Growth Lab

A Change of Denomination: The Case for CPI-Indexed World Bank Lending

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Abstract. This paper asks whether the World Bank can change the denomination of its lending without weakening its own financial position. Using monthly CPI and exchange-rate data, we construct the dollar returns the Bank would earn on loans indexed to borrowers' domestic inflation and aggregate those returns using current IBRD and IDA portfolio weights. Country returns are volatile. Portfolio returns are much calmer because cross-country correlations are low. The diversification dividend is large enough to make the financially indifferent coupon on a CPI-indexed instrument close to, and in some cases below, current lending rates. The World Bank can reduce one of the core sources of macroeconomic instability in borrowing countries at little or no financial cost to itself.

1. Introduction

Original sin remains one of the most consequential features in the international financial system. Developing countries borrow abroad in currencies they do not issue, while their fiscal capacity depends on incomes, taxes, and prices measured in local currency units. The currency of the contract is therefore misaligned with the currency of repayment capacity. A movement in the exchange rate becomes a movement in the public balance sheet.

This mismatch matters because the real exchange rate tends to move in the wrong direction. It appreciates in good times, when capital is abundant, exports are strong, and confidence is high. It depreciates in bad times, when financing dries up, reserves fall, terms of trade weaken, or confidence breaks. Countries exhibiting this problem display procyclical rather than countercyclical fiscal and monetary policies

This mechanism changes the way countries manage macroeconomic policy. Governments with dollar liabilities have strong incentives to fear floating, as documented by Calvo and Reinhart (2002). They defend exchange rates, run down reserves, compress imports, raise interest rates, and delay adjustment. Monetary and fiscal policy become procyclical because depreciation threatens solvency. These actions can buy time, but they also store pressure in the system. When the correction finally comes, it arrives through a larger depreciation, a weaker balance sheet, and a more difficult fiscal adjustment.

Eichengreen, et al. (2005a, 2005b) identified original sin as a structural inability of developing countries to borrow abroad in their own currencies, and Eichengreen, et al. (2023), in "Yet it Endures," show that this problem has persisted despite the development of domestic local-currency bond markets in some emerging economies. The persistence of original sin is a market failure with a natural institutional remedy. Private markets have not supplied developing countries with external debt instruments that track domestic repayment capacity. Multilateral development banks were created to solve precisely this kind of missing-market problem. Yet the World Bank still lends predominantly in dollars and passes denomination risk to borrowers.

Hausmann and Rigobon (2003) proposed a way out for IDA. They argued that concessional lending could be denominated in inflation-indexed domestic currency units, following the logic of Chile's Unidad de Fomento. Disbursements and repayments could still take place in dollars, but the value of the obligation would be indexed to the borrower's domestic price level. The borrower would owe a constant real domestic obligation instead of a volatile dollar claim. Their key insight was that IDA can pool what each borrower cannot bear alone. A single country's inflation-indexed

local-currency unit may be volatile in dollar terms. A diversified portfolio of many such units is much less volatile because exchange rate and inflation shocks are imperfectly correlated across countries. The World Bank can therefore warehouse denomination risk at the portfolio level and reduce the risk borne by each borrower.

This paper revisits and extends that proposal using monthly CPI and exchange-rate data for World Bank borrowers since 1995 and current IBRD and IDA portfolio weights. We construct the dollar returns the Bank would have earned if its loans had been indexed to borrowers' domestic inflation rather than denominated in dollars. We then ask whether the resulting portfolio would expose the Bank to a material financial cost.

The answer is favorable to reform. Country-level returns can be volatile, especially around large exchange rate corrections. Portfolio returns are far more stable. The diversification dividend is large enough that the coupon required to leave the World Bank financially indifferent is close to current lending terms.

The implication is straightforward. The World Bank can help solve original sin by changing the denominator of its lending. CPI-indexed lending would align debt service with domestic repayment capacity, reduce the balance sheet consequences of depreciation, and weaken the incentives that generate fear of floating. The Bank can do this while preserving its own financial position through the diversification power of its global portfolio.

2. Data and Construction of CPI-Indexed Returns

2.1. Return definition

We define the monthly CPI-indexed USD return for country i in month t as:

$$r_{i,t} = \frac{(1 + \pi_{i,t})}{(1 + \varepsilon_{i,t})} - 1$$

where $\pi_{i,t}$ is the domestic CPI inflation rate and $\varepsilon_{i,t}$ is the depreciation of the local currency against the U.S. dollar, both measured month-on-month. This return equals what a dollar-funded lender would earn if principal were indexed to domestic prices. Local-currency purchasing power grows with inflation. The dollar value of that purchasing power falls when the currency depreciates.

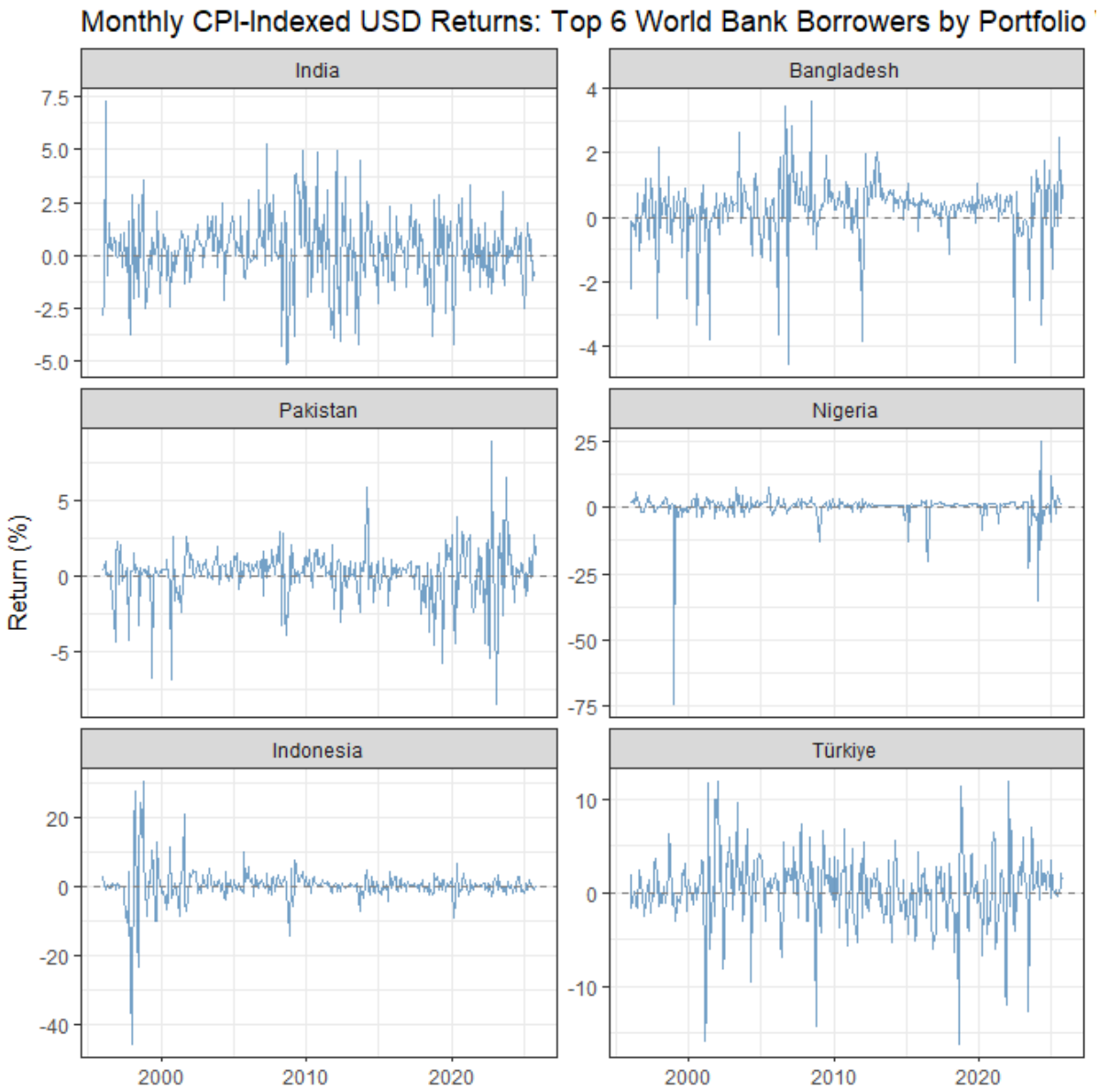
Monthly CPI and bilateral USD exchange-rate data are drawn from the IMF International Financial Statistics and the World Development Indicators for all World Bank borrowers with available data from January 1995 to December 2024. Portfolio weights are constructed from the latest available IBRD Statement of Loans and IDA Statement of Credits, which together define three portfolio variants used throughout: the combined IBRD+IDA portfolio, the IBRD-only portfolio, and the IDA-only portfolio. The top borrowers by exposure under each definition are reported in Appendix A.

Annual statistics throughout this paper use Weber's (2017) correct compounding formula in place of the conventional scaling, which understates volatility when monthly means are non-zero. The formula and a comparison of both approaches are provided in Appendix B.

3. The Diversification Result

3.1. Country-level vs. portfolio volatility

The main result is simple: risks that look large in one country become much smaller in a World Bank portfolio. The six charts below show monthly CPI-indexed USD returns for the six largest World Bank borrowers by portfolio weight: India, Bangladesh, Pakistan, Nigeria, Indonesia, and Türkiye. They cover the full sample from January 1995 to December 2024.



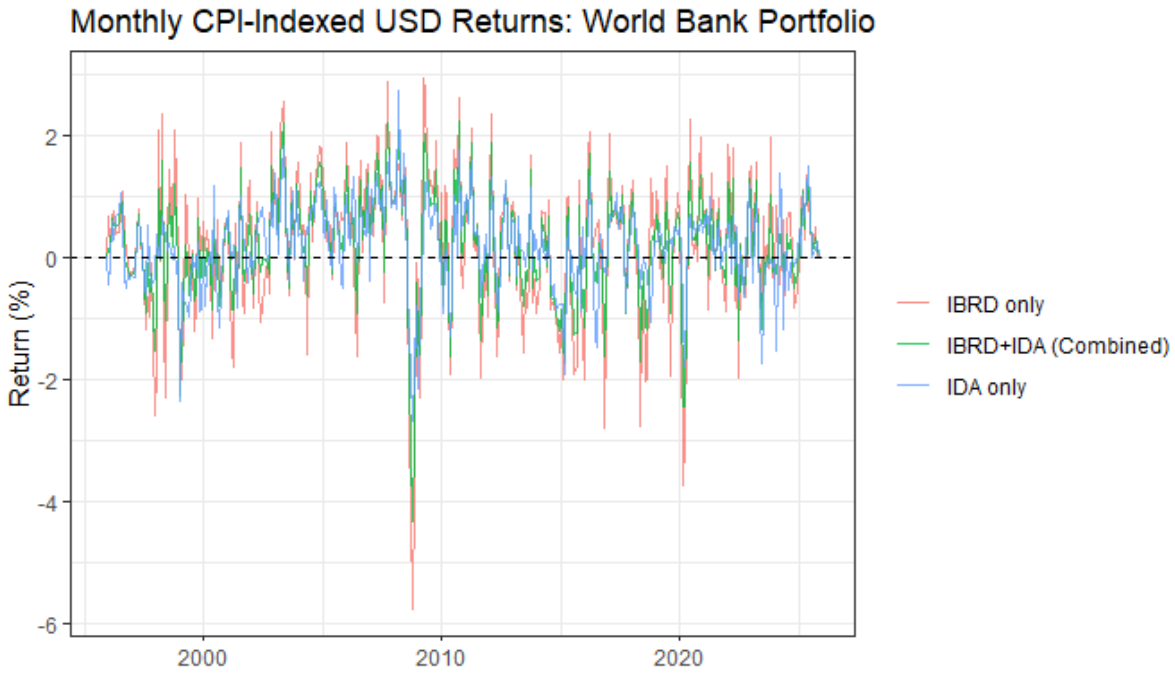
Source: Authors' calculations based on IMF International Financial Statistics, Economist Intelligence Unit, and national statistical agencies.

Each series is volatile. Extended periods of near-zero returns give way to sharp, one-sided spikes, almost always driven by large exchange rate depreciations, with domestic inflation playing a smaller role, as shown in Section 4. Nigeria shows two dramatic collapses separated by more than two decades. Indonesia experienced a catastrophic drop during the 1997-98 Asian financial crisis. Türkiye has had repeated episodes of sharp lira depreciation. These are exactly the FX-crash events

that original-sin theory predicts. Taken individually, any one of these exposures would represent substantial financial risk for a dollar-funded lender. The World Bank holds these positions together, pooled across a portfolio of dozens of countries.

3.2. Monthly return dynamics

The chart below shows what happens when these individual-country exposures are aggregated into the full portfolio.



Source: Authors' calculations based on IMF International Financial Statistics, Economist Intelligence Unit, and national statistical agencies.

Aggregation changes the picture. The portfolio returns are substantially stable than the individual-country series. Large country-level swings average out across the portfolio because the underlying shocks are largely independent: a devaluation in Nigeria is largely uncorrelated with a devaluation in India. The annual standard deviation of the combined portfolio falls to 3.04 percent, less than one-third of the exposure-weighted country average of 8.72 percent. The same compression holds for IBRD alone, from 9.67 percent to 4.09 percent, and IDA alone, from 7.6 percent to 2.48 percent. Table 1 quantifies this compression across all three portfolio definitions.

Portfolio Risk vs. Country Volatility: Full Sample 1995-2024 (Weber annualisation)

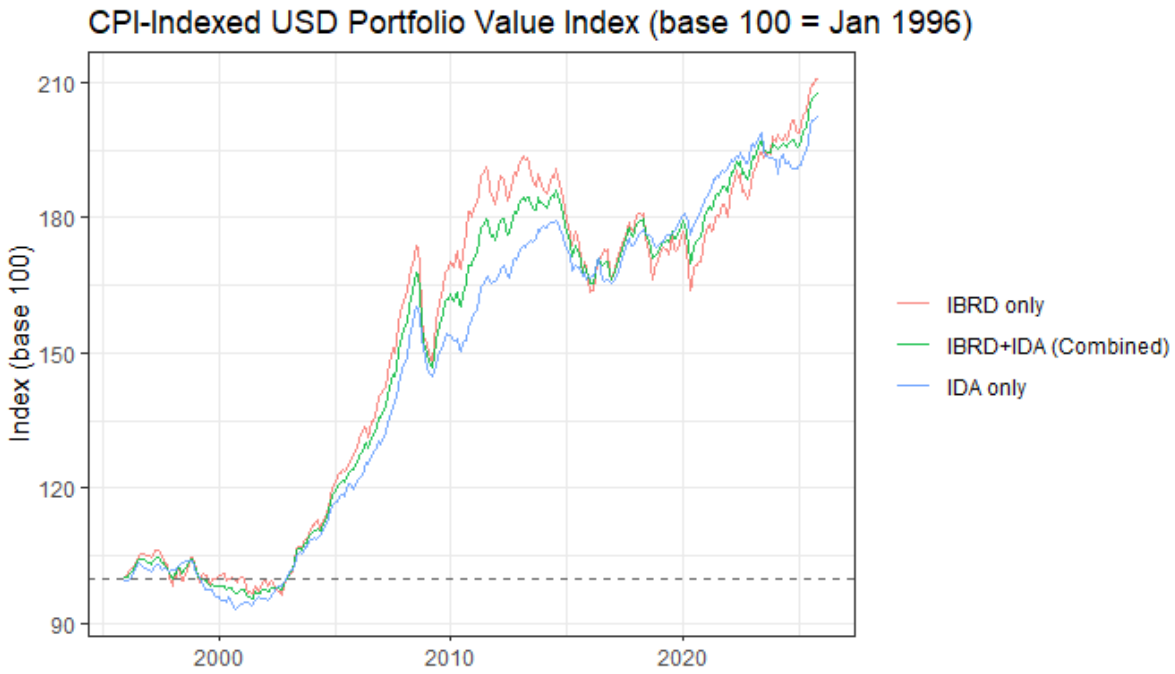
Portfolio	Annual portfolio SD (%)	Wtd avg country SD (%)	Avg cross-country corr
IBRD+IDA (Combined)	3.04	8.72	0.19
IBRD only	4.09	9.67	0.19
IDA only	2.48	7.60	0.19

This diversification comes from low average cross-country correlations. The average pairwise correlation across countries in the combined portfolio is only 0.19. Inflation and exchange-rate shocks are largely idiosyncratic: a currency crisis in Nigeria tells us little about crisis risk in India.

This is precisely the condition that allows a multilateral portfolio to warehouse denomination risk that no individual borrower can manage.

3.3. Cumulative value index

Compounding monthly returns from January 1996 (base = 100), the portfolio index shows the long-run trajectory of a hypothetical CPI-indexed loan book.



Source: Authors' calculations based on IMF International Financial Statistics, Economist Intelligence Unit, and national statistical agencies.

3.4. Summary statistics: full sample

Annualised CPI-Indexed USD Returns: Weber (2017) Correct Compounding

Portfolio	Period	Annual mean (%) [W]	Annual SD (%) [W]	Annual Sharpe [W]
IBRD+IDA (Combined)	1995-2025	2.51	3.04	0.827
IBRD only	1995-2025	2.60	4.09	0.636
IDA only	1995-2025	2.41	2.48	0.970

Note: [W] = Weber (2017) correct compounding. Annual statistics derived from monthly data using exact compounding formulas; see Appendix B.

The full bootstrap distribution of annual returns is reported next. For percentiles, no closed form exists under compounding. We draw 12 monthly returns at random (with replacement) from the observed history, compound them into an annual return, and repeat 10,000 times.

Distribution of Annual Returns (bootstrap, 10,000 replications with compounding). [W] = Weber (2017) closed form.

Portfolio	Mean [W]	SD [W]	Min	P10	P25	Median	P75	P90	Max
IBRD+IDA (Combined)	2.51	3.04	-12.24	-1.35	0.58	2.63	4.58	6.36	14.50
IBRD only	2.60	4.09	-13.95	-2.67	-0.06	2.71	5.36	7.77	16.77
IDA only	2.41	2.48	-7.44	-0.81	0.78	2.45	4.09	5.61	11.58

Mean [W] and SD [W]: Weber (2017) closed-form. All other columns: bootstrap percentiles from 10,000 replications of 12 compounded monthly returns.

4. Exchange Rate Crashes Drive Bad Outcomes

Original sin theory predicts a distinctive pattern. The worst outcomes in dollar-lending portfolios come from abrupt exchange-rate adjustments after periods of delayed correction. When a country with dollar liabilities resists depreciation, pressure accumulates and eventually releases in a disorderly move. The correction raises the domestic value of dollar debt, worsens fiscal balances, and destabilizes private and public balance sheets at the same time.

The CPI-indexed portfolio faces this risk through the dollar value of repayments, and the source of the tail events is clear: exchange-rate depreciation dominates local inflation. This finding has two implications. First, portfolio risk is concentrated in a small number of FX-crash events. Second, CPI indexation removes the balance-sheet channel that makes those crashes so costly for borrowers.

We identify the 20-country-month observations that contributed most to portfolio return, applying a selection algorithm that accepts a new episode only if it lies more than 24 months from any previously accepted episode in the same country. This ensures each distinct crisis is counted once and avoids producing multiple entries for the same event.

Top 20 Episodes by Contribution to Monthly Portfolio Return (distinct shocks, ±24-month window per country)

Country	Date	Country return (%)	Portfolio weight	Contribution (pp)	Inflation contrib (%)	FX contrib (%)	Driver
Nigeria	Jan 1999	-73.93	0.0416	-3.078	1.92	-74.42	FX-driven
Indonesia	Jan 1998	-45.56	0.0408	-1.858	7.17	-49.20	FX-driven
Nigeria	Feb 2024	-35.33	0.0416	-1.471	3.12	-37.28	FX-driven

Country	Date	Country return (%)	Portfolio weight	Contribution (pp)	Inflation contrib (%)	FX contrib (%)	Driver
Ethiopia, The Federal Democratic Republic of	Aug 2024	-42.91	0.0283	-1.213	1.18	-43.58	FX-driven
Ukraine	Feb 2015	-32.16	0.0348	-1.121	5.02	-35.41	FX-driven
Indonesia	Aug 2001	21.03	0.0408	0.858	-0.20	21.27	FX-driven
Nigeria	Jul 2016	-20.34	0.0416	-0.847	1.25	-21.32	FX-driven
Egypt, Arab Republic of	Nov 2016	-41.28	0.0200	-0.824	4.82	-43.98	FX-driven
Argentina	Dec 2023	-31.51	0.0228	-0.719	24.44	-44.96	FX-driven
Ukraine	Sep 1998	-19.78	0.0348	-0.689	2.34	-21.61	FX-driven
Uzbekistan, Republic of	Sep 2017	-44.48	0.0154	-0.683	1.32	-45.21	FX-driven
Ukraine	Dec 2008	-19.35	0.0348	-0.674	1.83	-20.80	FX-driven
Brazil	Feb 1999	-20.70	0.0309	-0.639	1.05	-21.53	FX-driven
Türkiye, Republic of	Aug 2018	-16.12	0.0397	-0.639	2.30	-18.00	FX-driven
Türkiye, Republic of	Mar 2001	-15.91	0.0397	-0.631	6.07	-20.72	FX-driven
Egypt, Arab Republic of	Mar 2024	-31.34	0.0200	-0.626	0.98	-32.00	FX-driven
Argentina	Jan 2002	-26.97	0.0228	-0.616	2.30	-28.61	FX-driven
Indonesia	Nov 2008	-14.56	0.0408	-0.594	0.12	-14.67	FX-driven
Türkiye, Republic of	Oct 2008	-14.25	0.0397	-0.565	2.60	-16.42	FX-driven
Nigeria	Jan 2009	-12.77	0.0416	-0.531	0.55	-13.24	FX-driven

The major episodes are Nigeria, Indonesia, Ukraine, Egypt, Argentina, Türkiye, and Brazil. Most are FX-driven and correspond to periods of delayed exchange-rate adjustment followed by abrupt correction. Inflation plays a secondary role in most cases: the local CPI rose by too little to offset the depreciation in dollar terms.

The data show the original-sin mechanism at work. Countries postpone adjustment, accumulate dollar-denominated obligations, and then experience a disorderly correction that inflates debt burdens and destabilizes balance sheets. CPI-indexed lending leaves currency crises possible. It removes the anti-cyclical debt-service mechanism that amplifies them. Time-series charts for each of the top 20 episodes are provided in Appendix C.

5. The Price of the Reform: The Indifference Coupon

5.1. What rate would leave the Bank indifferent?

The relevant question for the World Bank is whether CPI-indexed lending can improve borrower resilience while preserving the Bank's financial position. This section answers that question by computing the coupon on a CPI-indexed instrument that leaves the Bank financially indifferent relative to current dollar lending.

Formally, the Bank lends L dollars, converts at spot rate S_0, and receives repayments in local currency indexed to the domestic price level. The dollar return on the indexed instrument equals the CPI-indexed USD return r_i^{CPI} constructed above. The indifference coupon c^* satisfies:

$$(1 + c^*)\left(1 + r_i^{CPI}\right) - 1 = c_{USD}$$

which gives:

$$c^* = \frac{1 + c_{USD}}{1 + r_i^{CPI}} - 1 \approx c_{USD} - (\pi_i - \varepsilon_i)$$

Under relative PPP this reduces to $c^* \approx c_{USD} - \pi_{US}$: the real dollar interest rate. Deviations from PPP determine the empirical gap from this benchmark.

5.2. Under certainty: the indifference coupon falls below current rates

Using the Weber-annualised historical mean CPI-indexed USD return as the empirical estimate of $E[\pi_i - \delta_i]$, the certainty indifference coupon is:

Indifference Coupon Without Uncertainty: c* = (1+c_USD)/(1+E[r_P]) - 1. E[r_P] is the Weber-annualised historical mean CPI-indexed USD return.

Portfolio	USD rate (%)	E[r_P] (%)	c* (%)	Change vs USD (pp)
IBRD	5.5	2.60	2.83	-2.67
IDA	1.0	2.41	-1.38	-2.38

IBRD rate: 5.5% p.a. IDA rate: 1% p.a.

Under certainty, the indifference coupons fall well below current lending rates. The reason is mechanical: historical average CPI-indexed USD returns have been positive. Across the sample, borrowing-country inflation exceeded currency depreciation on net, so the Bank would have earned positive real returns on CPI-indexed loans before collecting a coupon.

5.3. Under uncertainty: diversification absorbs most of the risk premium

When returns are uncertain, a risk-averse institution demands a risk premium. Using a mean-variance framework with risk-aversion coefficient γ, the indifference condition becomes:

$$c^* = \frac{1 + c_{USD}}{1 + E[r_P] - \frac{\gamma}{2}\sigma_P^2} - 1$$

The term $\frac{\gamma}{2}\sigma_P^2$ is subtracted from $E[r_P]$ to obtain the certainty-equivalent portfolio return; a larger risk premium reduces the certainty equivalent and raises the required coupon. At $\gamma = 0$ the expression collapses to the multiplicative formula used in Section 5.2, so the two tables are directly comparable. Because $\sigma_P^2 \ll \sigma_{country}^2$, the portfolio variance determines the relevant risk, while individual-country variance becomes largely diversifiable. The table below reports how much of the single-country risk premium remains after diversification.

Risk Premium (pp) by Risk-Aversion Coefficient: Single Country vs. Portfolio. RP = (gamma/2) × sigma^2.

	IBRD portfolio			IDA portfolio		
gamma	Country avg RP - IBRD (pp)	Portfolio RP - IBRD (pp)	Reduction - IBRD (pp)	Country avg RP - IDA (pp)	Portfolio RP - IDA (pp)	Reduction - IDA (pp)
1	0.58	0.08	0.50	0.37	0.03	0.34
2	1.16	0.17	0.99	0.74	0.06	0.68
5	2.90	0.42	2.48	1.86	0.15	1.71
10	5.79	0.84	4.96	3.72	0.31	3.42

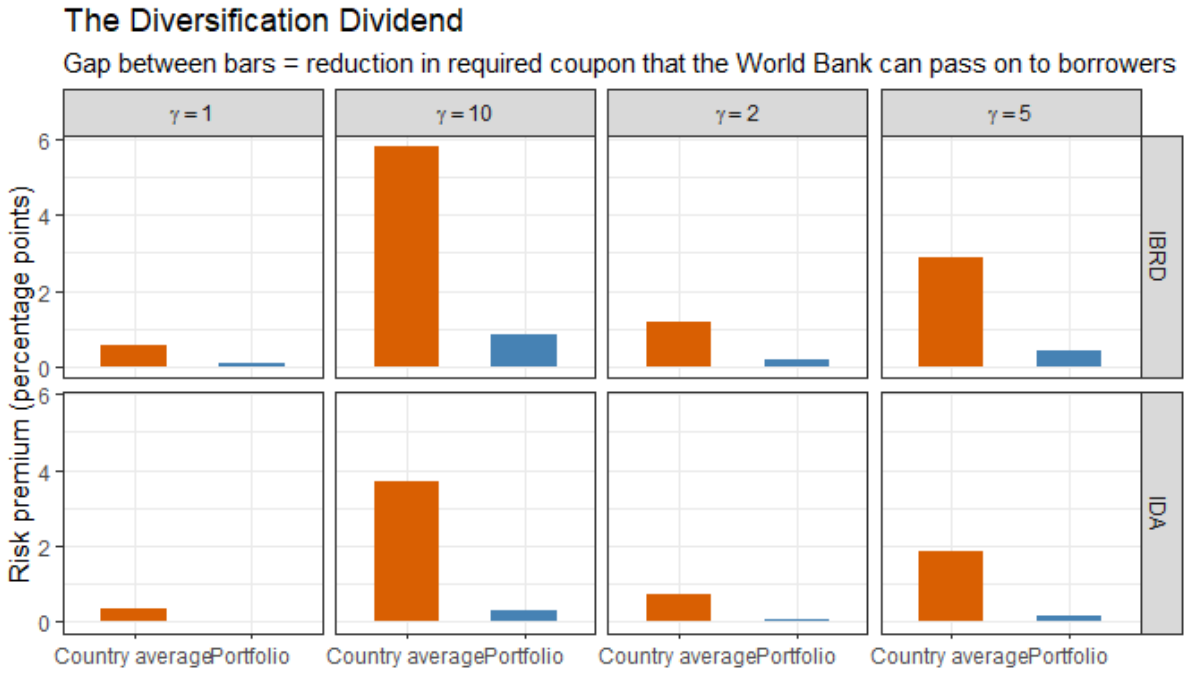
The diversification dividend is large. Even at $\gamma = 10$, well above standard estimates for institutional investors, the portfolio risk premium for IBRD is a fraction of the single-country average. For IDA, the same holds.

Portfolio-Level Indifference Coupon Under Uncertainty: c* = (1+c_USD)/(1+E[r_P]-(gamma/2)×sigma_P^2) - 1.

gamma	IBRD indiff. coupon* (%)	IBRD change vs USD (pp)	IDA indiff. coupon* (%)	IDA change vs USD (pp)
1	2.91	-2.59	-1.35	-2.35
2	3.00	-2.50	-1.32	-2.32
5	3.25	-2.25	-1.23	-2.23

gamma	IBRD indiff. coupon* (%)	IBRD change vs USD (pp)	IDA indiff. coupon* (%)	IDA change vs USD (pp)
10	3.67	-1.83	-1.08	-2.08

IBRD base rate: 5.5%. IDA rate: 1%. Weber-annualised portfolio statistics, full sample 1995-2024.



Source: Authors' calculations based on IMF International Financial Statistics, Economist Intelligence Unit, and national statistical agencies.

The chart makes the point visually. The gap between the country-average bar and the portfolio bar is the diversification dividend. It measures the reduction in the required coupon that portfolio diversification alone can justify. The dividend is large at all values of γ, and it grows with risk aversion because risk pooling becomes more valuable when risk aversion is higher.

6. Policy Implications

CPI-indexed lending can be implemented within the Bank's current operating model. The Bank lends in dollars at disbursement, as it does today. The outstanding principal is then expressed in local-currency units indexed to the domestic CPI. Amortization payments and interest are computed on the inflation-adjusted local-currency balance and converted back to dollars at the prevailing exchange rate at the time of payment. The borrower's obligation is constant in real domestic terms. The dollar amount varies with inflation and the exchange rate.

New IDA lending is the most tractable entry point. IDA is fiscally funded, faces no matching hard-currency liability constraint, and lends to countries where original sin is most damaging. A pilot with a subset of IDA borrowers, for example those with the deepest dollar debt and the most volatile exchange-rate histories, would generate real-world evidence on implementation costs and institutional feasibility before a broader rollout.

Hausmann and Rigobon (2003) proposed an additional option: offering existing IDA borrowers a voluntary once-and-for-all conversion of outstanding dollar loans to CPI-indexed local-currency instruments. This is operationally clean. Countries that find the conversion attractive opt in; others keep their existing terms. The Bank's aggregate exposure remains balanced if enough countries participate. The analysis in this paper, consistent with the original UF proposal, suggests that participation by half the IDA membership would provide more than enough risk sharing.

For IBRD, the path is more gradual: begin with new lending to middle-income countries with established inflation frameworks and well-measured CPI series, then expand as data quality and operational experience accumulate.

Governance can address the natural concern that borrowers might manipulate measured inflation to reduce their real debt burden. National statistical agencies already construct CPI series for domestic policy purposes, and the political cost of official data fraud is high. The Bank can also use quarterly or semi-annual CPI averages in place of the most recent monthly print, which further reduces the scope for opportunistic timing.

The reform directly addresses the transmission mechanism from original sin to fear of floating. Under CPI-indexed lending, a currency depreciation leaves the real local-currency burden of multilateral debt unchanged. Governments therefore face fewer balance sheet reasons to resist exchange rate flexibility. Over time this should reduce the systematic tendency toward overvalued exchange rates and delayed adjustment that the original-sin literature documents.

The reform also creates a second-order benefit beyond direct interest rate savings. If CPI-indexed multilateral lending contributed even modestly to greater exchange-rate flexibility among borrowing countries, the reduction in crisis frequency and severity would dwarf the direct coupon savings. That broader benefit lies outside our quantitative exercise, which measures only the Bank's financial position. It remains part of the case for the reform.

Implementation requires country-level CPI series with sufficient quality and frequency. Most IBRD borrowers and a growing share of IDA countries have monthly CPI data of reasonable quality. Where CPI series are short, irregular, or questionable, the Bank could use a basket of regional or comparator prices as a proxy, or defer indexation until data quality is adequate. This defines the sequencing of the reform.

7. Conclusion

The international financial system still imposes a damaging asymmetry on developing countries: they borrow instruments that fail to track their capacity to pay, and exchange-rate movements then make those obligations harder to service. This asymmetry is the essence of original sin. It helps explain why countries fear floating, postponing adjustment, and experience crises that become more disruptive than necessary.

The World Bank can help correct this problem. Risk that is large for an individual borrower becomes much smaller inside a diversified multilateral portfolio. Our results show that CPI-indexed lending would generate substantial risk reduction through diversification. The combined portfolio's annual standard deviation is 3.04 percent, against an exposure-weighted country average of 8.72 percent. The coupon required to leave the Bank financially indifferent is close to current

lending terms. The diversification dividend is large enough to make the reform financially viable across a wide range of assumptions about institutional risk aversion.

The extreme episodes show the original-sin mechanism in the data. Bad outcomes are FX-driven. They reflect abrupt corrections after periods of delayed adjustment in countries with dollar liabilities. CPI-indexed lending leaves currency crises possible. It removes the mechanism that makes them so fiscally destructive: the automatic rise in the real debt burden that accompanies depreciation under dollar debt.

The broader implication is institutional. Multilateral development banks were created to solve problems that markets leave unsolved. Private markets have failed to provide developing countries with external instruments that track domestic capacity to pay. Helping countries access such instruments at scale is precisely the kind of problem multilaterals exist to solve. The World Bank can become a solution to original sin.

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9. Appendix A: World Bank Portfolio Composition

The three tables below report the top 20 borrowers under each portfolio definition, derived from the latest available IBRD Statement of Loans and IDA Statement of Credits.

Top 20 World Bank (IBRD+IDA) Borrowers by Portfolio Exposure

ISO3	Exposure (US$ bn)	Portfolio Weight
IND	48.43	0.067
BGD	31.42	0.044
PAK	30.18	0.042
NGA	29.89	0.042
IDN	29.29	0.041
TUR	28.48	0.040
UKR	25.02	0.035
BRA	22.18	0.031
ETH	20.29	0.028
PHL	20.03	0.028
KEN	19.46	0.027
CHN	18.92	0.026
COL	17.91	0.025
TZA	17.58	0.024
MAR	16.41	0.023
ARG	16.39	0.023
EGY	14.34	0.020
VNM	14.28	0.020
MEX	13.66	0.019
UZB	11.03	0.015

Top 20 IBRD Borrowers by Loans Held

ISO3	Loans Held (US$ bn)	IBRD Weight
IND	35.21	0.091
IDN	29.29	0.076
TUR	28.48	0.074

ISO3	Loans Held (US$ bn)	IBRD Weight
BRA	22.18	0.057
PHL	20.03	0.052
CHN	18.92	0.049
COL	17.91	0.046
UKR	17.88	0.046
MAR	16.41	0.042
ARG	16.39	0.042
EGY	14.26	0.037
MEX	13.66	0.035
AGO	8.78	0.023
ROU	8.36	0.022
ECU	8.07	0.021
JOR	7.94	0.021
ZAF	7.21	0.019
PER	7.06	0.018
POL	6.83	0.018
TUN	6.68	0.017

Top 20 IDA Borrowers by Credits Held

ISO3	Credits Held (US$ bn)	IDA Weight
BGD	31.42	0.095
NGA	26.85	0.081
PAK	24.83	0.075
ETH	20.29	0.061
TZA	17.58	0.053
KEN	17.45	0.053
IND	13.23	0.040
VNM	11.60	0.035
GHA	9.77	0.029
COD	9.01	0.027

ISO3	Credits Held (US$ bn)	IDA Weight
CIV	8.92	0.027
UGA	8.29	0.025
SEN	7.64	0.023
UKR	7.14	0.022
UZB	6.87	0.021
MOZ	6.61	0.020
NPL	6.54	0.020
NER	6.12	0.018
CMR	5.97	0.018
MDG	5.48	0.017

Appendix B: Technical Notes on Annualisation

9.1. Weber (2017) correct compounding

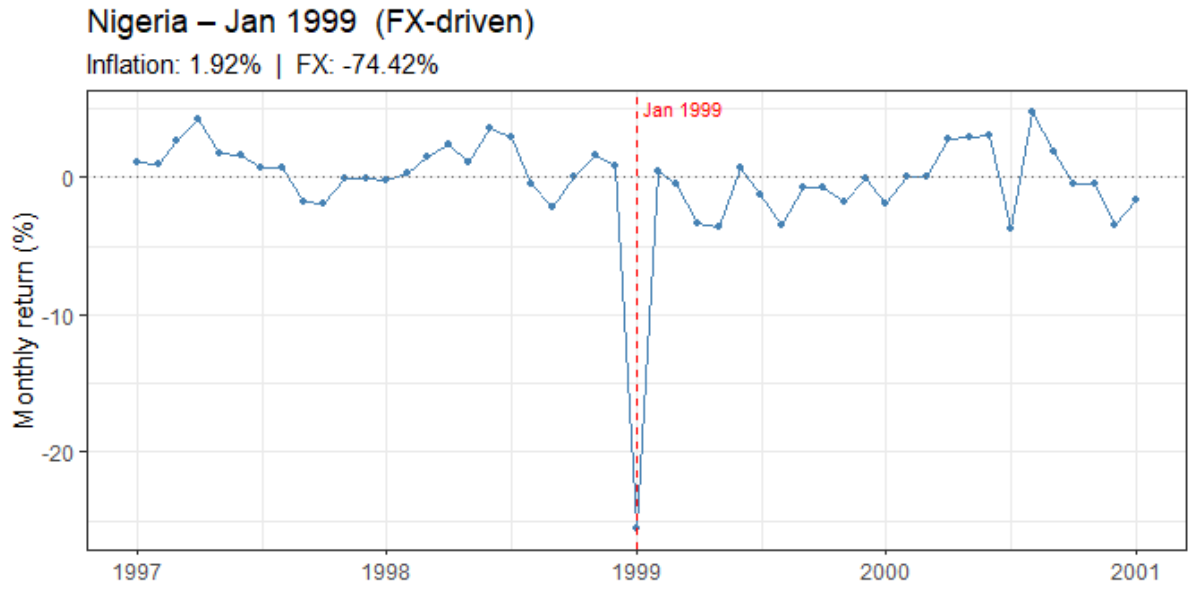
Multiplying the monthly mean by 12 and the monthly standard deviation by $\sqrt{12}$ assumes returns are summed over time, which is incorrect when they compound. Following Weber (2017), the correct annual mean and standard deviation are:

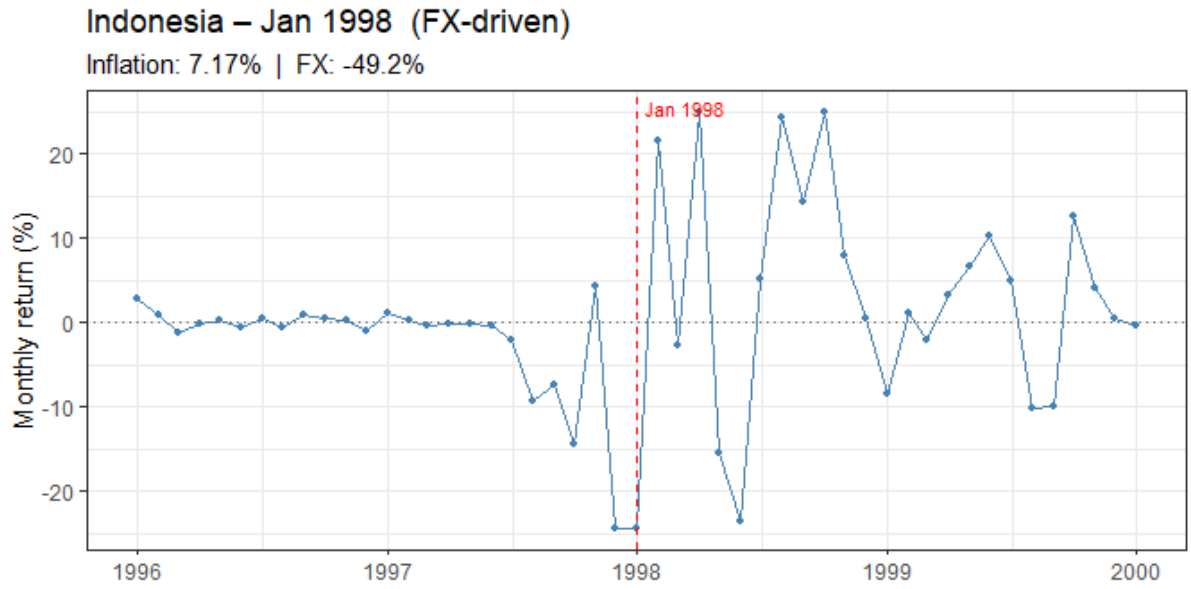
$$\mu_A = (1+\mu_m)^{12} - 1, \qquad \sigma_A = \sqrt{(\sigma_m^2 + (1+\mu_m)^2)^{12} - (1+\mu_m)^{24}}$$

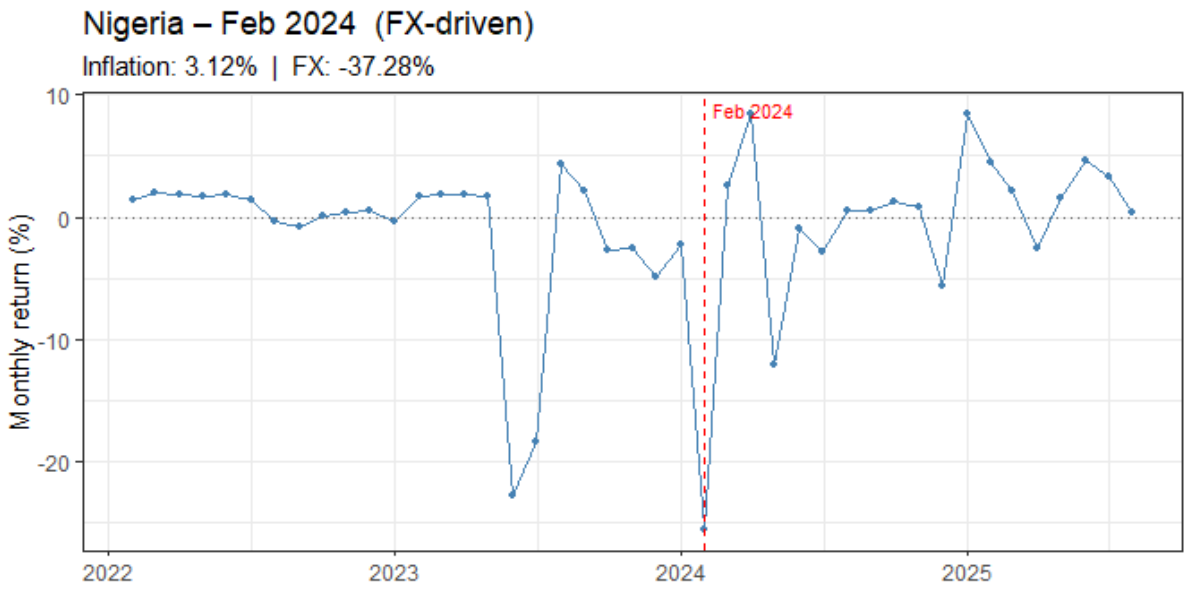
where μ_m and σ_m are expressed as decimals. Summary statistics using these formulas are reported in the main text (Table 1).

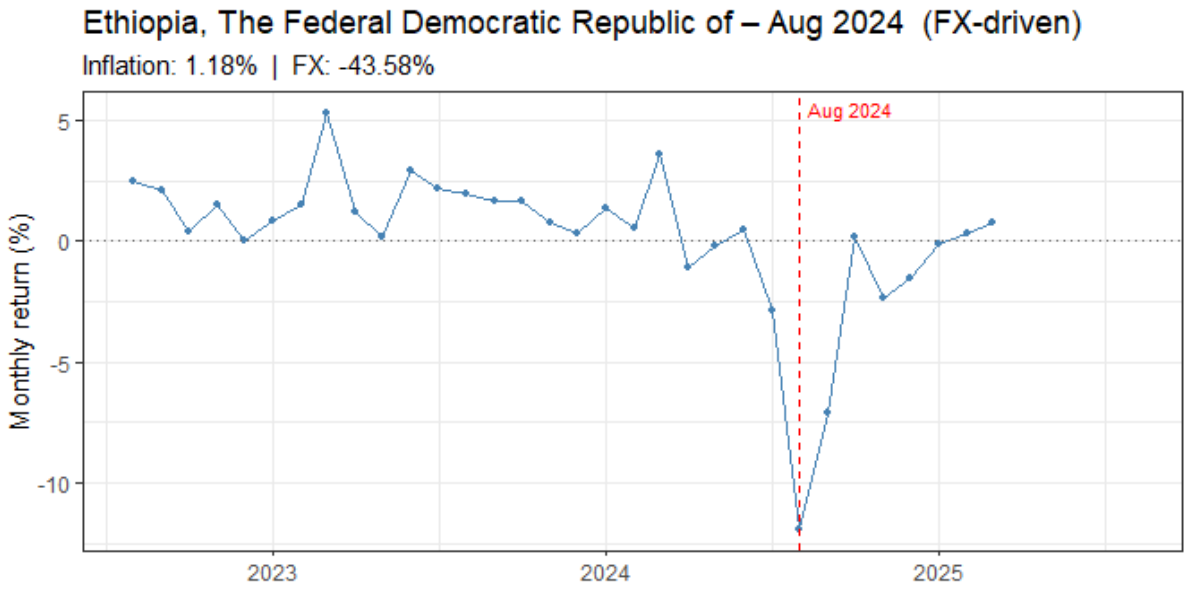
10. Appendix C: Episode Charts

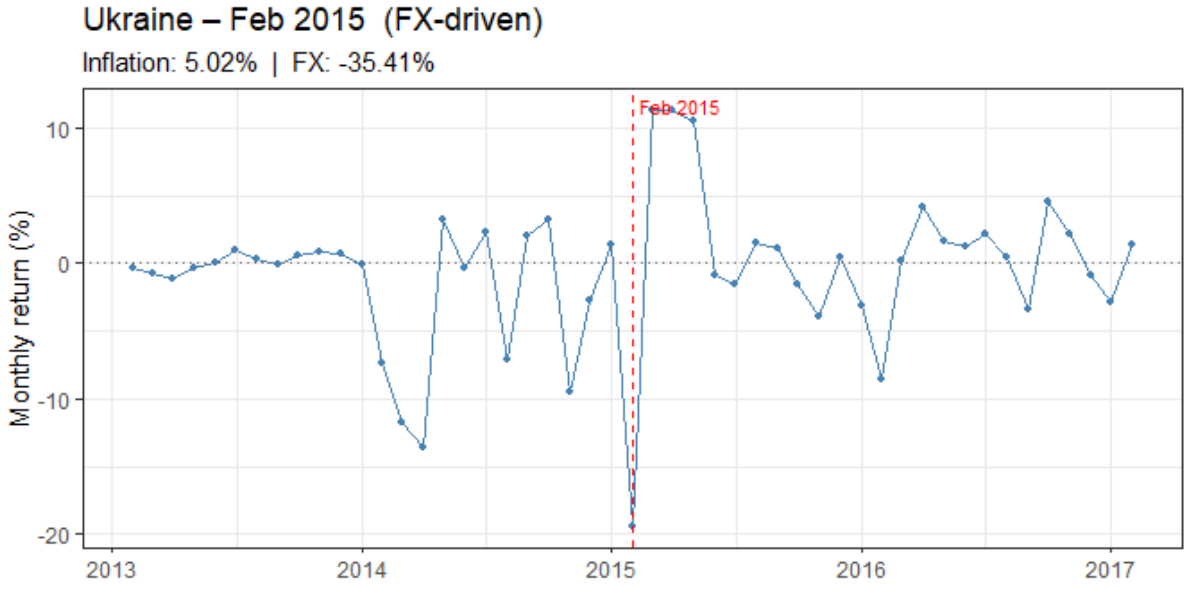
The charts below plot monthly CPI-indexed USD returns in the 24-month window around each of the top 20 episodes identified in Section 5. The red dashed vertical line marks the peak-contribution month; the driver classification (FX or inflation) and the decomposition of the return into its inflation and exchange-rate components are noted in each subtitle.

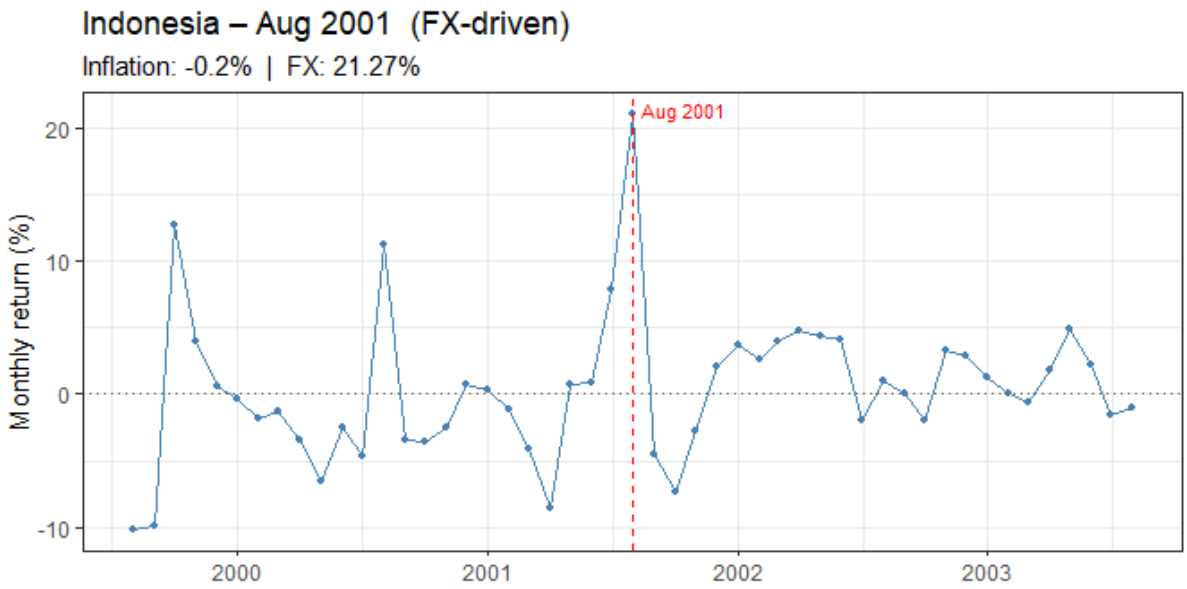


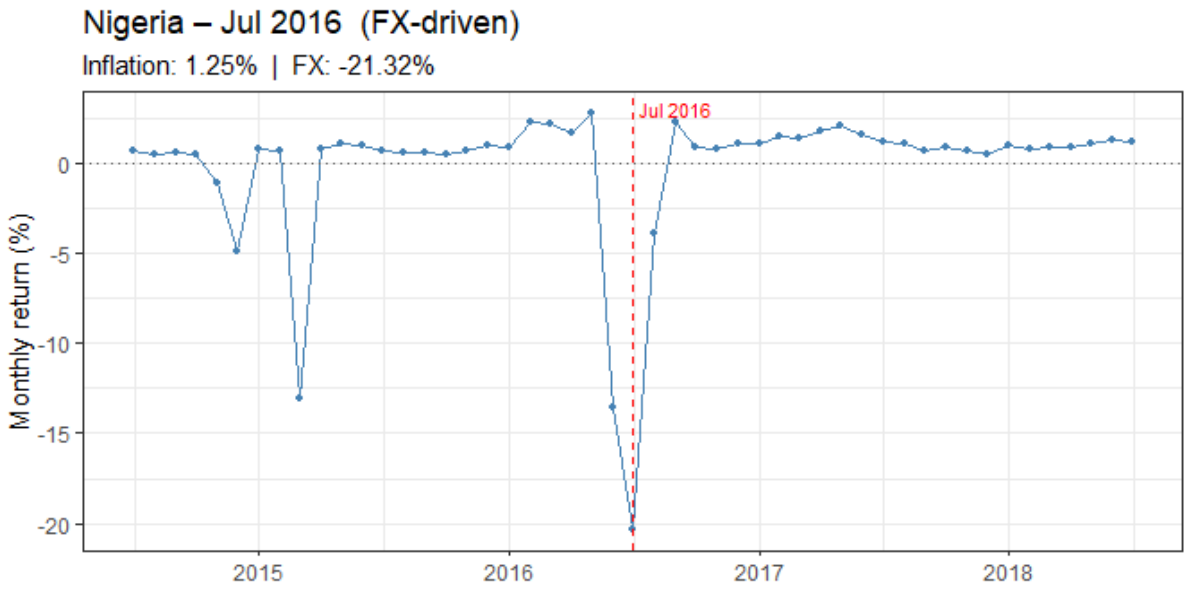


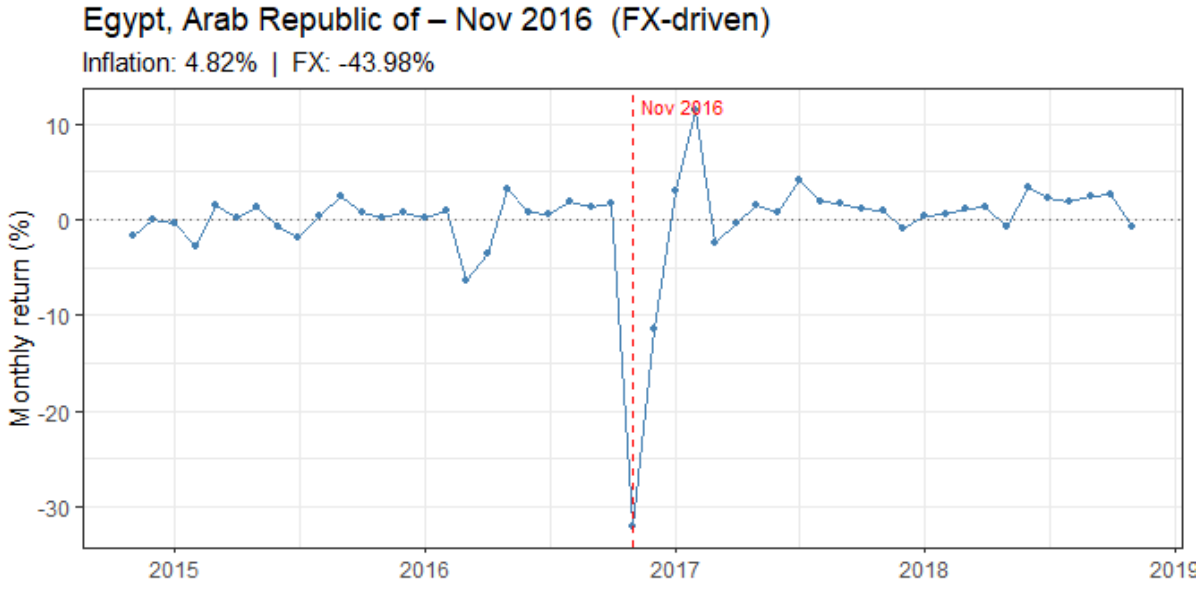

Nigeria – Feb 2024 (FX-driven)
Inflation: 3.12% | FX: -37.28%
Feb 2024
Monthly return (%)
10
0
-10
-20
2022
2023
2024
2025

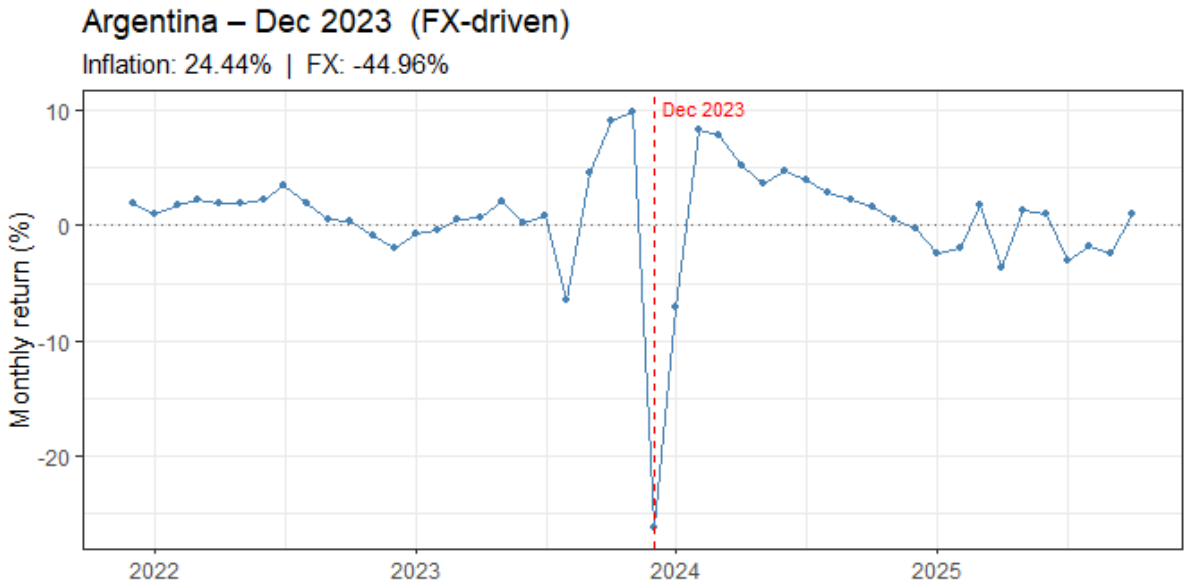

Ethiopia, The Federal Democratic Republic of – Aug 2024 (FX-driven)
Inflation: 1.18% | FX: -43.58%
Aug 2024
Monthly return (%)
5
0
-5
-10
2023
2024
2025

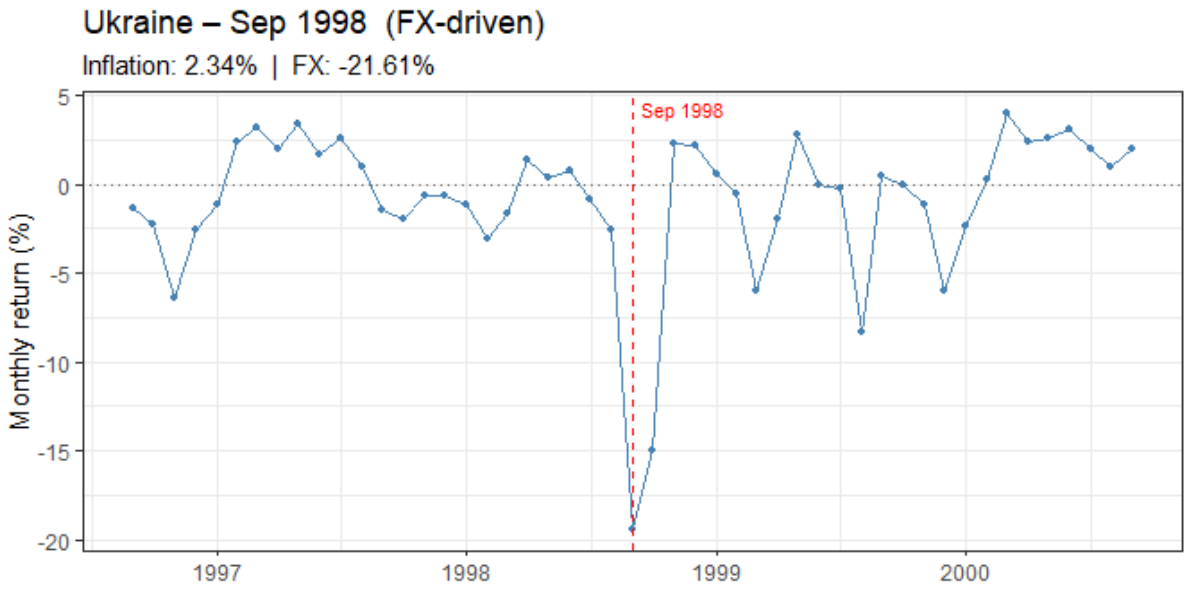

Ukraine – Feb 2015 (FX-driven)
Inflation: 5.02% | FX: -35.41%
Feb 2015
Monthly return (%)
10
0
-10
-20
2013
2014
2015
2016
2017

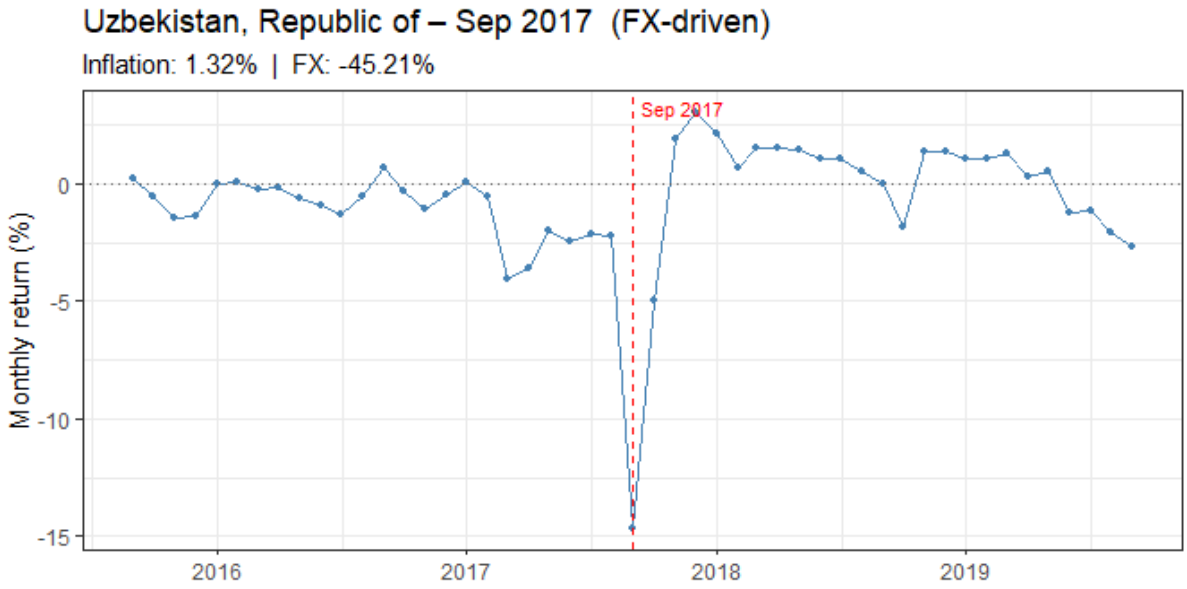

Indonesia – Aug 2001 (FX-driven)
Inflation: -0.2% | FX: 21.27%
Aug 2001
Monthly return (%)
20
10
0
-10
2000
2001
2002
2003

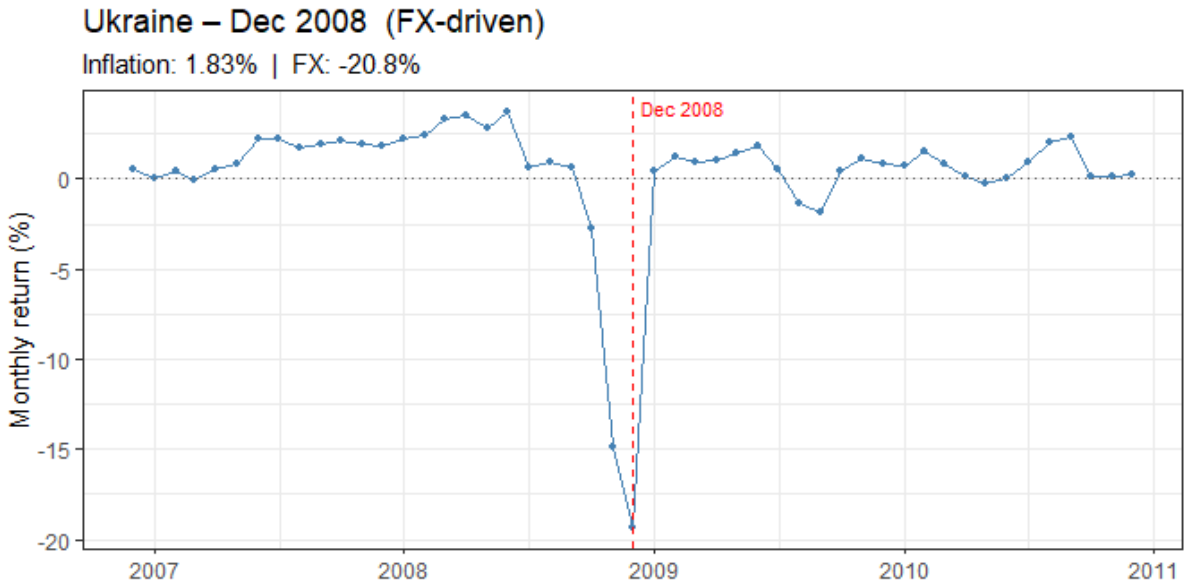

Nigeria – Jul 2016 (FX-driven)
Inflation: 1.25% | FX: -21.32%
Jul 2016
Monthly return (%)
0
-5
-10
-15
-20
2015
2016
2017
2018

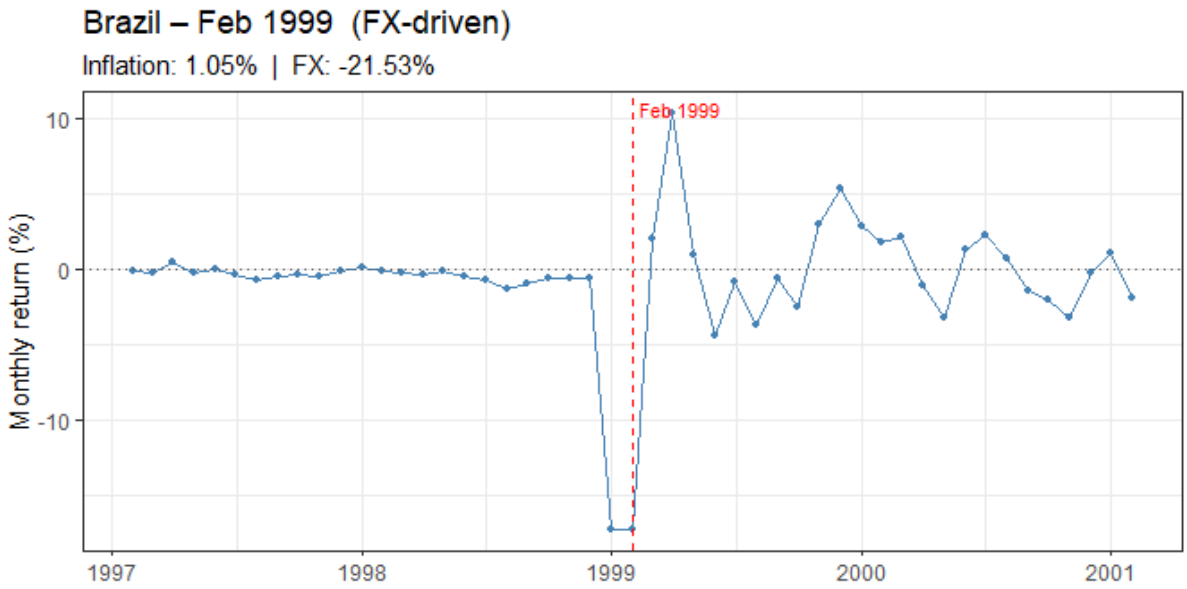

Egypt, Arab Republic of – Nov 2016 (FX-driven)
Inflation: 4.82% | FX: -43.98%
Nov 2016
Monthly return (%)
10
0
-10
-20
-30
2015
2016
2017
2018
2019

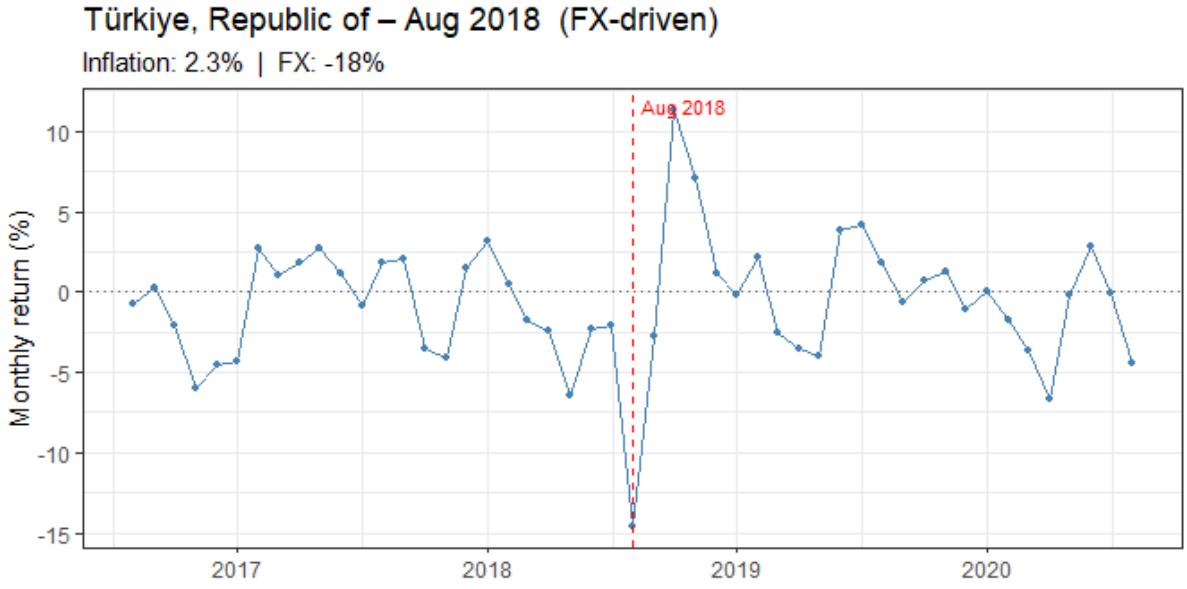

Argentina – Dec 2023 (FX-driven)
Inflation: 24.44% | FX: -44.96%
Dec 2023
Monthly return (%)
10
0
-10
-20
2022
2023
2024
2025

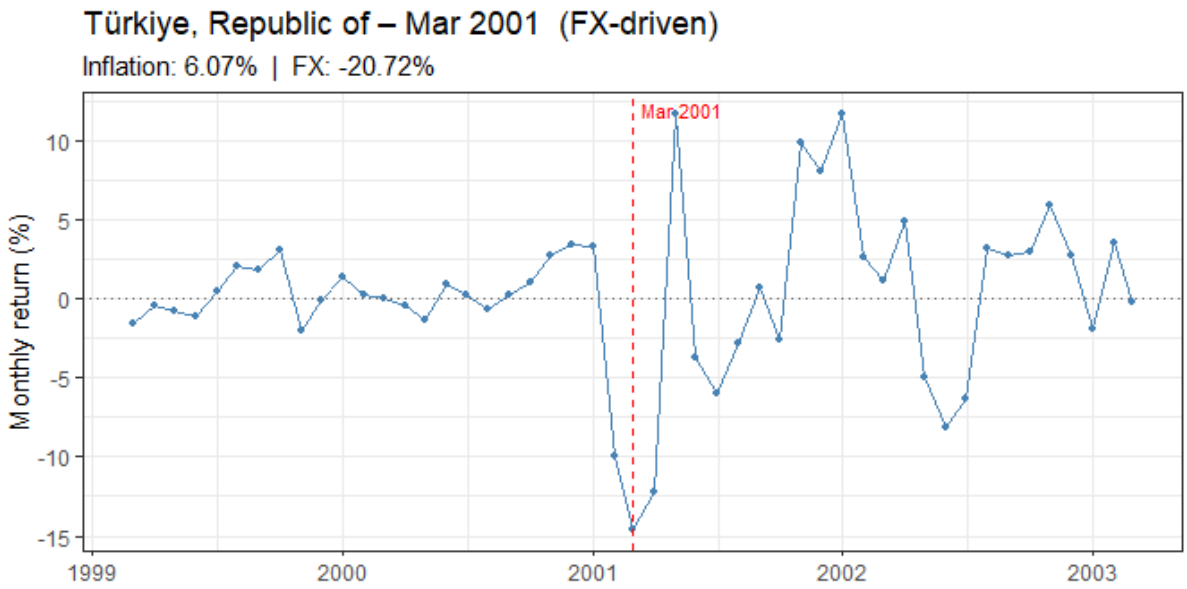

Ukraine – Sep 1998 (FX-driven)
Inflation: 2.34% | FX: -21.61%
Sep 1998
Monthly return (%)
5
0
-5
-10
-15
-20
1997
1998
1999
2000

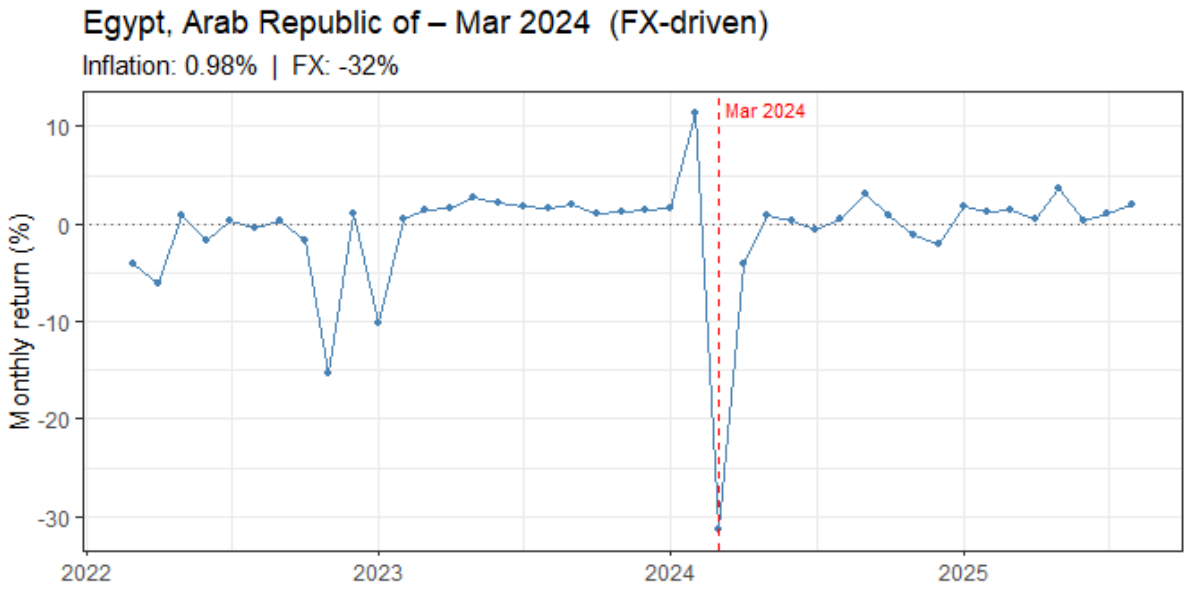

Uzbekistan, Republic of – Sep 2017 (FX-driven)
Inflation: 1.32% | FX: -45.21%
Sep 2017
Monthly return (%)
0
-5
-10
-15
2016
2017
2018
2019

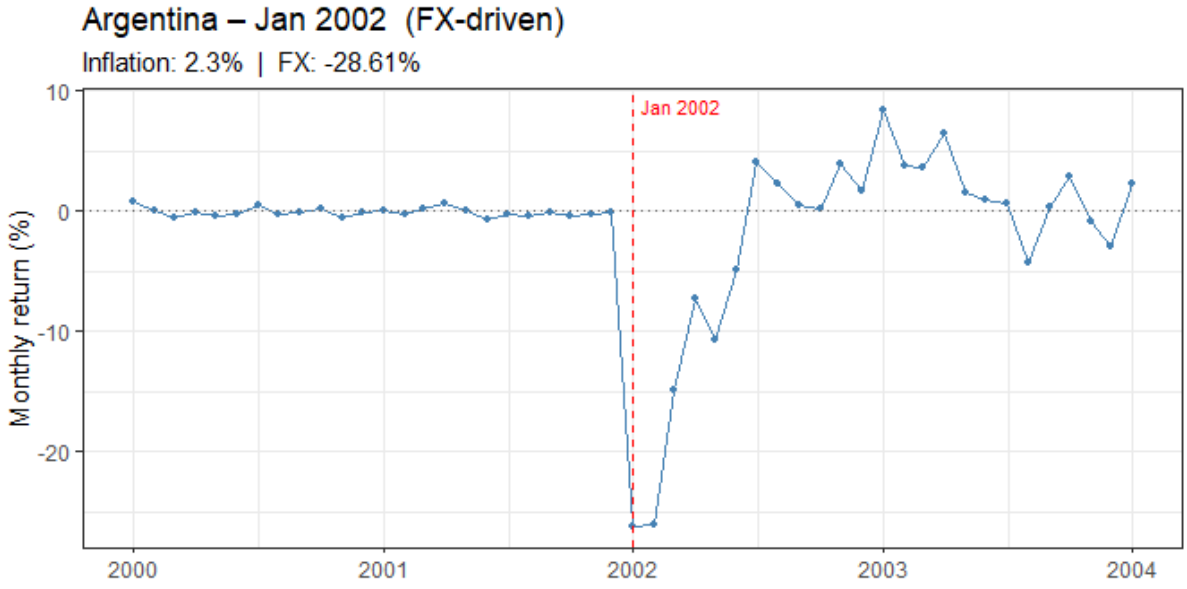

Ukraine – Dec 2008 (FX-driven)
Inflation: 1.83% | FX: -20.8%
Dec 2008
Monthly return (%)
0
-5
-10
-15
-20
2007
2008
2009
2010
2011

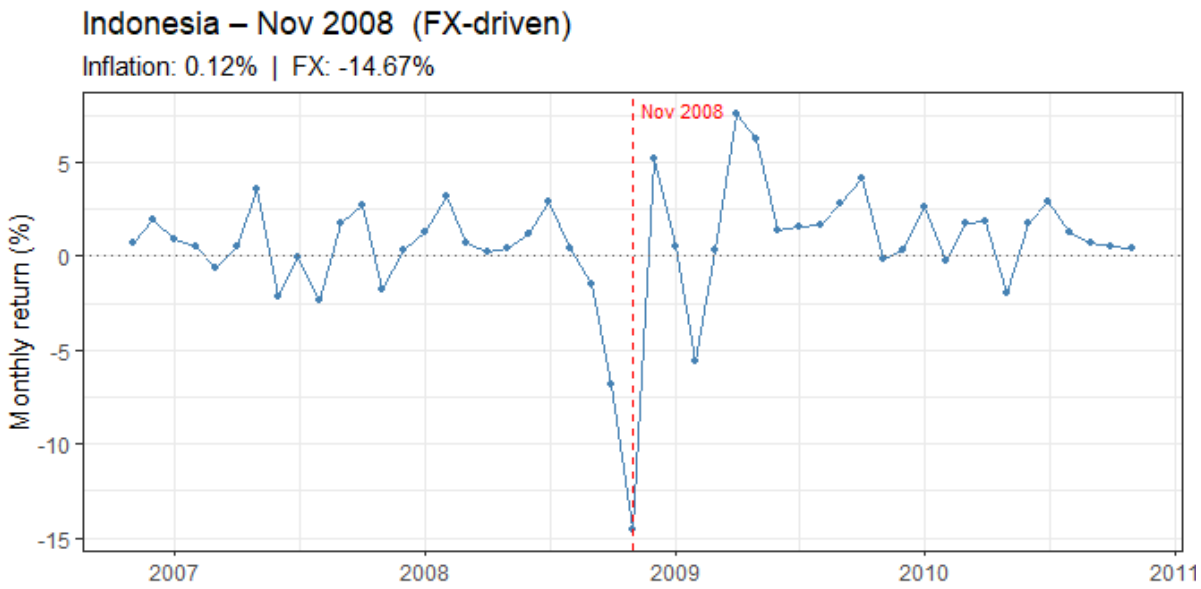

Brazil – Feb 1999 (FX-driven)
Inflation: 1.05% | FX: -21.53%
Feb 1999
Monthly return (%)
10
0
-10
1997
1998
1999
2000
2001

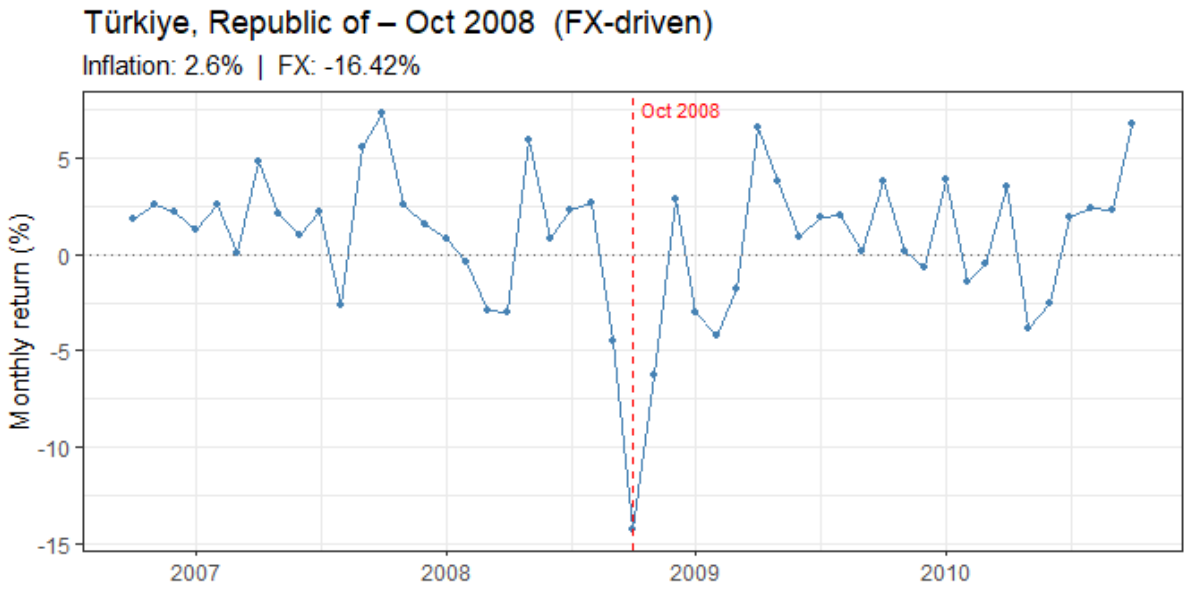

Türkiye, Republic of – Aug 2018 (FX-driven)
Inflation: 2.3% | FX: -18%
Aug 2018
Monthly return (%)
10
5
0
-5
-10
-15
2017
2018
2019
2020

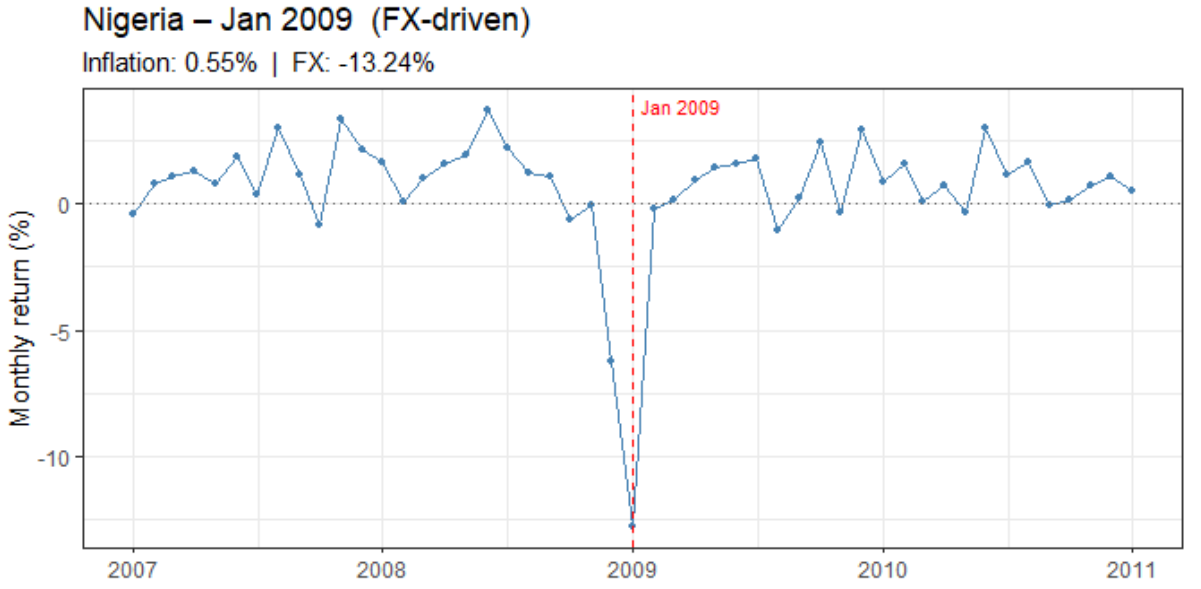

Türkiye, Republic of – Mar 2001 (FX-driven)
Inflation: 6.07% | FX: -20.72%
Mar 2001
Monthly return (%)
10
5
0
-5
-10
-15
1999
2000
2001
2002
2003


Egypt, Arab Republic of – Mar 2024 (FX-driven)
Inflation: 0.98% | FX: -32%
Mar 2024
Monthly return (%)
10
0
-10
-20
-30
2022
2023
2024
2025


Argentina – Jan 2002 (FX-driven)
Inflation: 2.3% | FX: -28.61%
Jan 2002
Monthly return (%)
10
0
-10
-20
2000
2001
2002
2003
2004


Indonesia – Nov 2008 (FX-driven)
Inflation: 0.12% | FX: -14.67%
Nov 2008
Monthly return (%)
5
0
-5
-10
-15
2007
2008
2009
2010
2011


Türkiye, Republic of – Oct 2008 (FX-driven)
Inflation: 2.6% | FX: -16.42%
Oct 2008
Monthly return (%)
5
0
-5
-10
-15
2007
2008
2009
2010


Nigeria – Jan 2009 (FX-driven)
Inflation: 0.55% | FX: -13.24%
Jan 2009
Monthly return (%)
0
-5
-10
2007
2008
2009
2010
2011

Source: Authors' calculations based on IMF International Financial Statistics, Economist Intelligence Unit, and national statistical agencies.