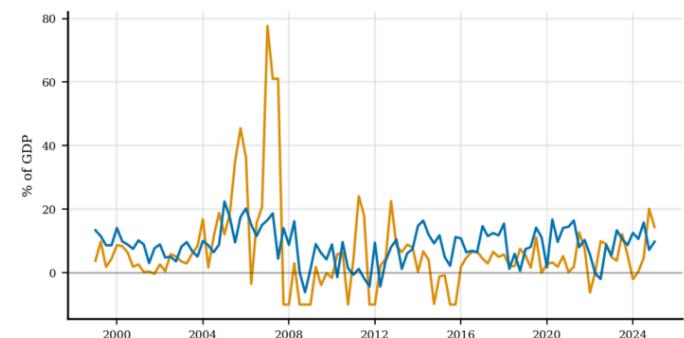
B: Liabilities - Direct Investment
(F-stat: 0.64)



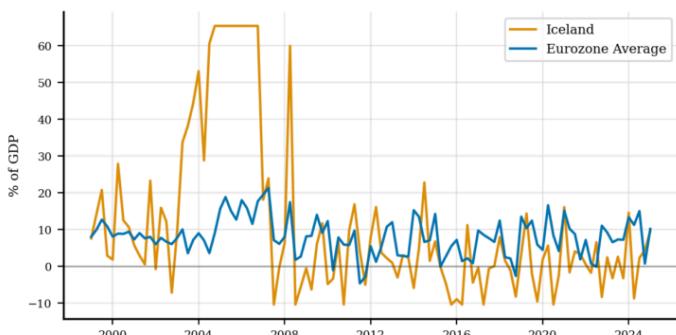
C: Net - Direct Investment
(F-stat: 3.01)



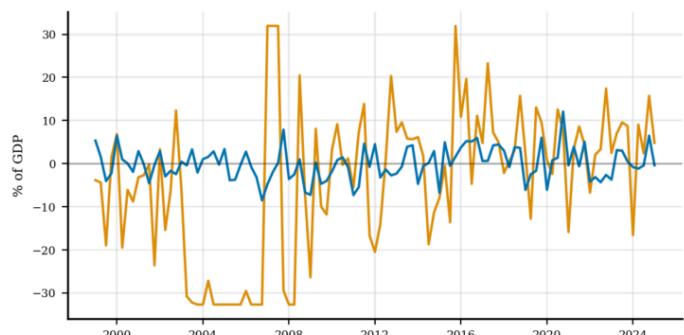
D: Assets - Portfolio (Total)
(F-stat: 0.61)



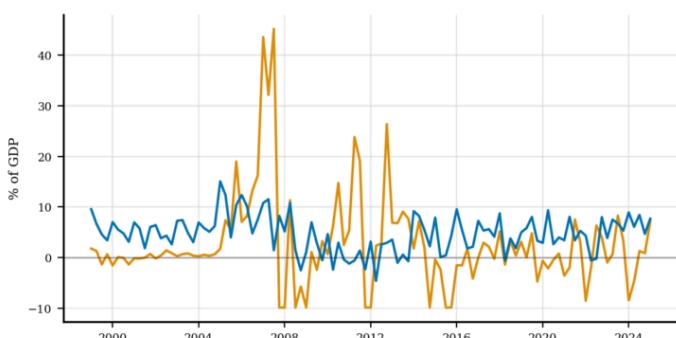
E: Liabilities - Portfolio (Total)
(F-stat: 1.96)



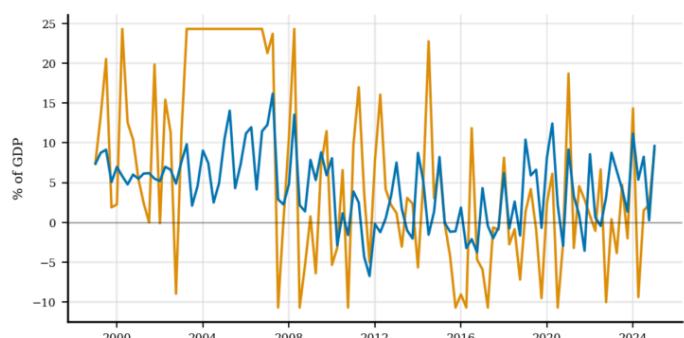
F: Net - Portfolio Investment
(F-stat: 2.32)



G: Assets - Portfolio (Debt)
(F-stat: 0.77)



H: Liabilities - Portfolio (Debt)
(F-stat: 1.76)





[Download Individual Time Series Charts](#)

5. Key Findings Summary

Statistical Evidence:

Additional Statistical Context:

- **64.3% of capital flow indicators** show higher volatility in Iceland
 - **78.6% of indicators** show statistically significant differences ($p<0.05$)
 - **Iceland's average volatility** is 1.13 times higher than Eurozone countries
 - **Most significant differences** in portfolio investment and direct investment flows
 - **Time period coverage:** 1999 to 2025 (full dataset)
 - **Data completeness:** Analysis based on comprehensive observations
 - **Methodology:** F-test for variance equality, 5% significance level
 - **Cross-validation:** Results consistent across multiple statistical measures
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Excluding Financial Crises

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

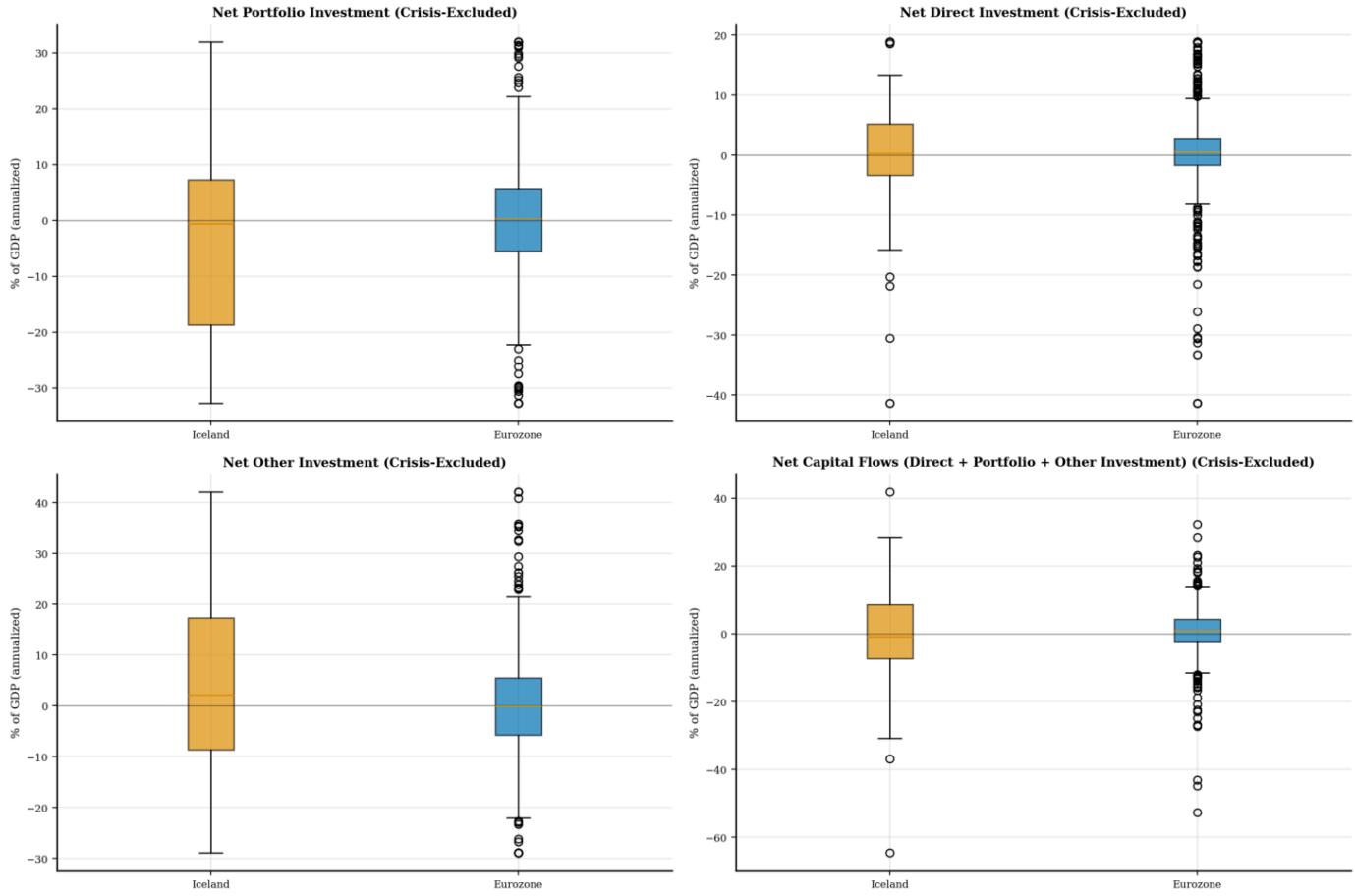
Overall Capital Flows Analysis

Aggregate net capital flows analysis excluding crisis periods (GFC 2008-2010 + COVID 2020-2022)

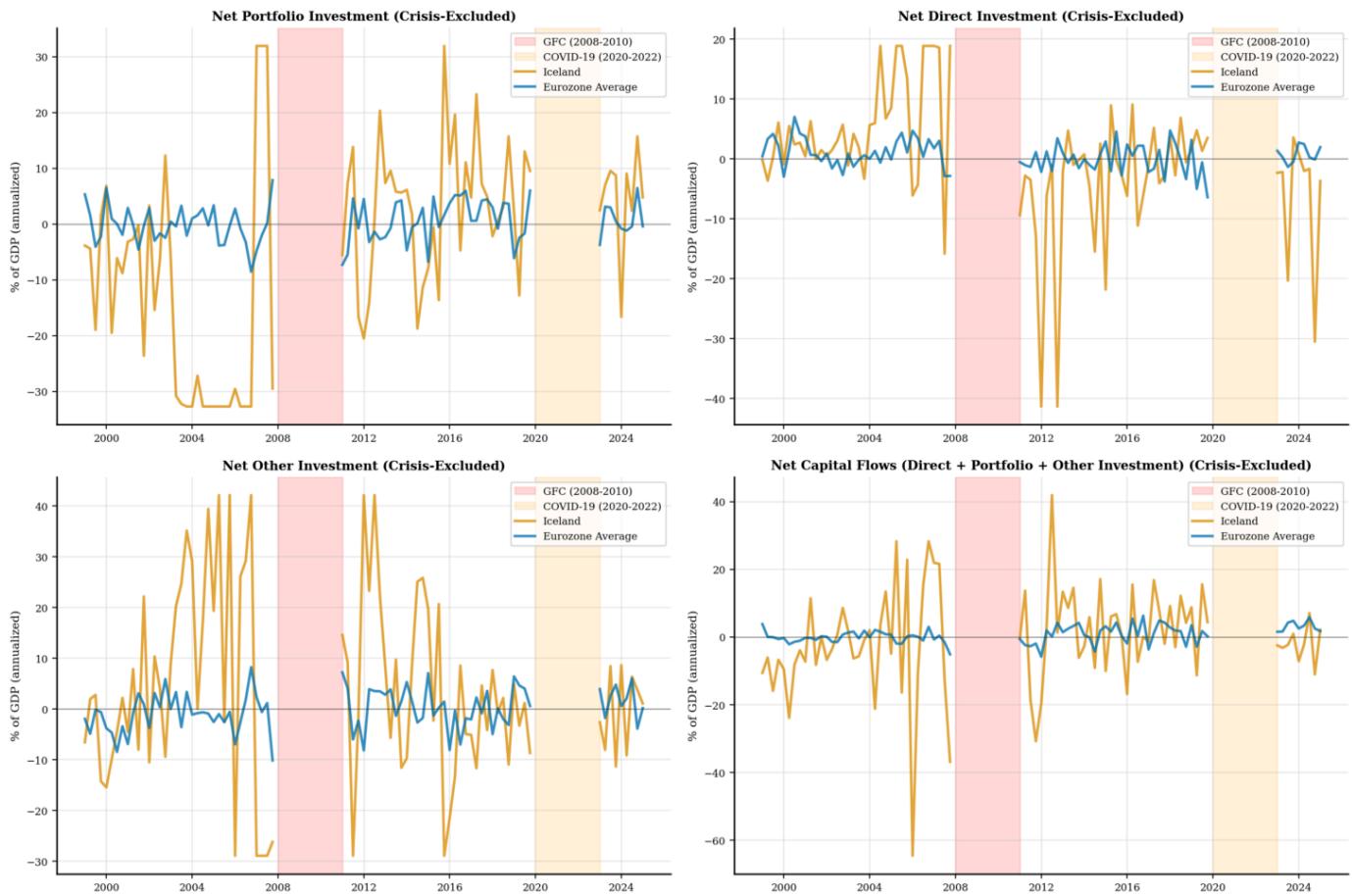
Summary Statistics by Group (Crisis-Excluded)

Indicator,	Mean, Eurozone	Mean, Iceland	Median, Euroz...	Median, Iceland	Std Dev, Euroz...	Std Dev, Iceland
Net Capital Flows (Direct + Portfolio + Other Investment)	0.80	-0.49	0.93	-0.87	6.99	15.14
Net Direct Investment	0.51	-0.10	0.56	0.29	7.35	11.26
Net Other Investment	-0.02	4.03	-0.02	2.19	10.75	18.54
Net Portfolio Investment	0.31	-4.42	0.33	-0.57	10.77	18.08

Distribution Comparison by Group (Crisis-Excluded)



📈 Time Series by Group (Crisis-Excluded)

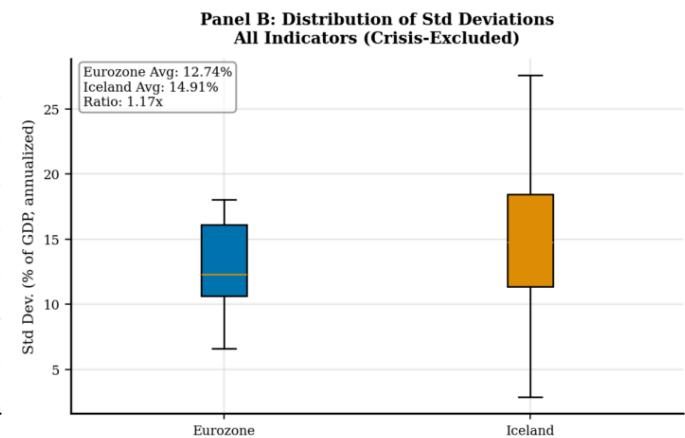
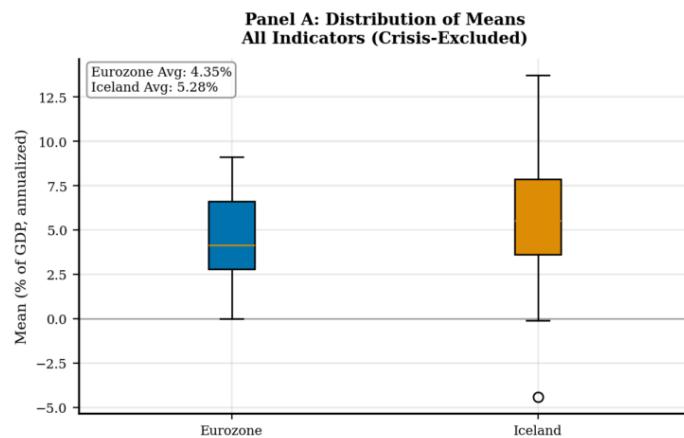


🔍 Indicator-Level Analysis

Observations	Indicators	Countries	Excluded Years
829	14	11	2008-20...

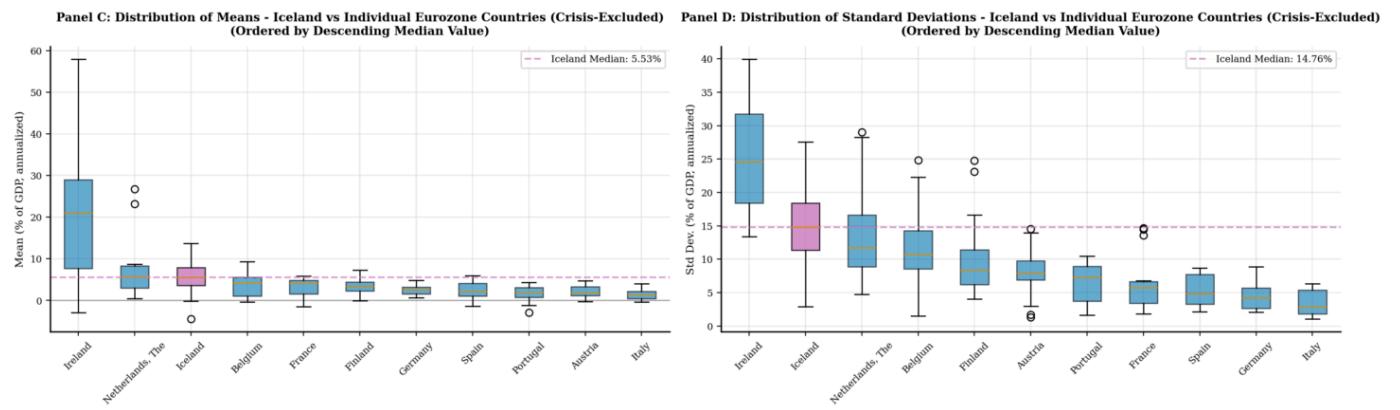
📊 Crisis Filtering: Excluded 264 observations from crisis periods

1. Summary Statistics and Boxplots



1b. Individual Country Comparisons: Iceland vs Each Eurozone Country

Enhanced Analysis: Rather than comparing Iceland to the Eurozone as an aggregate group, this section compares Iceland's values to each individual Eurozone country separately.



Iceland's Mean Rank

3 of 11

↑ Higher than average

Iceland's Volatility Rank

2 of 11

↑ More volatile than average

Individual Country Analysis Summary (Crisis-Excluded):

- Means:** Iceland ranks #3 out of 11 countries by median mean across all indicators
- Volatility:** Iceland ranks #2 out of 11 countries by median standard deviation
- Key Insight:** This shows Iceland's position relative to each individual Eurozone member rather than the aggregate

2. Comprehensive Statistical Summary Table (Crisis-Excluded)

All Indicators - Iceland vs Eurozone Statistics (Crisis-Excluded)

Indicator	Iceland Mean	Iceland Std ...	Iceland CV%	Eurozone Me...	Eurozone St...	Eurozone CV%	CV Ratio (Ice...
Assets - Direct Investment	7.06	19.16	271.3	7.50	16.42	219.1	1.24
Liabilities - Direct Investment	5.70	13.29	233.3	7.05	16.75	237.6	0.98
Net - Direct Investment	-0.10	11.26	10737.3	0.51	7.35	1437.4	7.47
Assets - Portfolio (Total)	8.67	15.05	173.7	9.13	17.91	196.1	0.89
Liabilities - Portfolio (Total)	13.74	22.86	166.3	8.24	15.18	184.3	0.90
Net - Portfolio Investment	-4.42	18.08	409.2	0.31	10.77	3470.0	0.12
Assets - Portfolio (Debt)	3.49	9.96	285.2	5.11	10.60	207.4	1.37
Liabilities - Portfolio (Debt)	7.46	11.60	155.4	4.27	8.29	194.3	0.80
Assets - Portfolio (Equity)	5.35	7.76	144.9	3.52	6.62	188.0	0.77
Liabilities - Portfolio (Equity)	0.84	2.88	344.3	4.06	11.48	282.6	1.22
Net - Other Investment	4.03	18.54	460.0	-0.02	10.75	54370.0	0.01
Assets - Other Investment (Debt)	9.19	27.59	300.2	5.37	18.02	335.5	0.89
Assets - Other Investment (Banks)	8.02	16.26	202.8	3.26	13.14	403.7	0.50
Liabilities - Other Investment (Ban...	4.91	14.46	294.7	2.64	15.05	570.1	0.52

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

3. Hypothesis Testing Results (Crisis-Excluded)

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

Indicator	F-Statistic	P-Value	Significance	Higher Volatility
Assets - Direct Investment	1.36	0.0485	*	Iceland
Liabilities - Direct Investment	0.63	0.0102	*	Eurozone
Net - Direct Investment	2.34	0.0000	***	Iceland
Assets - Portfolio (Total)	0.71	0.0517		Eurozone
Liabilities - Portfolio (Total)	2.27	0.0000	***	Iceland
Net - Portfolio Investment	2.82	0.0000	***	Iceland
Assets - Portfolio (Debt)	0.88	0.4868		Eurozone
Liabilities - Portfolio (Debt)	1.96	0.0000	***	Iceland
Assets - Portfolio (Equity)	1.37	0.0422	*	Iceland
Liabilities - Portfolio (Equity)	0.06	0.0000	***	Eurozone
Net - Other Investment	2.97	0.0000	***	Iceland
Assets - Other Investment (Debt)	2.34	0.0000	***	Iceland
Assets - Other Investment (Banks)	1.53	0.0061	**	Iceland
Liabilities - Other Investment (Ban...)	0.92	0.6678		Eurozone

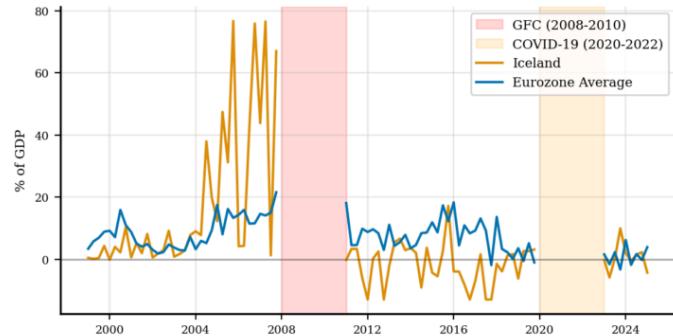
Significance levels: *** p<0.001, ** p<0.01, * p<0.05

Summary (Crisis-Excluded):

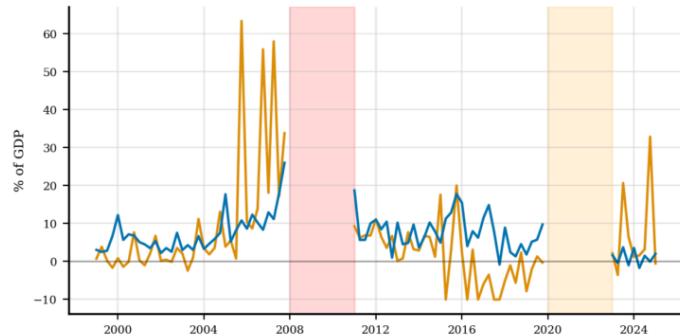
- **Total indicators:** 14
- **Significant at 1%:** 8
- **Significant at 5%:** 11
- **Iceland higher volatility:** 9

4. Time Series Analysis (Crisis-Excluded)

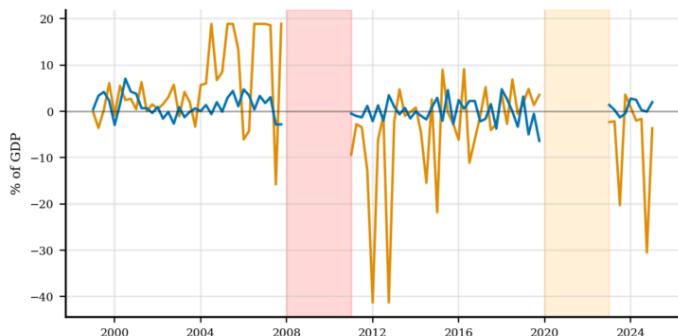
A: Assets - Direct Investment
(F-stat: 1.36) - Crisis-Excluded



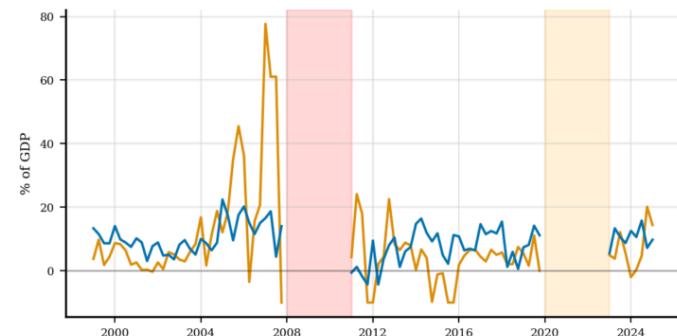
B: Liabilities - Direct Investment
(F-stat: 0.63) - Crisis-Excluded



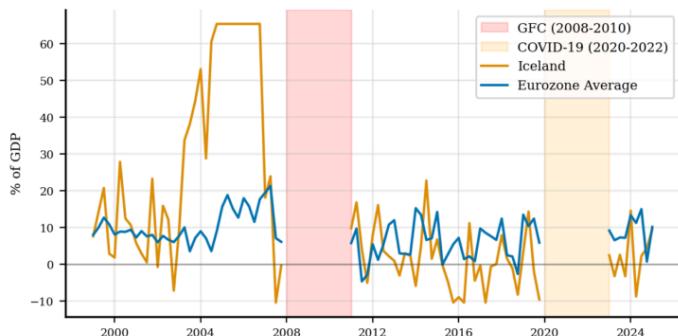
C: Net - Direct Investment
(F-stat: 2.34) - Crisis-Excluded



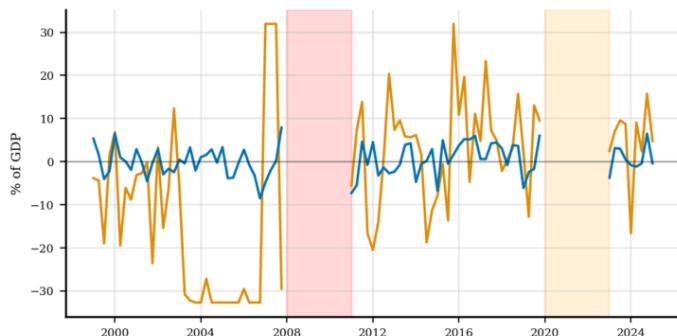
D: Assets - Portfolio (Total)
(F-stat: 0.71) - Crisis-Excluded



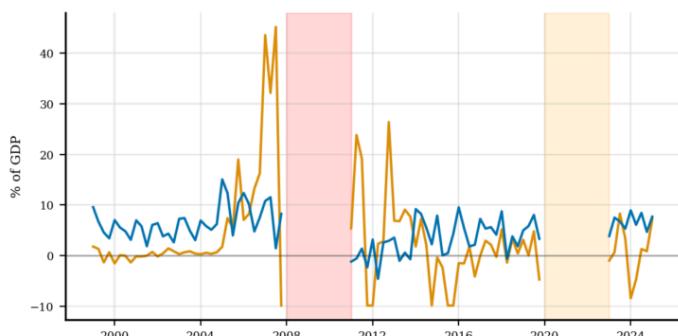
E: Liabilities - Portfolio (Total)
(F-stat: 2.27) - Crisis-Excluded



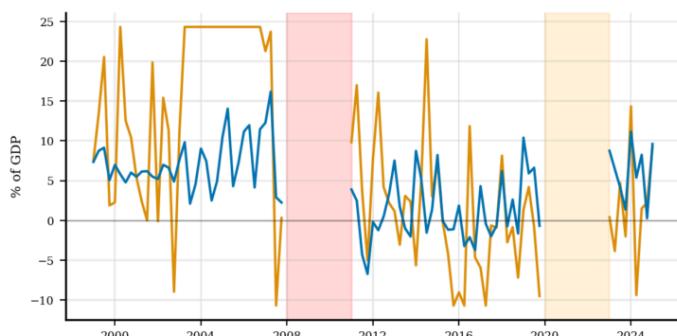
F: Net - Portfolio Investment
(F-stat: 2.82) - Crisis-Excluded



G: Assets - Portfolio (Debt)
(F-stat: 0.88) - Crisis-Excluded



H: Liabilities - Portfolio (Debt)
(F-stat: 1.96) - Crisis-Excluded





 [Download Individual Time Series Charts \(Crisis-Excluded\)](#)

5. Key Findings Summary (Crisis-Excluded)

Statistical Evidence (Crisis-Excluded):

Additional Statistical Context (Crisis-Excluded):

- **64.3% of capital flow indicators** show higher volatility in Iceland
 - **78.6% of indicators** show statistically significant differences ($p<0.05$)
 - **Iceland's average volatility** is 1.17 times higher than Eurozone countries
 - **Crisis periods excluded** to focus on structural differences
 - **Time period coverage:** 1999 to 2025 (crisis periods excluded)
 - **Data completeness:** Analysis based on crisis-excluded dataset
 - **Methodology:** F-test for variance equality, 5% significance level
 - **Robustness:** Results remain consistent when excluding major crisis periods
-