I Don't Want Your Dollars: Reverse Speculative Attacks and the Collapse of Bretton Woods (1971–1973)*

Patricio Goldstein
Columbia University

Andy Neumeyer†
Universidad Torcuato Di Tella

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Abstract

We interpret the 1971–1973 collapse of Bretton Woods as a sequence of reverse speculative attacks driven by the incompatibility of asymmetric monetary policies, capital mobility, and fixed dollar parities. In a two-country model with faster US domestic credit growth and no US foreign-exchange intervention, the peg survives only while foreign central banks absorb the excess supply of dollars as international reserves. A ceiling on their dollar holdings triggers the attack: reserves accumulate abroad rather than run down in the US. The model matches the crises' timing and reserve and inflation dynamics; archival evidence supports this interpretation, which extends to the 1992–1993 EMS crises.

Keywords: reverse speculative attacks; Bretton Woods; balance-of-payments crises; central bank balance sheets; monetary policy spillovers; international monetary system; trilemma.

JEL Codes: E42, E51, E58, F31, F32, F33, N10.

*†Corresponding author. Neumeyer: Universidad Torcuato di Tella (pan@utdt.edu). Goldstein: Columbia University (pmg2146@columbia.edu). Replication code and data are available here. We thank Fernando Alvarez, Michael Bordo, Markus Brunnermeier, Giovanni Dell'Ariccia, Jeffry Frieden, Owen Humpage, Akira Ishide, Harold James, Alain Naef, Juan Pablo Nicolini, Maury Obstfeld, Kurt Schuler, Alan Taylor, Silvana Tenreyro, and Ryland Thomas, as well as seminar participants at the IMF and the 2026 Society for Economic Dynamics Annual Meeting, for helpful discussions and assistance with historical sources. We also thank Yuma Iwata for excellent research assistance. We are grateful to the Bundesbank, the Bank of Japan, and the Swiss National Bank for assistance with historical archives. We thank Marcus Wolf for permitting us to reproduce the Fritz Wolf caricature.

I Introduction

In the spring of 1971, the collapse of the Bretton Woods system did not begin through a formal declaration but through a sudden breakdown. In the first three months of the year, the Deutsche Bundesbank purchased roughly 2 billion US dollars (USD) to defend the mark's parity; in April, it purchased another billion.[1] Pressure then intensified sharply: a billion dollars was added to the Bundesbank's balance sheet on May 3 and 4 alone, and in the first 40 minutes of trading on May 5, the Bundesbank was compelled to purchase an additional billion. At that point, foreign-exchange operations were suspended, and the mark peg was abandoned (Bordo et al., 2015b).

A few months later, Japan experienced a similar dynamic. Between January and July 1971, the Bank of Japan accumulated roughly USD 4 billion in foreign reserves. Following the Nixon Shock, which formally suspended official dollar convertibility into gold on August 15, speculative inflows intensified: in the next two weeks, the Bank of Japan absorbed an additional 4 billion, including 1.3 billion in the two days following the announcement (James, 1996). By the end of the month, Japan had also abandoned its peg. New parities among major economies were negotiated in December 1971 under the Smithsonian Agreement, but the respite proved short-lived. A fresh wave of speculative attacks in February–March 1973 dealt the final blow to the international monetary order agreed at Bretton Woods in 1944, and ushered in the era of generalized floating.

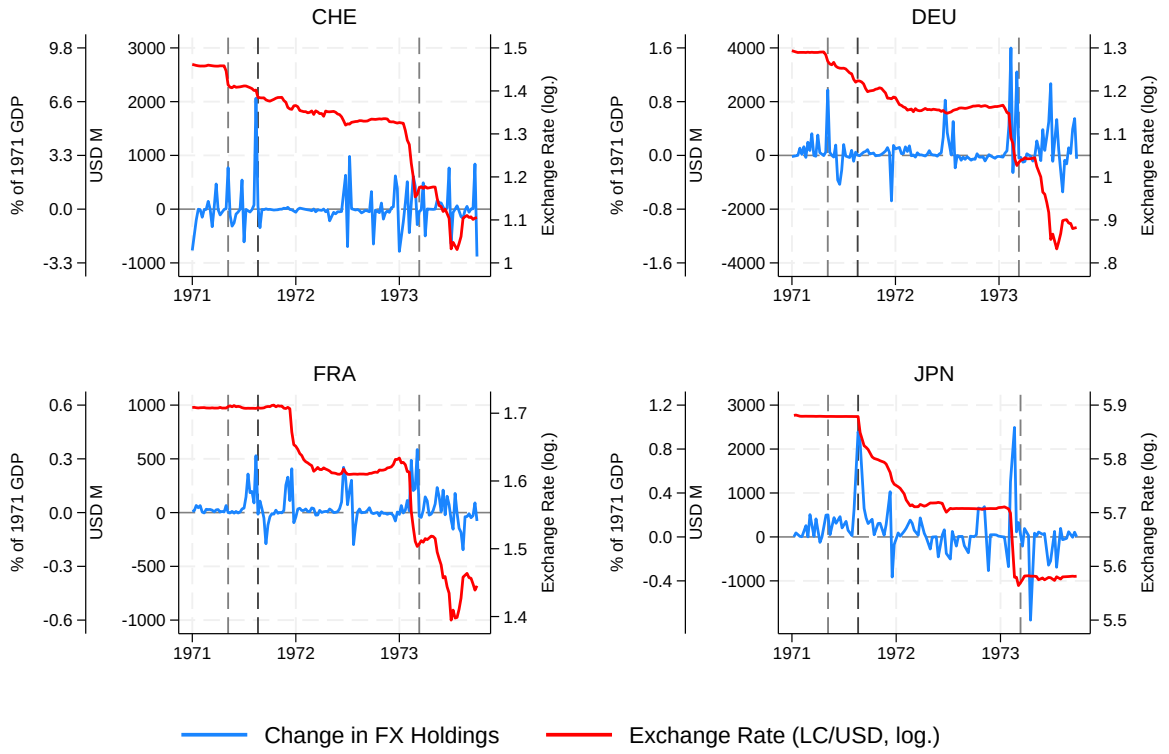
The end of the Bretton Woods system is one of the most consequential episodes in 20th-century international monetary history. In this paper, we interpret its collapse as a sequence of speculative attacks on the US dollar that took place between May 1971 and March 1973. During these attacks, investors sold their USD positions to non-US major central banks at the pegged exchange rate. We argue that the massive scale of US dollar purchases and the resulting accumulation of currency risk on central bank balance sheets triggered the abandonment of the fixed exchange rate system, which had sustained monetary stability in the postwar era. Figure 1 documents this directly: each panel shows weekly changes in central bank foreign exchange holdings alongside the log exchange rate for major partner economies. Large spikes in reserve accumulation coincide precisely with the May and August 1971 crisis episodes and again in March 1973.[2] The counterpart of these reserve movements was private capital flows, not current account imbalances. The United States ran a current account surplus in every year between 1960 and 1970; even in 1971–1973, quarterly shortfalls never exceeded 0.5% of GDP.[3] The dollar balances absorbed by partner central banks reflected private portfolio reallocations rather than a trade-driven supply of dollars. At the time, the rapidly expanding Eurodollar market made offshore dollar claims highly substitutable for partner-currency deposits, enabled by a sharp rise in de facto international capital mobility throughout the 1960s despite the formal persistence of capital controls (Obstfeld and Taylor, 2004).

[1] Authors' calculations from Bundesbank and Bank of Japan balance-sheet data; see Figure 1. Germany's and Japan's GDPs in 1970 were each approximately USD 220 billion, so every billion dollars purchased by their respective central banks represented about 0.5% of GDP.

[2] The same pattern extends to the other advanced economies, as documented in Appendix Figure A.1.

[3] See Appendix Figure A.2.

Figure 1: Weekly Changes in Central Bank Foreign Exchange Holdings

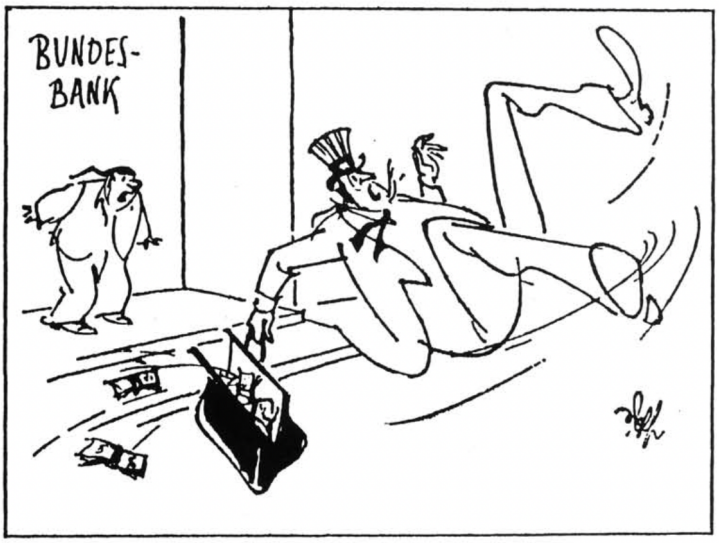


Sources: Schweizerische Nationalbank, Deutsche Bundesbank, Baubeau (2018), Bank of Japan, BIS, World Bank WDI. Dashed lines represent the May 1971 DEM float, August 1971 Nixon Shock, and March 1973 G-10 float. The figure combines weekly changes in foreign-exchange assets drawn from central bank balance sheets with reported intervention (purchase) data when available. Exchange rates are quoted as local currency units per USD; a fall denotes a revaluation of the local currency.

Our narrative is guided by a two-country model of speculative attacks that extends the seminal contribution of Krugman (1979). Under free capital mobility, divergent rates of domestic credit expansion across countries generate persistent pressures on central bank balance sheets, which eventually trigger a speculative attack that ends the exchange rate peg. We depart from Krugman's model by considering reverse speculative attacks; that is, attacks in which the strong-currency country is the target. We assume that a tight-money, strong-currency country can temporarily defend the peg through reserve accumulation, while the anchor country—the loose-money side—does not intervene in the foreign exchange market. An upper bound on the reserve stock of the weak currency held by the strong-currency central bank drives speculators' incentives to run on the currency peg. The model characterizes monetary and price dynamics before, during, and after a reverse speculative attack. Consistent with our empirical framing, monetary policy is neutral with respect to the real allocation: the trade balance and the current account are constant; the entire mechanism operates through the capital account. We support this interpretation with historical evidence from central bank balance sheets and foreign exchange interventions. We also document how a similar mechanism operated in the 1992–1993 crises of the European Monetary System.

This interpretation closely mirrors how policymakers themselves understood the events. Partner countries' central banks recognized the incompatibility of fixed exchange rates, divergent monetary policies, and free capital mobility; identified US domestic credit expansion as the driving force; and explicitly acknowledged a binding limit on their willingness to continue accumulating dollar reserves. The limit on the European and Japanese central banks' appetite for US dollar reserves is illustrated in the Fritz Wolf cartoon in Figure 2. The US side of the asymmetry was captured by Treasury Secretary John Connally, who reportedly told a gathering of European finance ministers at the Rome G-10 meeting in November 1971 that "the dollar may be our currency but it's your problem" (Volcker and Gyohten, 1992, p. 81).

Figure 2: I Don't Want Your Dollars



„Ich will deine Dollars nicht!"

Source: Drawing by Fritz Wolf, originally published in *Neue Osnabrücker Zeitung* (1971); reproduced from James (1996).

We map our interpretation onto the conventional framing of the end of Bretton Woods, which, as synthesized by Bordo (1993), identifies three classic problems behind the regime's collapse: an adjustment problem (who bears the burden of correcting balance-of-payments imbalances, and through what mechanism), a liquidity problem (whether the system supplies enough reserves to finance world output growth), and a confidence problem (whether the United States could credibly honor the convertibility of outstanding dollar liabilities into gold). On the adjustment problem, we align with Bordo (1993) and Obstfeld (1993): the system's main mechanisms for correcting "fundamental" imbalances were peg realignments and capital controls, leaving it structurally prone to speculative attacks, a mechanism our model makes precise. On the liquidity and confidence problems, we depart from standard narratives. After March 1968 the dollar's gold convertibility was effectively moot, so the confidence problem became immaterial for the 1971–1973 crises; the liquidity problem, once detached from gold, reduced to the question of foreign central banks'

willingness to hold dollar reserves, precisely the margin our analysis emphasizes. Our interpretation is hence closest in spirit to the monetary imbalance view of Bordo (2020), which identifies monetary expansion as the fundamental source of growing international pressures.[4]

Our interpretation centers on the mechanics by which divergent monetary stances across countries brought the system down. Under the peg, goods-market arbitrage tied inflation rates together across countries, with the common inflation rate governed by the global money supply. As US monetary expansion outpaced domestic dollar demand, the excess liquidity spilled across borders, forcing partner central banks to absorb the excess dollars through reserve accumulation and endogenously expand their own money supplies. The regime hence transmitted US credit expansion directly to foreign economies and resulted in a higher inflation rate. At the same time, foreign central banks accumulated currency risk on their balance sheets: long in depreciating dollars, short in their own appreciating currencies. The existence of a limit on the US dollar reserves that partner central banks would tolerate was sufficient to render collapse inevitable. Neither real variables nor rigidities played a significant role in the system's demise.

A precedent for applying this framework to Bretton Woods is Garber (1993), who proposed a model of speculative attacks to explain the breakdown of the dollar-gold parity. Garber's paper was not without controversy: in the published discussion, Krugman argued that speculative attack models were parables for capital flight in Latin America and were not useful for analyzing Bretton Woods, which he saw as driven by the adjustment problem rather than liquidity issues. Garber disagreed, contending that the two are not mutually exclusive: "What leads to a speculative attack is that there is a limit on the amount of financing that the monetary authority is willing to use to maintain the fixed exchange rate system". Our analysis vindicates Garber's position by supplying the formal two-country apparatus his intuition called for, in a setting in which only the strong-currency central bank intervenes in the foreign exchange market while the weak-currency country does not—an asymmetry that mirrors the institutional architecture of Bretton Woods.

A large historical literature analyzes the end of the Bretton Woods regime, with Bordo (1993) a natural starting point, followed by work analyzing the system's internal inconsistencies, adjustment failures, and political economy dimensions (Angel, 1991; James, 1996; Schenk, 2010; Bordo and Eichengreen, 2013; Bordo et al., 2015a,b; Bordo, 2020; Garten, 2021; Naef, 2022). We add to this literature by elucidating through a theoretical model the role of reverse speculative attacks in the critical episodes of 1971–1973 and by providing new empirical evidence consistent with this mechanism. The analysis complements contemporaneous policy accounts, archival sources, and retrospective memoirs that document the constraints faced by policymakers during the system's final years (Emminger, 1986; Silber, 2012; Volcker and Harper, 2018).

The theoretical literature on speculative attacks descends from the canonical first-generation framework of Krugman (1979), recast by Calvo (1987) as a modern dynamic general equilibrium model with optimizing agents. We extend Calvo's formulation to two countries and characterize

[4]We interpret the emphasis on inflation in the historical literature as referring to excessive domestic credit growth rather than differential inflation outcomes: as Figure 8 and Appendix Figure A.9 document, inflation rates were broadly similar across countries during the Bretton Woods period, diverging only after the system's collapse.

equilibria with *reverse* speculative attacks—in which the strong-currency country is the target. Within the same lineage, work that allows for reverse speculative attacks in one-country models begins with the "selling attacks" of Grilli (1986) and continues with Amador et al. (2016) and Amador et al. (2020).

Finally, the paper relates to the literature on endogenous selection of the international monetary system. In contrast to existing work that places the determination of regime outcomes primarily on the hegemon (Farhi and Maggiori, 2018; Gourinchas et al., 2019), this paper emphasizes a setting in which the binding constraints governing regime continuation originate in partner economies, shifting effective control over regime outcomes away from the anchor country.

The remainder of the paper is organized as follows. Section II documents the monetary and exchange rate policy environment of the period and establishes the four empirical patterns that motivate the model. Section III develops the two-country model of reverse speculative attacks, characterizes the equilibrium, provides a quantitative illustration using US, German, and Japanese data, corroborates the model's mechanisms with contemporary accounts drawn from central bank archives and policy deliberations, and shows that the same mechanism operated in the 1992–1993 crises of the European Monetary System. Section IV concludes.

II Monetary and Exchange Rate Policy: 1958–1973

The collapse of the Bretton Woods fixed exchange rate system was not a single event but the endpoint of a decade-long accumulation of monetary imbalances and increasing capital mobility. It proceeded in two stages. First, there was a run on the dollar-gold exchange rate, then a sequence of runs on the cross-country exchange rate pegs. This section documents the run on the Gold Pool before turning to the 1968–1973 trends that motivate the model in Section III.

II.1 The Gold Pool

On December 27, 1958, the core Bretton Woods countries made their currencies "convertible". Currency convertibility had been one of the Marshall Plan's founding conditionalities, and its restoration marked the Bretton Woods system's transition from postwar reconstruction to full operation. Under the system, the dollar was pegged to gold at 35 USD/oz and each partner currency to the dollar. The parallel market premia on major European currencies and the yen narrowed sharply and effectively disappeared by the early 1960s.[5] Capital controls were progressively liberalized over the course of the decade and de facto capital mobility rose well ahead of the formal removal of restrictions (Obstfeld and Taylor, 2004). Against this background, the Eurodollar market emerged and expanded rapidly in the 1960s, intermediating offshore dollar claims that circumvented the residual capital controls and interest-rate restrictions. The market provided a low-friction channel for private agents to shift between dollar and partner-currency positions: a holder of Eurodollar deposits could move into Euro-DEM deposits, the counterparty bank would

[5]See Appendix Figure A.3.

sell dollars for marks in the spot market, and the Bundesbank, committed to the parity, would stand on the other side of the trade.[6] By 1971, the external US-dollar liabilities of banks in eight European countries had climbed to USD 71 billion (McKinnon, 1977).

The gold market at the time was anchored in London, where the Bank of England intervened to defend the gold peg. To stabilize the private market price of gold, the central banks of the United States, Germany, the United Kingdom, France, Italy, Belgium, the Netherlands, and Switzerland established the London Gold Pool in 1961, committing to coordinated gold sales and purchases to absorb imbalances (Schenk, 2010, 2013; Naef, 2022). The Bank of England acted as the sole operating agent, transacting daily on behalf of all members and settling with them monthly in proportion to their quotas. The Pool itself foreshadowed the tensions that came to a head between 1968 and 1973. Had the United States been unconditionally committed to converting dollars at 35 USD/oz on demand, there would have been no need for the Pool: any central bank intervening to defend its parity could have presented its accumulated dollars at the US Treasury and obtained gold automatically. The Pool's role in stabilizing the London market price at 35 USD/oz hence reveals an implicit commitment by member central banks to hold dollars rather than convert them, and to share the cost of defending the parity by selling their own gold reserves into the private market when needed. Gavin (2004) interprets this arrangement as central to the Cold War bargain: European financial support for the dollar in exchange for US military support for European security.

Tensions surfaced whenever partner countries' central banks sought to step out of this implicit commitment, whether by selling dollars for gold in the London market—forcing the Pool to defend 35 USD/oz by selling other members' gold reserves—or by presenting dollars at the US Treasury for direct conversion (Naef, 2022). The two leading European cases of the late 1960s illustrate sharply asymmetric responses. France added roughly USD 1.5 billion of gold to its reserves between 1965 and 1966 and withdrew from the Pool in June 1967, in step with its 1966 withdrawal from NATO's integrated military command (Bordo et al., 2019). Germany, by contrast, made its acceptance of the constraint explicit. In a letter to Federal Reserve Chairman William McChesney Martin Jr. of March 30, 1967, Bundesbank President Karl Blessing wrote: "By refraining from dollar conversions into gold from the United States Treasury the Bundesbank has intended to contribute to international monetary cooperation and to avoid any disturbing effects on the foreign exchange and gold markets. You may be assured that also in the future the Bundesbank intends to continue this policy and to play its full part in contributing to international monetary cooperation" (Blessing, 1967).[7] Taken together, these episodes show that the US gold window for official transactions was

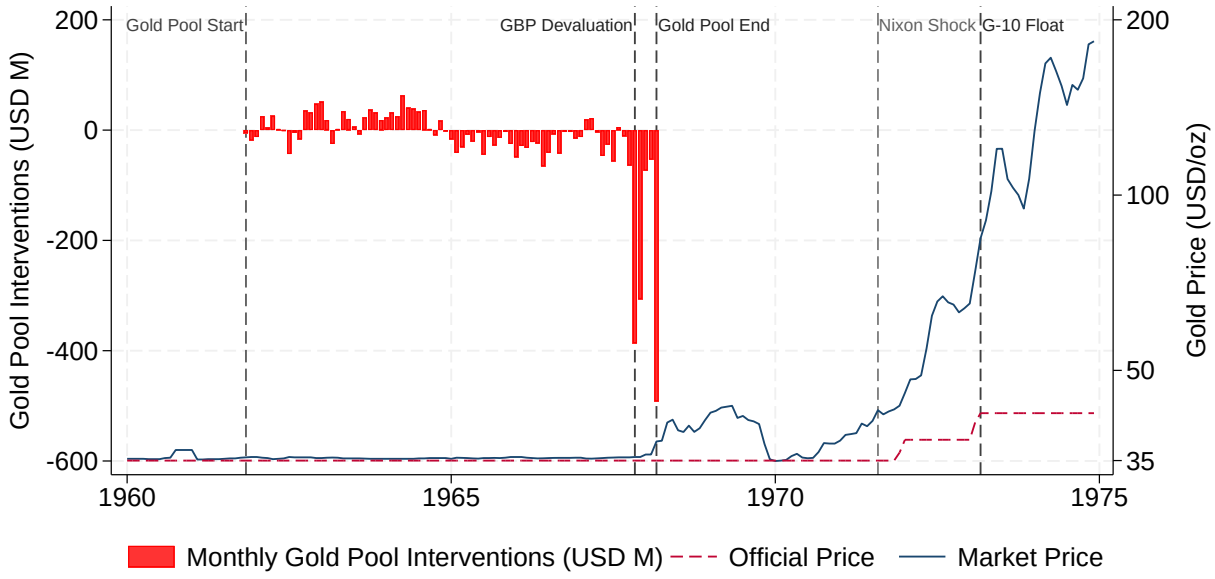
[6] "Consequently, wide interest-arbitrage incentives opened in favor of domestic European markets over both the United States money market and the Euro-dollar market, and large amounts of dollars were taken up by European borrowers—banks and nonbanks—for conversion into local currencies. German business firms in particular were heavy borrowers, but there were sizable flows to other countries as well. With many currencies at or near their upper intervention points, European central banks were obliged to absorb the dollars offered on the exchanges, which added to their international reserves while simultaneously expanding domestic liquidity and thereby tending to negate their policies of restraint" (Coombs, 1971).

[7] Zimmermann (2000) places the Blessing letter in the context of the trilateral offset negotiations between Germany, the United States, and the United Kingdom over the cost of Allied forces stationed on German soil.

never automatic—it was the object of continuous political negotiation.

The Gold Pool collapsed in March 1968 under a speculative attack of the kind later formalized by Krugman (1979), reflecting the interplay of the problems of adjustment, liquidity, and confidence identified by Bordo (1993). The high rate of domestic credit growth in the US created an excess supply of dollars, which the Pool absorbed through gold sales in the London market. This drain on the Pool's resources accelerated after sterling's devaluation in November 1967 and culminated in the run on the Pool's gold stock that forced its dissolution (Naef, 2022). Figure 3 illustrates these dynamics. In the aftermath of the crisis, a two-tier gold market arrangement formally separated the official and private gold prices, with a premium emerging in the private market. This effectively suspended dollar-gold convertibility in all but name: the US gold stock remained broadly frozen after 1968, reflecting the de facto end of gold as the system's anchor.[8] From that point on, currency cross rates remained pegged, supported by foreign-exchange interventions by partner central banks. The Nixon Shock on August 15, 1971, merely formalized the regime that followed the 1968 run. Writing in its immediate aftermath, Friedman concluded that "the official price is wholly symbolic, and so is the monetary role of gold" (Friedman, 1971a).

Figure 3: Gold Pool Interventions and the Market Price of Gold



Sources: Naef (2022) and Bank for International Settlements.

II.2 Cross-Country Pegs

We can now document four empirical patterns for the 1968–1973 period that discipline and motivate our two-country model of balance-of-payments crises. First, the United States experienced sustained monetary expansion, driven by the accumulation of net domestic assets, while net for-

[8] See Appendix Figure A.4.

eign assets remained broadly stable. Second, non-US Group of Ten (G-10) economies pursued relatively restrictive domestic credit policies; under the exchange rate peg, their monetary base expanded endogenously through the accumulation of net foreign assets.[9] Third, repeated runs on the dollar—most prominently in May 1971 and February–March 1973—took the form of sudden, large, and accelerating reserve accumulation by foreign central banks, culminating in the abandonment of the peg; that is, reverse speculative attacks. Fourth, following the transition to generalized floating, inflation rates and price levels diverged sharply across countries, marking the breakdown of the common price-level path implied by fixed exchange rates.

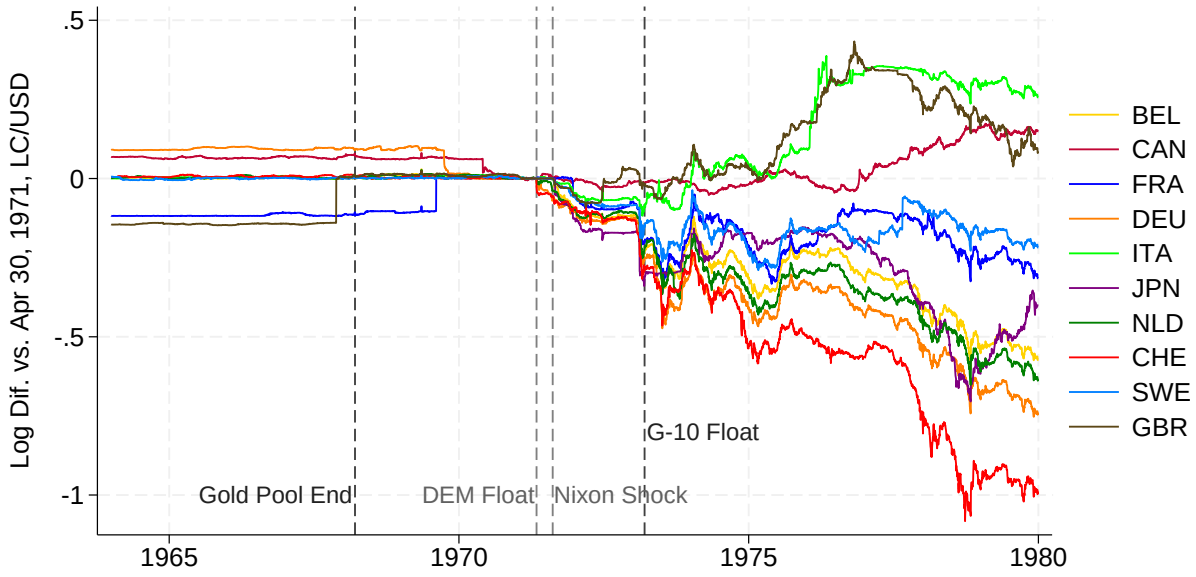
The end of Bretton Woods came as a sequence of disruptions between 1971 and 1973 that culminated in generalized floating. These events appear as sharp discontinuities in nominal exchange rates in Figure 4.[10] Parity pressures had intensified in 1969: the French franc was devalued in August, and the Deutsche Mark was revalued in October of that year. After a brief period of calm, a new wave of speculative pressures brought the regime to a crisis. As documented in the introduction, on May 5, 1971, Germany suspended foreign-exchange operations and on May 10 allowed the mark to float when markets reopened; the Netherlands, Switzerland, and Belgium followed shortly.[11] On August 15, 1971, the Nixon Shock formally suspended official gold convertibility and introduced wage and price controls alongside a temporary import surcharge. The announcement was followed by a speculative attack on the yen, which forced the Bank of Japan to abandon its peg by the end of the month. A negotiated realignment followed in December 1971 under the Smithsonian Agreement, which "formalized what foreign exchange markets had already in large part delivered" (Irwin, 2013). The agreement devalued the dollar against other currencies through a devaluation against gold (from 35 to 38 USD/oz), reset central parities, and widened intervention bands. By this point, however, the gold parity was largely symbolic: with dollar-gold convertibility suspended, the Smithsonian realignment was less a restoration of the Bretton Woods architecture than a managed step toward floating exchange rates. The new pegs proved short-lived, and by February 1973 the system again came under attack. The United States devalued the dollar a second time, to 42.22 USD/oz on February 12. Japan floated within days, and on March 16 a G-10 communiqué formally accepted the temporary floating arrangements that effectively marked the end of the Bretton Woods system.

[9] The Group of Ten is a group of countries that have participated since 1962 in the General Arrangements to Borrow, an agreement to provide liquidity to the International Monetary Fund (IMF), and included initially the United States, the United Kingdom, Belgium, Canada, France, Italy, Japan, the Netherlands, and the central banks of West Germany and Sweden. Switzerland became an associate after 1964.

[10] See zoomed views of the key windows in Appendix Figure A.5 and the corresponding real exchange-rate movements in Appendix Figure A.6.

[11] Contemporary observers disagreed on whether the May 1971 episode was best understood as a "mark crisis" reflecting idiosyncratic German conditions or as a more general crisis of confidence in the dollar (Yeager, 1976, p. 512). Writing in May 1971, Friedman argued that the absence of simultaneous flight into the franc, sterling, or yen pointed to a German-specific episode (Friedman, 1971b).

Figure 4: Nominal Exchange Rate (LC/USD), Daily (1964–1979)



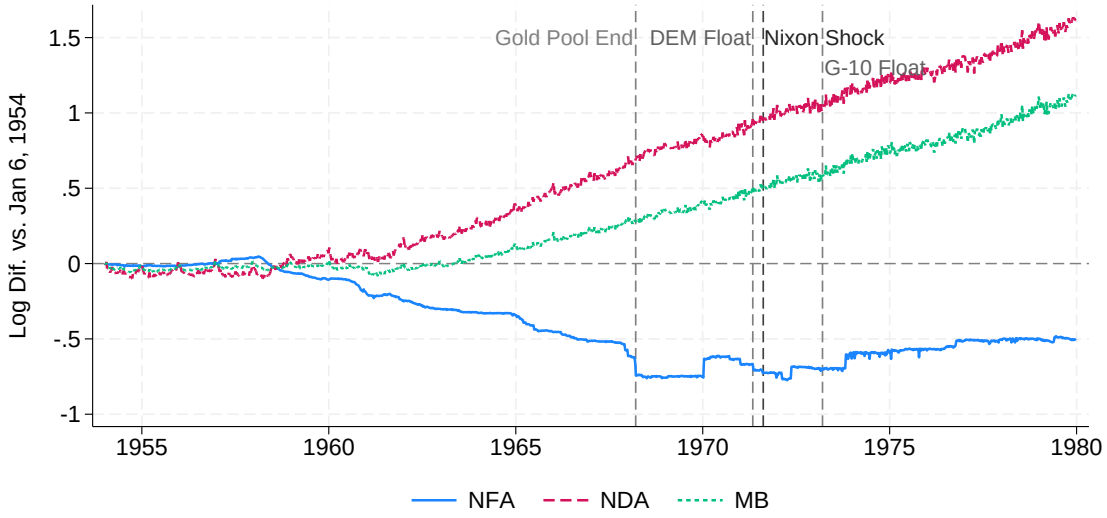
Source: Bank for International Settlements. Missing daily observations are filled forward using the last available rate. A positive log change represents a nominal appreciation of the US dollar vis-à-vis the currency indicated in the legend.

Figure 5 documents the monetary pressures that preceded the collapse. From the early 1960s onward, the Federal Reserve's net domestic assets expanded steadily. Net foreign assets fell through the Gold Pool era as gold reserves were drawn down, then stabilized after March 1968 when the Pool dissolved and gold convertibility was effectively suspended. The expansion in domestic credit not only was large in absolute terms but also proceeded at a pace that exceeded that of most partner economies. Table 1 documents the asymmetry in domestic credit growth across G-10 economies.[12] Each entry reports domestic credit growth estimated over two windows: the last Bretton Woods decade (1964–1973) and the post-Gold Pool period (1968–1973). For the United States, parentheses report Newey–West standard errors; for all other countries, parentheses report the *t*-statistic for the one-sided test that US domestic credit growth exceeds that of the comparator country, based on Driscoll–Kraay standard errors from a pooled two-country regression. US net domestic assets grew at roughly 8% per year in log terms, or around 4–4.6% when correcting for real GDP growth. Germany and Japan, the two countries at the center of the 1971 crises, show growth-adjusted differentials of roughly 5–6 percentage points for Germany and 6–9 percentage points for Japan across the two windows, significant at the 10% level or better. The post-Gold Pool window produces larger differences in credit growth for France, the United Kingdom, and Sweden, reflecting the relative acceleration of US monetary expansion in the late 1960s. Canada and Italy are notable exceptions: Canada shows a near-zero growth-adjusted differential of 0.3

[12]The Netherlands and Switzerland are excluded because their NDA levels are negative over part of the sample, precluding a log-linear trend estimation. As Figure 6 and Appendix Figure A.8 show, NDA growth during this period is negative in the Netherlands and approximately zero in Switzerland; including them would only reinforce the cross-country pattern.

percentage points in the later window, while Italy's domestic credit growth outpaced even that of the United States over both periods. Consistent with the model in Section III, Canada experienced no speculative pressure on its dollar parity (it abandoned its peg in May 1970), while Italy faced runs against the lira rather than the dollar.

Figure 5: US Federal Reserve — Weekly Balance Sheet



Source: Bao et al. (2018).

Table 1: Net Domestic Assets Growth

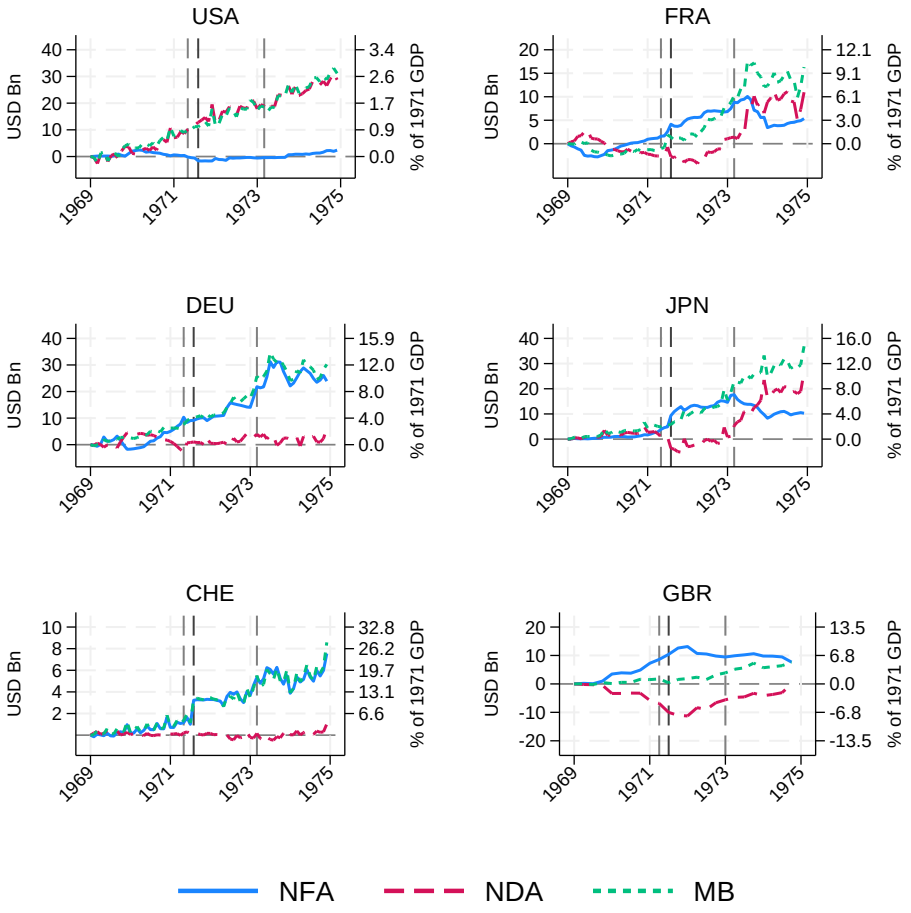
		1964–1973		1968–1973	
	Min. Year	NDA (log)	Growth-Adjusted	NDA (log)	Growth-Adjusted
BEL	1968	-0.1132***	-0.1689***	-0.1132***	-0.1689***
		(8.60)	(9.25)	(8.79)	(9.76)
CAN	1964	0.0664***	0.0172***	0.0903	0.0430
		(2.33)	(3.65)	(-1.44)	(0.49)
DEU	1968	0.0371	-0.0110*	0.0371	-0.0110**
		(1.26)	(1.47)	(1.28)	(1.68)
FRA	1964	0.0897	0.0371	0.0345*	-0.0224***
		(-0.90)	(0.30)	(1.63)	(2.43)
GBR	1964	0.0015***	-0.0306***	-0.0781***	-0.1125***
		(4.84)	(4.31)	(5.02)	(5.02)
ITA	1964	0.1555	0.1047	0.1952	0.1484
		(-9.38)	(-8.13)	(-17.52)	(-15.60)
JPN	1965	0.0662	-0.0154**	0.0211	-0.0440**
		(0.52)	(1.96)	(1.22)	(1.86)
SWE	1964	0.0869	0.0525	-0.0128***	-0.0494***
		(-0.32)	(-0.67)	(2.77)	(2.84)
USA	1964	0.0810***	0.0401***	0.0806***	0.0464***
		(0.0016)	(0.0016)	(0.0024)	(0.0024)

Source: IMF Monetary and Financial Statistics (central bank balance sheets) and World Bank World Development Indicators (GDP). NDA is computed as reserve money minus net foreign assets. For each country c we estimate $\log \mathrm{NDA}_{c,t} = \alpha_c + \theta_c t + \varepsilon_{c,t}$ by OLS and report the annualized trend $\hat{\theta}_c$ (multiplied by 12 for monthly data, or 4 for quarterly data, the latter for the United Kingdom only). "Min. Year" reports the first year of reliable NDA data for each country; estimation windows begin at the later of the window start and the Min. Year year (e.g., the 1964–1973 estimates for Belgium and Germany are based on 1968–1973 data, and Japan's on 1965–1973). The growth-adjusted column reports $\hat{\theta}_c - g_c$, where g_c is the average annual real GDP growth rate over the same window, computed from WDI annual data at the window endpoints. For the United States, parentheses report Newey–West standard errors. For all other countries, parentheses report the t-statistic for the one-sided test $H_0\colon \theta_{\mathrm{US}} \le \theta_c$ against $H_1\colon \theta_{\mathrm{US}} > \theta_c$, based on Driscoll–Kraay standard errors from a pooled two-country regression with the United States; $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

As Bordo (2020) emphasizes, the central tension of the Gold Pool period was the difficulty of reconciling the US monetary expansion with the external constraint of gold convertibility—a tension that ultimately broke in the speculative attack on the dollar-gold peg. After 1968, with gold convertibility suspended and the US no longer intervening in foreign exchange markets, the Bretton Woods system had entered its final phase as a dollar-peg system sustained entirely by foreign central banks' willingness to accumulate dollar reserves. The United States and partner central banks deployed a range of tools to prolong this arrangement, including expanded forward market operations, an enlarged network of Federal Reserve swap lines, and the creation of Special Drawing Rights, but none addressed the underlying monetary inconsistencies driving reserve

accumulation (Bordo et al., 2015a,b). With US domestic credit expanding faster than in other major economies and US net foreign assets barely declining after the end of the Gold Pool, parities could be maintained only if partner countries' central banks absorbed dollar inflows by accumulating foreign assets, so that their net foreign assets rose even as US gold losses slowed. This is exactly what the data show. Figure 6 documents a marked rise in net foreign assets for the major G-10 economies, most notably France, Germany, Japan, Switzerland, and even the United Kingdom, both in levels and as a share of GDP. A similar pattern is evident for Belgium, the Netherlands, and Sweden, but less so for Canada and Italy.[13] These inflows continued to sustain the parities through large-scale reserve accumulation by partner countries until 1973, when speculative pressures finally triggered the major partner countries' decision to float.

Figure 6: G-10 Central Banks' Balance Sheet (1969–1974)



Sources: IMF Monetary and Financial Statistics; BIS (exchange rates); World Bank WDI (GDP). Balance-sheet variables are expressed as changes relative to the base year and scaled by 1971 GDP (in current USD). Dashed lines represent the May 1971 DEM float, August 1971 Nixon Shock, and March 1973 G-10 float.

Monthly data on official foreign exchange reserves provide more direct evidence of reverse

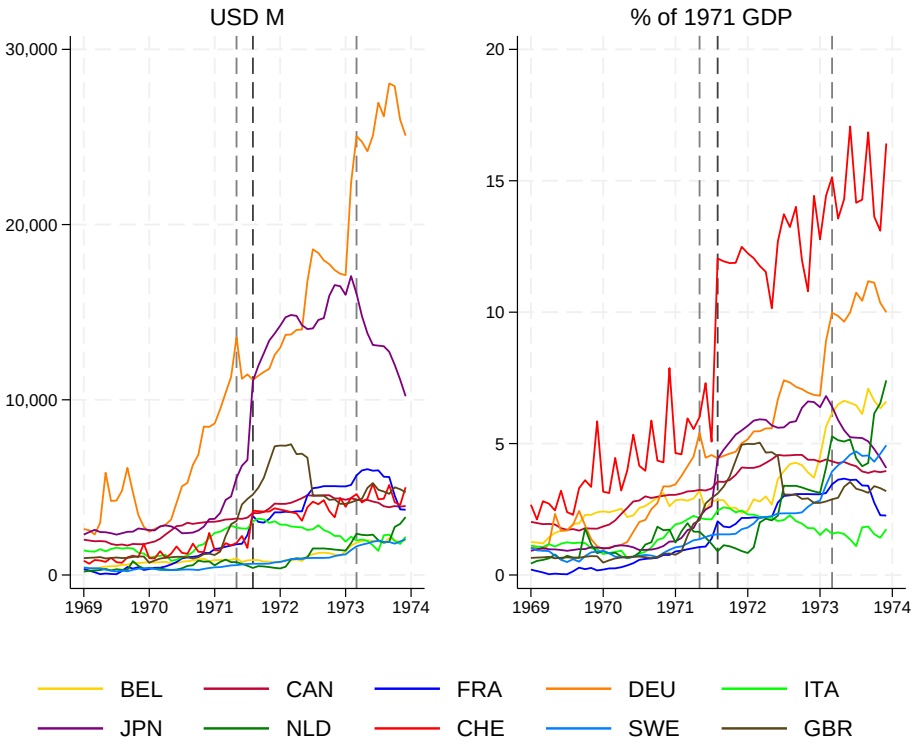
[13] See Appendix Figure A.7 and Appendix Figure A.8.

speculative attacks in the final phase of Bretton Woods. Figure 7 shows sharp increases in reserve holdings around the major regime disruptions.[14] Foreign exchange reserves surged in Germany in the months preceding the May 1971 suspension of intervention and float of the Deutsche Mark, consistent with capital inflows betting on revaluation. Similar reserve surges occur for Japan and other major economies immediately following the August 1971 Nixon Shock, as well as again in early 1973 after the February devaluation of the dollar against gold and before the G-10 decision to float. When scaled by GDP, the magnitude of these inflows is striking for smaller economies such as Belgium, the Netherlands, and Switzerland, indicating that the speculative pressures associated with the collapse of the system were not confined to its largest members but were broadly shared across the G-10. Moreover, spot reserve changes understate the scale of intervention, since central banks also absorbed dollars through forward operations. The Bundesbank's own records put its outstanding forward-dollar book at the May 1971 float at DM 9,816 million, about USD 2.7 billion.[15]

[14] Reserves were not exclusively in US dollars, but the dollar dominated official reserve portfolios during this period: in 1970 about 74% of global currency reserves were held in dollars, rising to 76% by 1973 (Eichengreen et al., 2018).

[15] *Deutsche Bundesbank*, Scholl, "Bemerkungen zu einigen Wechselkursfragen," May 17, 1971, § VIII (Historisches Archiv der Deutschen Bundesbank, B330/21812). The memorandum decomposes the book by counterparty—DM 1,961 million contracted through the Federal Reserve Bank of New York acting for Bundesbank account, DM 2,227 million under swaps with German commercial banks, and DM 5,628 million in outright forward purchases—and by maturity: DM 1,961 million falling due in June, DM 7,414 million in July and DM 441 million in August 1971. Converted at the April 1971 average rate of 3.63 DM/USD this is USD 2.70 billion, reproducing the figure reported contemporaneously by Coombs (1971). The German original is reproduced in Appendix A.5.

Figure 7: Central Banks' Monthly Foreign Exchange Reserves

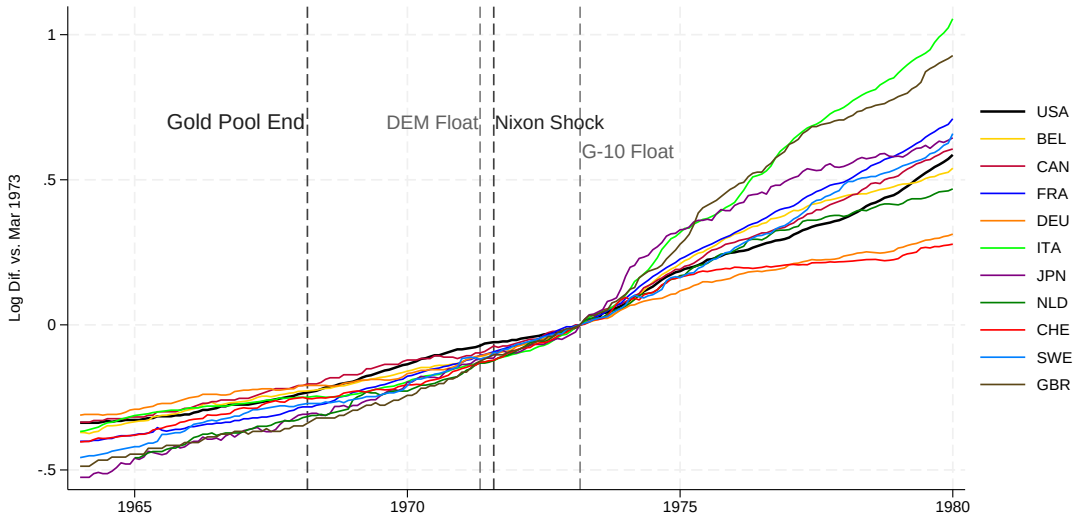


Sources: IMF International Liquidity (foreign currency reserves), World Bank World Development Indicators (GDP in current USD). Dashed lines represent the May 1971 DEM float, August 1971 Nixon Shock, and March 1973 G-10 float.

Weekly balance sheet series allow a higher-frequency view of intervention dynamics. Using archival reports from national central banks, and work from Baubeau (2018) and Naef (2022), we reconstruct changes in weekly foreign exchange holdings for a subset of countries. Figure 1 documents sharp increases in foreign exchange assets for Germany, France, Japan, and Switzerland in May and August 1971, consistent with heavy dollar sales to central banks ahead of the breakdown of parities.[16] Germany and Japan show the sharpest spikes around the May and August 1971 episodes, respectively. France displays a distinct pattern, with particularly large reserve movements around the Smithsonian Agreement. Pressures on major economies' exchange rates intensified again in February–March 1973, when speculative inflows surged across countries as the system entered its final crisis phase. Comparable dynamics for the United Kingdom, Sweden, the Netherlands, Belgium, and Canada are shown in Appendix Figure A.1, with Canada standing out as an outlier without any large reserve movements in the period. Overall, the weekly series point to episodic but highly synchronized reverse speculative attacks across countries during the final two years of the regime.

[16]The Federal Reserve's 1971 Annual Report documented some of these dynamics contemporaneously, presenting a chart of joint reserve and exchange-rate movements for Germany, Japan, France, and Switzerland that closely parallels Figure 1 (Federal Reserve, 1972).

Figure 8: Price Level



Source: Bank for International Settlements.

Figure 8 shows the evolution of price levels across countries. Prior to the breakdown of the system, inflation rates were broadly aligned, with the modest differentials that did exist consistent with a Balassa–Samuelson effect, given differences in relative productivity growth of the tradable and nontradable sectors across countries. After the end of the peg system, inflation rates diverged, although the consequences were initially delayed by the wage and price controls introduced alongside the Nixon Shock in August 1971. By 1980, the US price level had diverged sharply from low-inflation partner countries such as Germany and Switzerland.[17]

III Model

This section develops a two-country, perfect-foresight model designed to interpret the empirical patterns documented above—most notably, large-scale reserve accumulation in partner countries, synchronized inflation under the peg, and the eventual collapse of parities following a sudden burst of sustained speculative inflows. The framework builds on the canonical first-generation model of Krugman (1979) and is adapted to allow for *reverse* speculative attacks: under a pegged exchange rate, sustained monetary expansion in the anchor country generates persistent money market pressure that is absorbed by reserve accumulation in partner countries. As long as the peg is maintained, inflation is jointly determined across countries by the global evolution of domestic credit. When foreign official reserves reach an upper bound, the fixed exchange rate regime is abandoned, and the system transitions endogenously to a float.

[17] Appendix Figure A.9 shows a consistent divergence in inflation rates.

III.1 Economic Environment

Consider a perfect-foresight, one-good, two-country endowment economy. We think of the US as the home country and Germany or Japan as the foreign country. In each country, there is a representative household and a government. Agents trade money and bonds denominated in local and foreign currency, as well as the consumption good. Trade and capital mobility are frictionless. Foreign variables are identified by an asterisk (*).

We model time as continuous. Economic variables are almost everywhere continuously differentiable functions of time. Throughout, Θ denotes the set of *portfolio reallocation times*, dates at which agents may discretely reshuffle their asset holdings; in the equilibria we study, $\Theta = \{T\}$, where T is the date of the speculative attack. For any time path x_t, we define the left and right limits at T as $x_{T^-} \equiv \lim_{t \uparrow T} x_t$ and $x_{T^+} \equiv \lim_{t \downarrow T} x_t$, and when x_t is continuous at T, we write $x_T \equiv x_{T^-} = x_{T^+}$. Nominal asset stocks and nominal interest rates may jump at $T \in \Theta$; flow laws of motion hold for $t \notin \Theta$ and are supplemented by jump restrictions at $T \in \Theta$, stated below. Prices cannot jump: an anticipated discontinuity in the price level or the exchange rate would offer a foreseeable discrete capital gain, and the portfolio shift an instant ahead of it is inconsistent with equilibrium (Calvo, 1977, 1979). Equilibrium price paths P_t, P_t^*, and the nominal exchange rate E_t—units of home currency per unit of foreign currency—are therefore continuously differentiable functions of time for $t \notin \Theta$, with possibly distinct left and right derivatives at $T \in \Theta$.

The devaluation rate $\epsilon_t \equiv \dot{E}_t / E_t$ and the inflation rates $\pi_t \equiv \dot{P}_t / P_t$ and $\pi_t^* \equiv \dot{P}_t^* / P_t^*$ are then defined for $t \notin \Theta$ and admit distinct one-sided limits at $T \in \Theta$ (i.e., $\pi_{T^-} \neq \pi_{T^+}$). The nominal interest rates are i_t and i_t^*. With a single traded good, the law of one price implies

$$P_t = E_t P_t^*. \tag{1}$$

Free trade and free capital mobility imply, for $t \notin \Theta$, the no arbitrage conditions

$$i_t = i_t^* + \epsilon_t, \tag{2}$$

$$\pi_t = \pi_t^* + \epsilon_t. \tag{3}$$

Equations (2) and (3) imply equal real interest rates across countries, $r_t = r_t^*$, where $r_t \equiv i_t - \pi_t$. During Bretton Woods, $\epsilon_t = 0$, hence $\pi_t = \pi_t^*$ in this one-good baseline. We assume, for simplicity, a constant endowment in each country so that

$$y_t = y \text{ and } y_t^* = y^* \text{ for all } t. \tag{4}$$

III.1.1 Monetary and Fiscal Policy

We use a superscript to denote the holder of an asset and a subscript to denote its currency denomination. An empty superscript refers to the home private household, * to the foreign private household, and g, g^* to the home and foreign governments. Subscripts h, f denote assets

denominated in home and foreign currency. The home central bank's nominal balance sheet is

$$M^{g}_{f,t}E_t + D_{h,t} = M_{h,t} + M^{g^*}_{h,t} + NW_{h,t}. \tag{5}$$

Assets are foreign reserves $M^{g}_{f,t}$ (claims on foreigners) and net domestic assets $D_{h,t}$ (claims on the government/financial sector). Liabilities are money held by the home private sector $M_{h,t}$ and the foreign central bank's holdings of home-currency reserves $M^{g^*}_{h,t}$. The net worth of the central bank is $NW_{h,t}$. We assume central bank international reserves do not earn interest. In real terms, equation (5) is

$$m^{g}_{f,t} + d_{h,t} = m_{h,t} + m^{g^*}_{h,t} + nw_{h,t}. \tag{6}$$

The home government's nominal budget constraint is $\dot{B}^{g}_{h,t} = \dot{D}_{h,t} + P_t\left(\tau_t - \mathcal{T}_t + \mathcal{X}_t\right) + i_t B^{g}_{h,t}$, where τ_t is the primary surplus (lump-sum taxes), $\mathcal{T}_t$ is a net intergovernmental transfer, in real terms, from the home to the foreign government, $\mathcal{X}_t$ is the central bank's profits transferred to the treasury, in real terms (a recapitalization of the central bank when negative), $B^{g}_{h,t}$ are government assets in home currency, and $D_{h,t}$ is the central bank's credit to the government. The central bank finances asset purchases and remittances by issuing money, $E_t\dot{M}^{g}_{f,t} + \dot{D}_{h,t} + P_t\mathcal{X}_t = \dot{M}_{h,t} + \dot{M}^{g^*}_{h,t}$; combined with the time derivative of equation (5), central bank net worth accumulates profits—the valuation gain on reserves—net of remittances to the treasury: $N\dot{W}_{h,t} = \dot{E}_t M^{g}_{f,t} - P_t\mathcal{X}_t$. Dividing the budget constraint by the price level and using $\dot{D}_{h,t}/P_t = \dot{d}_{h,t} + \pi_t d_{h,t}$, the government's real budget constraint is

$$\dot{b}^{g}_{h,t} = \dot{d}_{h,t} + \pi_t d_{h,t} + \tau_t - \mathcal{T}_t + \mathcal{X}_t + (i_t - \pi_t)b^{g}_{h,t}. \tag{7}$$

Eliminating intra-public-sector claims, using the central bank balance sheet and the net worth accumulation above, yields the consolidated public-sector real budget constraint. We define the government's net asset position as $a^{g}_t \equiv m^{g}_{f,t} + b^{g}_{h,t} - m_{h,t} - m^{g^*}_{h,t}$, which measures consolidated public wealth as the difference between the government's claims on the foreign central bank and its bond holdings, and its monetary liabilities to the domestic private sector and to the foreign central bank. For $t \notin \Theta$, the law of motion $\dot{a}^{g}_t = r_t a^{g}_t + \tau_t - \mathcal{T}_t + i_t\left(m_{h,t} + m^{g^*}_{h,t}\right) - i^*_t\, m^{g}_{f,t}$ implies

$$0 = a^{g}_0 + \int_0^{\infty}\left(\tau_t - \mathcal{T}_t + i_t\left(m_{h,t} + m^{g^*}_{h,t}\right) - i^*_t\, m^{g}_{f,t}\right)e^{-\int_0^t r_s ds}dt, \tag{8a}$$

$$a^{g}_T = m^{g}_{f,T^+} + b^{g}_{h,T^+} - m_{h,T^+} - m^{g^*}_{h,T^+} = m^{g}_{f,T^-} + b^{g}_{h,T^-} - m_{h,T^-} - m^{g^*}_{h,T^-} \qquad \text{for } T \in \Theta. \tag{8b}$$

Equation (8a) is standard. The jump restriction (8b) states that at portfolio reallocation times $T \in \Theta$, consolidated public-sector real wealth is preserved across the reallocation. The foreign central bank balance sheet and consolidated budget constraints are symmetric—each position again carries the rate of its currency of denomination, the transfer enters with the opposite sign,

with the foreign remittance $\mathcal{X}_t^*$ defined analogously:

$$m_{h,t}^{g^*} + d_{f,t}^* = m_{f,t}^* + m_{f,t}^g + nw_{f,t}^*, \tag{9a}$$

$$0 = a_0^{g^*} + \int_0^\infty \left(\tau_t^* + \mathcal{T}_t + i_t^* \left(m_{f,t}^* + m_{f,t}^g\right) - i_t\, m_{h,t}^{g^*}\right) e^{-\int_0^t r_s ds} dt, \tag{9b}$$

$$a_T^{g^*} = m_{h,T^+}^{g^*} + b_{f,T^+}^{g^*} - m_{f,T^+}^* - m_{f,T^+}^g = m_{h,T^-}^{g^*} + b_{f,T^-}^{g^*} - m_{f,T^-}^* - m_{f,T^-}^g \qquad \text{for } T \in \Theta. \tag{9c}$$

The policy environment during the Bretton Woods period is captured by three assumptions governing domestic credit creation, fiscal policy, and exchange rate policy.

Assumption 1 (Monetary Policy)

- *Home country domestic credit and net worth:* $\frac{\dot{D}_{h,t}}{D_{h,t}} = \theta > 0$, $NW_{h,0} = 0$ *and* $\mathcal{X}_t = 0$ *for all* t.
- *Foreign country domestic credit and net worth:* $\frac{\dot{D}_{f,t}^*}{D_{f,t}^*} = \theta^* > -\rho$, $NW_{f,0}^* = 0$ *and* $\mathcal{X}_t^* = 0$ *for all* t.

Assumption 1 captures the empirical patterns documented in Section II. In our application, the home country (the United States) follows a monetary policy with sustained domestic credit expansion relative to the foreign country, $\theta^* < \theta$; we do not impose this ordering as an assumption, since Proposition 1 establishes it as a necessary condition for a reverse speculative attack. The lower bound $\theta^* > -\rho$ ensures that foreign money demand is well defined under the float. For tractability, we also assume that exchange-rate valuation effects are absorbed by central bank net worth and are not distributed to the treasury, such that $\dot{NW}_{h,t} = \dot{E}_t M_{f,t}^g$ and $\dot{NW}_{f,t}^* = -\epsilon_t M_{h,t}^{g^*}/E_t$.

Assumption 2 (Fiscal Policy)

- *Home country fiscal policy:* $\tau_t = -r_t b_{h,t}^g$ *for* $t \neq T$, *and* $b_{h,T^+}^g = b_{h,T^-}^g$.
- *Foreign country fiscal policy:* $\tau_t^* = -r_t b_{f,t}^{g^*}$ *for* $t \neq T$, *and* $b_{f,T^+}^{g^*} = b_{f,T^-}^{g^*}$.
- *Intergovernmental transfers:* $\mathcal{T}_t = i_t\, m_{h,t}^{g^*} - i_t^*\, m_{f,t}^g$.

Assumption 2 is a simple way to assume a balanced budget in a Ricardian economy and restricts, for simplicity, open market operations with bonds at the time of the speculative attack. The intergovernmental transfer $\mathcal{T}_t$ rebates to each government the seigniorage income that its reserve holdings generate for the other; it is equivalent to assuming that official reserves are remunerated at the issuing currency's interest rate. This assumption simplifies the characterization of the equilibrium considerably, and in our quantitative illustration seigniorage flows are negligible relative to output.

Assumption 3 (Exchange Rate Policy)

1. *Fixed Exchange Rate for* $0 < t < T$: $E_t = E$, *fixed home currency reserves,* $m_{f,t}^g = 0$, *and market determined foreign international reserves* $m_{h,t}^{g^*}$.

2. *Floating Exchange Rate for $t \geq T$: E_t is market determined and nominal reserve positions are fixed, such that $M^{g^*}_{h,t} = \bar{M}^{g^*}_h = \bar{m}^{g^*}_h P_{T^-}$.*

3. *Regime Switch: the exchange rate regime switches at T when the post-switch foreign reserve position reaches its upper bound, $m^{g^*}_{h,T^+} = \bar{m}^{g^*}_h$, with $\bar{m}^{g^*}_h \in (0, \infty]$.*

Assumption 3 captures the essence of the exchange rate policy adopted by the US and its G-10 partners during the 1968–1973 period. A fixed exchange rate regime is maintained as long as foreign official reserves can absorb incoming capital flows; once these reserves reach an upper bound, the peg is abandoned, and the economy transitions to a floating exchange rate regime. To capture reverse speculative attacks observed in the data, we restrict attention to equilibria in which reserve accumulation occurs entirely in the foreign country. While modeled as an exogenous upper bound, the reserve limit should be interpreted as capturing political, institutional, or monetary-control constraints that made continued intervention increasingly costly for G-10 countries, as documented in the historical record.

III.1.2 Households

The home household chooses consumption, money holdings, and portfolio positions in home- and foreign-currency bonds. Its nominal flow budget constraint is

$$\begin{aligned} \dot{M}_{h,t} + E_t \dot{B}_{f,t} + \dot{B}_{h,t} &= P_t(y - c_t - \tau_t) + i_t B_{h,t} + E_t i^*_t B_{f,t} && t \notin \Theta, \\ M_{h,T^+} + E_T B_{f,T^+} + B_{h,T^+} &= M_{h,T^-} + E_T B_{f,T^-} + B_{h,T^-} && T \in \Theta. \end{aligned}$$

At portfolio reallocation times $T \in \Theta$, households can reshuffle asset holdings without changing their nominal wealth. For the household's problem to have a solution in the perfect foresight model with no financial frictions, wealth must be bounded, and hence the exchange rate must be a continuous function of time, i.e., it cannot jump at T.

The home household's optimization problem in real terms is derived by dividing by the price level P_t and using $\dot{B}/P = \dot{b} + \pi b$ so that,

$$\max_{c_t, m_{h,t}, a_t} \int_0^\infty u(c_t, m_{h,t}) e^{-\rho t} dt \text{ s.t. } \begin{cases} \dot{a}_t = r_t a_t + y - c_t - i_t m_{h,t} - \tau_t \\ a_0 \text{ given and } \lim_{t\to\infty} a_t e^{-\rho t} \geq 0, \end{cases} \tag{10}$$

where real wealth is $a_t = m_{h,t} + b_{f,t} + b_{h,t}$, with $m_{h,t} \equiv M_{h,t}/P_t$, $b_{h,t} \equiv B_{h,t}/P_t$, and $b_{f,t} \equiv E_t B_{f,t}/P_t$. With separable, differentiable preferences, the optimality conditions satisfy

$$\frac{u_m\left(m_{h,t}\right)}{u_c\left(c_t\right)} = i_t, \tag{11a}$$

$$\frac{\dot{c}_t}{c_t} = -\frac{u_c(c_t)}{u_{cc}(c_t)c_t}\left(r_t - \rho\right), \tag{11b}$$

$$\int_0^\infty \left(c_t + i_t m_{h,t} + \tau_t\right) e^{-\int_0^t r_s ds}\, dt = a_0 + \int_0^\infty y e^{-\int_0^t r_s ds}\, dt, \tag{11c}$$

$$a_T = m_{h,T^+} + b_{f,T^+} + b_{h,T^+} = m_{h,T^-} + b_{f,T^-} + b_{h,T^-}. \tag{11d}$$

Equation (11a) characterizes the money demand. The household equates the marginal rate of substitution between real money balances and consumption to the nominal interest rate. Equation (11b) is the standard Euler equation governing intertemporal consumption choices. The intertemporal budget constraint (11c) is obtained by integrating the flow constraint forward and imposing the transversality condition, and is such that the present discounted value of expenditures, including the opportunity cost of holding money, equals initial wealth plus the present discounted value of income. At portfolio reallocation dates $T \in \Theta$, households adjust the composition of their asset holdings without changing nominal wealth. Equation (11d) imposes the continuity of nominal asset values at the time of regime changes. The foreign household's conditions are analogous:

$$\frac{u_m\left(m^*_{f,t}\right)}{u_c\left(c^*_t\right)} = i^*_t, \tag{12a}$$

$$\frac{\dot{c}^*_t}{c^*_t} = -\frac{u_c(c^*_t)}{u_{cc}(c^*_t)c^*_t}\left(r^*_t - \rho\right), \tag{12b}$$

$$\int_0^\infty \left(c^*_t + i^*_t m^*_{f,t} + \tau^*_t\right) e^{-\int_0^t r^*_s ds}\, dt = a^*_0 + \int_0^\infty y^* e^{-\int_0^t r^*_s ds}\, dt, \tag{12c}$$

$$a^*_T = m^*_{f,T^+} + b^*_{f,T^+} + b^*_{h,T^+} = m^*_{f,T^-} + b^*_{f,T^-} + b^*_{h,T^-}. \tag{12d}$$

Aggregating private and public budget constraints yields the home-country net foreign asset dynamics

$$\dot{\bar{a}}_t = r_t \bar{a}_t + y - c_t, \tag{13}$$

where $\bar{a}_t \equiv a_t + a^g_t$, and analogously for the foreign country: the transfer exactly offsets the seigniorage income from foreign official holdings of home currency, so net foreign assets evolve with the trade balance and interest income alone.

III.2 Equilibrium

Aggregate consistency requires goods, money, and bond markets to clear:

$$c_t + c^*_t = y + y^*, \tag{14a}$$

$$m_{h,t} + m^*_{f,t} = d_{h,t} + d^*_{f,t} \qquad \text{for } t \le T, \tag{14b}$$

$$m_{h,t} = \frac{M_{h,t}}{P_t} \text{ and } m^*_{f,t} = \frac{M^*_{f,t}}{P^*_t} \qquad \text{for } t \ge T, \tag{14c}$$

$$b_{h,t} + b^{g}_{h,t} + b^{*}_{h,t} = 0, \tag{14d}$$

$$b_{f,t} + b^{g^*}_{f,t} + b^{*}_{f,t} = 0. \tag{14e}$$

Under a peg, free trade, and free capital mobility, there is only one world money market clearing condition, equation (14b). Free trade and the fixed exchange rate imply there is only one price level to be determined, while free capital mobility under a peg implies that the money supply in each country and reserves are endogenous.[18] Under floating, the two conditions in equation (14c) must hold to determine the two price levels. Equations (14d) and (14e) are redundant by Walras's law if the rest of the equations (14) hold.

Definition 1 (Competitive Equilibrium) *Given initial world wealth distribution satisfying* $a_0 + a^{g}_0 = -a^{*}_0 - a^{g^*}_0$, *a constant endowment* y *in each country, and policies satisfying Assumptions 1, 2, and 3, a* Competitive Equilibrium *is a regime-switch time* T*; paths for quantities*

$$(a_t, a^{*}_t, a^{g}_t, a^{g^*}_t, m_{h,t}, m^{*}_{f,t}, b_{h,t}, b^{g}_{h,t}, b^{*}_{h,t}, b_{f,t}, b^{*}_{f,t}, b^{g^*}_{f,t}, c_t, c^{*}_t)_{t\geq 0};$$

prices $(r_t, i_t, P_t, r^{*}_t, i^{*}_t, P^{*}_t)_{t\geq 0}$*; an exchange-rate path* $(E_t)_{t\geq 0}$ *with* $E_t = E$ *for* $t < T$ *and market determined* E_t *for* $t \geq T$*; and reserve holdings* $(m^{g^*}_{h,t})_{t\in[0,T]}$*, such that:*

(i) The law of one price (1) and uncovered interest parity (2) hold.

(ii) The public-sector constraints (6), (8), and (9) are satisfied.

(iii) Households optimize, satisfying (11) and (12).

(iv) Aggregate consistency conditions (14) hold.

III.3 Characterization of Equilibrium

This section fully characterizes the equilibrium. In order to obtain a closed-form solution, we restrict attention to separable preferences.

Assumption 4 (Preferences) *Preferences are separable in consumption and real money balances. We assume CES money demand, with* $\sigma \geq 1$*:*

$$u(c_t, m_t) = \frac{c_t^{1-\sigma}}{1-\sigma} + \alpha \frac{m_t^{1-\sigma}}{1-\sigma},$$

and analogously for the foreign household with shifter α^{*}*.*

Assumption 4 and the household's optimization problem imply the money demand functions

$$m(i_t, c) = c\left(\frac{\alpha}{i_t}\right)^{1/\sigma}, \qquad m^{*}(i^{*}_t, c^{*}) = c^{*}\left(\frac{\alpha^{*}}{i^{*}_t}\right)^{1/\sigma}. \tag{15}$$

[18] Assumption 1 implies $\dot{NW}_{h,t} = \dot{NW}^{*}_{f,t} = 0$. Since $NW_{h,0} = NW^{*}_{f,0} = 0$, we have $nw_{h,t} = nw^{*}_{f,t} = 0$ for all $t < T$, so equation (14b) reduces to the condition $m_{h,t} + m^{*}_{f,t} = d_{h,t} + d^{*}_{f,t}$.

Real Equilibrium. The real equilibrium of this economy is purposely simple. Assumption 4 and the definition of equilibrium imply that the equilibrium interest rates are

$$r_t = \rho \text{ for all } t. \tag{16}$$

The equilibrium interest rates in equation (16) follow directly from the assumptions of free capital mobility, the separability of preferences, and a constant endowment. Free capital mobility and perfect foresight imply $r_t = r_t^*$. Under Assumption 4, equation (11b) and equation (12b) imply that consumption growth is identical across countries—i.e., $\frac{\dot{c}_t}{c_t} = \frac{\dot{c}_t^*}{c_t^*} = \frac{1}{\sigma}(r_t - \rho)$. At the same time, a constant aggregate endowment and market clearing, equation (14a), imply a constant aggregate consumption. Since both countries have identical consumption growth, the only feasible path is zero growth. Substituting back into the Euler equation, this implies $r_t = \rho$ for all t. Equilibrium consumption is:

$$c = y + \rho\left(a_0 + a_0^g\right), \tag{17a}$$

$$c^* = y^* + \rho\left(a_0^* + a_0^{g^*}\right). \tag{17b}$$

Consumption equals permanent income: the constant endowment y plus the interest income on initial national wealth $\bar{a}_0$. Absent the intergovernmental transfer, consumption would also include the annuitized present value of net seigniorage flows: with $m_{h,t}^{g^*} > 0$ and $m_{f,t}^g = 0$, home consumers would benefit from the "inflation tax" paid by the foreign central bank on its reserve holdings. Under Assumption 2 these flows are rebated, so they net to zero country by country, not merely globally, resulting in a constant trade balance and current account. Assumption 4 yields a clean separation between consumption and monetary dynamics, which helps make the case that the balance-of-payments imbalances under Bretton Woods are independent of real variables, such as trade balance dynamics.

Monetary Equilibrium: Prices. Solving for the monetary equilibrium requires finding the equilibrium price levels P_t and P_t^*, as well as the regime-switch time T, which are jointly determined by the money market clearing conditions, the no arbitrage condition for goods, the continuity of prices as a function of time, and the household's boundary conditions.[19] No arbitrage in goods (1) implies that the exchange rate E determines the ratio P_t/P_t^* under a peg and the prices P_t/P_t^* determine the floating exchange rate E_t after the fixed exchange rate regime collapses.

The money market equilibrium conditions are differential equations of the type studied in Sargent and Wallace (1973), with the nuance that they are different before and after the regime-switch time T. We solve for the path of P_t using the domestic money market clearing condition for $t \geq T$ and the global market clearing condition for $t \leq T$. The money market equilibrium

[19] Anticipated price jumps are inconsistent with equilibrium in a perfect foresight model with unrestricted asset trade (Calvo, 1977, 1979). We derive the equilibrium by solving for the price level before and after the switch to floating rates and imposing $P_{T^-} = P_{T^+}$ and $P_{T^-}^* = P_{T^+}^*$.

conditions under floating exchange rates are

$$D_{h,0}e^{\theta t} - P_T\bar{m}_h^{g^*} = P_t m(\rho + \pi_t, c) \qquad \text{for } t \geq T, \tag{18a}$$

$$D^*_{f,0}e^{\theta^* t} + P^*_T\bar{m}_h^{g^*} = P^*_t m^*(\rho + \pi^*_t, c^*) \qquad \text{for } t \geq T. \tag{18b}$$

The left-hand side of each equation (18) is the money supply, while the right-hand side is the demand for nominal money balances—the product of the demand for real money balances and the price level. The money supply under the floating regime on the left-hand side of equation (18) is driven by the evolution of domestic credit. The fixed exchange rate regime ends when the foreign country's reserves reach an upper bound $\bar{m}_h^{g^*}$. After the regime change, nominal reserve positions are fixed at the bound. The home money supply equals domestic credit minus foreign official holdings of home-currency reserves, while the foreign money supply equals domestic credit plus the value of those reserves at the switch. Since the money demand depends on inflation, each money market clearing condition is a differential equation. It has a unique solution because equation (10) implies the boundary condition $\lim_{s\to\infty} e^{-\rho\sigma s}P_s^{-\sigma} = 0$. The solution to the money market clearing conditions in equation (18), derived in Appendix A.3.1, is:

$$P_t = \left[\sigma\alpha c^\sigma \int_t^\infty \left(D_{h,0}e^{\theta s} - P_T\bar{m}_h^{g^*}\right)^{-\sigma} e^{-\rho\sigma(s-t)}\, ds\right]^{-1/\sigma} \qquad \text{for } t \geq T, \tag{19a}$$

$$P^*_t = \left[\sigma\alpha^*(c^*)^\sigma \int_t^\infty \left(D^*_{f,0}e^{\theta^* s} + P^*_T\bar{m}_h^{g^*}\right)^{-\sigma} e^{-\rho\sigma(s-t)}\, ds\right]^{-1/\sigma} \qquad \text{for } t \geq T. \tag{19b}$$

Under floating, the home domestic price level depends on a weighted average of future money supplies, $M_t = D_{h,0}e^{\theta t} - P_T\bar{m}_h^{g^*}$. The growth rate of the money supply is $\mu_t = \theta\frac{D_{h,0}e^{\theta t}}{D_{h,0}e^{\theta t} - P_T\bar{m}_h^{g^*}}$, and satisfies $\mu_t \geq \theta$ and $\lim_{t\to\infty}\mu_t = \theta$. The foreign price level has an equivalent expression, with $M^*_t = D^*_{f,0}e^{\theta^* t} + P^*_T\bar{m}_h^{g^*}$ and $\mu^*_t = \theta^*\frac{D^*_{f,0}e^{\theta^* t}}{D^*_{f,0}e^{\theta^* t} + P^*_T\bar{m}_h^{g^*}}$, and satisfies $\mu^*_t \leq \max(\theta^*, 0)$, $\lim_{t\to\infty}\mu^*_t = \theta^*$ for $\theta^* \geq 0$, and $\lim_{t\to\infty}\mu^*_t = 0$ for $\theta^* < 0$.

For the fixed exchange rate regime, there is only one price to determine since the fixed exchange rate $E_t = E$ and free trade imply $P^*_t = P_t/E$ for $t < T$. The global money market clearing condition, equation (14b), becomes

$$D_{h,0}e^{\theta t} + ED^*_{f,0}e^{\theta^* t} = P_t\Big(m(\rho + \pi_t, c) + m^*(\rho + \pi_t, c^*)\Big). \tag{20}$$

The left-hand side of equation (20) is the global money supply, while the right-hand side is the global money demand. Equation (20) is a differential equation, and by the continuity of P_t, its boundary condition is the equilibrium price at P_T under the floating regime—determined by equation (19a). The solution for the price level is

$$P_t^{-\sigma} = \sigma\Big(c\,\alpha^{1/\sigma} + c^*(\alpha^*)^{1/\sigma}\Big)^\sigma \int_t^T \left(D_{h,0}e^{\theta s} + ED^*_{f,0}e^{\theta^* s}\right)^{-\sigma} e^{-\rho\sigma(s-t)}\, ds + e^{-\rho\sigma(T-t)}P_T^{-\sigma} \qquad \text{for } t \leq T. \tag{21}$$

The price level at t, for $t \leq T$, is determined by the anticipated price level at the time of the regime switch, P_T, and by the evolution of the global money supply, $D_{h,0}e^{\theta t} + ED^*_{f,0}e^{\theta^* t}$, between t and T.

The home and foreign price levels at the regime switch, P_T and P^*_T, are of particular interest. It is convenient to define the rescaled prices at the time of the attack $\widetilde{P} \equiv e^{-\theta T}P_T$ and $\widetilde{P}^* \equiv e^{-\theta^* T}P^*_T$. Evaluating equation (19) at $t = T$, changing the variable of integration and factoring out the growth of domestic credit yields two fixed-point equations, one for each rescaled price, which are independent of T:

$$\widetilde{P} = \left[\sigma\alpha c^\sigma \int_0^\infty \left(D_{h,0}e^{\theta s} - \widetilde{P}\,\bar{m}_h^{g^*}\right)^{-\sigma} e^{-\rho\sigma s}\,ds\right]^{-\frac{1}{\sigma}}, \tag{22a}$$

$$\widetilde{P}^* = \left[\sigma\alpha^*(c^*)^\sigma \int_0^\infty \left(D^*_{f,0}e^{\theta^* s} + \widetilde{P}^*\bar{m}_h^{g^*}\right)^{-\sigma} e^{-\rho\sigma s}\,ds\right]^{-\frac{1}{\sigma}}. \tag{22b}$$

The home equation (22a) always has a unique solution. The foreign equation (22b) has a (unique) solution if and only if the reserve bound is strictly below foreign money demand at $i^* = \rho$, that is, $\bar{m}_h^{g^*} < m^*(\rho, c^*)$—a condition we assume throughout and which holds in all our calibrations.[20]

The fixed-point equations (22) admit a money-market interpretation. Recall that the reserve bound $\bar{m}_h^{g^*}$ is expressed in units of goods, so that $\widetilde{P}\,\bar{m}_h^{g^*}$ and $\widetilde{P}^*\,\bar{m}_h^{g^*}$ are its values in home and foreign currency at the time of the attack. Let

$$x \equiv \frac{\widetilde{P}\,\bar{m}_h^{g^*}}{D_{h,0}}, \qquad x^* \equiv \frac{\widetilde{P}^*\,\bar{m}_h^{g^*}}{D^*_{f,0}}$$

denote the reserve bound, valued at collapse prices, as a share of each country's domestic credit. With this notation, equation (22) can be rewritten as

$$\frac{D_{h,0}\,\mathcal{K}(x)}{\widetilde{P}} = m(\rho+\theta, c), \qquad \frac{D^*_{f,0}\,\mathcal{K}^*(x^*)}{\widetilde{P}^*} = m^*(\rho+\theta^*, c^*),$$

where the right-hand sides are the money demands at the steady-state nominal interest rates $\rho+\theta$ and $\rho+\theta^*$, and the correction factors

$$\mathcal{K}(x) = \left[\sigma(\rho+\theta)\int_0^\infty \left(1 - x\,e^{-\theta s}\right)^{-\sigma} e^{-\sigma(\rho+\theta)s}\,ds\right]^{-1/\sigma}, \qquad x \in [0,1),$$

$$\mathcal{K}^*(x^*) = \left[\sigma(\rho+\theta^*)\int_0^\infty \left(1 + x^*\,e^{-\theta^* s}\right)^{-\sigma} e^{-\sigma(\rho+\theta^*)s}\,ds\right]^{-1/\sigma}, \qquad x^* \geq 0,$$

adjust the money supplies for the reserves the foreign government carries into the floating regime and the money demands for deviations of nominal interest rates from their steady state values at T.

[20] Existence and uniqueness are established in the proof of Proposition 1 in Appendix A.3.4.

In the limiting case of a zero reserve bound, $\bar{m}_h^{g^*} \to 0$, $\mathcal{K}(0) = \mathcal{K}^*(0) = 1$, and the prices at T simply clear each money market given the money supplies $D_{h,T}$ and $D^*_{f,T}$ and the money demands at $i = \rho + \theta$ and $i^* = \rho + \theta^*$. If instead the foreign government holds home-currency reserves under the floating regime, $\bar{m}_h^{g^*} > 0$, these holdings shrink the home money supply in private hands and back additional foreign money. As discussed above, positive foreign government reserves also imply that money growth for $t \geq T$ satisfies $\mu_t > \theta$ and $\mu_t^* \leq \max(\theta^*, 0)$, which affects nominal interest rates and money demand during the transition. The correction factors $\mathcal{K}, \mathcal{K}^*$ account for the effect of these forces on the price level at T. Inspection of the integrands shows that $\mathcal{K}(x) < 1 < \mathcal{K}^*(x^*)$ for $x, x^* > 0$: at the time of the switch, the home price level lies below—and the foreign price level above—the level implied by money-market clearing at the money demands $m(\rho + \theta, c)$ and $m^*(\rho + \theta^*, c^*)$. Consistently, Lemma 1 shows that, when $\theta > \theta^*$, home inflation along the transition exceeds θ, so that $i > \rho + \theta$, while for $\theta^* > 0$ foreign inflation falls short of θ^*, so that $i^* < \rho + \theta^*$; for $\theta^* = 0$ foreign inflation is exactly zero; and for $\theta^* < 0$, the foreign money supply is asymptotically constant and foreign inflation converges to zero rather than θ^*.

Lemma 1 (Inflation Dynamics) *Under Assumptions 1–4, with $\theta > \theta^*$, $\bar{m}_h^{g^*} < m^*(\rho, c^*)$, and $\widetilde{P} < E\widetilde{P}^*$, the path for inflation has the following properties:*

1. *Floating exchange rate regime:*

   (a) *Home country: for all $t \geq T^+ : \pi_t > \theta$ and $\lim_{t\to\infty} \pi_t = \theta$.*

   (b) *Foreign country: for all $t \geq T^+ : \pi_t^* = 0$ when $\theta^* = 0$, $\pi_t^* \in (-\rho, \max(\theta^*, 0))$ for $\theta^* \neq 0$, and*

$$\lim_{t\to\infty} \pi_t^* = \begin{cases} \theta^* & \text{for } \theta^* \geq 0 \\ 0 & \text{for } \theta^* \leq 0. \end{cases}$$

2. *Fixed exchange rate regime:*

   (a) *For all $t \leq T^-$, $\pi_t < \pi_{T^+}$. If, in addition, $\theta D_{h,0} + \theta^* E D^*_{f,0} \geq 0$, then also $\pi^*_{T^+} < \pi_t$.*

   (b) *For all $t \leq T^-$:*

$$\theta^* < \pi_t < \theta \iff \frac{c\alpha^{1/\sigma} + c^*(\alpha^*)^{1/\sigma}}{D_{h,0}/\widetilde{P} + D^*_{f,0}/\widetilde{P}^*} \in \left((\rho + \theta^*)^{1/\sigma}, (\rho + \theta)^{1/\sigma}\right), \tag{23}$$

   where $\widetilde{P}, \widetilde{P}^*$ satisfy equation (22).

Proof See Appendix A.3.2.

Under the peg, inflation is common across countries, $\pi_t = \pi_t^*$, determined jointly by the global money market clearing condition in equation (20). Lemma 1 establishes that, at the moment of collapse, the common peg inflation rate lies strictly between the two post-collapse country-specific rates: $\pi^*_{T^+} < \pi_{T^-} < \pi_{T^+}$. The upper bound applies to the entire pre-collapse path unconditionally;

the lower bound applies whenever the world money supply is non-decreasing. Peg inflation is strictly bounded between the two countries' domestic credit growth rates, $\theta^* < \pi_t < \theta$ for all $t < T$, if and only if equation (23) holds, which requires world real money demand at the moment of the attack to be neither so large nor so small as to place the common peg nominal interest rate outside the interval $(\rho + \theta^*, \rho + \theta)$. Both conditions are satisfied by our quantitative illustration with the United States, Germany, and Japan data.

After the regime switch, the inflation paths diverge sharply: home inflation jumps up at T and converges monotonically to θ from above, while foreign inflation falls at the switch and converges to its long-run rate from below.[21] Nominal interest rates inherit these dynamics, and by equation (3) the depreciation rate jumps from zero to $\epsilon_{T^+} = \pi_{T^+} - \pi^*_{T^+} > 0$ and converges to a constant from above.

Monetary Equilibrium: Capital Flows under the Peg. Under the peg, the home central bank balance sheet equation (6) and Assumption 3 imply $m^{g^*}_{h,t} = d_{h,t} - m_{h,t}$: foreign official holdings of home-currency reserves equal the excess of real domestic credit over home money demand. Reserve accumulation therefore reflects the gap between the rate at which the home country creates credit and the rate at which the world absorbs it through money demand, as derived in Appendix A.3.3:

$$\dot{m}^{g^*}_{h,t} = (\theta - \pi_t)\, d_{h,t} + \frac{1}{\sigma}\, m_{h,t}\, \frac{\dot{\pi}_t}{\rho + \pi_t}, \qquad t < T. \tag{24}$$

The first term captures the direct effect of credit expansion: when $\pi_t < \theta$, real domestic credit grows faster than prices, and the excess flows abroad as reserves, which is always the case in our quantitative illustration. The second term captures the indirect effect through money demand: when peg inflation rises, real money demand falls, freeing additional resources that are absorbed as reserves. Using the world money-market condition under the peg and dividing by the outstanding stock of reserves, equation (24) can be rewritten as

$$\frac{\dot{m}^{g^*}_{h,t}}{m^{g^*}_{h,t}} = (\theta - \theta^W_t)\, \frac{m_{h,t}}{m^{g^*}_{h,t}} + (\theta - \pi_t), \qquad t < T, \tag{25}$$

where $\theta^W_t \equiv \dot{M}^W_t / M^W_t$ and $M^W_t = D_{h,0} e^{\theta t} + E D^*_{f,0} e^{\theta^* t}$ is the world money supply. The rate at which reserves grow equals the rate of real domestic credit growth, $\theta - \pi_t$, plus an amplification term that captures the excess of home credit growth over world money growth, scaled by the ratio of home real balances to the existing reserve stock.

In the model, reserve accumulation is entirely a capital-account phenomenon. Consumption is constant in both countries, so the trade balance is constant, and by equation (13) and equation (17) the current account is always balanced: the seigniorage income the United States earns on foreign official dollar holdings is returned through the intergovernmental transfer, and since consumption equals permanent income, net foreign asset positions are constant at their initial levels. The

[21] Assumption 1 guarantees that the capital gains and losses from reserve holdings are absorbed by the central bank's net worth and are not monetized.

balance-of-payments imbalance under Bretton Woods therefore operated entirely through the capital account. Excess dollar liquidity created by US domestic credit expansion was intermediated through private capital flows and ultimately absorbed by foreign central banks as official reserves.

Monetary Equilibrium: The Speculative Attack. A speculative attack occurs when agents anticipate that the foreign central bank's accumulation of international reserves is approaching its upper bound and that a change of regime is imminent. At the moment of the switch, domestic nominal interest rates rise, reducing demand for home money, while foreign rates fall, increasing demand for foreign money. Since the foreign central bank is still supporting the peg at T, it accommodates private portfolio shifts by purchasing home currency in exchange for its own liabilities, producing the discrete jump in reserve holdings visible in Figure 1.

To determine the attack date, we define the *shadow exchange rate* E_t^f: the exchange rate that satisfies PPP, equation (1), at the prices that clear the money markets if the regime switches to a float at t. From equation (19):

$$E_t^f = e^{(\theta-\theta^*)t}\,\frac{\widetilde{P}}{\widetilde{P}^*}. \tag{26}$$

Because the normalized collapse prices are constants, the shadow rate depends on time only through the exponential term: it grows at the rate $\theta - \theta^*$ at which home credit outgrows foreign credit. A switch at t would produce a discrete depreciation of the home currency if $E_t^f > E$ and a discrete appreciation if $E_t^f < E$; neither is consistent with equilibrium, as the price levels, and hence the exchange rate, cannot jump at an anticipated date. The regime switch therefore occurs when the shadow rate meets the peg, $E_T^f = E$:

$$\frac{\widetilde{P}}{\widetilde{P}^*}\,e^{(\theta-\theta^*)T} \;=\; E, \qquad \Rightarrow \qquad T \;=\; \frac{\ln(E\widetilde{P}^*/\widetilde{P})}{\theta-\theta^*}. \tag{27}$$

On the date of the regime change, there is a portfolio shift that floods the foreign central bank with domestic currency reserves in exchange for foreign currency: the reverse speculative attack. The portfolio shift is induced by the change in nominal interest rates in the two countries, a consequence of the jump in inflation rates in Lemma 1. The portfolio shift leaves the foreign central bank's reserve holdings exactly at its bound $\bar{m}_h^{g^*}$. The *size of the speculative attack* is

$$\Delta = \bar{m}_h^{g^*} - m_{h,T^-}^{g^*}. \tag{28}$$

Continuity of prices pins down *when* the attack occurs, while the portfolio shifts at T determine its *size*. Proposition 1 provides necessary and sufficient conditions for a reverse speculative attack and characterizes both its timing and its size.

Proposition 1 (Reverse Speculative Attack) *In an economy satisfying Assumptions 1–4 in which the reserve bound, whenever finite, satisfies $\bar{m}_h^{g^*} < m^*(\rho, c^*)$ and the associated unique solution $(\widetilde{P}, \widetilde{P}^*)$ of equation (22) satisfies $\widetilde{P} < E\widetilde{P}^*$, the fixed exchange rate regime collapses at a unique finite date $0 < T < \infty$ if,*

and only if,

(i) $\theta > \theta^*$, *and*

(ii) $\bar{m}_h^{g^*} < \infty$,

in which case the collapse date and the size of the attack are

$$T = \frac{\ln\left(E\widetilde{P}^*/\widetilde{P}\right)}{\theta - \theta^*}, \qquad \Delta \;=\; m(\rho + \pi_{T^-}, c) - m(\rho + \pi_{T^+}, c) \;=\; m^*(\rho + \pi^*_{T^+}, c^*) - m^*(\rho + \pi^*_{T^-}, c^*) \;>\; 0.$$

Proof See Appendix A.3.4.

Proposition 1 states that a finite collapse time requires exactly two asymmetries: faster home credit growth, $\theta > \theta^*$, and a finite bound on foreign reserve accumulation, $\bar{m}_h^{g^*} < \infty$. If home credit does not outgrow foreign credit, the shadow rate never rises to meet the peg; if the reserve bound is infinite, the collapse date is pushed to infinity. With both asymmetries in place, the foreign central bank reaches its reserve ceiling at a unique finite date, triggering a reverse speculative attack and an endogenous collapse of the peg. The collapse is therefore driven not by the level of inflation, which is common across countries under the peg, but by the divergence in domestic credit growth. The restriction $\widetilde{P} < E\widetilde{P}^*$ in Proposition 1 requires the level of the fixed exchange rate, E, to be consistent with an equilibrium. If this condition is violated at date 0, i.e., $E_0^f \geq E$, then there is an immediate attack and the currency floats from the outset at a level that entails a home currency depreciation with respect to E.

The opposite case, $\theta < \theta^*$ with a finite lower bound $\underline{m}_h^{g^*}$ on the foreign country's reserves, is the one analyzed in the balance-of-payments-crisis literature following Krugman (1979).[22] In that configuration, under the peg the foreign central bank steadily *loses* home-currency reserves, and the natural exit is the classic speculative attack, in which the run exhausts the reserves of the weak-currency country, here the foreign country. If Assumption 3 is amended so that reserves face a finite floor rather than a ceiling, a symmetric argument under the mirrored conditions $\widetilde{P} > E\widetilde{P}^*$ and $\underline{m}_h^{g^*} < m^*(\rho, c^*)$ delivers exactly this case: the collapse date is again given by equation (27), with the regime-switch prices computed at the reserve floor $\underline{m}_h^{g^*}$. Because Bretton Woods placed the expanding country at the center of the system, we focus throughout on the reverse attack.

The expression for Δ in Proposition 1 reads the size of the attack off the two money markets. At the switch time, the home nominal interest rate jumps up, and the foreign one falls, so home money demand drops and foreign money demand rises. Because the attack leaves the world money supply unchanged—the home currency the foreign central bank absorbs is exactly offset by the foreign currency it issues—the two shifts are equal, and each equals the discrete jump in reserves.

The equilibrium also pins down the portfolio counterpart of the attack on the private-sector side. Let $\mathbf{b}_t \equiv b_{h,t} + b_{f,t}$ and $\mathbf{b}_t^* \equiv b_{h,t}^* + b_{f,t}^*$ denote the total real bond holdings of home and foreign

[22] This literature also assumes the foreign country is small relative to the home country.

households, respectively, summed across home- and foreign-currency denominations. From the household portfolio reallocation conditions equation (11d) and equation (12d), together with bond market clearing equation (14d)–equation (14e) and continuity of domestic credit, government bond holdings, and prices across the regime switch, the change in private bond positions at T satisfies

$$\mathbf{b}_{T^+} - \mathbf{b}_{T^-} = \Delta = -\left(\mathbf{b}^*_{T^+} - \mathbf{b}^*_{T^-}\right).$$

The attack therefore transfers Δ worth of bonds, in real terms, from foreign to home households: each side exchanges money for bonds in the amount of the money-demand shift just described. Under uncovered interest parity, equation (2), home- and foreign-currency bonds are perfect substitutes in household portfolios, so the currency composition of this reshuffle is indeterminate: only the totals $\mathbf{b}_t$ and $\mathbf{b}^*_t$ are pinned down by the equilibrium.

Note that there are no outside speculators in the model: the "speculators" of the historical narrative are the home and foreign households themselves, and their joint portfolio reshuffle at T *is* the reverse speculative attack. In the data, the dollars sold to the partner central banks in Figure 1 came from banks, firms, and households shifting their portfolios—the empirical counterpart of the model's household sector—rather than from a distinct class of speculative traders.

The collapse date T and the size of the reverse speculative attack both depend on the structural parameters of the model in intuitive ways. Given the initial relative nominal credit position $\Lambda \equiv \frac{D_{h,0}}{E D^*_{f,0}}$, the equilibrium collapse date and the size of the attack can be written as functions

$$T = T\left(\Lambda,\, \bar{m}_h^{g^*},\, \theta, \theta^*\right) \qquad \text{and} \qquad \Delta = \Delta\left(\bar{m}_h^{g^*},\, \theta, \theta^*\right).$$

The exchange rate E and the nominal credit levels $(D_{h,0}, D^*_{f,0})$ enter T only through Λ, reflecting the model's neutrality with respect to rescaling the units of nominal variables.

Lemma 2 (Comparative Statics) *Under Assumptions 1–4, with $\theta > \theta^*$, $\bar{m}_h^{g^*} < m^*(\rho, c^*)$, and $\widetilde{P} < E\widetilde{P}^*$:*

(a) The collapse date $T(\Lambda, \bar{m}_h^{g^*}, \theta, \theta^*)$ satisfies, where $\Lambda \equiv \frac{D_{h,0}}{E D^*_{f,0}}$,

$$\frac{\partial T}{\partial \Lambda} = -\frac{1}{(\theta - \theta^*)\,\Lambda} < 0, \qquad \frac{\partial T}{\partial \bar{m}_h^{g^*}} > 0, \qquad \frac{\partial T}{\partial \theta} < 0, \quad \frac{\partial T}{\partial \theta^*} > 0.$$

(b) The size of the reverse speculative attack Δ, as defined in equation (28), is independent of Λ and satisfies $\partial\Delta/\partial\theta > 0$. If, in addition, $\theta^* \geq 0$, then $\partial\Delta/\partial\bar{m}_h^{g^*} > 0$.

Proof See Appendix A.3.5.

A larger initial credit position Λ brings the collapse forward, as does faster home credit growth θ, by accelerating reserve accumulation under the peg; a larger reserve bound $\bar{m}_h^{g^*}$ delays the collapse. The size of the attack is strictly increasing in home credit growth θ and, when $\theta^* \geq 0$, in

the reserve bound $\bar{m}_h^{g^*}$; but it is independent of Λ: the relative credit position governs when the regime collapses, not how large the resulting portfolio shift is.

III.4 Quantitative Illustration

This section uses US, German, and Japanese data from the final years of Bretton Woods to illustrate the mechanics and quantitative magnitudes implied by the model. We show how a speculative attack unfolds and produces a sudden, discrete shift of dollar holdings from private portfolios onto the balance sheets of partner countries' central banks.

The framework is intentionally stylized and abstracts from several features of the data that likely matter for inflation. In particular, we omit a non-traded sector, which could generate inflation differentials across G-10 countries through Harrod–Balassa–Samuelson effects; we do not capture Nixon's wage-and-price controls of August 1971, which likely held down measured US inflation through 1972; and we do not model the 1973 oil shock or heterogeneous monetary accommodation to it across G-10 countries, which in our framework would correspond to differences in θ and could help account for the cross-country divergence of inflation after the collapse. The model is also not intended to apply to Canada and Italy: Proposition 1 requires $\theta > \theta^*$ as a necessary condition for a reverse speculative attack, a condition that is not satisfied for Canada even before the country had floated its currency, or for Italy, where domestic credit expanded faster than in the United States. Consistent with this, neither country experienced a reverse speculative attack in the data.

Taking the model to the data also requires a convention for mapping historical time into model time. In the model, the speculative attack is instantaneous. In the historical episode, by contrast, the transition from the first attacks on the pegs to generalized floating spanned roughly 18 to 22 months, depending on the starting date. The Bundesbank abandoned its peg on May 5, 1971, after the first speculative attack; the Bank of Japan followed on August 28, 1971. The Smithsonian Agreement of December 18, 1971, then reset parities, but the new pegs were themselves attacked and collapsed in February and March 1973, culminating in the temporary floating arrangements formally accepted by the G-10 on March 16.

We therefore implement two mappings from the model to the data. In both, time is measured in years and the initial date is January 1, 1970, so that $T = 1$ denotes January 1, 1971. In the first mapping, T is the end of the month of the first speculative attack (May 1971 for Germany; August 1971 for Japan), and the size of the attack is measured by the partner country's central bank's dollar purchases over the 30 days preceding T. In the second mapping, T is March 1973, and the size of the attack is measured by cumulative dollar purchases from the onset of the first attack through that date. In both cases, the finite accumulation window—30 days in the first mapping, the full transition in the second—is the empirical counterpart to the point mass of reserve losses that the model concentrates at T.

We proceed in three steps to calibrate the model. First, we fix output levels (y, y^*) using World Bank WDI data. We calibrate country size using the average size of US GDP relative to Germany and Japan over the period 1968–1973, normalizing $y + y^* = 1$. We then set $c = y$ and $c^* = y^*$, so

that the resource constraint $c + c^* = 1$ holds.[23] Second, we set credit growth using the 1964–1973 estimates from Table 1, correcting for real GDP growth, and normalize $E = 1$. Third, we calibrate five parameters, the initial nominal credit stocks $(D_{h,0}, D^*_{f,0})$, the money-demand shifters (α, α^*), and the foreign reserve upper bound $\bar{m}^{g^*}_h$, by normalizing $P_0 = 1$ and matching four observations: the initial ratios of net domestic assets to output $(d_{h,0}/y, d^*_{f,0}/y^*)$, the initial foreign monetary base net of reserves other than foreign exchange as a share of output, $(m^*_{f,0} - g^*_{f,0})/y^*$, and the historical date of the speculative attack T. In the model, the net-of-gold monetary base is the counterpart of $m^*_{f,0}/y^*$, since the model abstracts from gold and other official reserve assets such as SDRs, and treats reserve accumulation as foreign official holdings of home-currency claims. The home monetary base is not an independent observation: the home balance sheet identity implies $m_{h,0} + m^{g^*}_{h,0} = d_{h,0}$, so private home money demand, $m_{h,0}$, is pinned by the initial stocks of reserves in the foreign central bank, $m^{g^*}_{h,0}$, and domestic credit, $d_{h,0}$. We describe the calibration algorithm in Appendix A.4. Table 2 reports the assigned inputs, while Table 3 reports the calibrated parameters for all four episodes. The money-demand shifters (α, α^*) are stable across calibrations; most of the adjustment across attack dates occurs through the reserve ceiling $\bar{m}^{g^*}_h$.

Table 2: Calibration Assumptions

Var.	Description	Source	DEU	JPN
σ	Inverse intertemporal elasticity of substitution	Assumption	2	
ρ	Discount rate	Assumption	0.05	
E_0	Fixed exchange rate	Assumption	1	
θ	US dom. credit growth	IMF, WB	0.040	
y	US real GDP share (1968–1973)	WB	0.790	0.776
y^*	Foreign real GDP share (1968–1973)	WB	0.210	0.224
θ^*	Foreign dom. credit growth	IMF, WB	-0.011	-0.015

[23] By equation (17a), setting $c = y$ corresponds to zero initial home net foreign assets, $\bar{a}_0 \equiv a_0 + a^g_0 = 0$; global asset-market clearing $\bar{a}_0 + \bar{a}^*_0 = 0$ and the resource constraint equation (14a) then give $c^* = y^*$.

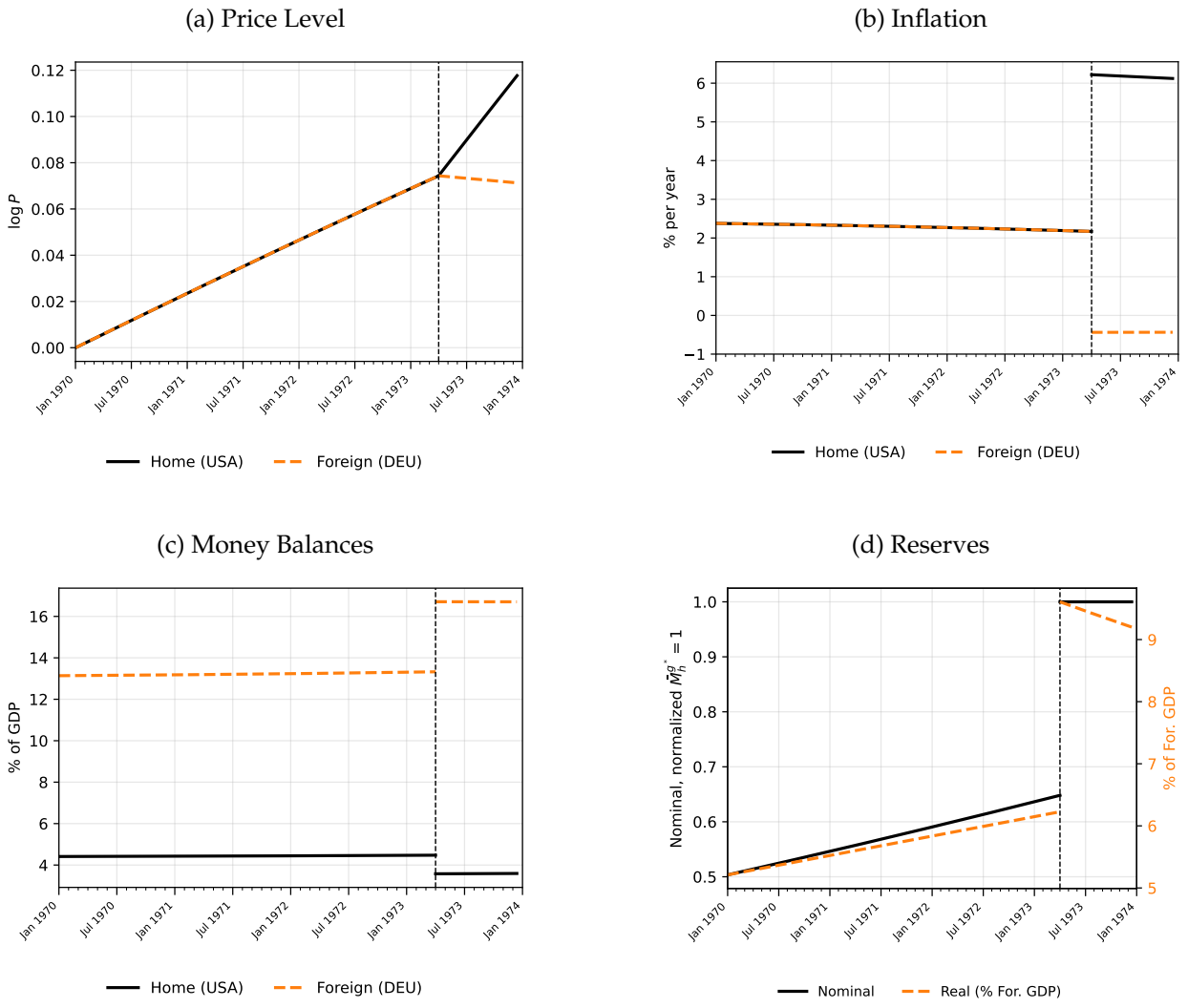
Table 3: Calibration Results

	DEU		JPN	
	May 1971	Mar 1973	Aug 1971	Mar 1973
Observations				
$d_{h,0}/y$	0.058	0.058	0.058	0.058
$d^*_{f,0}/y^*$	0.079	0.079	0.059	0.059
$m^*_{f,0}/y^*$	0.131	0.131	0.073	0.073
$g^*_{f,0}/y^*$	0.024	0.024	0.006	0.006
T	1.417	3.250	1.667	3.250
Parameters				
α	1.40×10^{-4}	1.44×10^{-4}	2.19×10^{-4}	2.22×10^{-4}
α^*	1.24×10^{-3}	1.27×10^{-3}	4.00×10^{-4}	4.06×10^{-4}
$\bar{m}_h^{g^*}/y^*$	0.090	0.096	0.042	0.046

Figure 9 reports the calibrated equilibrium dynamics before and after the collapse of the peg.[24] The model delivers the intended mechanism. Panels a and b show that, under the fixed exchange rate regime, inflation is equal across countries, reflecting PPP and the common price level implied by the peg. During this phase, inflation lies between the domestic credit growth rates of both countries. Following the crisis, inflation paths diverge: in the partner country, inflation falls immediately and converges to $\max\{\theta^*, 0\}$, while in the US, inflation declines gradually to θ as domestic credit continues to expand. Price levels mirror these dynamics. While prices move in lockstep prior to the crisis, they diverge sharply once the peg collapses, leading to a depreciation of the nominal exchange rate. Panel c shows that real money balances decline slowly during the pre-crisis phase as rising inflation erodes money demand, then jump discretely at the regime switch. Panel d shows that the foreign country gradually accumulates reserves prior to the speculative attack at time T, followed by a discrete jump at the moment of collapse. Although nominal reserve holdings remain elevated thereafter, their real value declines over time due to continued inflation in the home country.

[24] Figure A.10 reports dynamics for the March 1973 episode using Japan as the foreign economy.

Figure 9: Calibrated Model Results — Germany, March 1973 Crisis

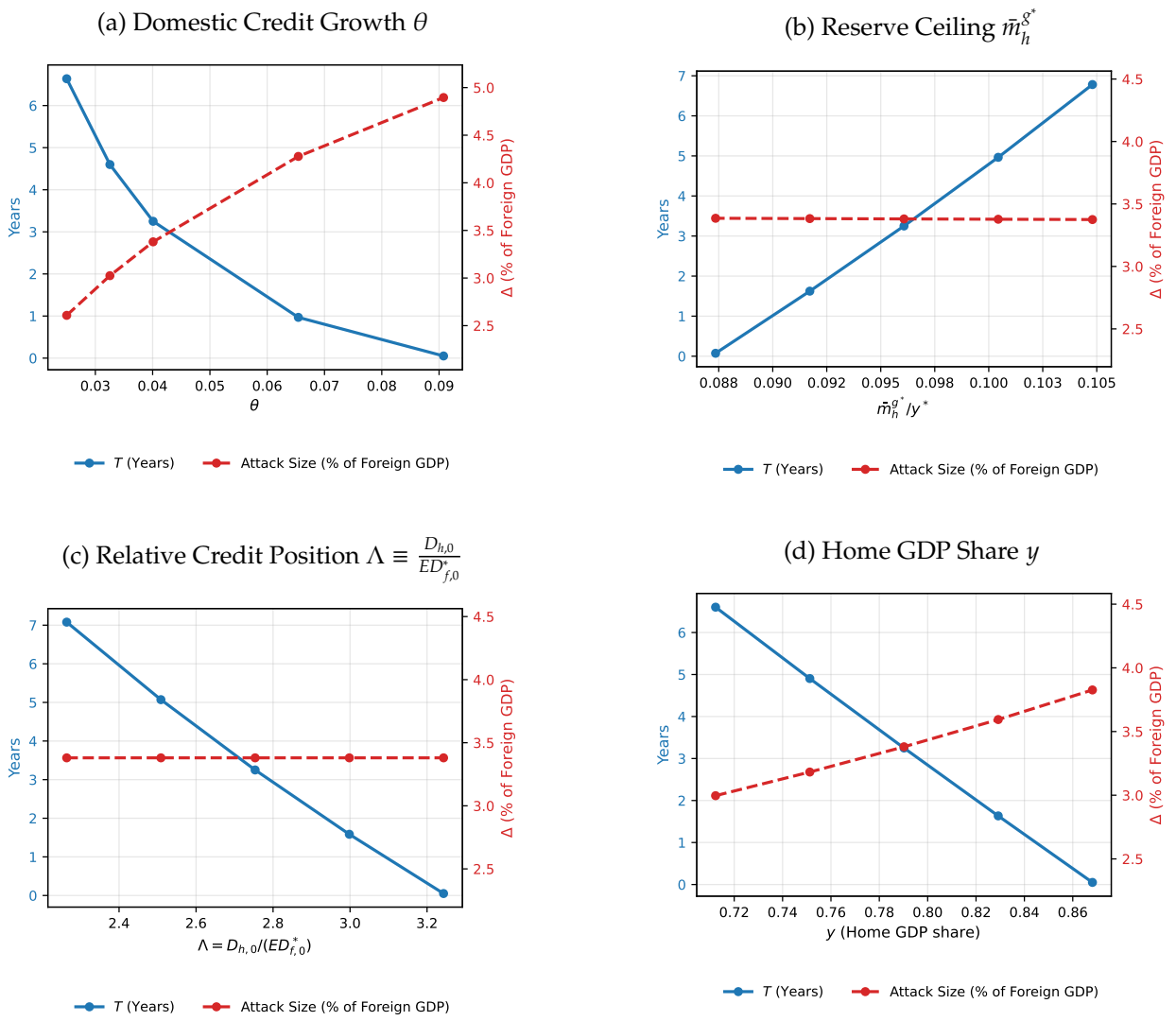


Notes: Paths are computed from the baseline Germany (March 1973) calibration.

The model's comparative statics—formalized in Lemma 2—show that the timing of the attack depends critically on the growth rate of domestic credit, the foreign reserve ceiling, and the two central banks' initial relative domestic credit position. Figure 10 summarizes how each parameter affects the attack date T and the size of the discrete jump in reserves at $t = T$, Δ. Panel a shows that higher home credit growth θ compresses the period of reserve accumulation. Appendix Figure A.11 illustrates the underlying dynamics: higher θ raises inflation both before and after the crisis, and reduces real money balances in the pre-crisis phase. Panel b shows that a larger reserve ceiling $\bar{m}_h^{g^*}$ mainly delays the crisis with only a small increase in the size of the attack, while a sufficiently low ceiling triggers an immediate collapse. Appendix Figure A.12 confirms that the inflation and price paths are relatively insensitive to $\bar{m}_h^{g^*}$. Panel c shows that a higher relative credit position $\Lambda \equiv D_{h,0}/(ED^*_{f,0})$ compresses the period of reserve accumulation and, when sufficiently

large, produces an instantaneous attack, while Δ remains invariant to Λ. Panel d shows the role of country size: a smaller home economy both delays the attack and reduces the reserve jump at collapse.

Figure 10: Comparative Statics

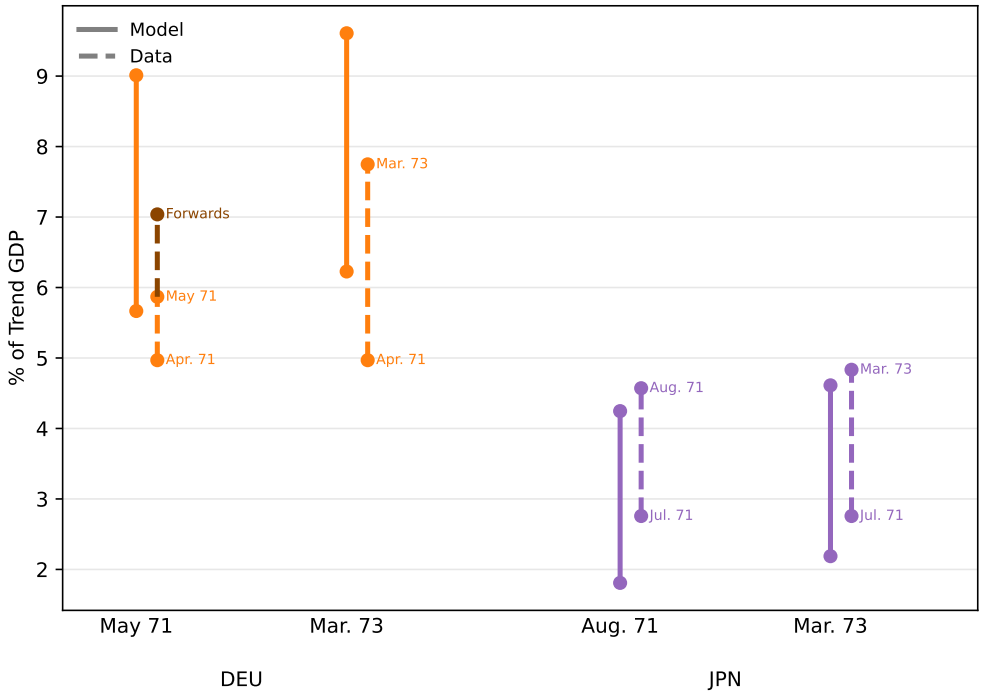


Notes: Each panel varies one parameter at a time, holding all others at their baseline values from the Germany (March 1973) calibration. The left axis (blue, solid) reports the attack date T; the right axis (red, dashed) reports the size of the discrete reserve jump Δ at T, expressed as % of foreign GDP. The middle point in each panel corresponds to the baseline calibration. In panel d, $d_{h,0}$ is scaled proportionally with y, and $(d^*_{f,0}, \bar{m}_h^{g^*})$ with y^*.

Figure 11 illustrates how the country-specific calibrations and time conventions map into different predicted sizes of the portfolio shift, Δ. For each country, we compare the model to two empirical episodes: the initial 1971 attack and the March 1973 collapse. The model captures the order of magnitude of the attacks and the qualitative ranking across countries. In Germany, the model predicts a first-attack portfolio shift just over 3% of trend GDP. The change in official foreign-

currency reserves between April and May 1971 was only about 0.9%, but over the same episode the Bundesbank was also absorbing dollars through forward market operations: its outstanding forward book stood at DM 9,816 million, some USD 2.7 billion, when the mark was floated.[25] This raises the empirical magnitude to roughly 2.1% of trend GDP, closer to the model's prediction. For the full transition window, the model's predicted cumulative purchases, about 3.4% of trend GDP, are somewhat above the observed German accumulation of about 2.7%. For Japan, observed attack magnitudes are within roughly half a percentage point of trend GDP of the model's predictions in both episodes. The reserve ceiling that triggers the attack—the upper endpoint of each vertical line—is moderately overpredicted for Germany and underpredicted for Japan.

Figure 11: Attack Size — Model vs. Data



Notes: Each column reports the reserve change for a given country-episode. Solid lines show the model-implied change in real foreign reserves, $m_h^{s^*}/y^*$, at the attack date T. Dashed lines show the observed change in official foreign-currency holdings as a share of trend GDP. Trend GDP is constructed by regressing log annual current-dollar GDP on a linear time trend over 1968–1973. Given the fitted annualized log growth rate $\hat{b}$, trend GDP at horizon s months after the pre-attack month is $\widehat{\text{GDP}}_s = \text{GDP}_{\text{prev}} \exp(\hat{b}s/12)$ where GDP_{prev} is log-linearly interpolated current-dollar GDP in the month preceding the attack. For the 1971 episodes, the dashed segment runs from the month before the attack to the attack month: May 1971 for Germany and August 1971 for Japan. For March 1973, it runs from the month preceding the country's 1971 attack (the same base month as the 1971 segment) through the final G-10 float. The "Forwards" marker adds the Bundesbank's outstanding forward-dollar commitments at the float, DM 9,816 million (Historisches Archiv der Deutschen Bundesbank, B330/21812), converted at the April 1971 BIS average exchange rate.

[25] The book was accumulated during the attack: the Bundesbank's preceding forward operation had closed on September 23, 1970, and no contract outstanding in May 1971 matured before June. It does, however, span a moderately longer window than the April–May change in spot reserves to which it is added—DM 7,855 million was contracted from early April onward, the remaining DM 1,961 million through the Federal Reserve Bank of New York in late February and early March. See *Deutsche Bundesbank*, Fischer-Erlach, "Das Für und Wider von Interventionen am US-Dollar-Terminmarkt," July 27, 1977, § 4 (Historisches Archiv der Deutschen Bundesbank, B330/21812).

The calibrated model reproduces the four empirical patterns of Section II: the asymmetric expansion of US net domestic assets, the endogenous expansion of partner monetary bases through reserve accumulation, the timing and magnitude of the May 1971, August 1971, and February–March 1973 attacks, and the post-1973 inflation divergence.[26]

III.5 Contemporary Accounts

Beyond the empirical patterns documented in Section II, policymakers' own accounts—drawn from memoirs, IMF staff documents, and central bank internal records—provide direct support for the three theoretical mechanisms at the heart of the model: the incompatibility of fixed exchange rates, uncoordinated monetary policies, and capital mobility; the role of US domestic credit expansion as the driving force; and the existence of a binding upper limit on partner central banks' willingness to accumulate dollar reserves.

The incompatibility between the fixed exchange rates and divergent monetary policies under free capital mobility was widely understood by participants as the root cause of the speculative attacks that brought down the system. Governor Olivier Wormser of the Banque de France captured this structure directly: reviewing the February 1973 devaluation before the Conseil général, he observed that, "because of the speculative attacks of which the dollar has been the object," it was the governments "of the countries whose currencies were concerned—because they were the strongest" that were forced to choose between revaluing, demanding an American devaluation, or floating jointly.[27] Paul Volcker, at the time Undersecretary of the Treasury for Monetary Affairs, recalled in his joint account with Toyoo Gyohten that the move to generalized floating reflected not any positive assessment of flexible exchange rates but "a last resort when, by general assent, the effort to maintain par values or central rates seemed too difficult in the face of speculative movements of capital across the world's exchanges" (Volcker and Gyohten, 1992, p. 124). At a Bundesbank council meeting in March 1971, Otmar Emminger, then-Vice President of the Bundesbank, warned that the high-interest-rate policy risked being "self-defeating," as the resulting foreign exchange inflows would shake confidence in the exchange-rate structure leading to credit policy being "completely overrun by speculative—that is, non-interest-induced—foreign funds".[28] In his memoirs, Emminger described the mechanism precisely: "It was no longer the German monetary authorities, but rather the liquidity-policy oscillations originating in American credit policy, as well as the speculative back-and-forth of the wandering dollar masses, that during this period largely determined the money supply of the German economy and thereby also the success or failure of German stabilization policy" (Emminger, 1986). IMF staff had a similar view in

[26] The model predicts deflation for the foreign (strong-currency) country following the float, which is not consistent with the higher inflation observed in many partner economies after 1971. This discrepancy reflects other factors absent from the baseline model, specifically the shift in partner economies' monetary policy following the transition to floating, and particularly after the 1973 oil shock.

[27] *Banque de France*, Procès-verbal du Conseil général, February 15, 1973 (Archives historiques de la Banque de France, folio 58).

[28] *Deutsche Bundesbank*, Protokoll der 335. Sitzung des Zentralbankrats, March 31, 1971 (Historisches Archiv der Deutschen Bundesbank, B330/6157-1).

their consultations with Germany: "The independence of the authorities was, however, seriously compromised by the continuing inflows of funds from abroad initially induced from early 1970 onward by the persistence of interest rate differentials in favor of Germany."[29]

The identification of US domestic credit expansion as the driving force behind these pressures is equally prominent in contemporary accounts. The Swiss National Bank's directorate noted in May 1971 that the American authorities had begun to loosen their previously restrictive monetary policy since the second half of 1970, and that the resulting changes in interest-rate differentials had caused "ever-greater funds to flow above all into the Federal Republic of Germany, but also into Switzerland".[30] Volcker was blunt on the same point: when Arthur Burns pleaded for a restoration of fixed exchange rates, his "instinctive comment, given that the dollar couldn't possibly be stabilized unless we tackled our inflation problem, was 'Then, you'd better get back to Washington and tighten money' ". (Volcker and Harper, 2018).

The limit on reserve accumulation—the model's $\bar{m}_h^{g^*}$—is not merely our theoretical construct but a constraint that policymakers named explicitly in real time as the decisive factor triggering each abandonment of the peg. Günther Schleiminger, executive director for Germany at the IMF, characterized the authorities' efforts to absorb the liquidity generated by capital inflows as "Sisyphus labours".[31] IMF staff concluded that by late April 1971 the Bundesbank had determined "that it could no longer continue to add indefinitely to this commitment."[32] At the May 5 Bundesbank council meeting, Friedrich Wilhelm von Schelling stated that "the Bundesbank had gone, in its accumulation of dollars, to the limit of what is bearable," while Emminger described an "acute emergency" caused by "progressively swelling dollar inflows . . . for which there are virtually no quantitative limits."[33] The Swiss National Bank faced the same constraint simultaneously. Peter Jäggi, then Vice President of the SNB's Bank Council, articulated the regime's fundamental fragility most directly in a February 1973 memorandum: "Legally, we find ourselves since August 1971 in a 'no man's land,' . . . pushed against our will from a legally founded system of fixed exchange rates into an unregulated system, which can be nothing other than a fundamental regime of floating," adding that "if a massive slide gets underway—which is easily possible because of the huge 'avalanche slope' of the Eurodollar mass—then the unrestricted takeover of dollars cannot be justified".[34] Jelle Zijlstra, president of De Nederlandsche Bank at the time, was equally unambiguous in his memoirs: "we held dollars only up to an amount that we considered a working stock; what exceeded that, we wished to exchange for gold or something that could be put on a par with it" (Zijlstra, 1978).

Additional contemporaneous evidence from the IMF, the Bundesbank, the Banque de France

[29] *International Monetary Fund*, Staff Report for the 1972 Article VIII Consultation, 1972 (IMF Archives, doc. 212137).
[30] *Schweizerische Nationalbank*, Direktoriumsprotokoll Nr. 460, May 13, 1971.
[31] *International Monetary Fund*, Mr. Schleiminger's Statement on the Federal Republic of Germany, §7, Executive Board Meeting 71/60, July 7, 1971 (BUFF/71/79; IMF Archives, doc. 298134).
[32] *International Monetary Fund*, Staff Report SM/71/140, 1971 (IMF Archives, doc. 169161).
[33] *Deutsche Bundesbank*, Protokoll der 337. Sitzung des Zentralbankrats, May 5, 1971.
[34] *Schweizerische Nationalbank*, Direktoriumsprotokoll Nr. 120, February 8, 1973, pp. 171–172—"Zur währungspolitischen Lage," letter from Vice President Prof. Dr. P. Jäggi of February 3, 1973.

and the Swiss National Bank is collected in Appendix A.5, while selected press coverage of the May 1971 crisis is reported in Appendix A.6.

III.6 A Second Act: The European Monetary System, 1978–1993

The mechanism we highlighted did not disappear with the collapse of Bretton Woods. When the European Monetary System (EMS) was created, its charter bound the participating central banks to defend the parities through unlimited mutual intervention. At the bilateral margins intervention was "compulsory," and—in the words of the operating Agreement—such interventions "shall be unlimited at the compulsory intervention rates," financed by "very short-term credit facilities, unlimited in amount."[35] Because the obligation fell symmetrically on both currencies at each bilateral margin, it bound whichever central bank issued the strong currency—in practice, the Bundesbank—to buy up weak partner currencies without limit. Read literally, *de jure*, the anchor stood ready to take onto its balance sheet an unbounded amount of partner currency—in our notation, $\bar{m}_h^{g^*} = \infty$—and, by the logic of Proposition 1, this shielded the parities from speculative attack.

De facto, however, no such commitment was binding: to protect its monetary autonomy the Bundesbank had already capped the amount of partner currency it would absorb, a limit $\bar{m}_h^{g^*} < \infty$ never communicated to the partner governments (Eichengreen and Wyplosz, 1993). In a letter to the federal government of November 16, 1978, the so-called 'Emminger letter,' then-Bundesbank President Otmar Emminger recorded the council's condition for accepting the EMS: that its monetary-policy autonomy would be endangered if "strong imbalances in the future EMS" produced "excessive intervention obligations" threatening domestic monetary stability, and that in such a case the government would safeguard the Bundesbank "either by a correction of the parities in the EMS or, if necessary, by at least a temporary release from the intervention obligation."[36] Decisively, the safeguard rested not on a written government pledge but, in the letter's own words, on "repeated *oral* assurances of the Chancellor and the Finance Minister."

Chancellor Helmut Schmidt gave those assurances in person. Addressing the Bundesbank council on November 30, 1978—five days before the "unlimited" charter was proclaimed—he met the council's central objection, that intervention obligations could again grow without limit and undermine domestic stability, by invoking the spring 1973 precedent: as finance minister he had "released the Bundesbank from the obligation to intervene against the dollar, solely out of the motive of gaining room, within our country, for a stable, stability-oriented policy." He agreed

[35] Resolution of the European Council, Brussels, December 5, 1978, on the establishment of the European Monetary System, §§3.4 and 3.7; Agreement of March 13, 1979 between the central banks of the Member States of the EEC laying down the operating procedures for the EMS, Arts. 2.2 (§I, Exchange Rate Mechanism) and 6.1 (§II, Very Short-Term Financing), adopted by the European Monetary Cooperation Fund in Board of Governors Decision No. 12/79.

[36] Otmar Emminger to the Federal Government, November 16, 1978 (the 'Emminger letter'), Historisches Archiv der Deutschen Bundesbank, B330/9656. The letter is analyzed in Eichengreen and Wyplosz (1993, p. 109), quoting Emminger's memoirs (Emminger, 1986, pp. 361–62). The conversation transcript of the 521st meeting of the Zentralbankrat, November 30, 1978, is held separately at the Historisches Archiv der Deutschen Bundesbank, Nachlass Emminger, N2/269. The German originals of the passages quoted in this subsection are reproduced in Appendix A.5.

with the substance of the clause but, invoking the maxim *ultra posse nemo obligatur*—no one is bound beyond what he can do—refused to commit it to paper, warning that a French or Italian newspaper would savage its own government for having tied itself to "so flimsy a promise" with the Germans, and concluding that "one does not write such a thing down." He even named the case our model formalizes—that in a genuine crisis it might be the creditor, not the debtor, that reaches its limit: historically "the debtor countries pull back first, not the creditor countries; but it may well be that the creditor Federal Republic would one day have to pull back."[37]

What the founding instruments proclaimed with one hand—unlimited mutual support—the anchor country had, in private, unwritten with the other. The EMS was hence born with a concealed but binding counterpart to our $\bar{m}_h^{g^*}$: a finite limit on the partner currencies the anchor would absorb in defense of the parities, known to the Chancellor, his Finance Minister, and the Bundesbank but not to the partners relying on the treaty's guarantee. That limit bound during the 1992–1993 crises of the Exchange Rate Mechanism. The Bundesbank's own recorded purchases of lire—the direct counterpart of the reserve accumulation in our model—exceeded USD 4 billion on September 4, 1992, its largest intervention of the crisis, and totaled nearly USD 10 billion over the year (Eichengreen and Naef, 2022).[38] On September 11, 1992, the German government confronted the Italian authorities with the Emminger letter's existence and the warning that the Bundesbank could not continue to intervene, forcing the lira devaluation that preceded Black Wednesday (James, 2012, pp. 355–359). Sterling met the same limit without ever having been told of it: on September 16 the Bundesbank halted intervention on its own account, buying pounds only on behalf of the Bank of England, whose governor protested in a personal letter to Bundesbank President Schlesinger. When speculative pressure turned against the French franc in July 1993 the Bundesbank again refused unlimited intervention, and the crisis was resolved by widening the ERM's fluctuation bands on August 2, 1993, ending the ERM as a fixed exchange rate system in all but name.

IV Final Remarks

This paper interprets the collapse of the Bretton Woods system of fixed exchange rates during 1971–1973 as a sequence of reverse speculative attacks on the US dollar driven by persistent asymmetries in domestic credit growth. With the Federal Reserve expanding domestic credit while the Bundesbank and the Bank of Japan held domestic credit growth well below that of the Federal Reserve, excess dollar liquidity flowed abroad and was absorbed by partner central banks, thereby endogenously expanding their monetary bases. The model shows that any upper bound on these banks' willingness to continue accumulating reserves—whether imposed by currency

[37] *Deutsche Bundesbank*, Protokoll der 521. Sitzung des Zentralbankrats, November 30, 1978. The minutes were not made public until 2008, when they were brought to light by Marsh (2009) from Emminger's papers.

[38] Bundesbank lira purchases from Eichengreen and Naef (2022). The published narrative dates the largest intervention, over USD 4 billion, to September 4, 1992; the daily dataset records four days of Bundesbank lira purchases in 1992 totaling USD 9.8 billion, including USD 1.2 billion on September 16, the lira's last day of ERM defense.

risk, inflation tolerance, institutional mandate, or political constraints—makes a speculative attack inevitable. Consistent with the balance-sheet evidence and contemporaneous policy accounts, the framework accounts for the buildup of reserve imbalances and the size of the reverse speculative attacks, as well as the absence of reverse attacks in Canada and Italy. In our stylized model, the exchange rate does not jump at the regime switch; extending the framework to allow for discrete devaluations, along the lines of Broner (2008), is a natural direction for future work.

We take the divergence in domestic credit growth as given. One natural interpretation, which we do not formalize, is that the asymmetry reflects a commitment problem. The United States was bound by the Bretton Woods regime to maintain money creation consistent with the nominal anchor; in practice, the Federal Reserve accommodated inflation expectations rather than pursue the monetary contraction required to reset them, a pattern Sargent (1999) rationalizes through adaptive learning over an apparent Phillips-curve tradeoff. The US expansionary monetary policy can also be interpreted as the bad equilibrium of Barro and Gordon (1983a,b): a central bank that cannot commit to low inflation validates expectations of monetary expansion, even though all parties would be better off under a commitment to price stability. The historical evidence is consistent with this reading: sustained political pressures shaped US monetary policy under Johnson and Nixon, while the Bundesbank and the Bank of Japan remained committed to containing domestic credit growth.[39] This asymmetry in commitment, under fixed exchange rates and capital mobility, forced partner economies to absorb US monetary expansion until the currency risk on their balance sheets became untenable. Why some partner economies proved more resistant to these inflationary pressures while others did not, whether due to differences in political preferences stemming from past inflationary episodes, to differences in central bank independence, or to other institutional features, remains an open question.

The mechanism we have described is not specific to the dollar or the Bretton Woods era; as the EMS episode makes clear, it illustrates the trilemma. Any regime that combines a fixed exchange rate, mobile capital, and divergent national monetary policies ($\theta \neq \theta^*$) is unsustainable unless there is a central bank committed to absorbing reserves without limit ($\bar{m}_h^{s^*} = \infty$): the fixed parity must eventually give way to a speculative attack. Which side breaks is not preordained: the classic run drains the reserves of the weak-currency country (Krugman, 1979); the reverse attack we have modeled exhausts the strong-currency partner's willingness to keep absorbing.

[39] See Bremner (2008); Hetzel (2008) on Martin's accommodation of Vietnam-era fiscal expansion, and Abrams (2006); Ferrell (2010); Drechsel (2026) on Burns's expansionary stance ahead of the 1972 election.

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A Appendix

A.1 Additional Notes to Figures

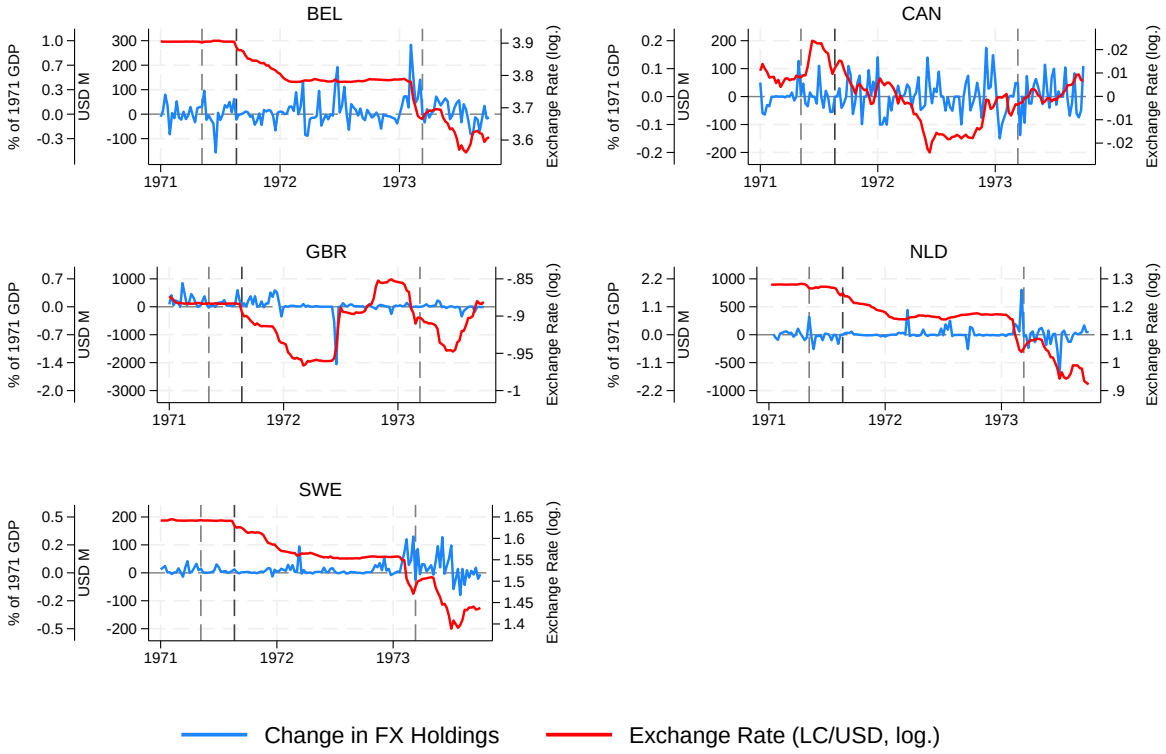
Figure 1. Sources: Schweizerische Nationalbank, *Ausweise der Schweizerischen Nationalbank* (weekly *Devisenbestände* - "foreign-exchange holdings"); Deutsche Bundesbank, *Monatsbericht*, "Aktiva und Passiva der Deutschen Bundesbank" (weekly *Guthaben bei ausländischen Banken und Geldmarktanlagen im Ausland* plus *Sonstige Geldanlagen im Ausland* - "deposits with foreign banks and money-market investments abroad, plus other foreign investments"); Baubeau (2018) (Banque de France: weekly *Disponibilités à vue à l'étranger* - "cash on demand abroad" - and *Avances au Fonds de stabilisation des changes / Autres opérations* - "advances to the Exchange Equalization Fund / other operations"); Bank of Japan, 営業毎旬報告 - Ten-day balance sheet report (海外資産勘定 - "foreign asset account"); Bank for International Settlements (exchange rates); World Bank World Development Indicators (GDP). Dashed lines represent the May 1971 DEM float, August 1971 Nixon Shock, and March 1973 G-10 float. The figure combines weekly changes in foreign-exchange assets drawn from central bank balance sheets with reported intervention (purchase) data when available. Balance-sheet changes reflect movements in foreign currency asset positions, while reported intervention series measure net foreign exchange purchases. Exchange rates are quoted as local currency units per USD; a fall denotes a revaluation of the local currency.

Figure 5. Source: Bao et al. (2018). Net Foreign Assets (NFA) include gold or gold certificates and foreign financial assets, net of foreign liabilities. The Monetary Base (MB) includes currency and deposits. Net Domestic Assets (NDA) are computed residually as MB minus NFA, and consist of credit to banks and other financial institutions, credit to the nonfinancial private sector, credit to the central government, credit to government agencies, and mortgage-backed securities and other assets, net of amounts owed to banks (other than reserve deposits), amounts owed to government, other liabilities, other legal tender, and the net worth of the Federal Reserve System.

Figure 6. Sources: IMF Monetary and Financial Statistics (central bank balance sheets), Bank for International Settlements (exchange rates) and World Bank World Development Indicators (GDP). NFA denotes net foreign assets (foreign assets net of foreign liabilities). Net domestic assets (NDA) is computed as reserve money (monetary base or MB) minus NFA. Balance-sheet variables are expressed as changes relative to the base year and scaled by 1971 GDP (in current USD). Dashed lines represent the May 1971 DEM float, August 1971 Nixon Shock, and March 1973 G-10 float.

A.2 Additional Figures

Figure A.1: Weekly Changes in Central Bank Foreign Exchange Holdings — Additional Countries



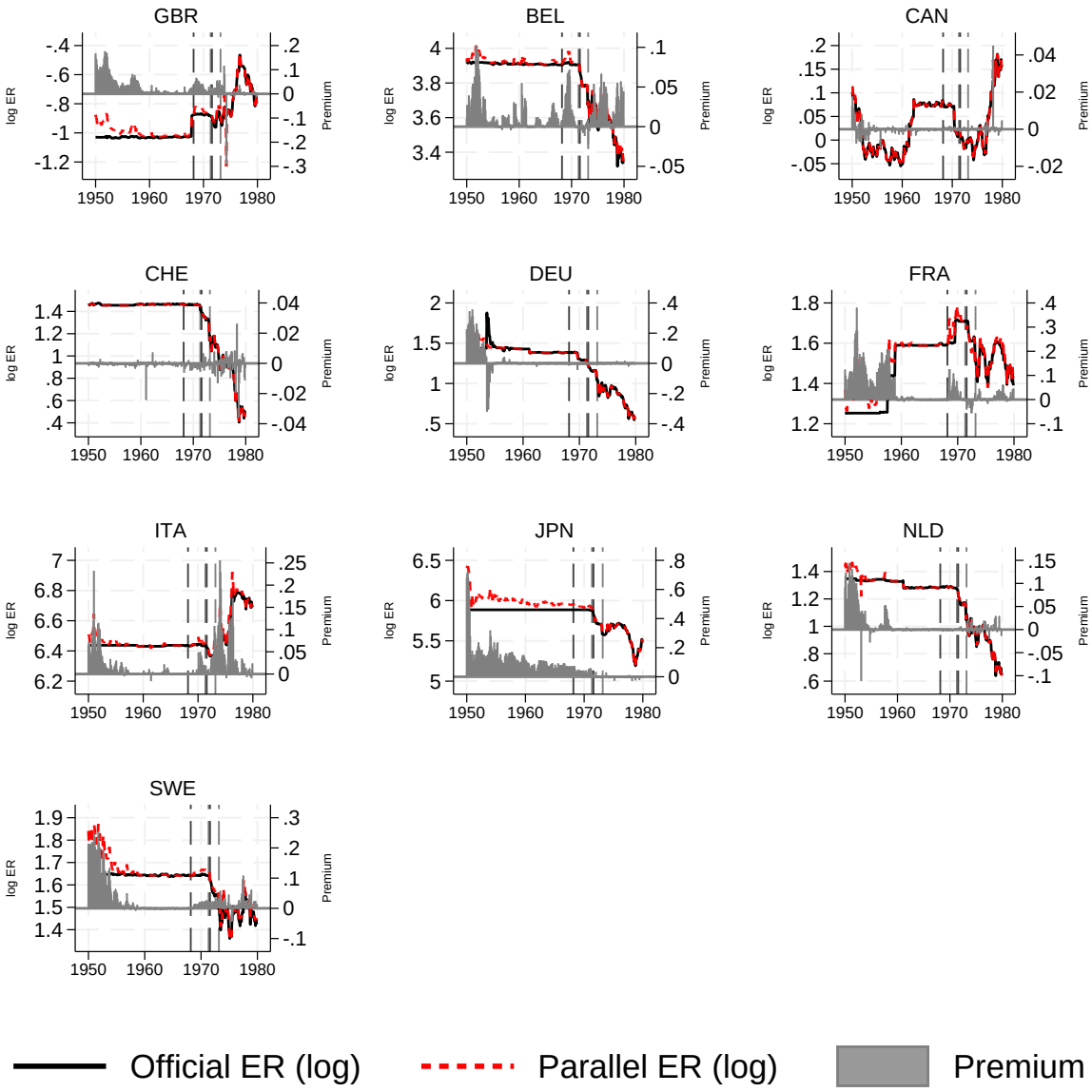
Sources: National Bank of Belgium, weekly returns published in the *Moniteur Belge* (weekly *Foreign currencies*); Bank of Canada, *Statistical Summary* (weekly balance sheet, up to September 1971) and *Bank of Canada Review* (thereafter), with foreign exchange positions measured as foreign currency assets minus foreign currency liabilities; Naef (2022) (Bank of England: daily *Total intervention in USD (excluding customer operations)*); De Nederlandsche Bank, *Verkorte balans van De Nederlandsche Bank* (weekly *Vorderingen en geldswaardige papieren luidende in goud of in buitenlandse geldsoorten* - "claims and marketable securities denominated in gold or foreign currencies", net of *Saldo's luidende in buitenlandse geldsoorten* - "balances denominated in foreign currencies"); Sveriges Riksbank, *Årsbok* (Annual Report), Table A:13 "*Guld och utländska valutor varje rapportdag*" (weekly *Utländska statspapper, fordringar hos utländsk bank eller bankir, nettobelopp, samt utrikes växlar* - "foreign government securities, claims on foreign banks and bankers, net, and bills payable abroad"); Bank for International Settlements (exchange rates); World Bank World Development Indicators (GDP). Dashed lines represent the May 1971 DEM float, August 1971 Nixon Shock, and March 1973 G-10 float. The figure combines weekly changes in foreign-exchange assets drawn from central bank balance sheets with reported intervention (purchase) data when available. Balance-sheet changes reflect movements in foreign currency asset positions, while reported intervention series measure net foreign exchange purchases. Exchange rates are quoted as local currency units per USD; a fall denotes a revaluation of the local currency.

Figure A.2: US Current Account and Trade Balance



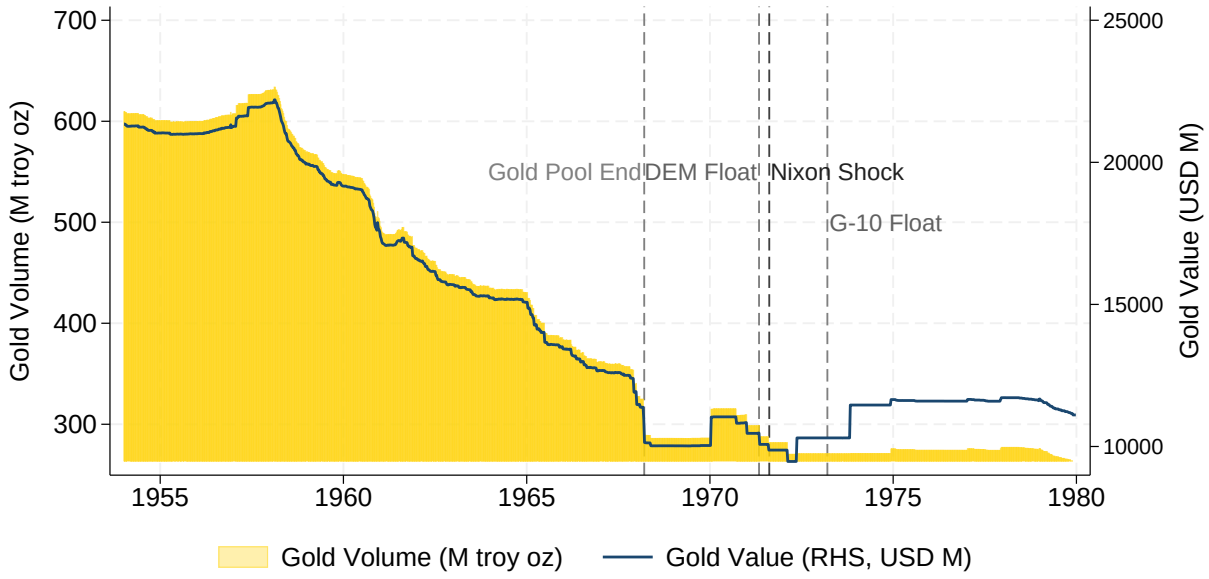
Source: FRED. Dashed lines represent the May 1971 DEM float, August 1971 Nixon Shock, and March 1973 G-10 float.

Figure A.3: Official and Parallel Exchange Rates



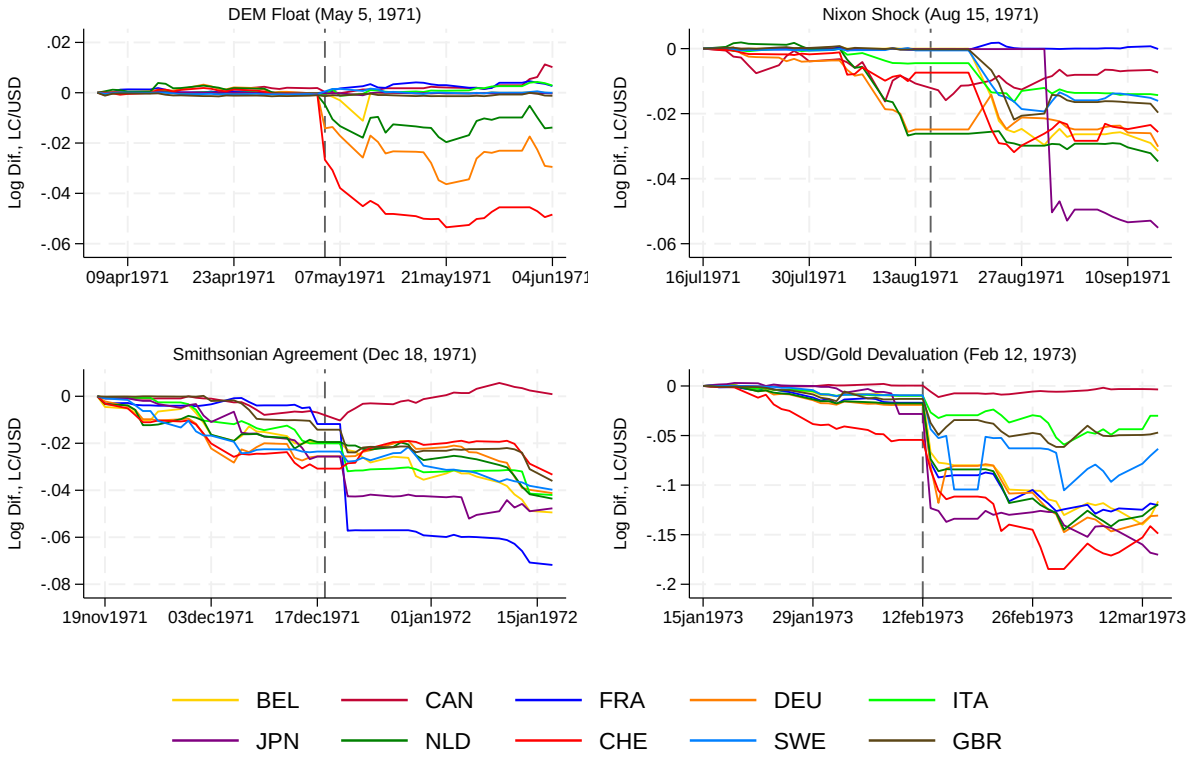
Source: Finaeon. Premium is the percentage by which the market price exceeds the official price. Dashed lines represent the May 1971 DEM float, August 1971 Nixon Shock, and March 1973 G-10 float.

Figure A.4: Federal Reserve Gold Holdings



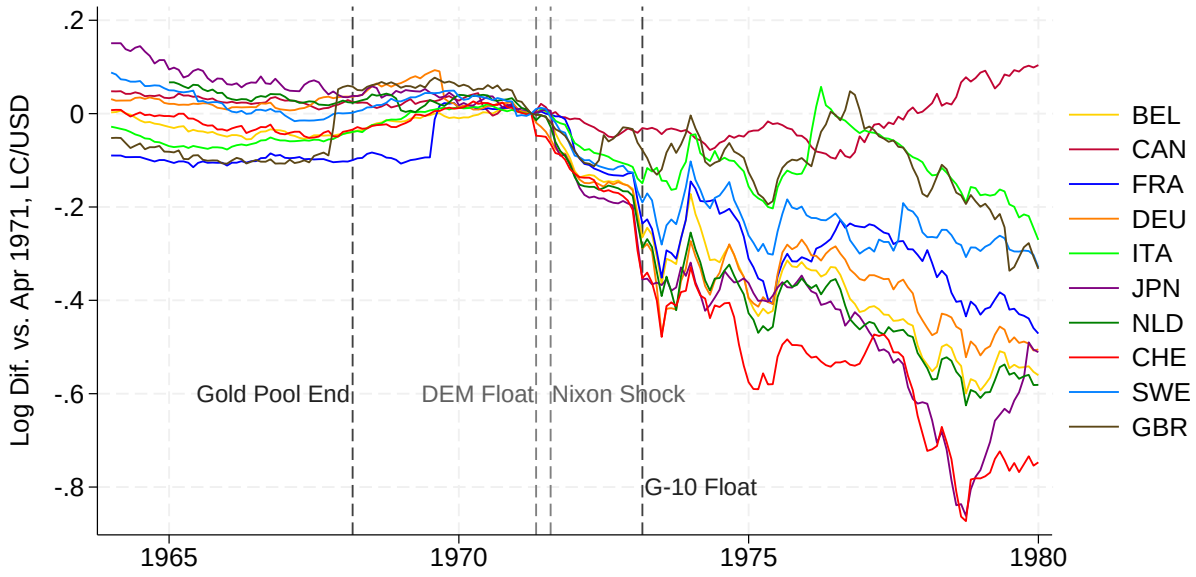
Source: Bao et al. (2018).

Figure A.5: Nominal Exchange Rate (LC/USD), Daily



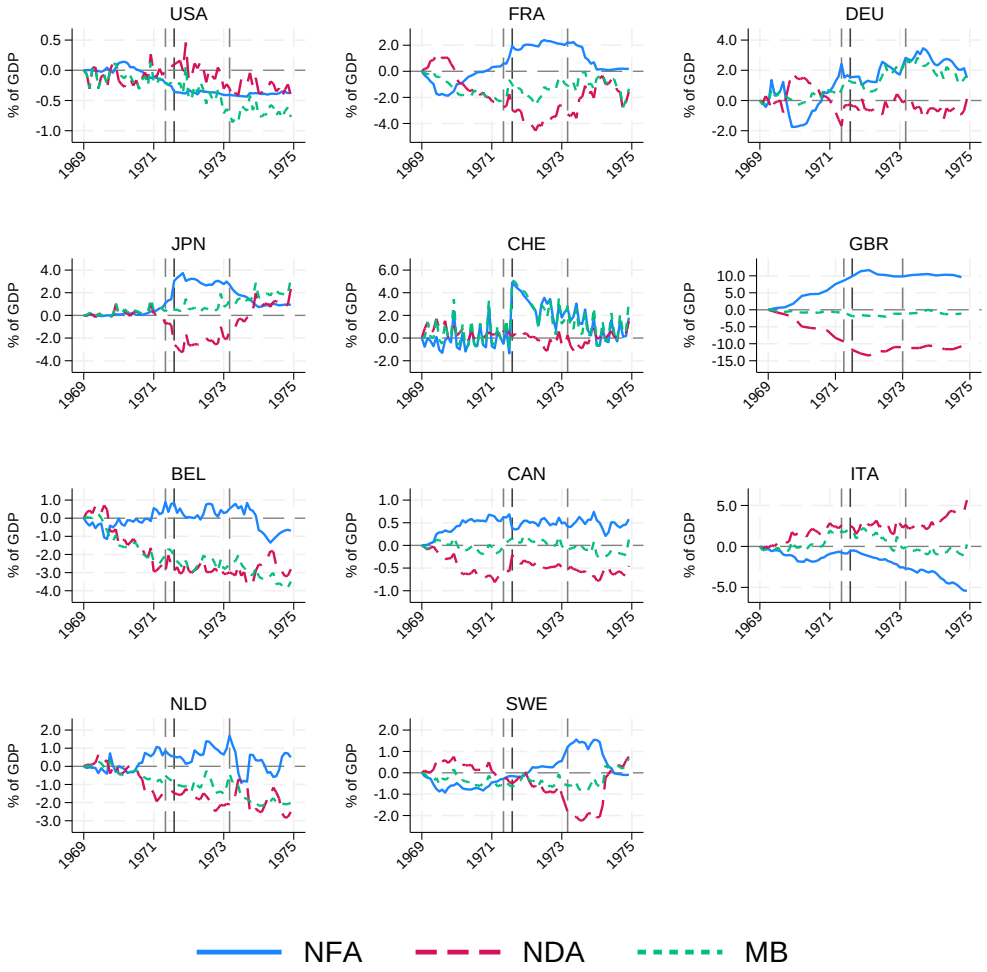
Source: Bank for International Settlements. Missing daily observations are filled forward using the last available rate. A positive log change represents a nominal appreciation of the US dollar vis-à-vis the currency indicated in the legend.

Figure A.6: Real Exchange Rate (LC/USD), Monthly (1964–1979)



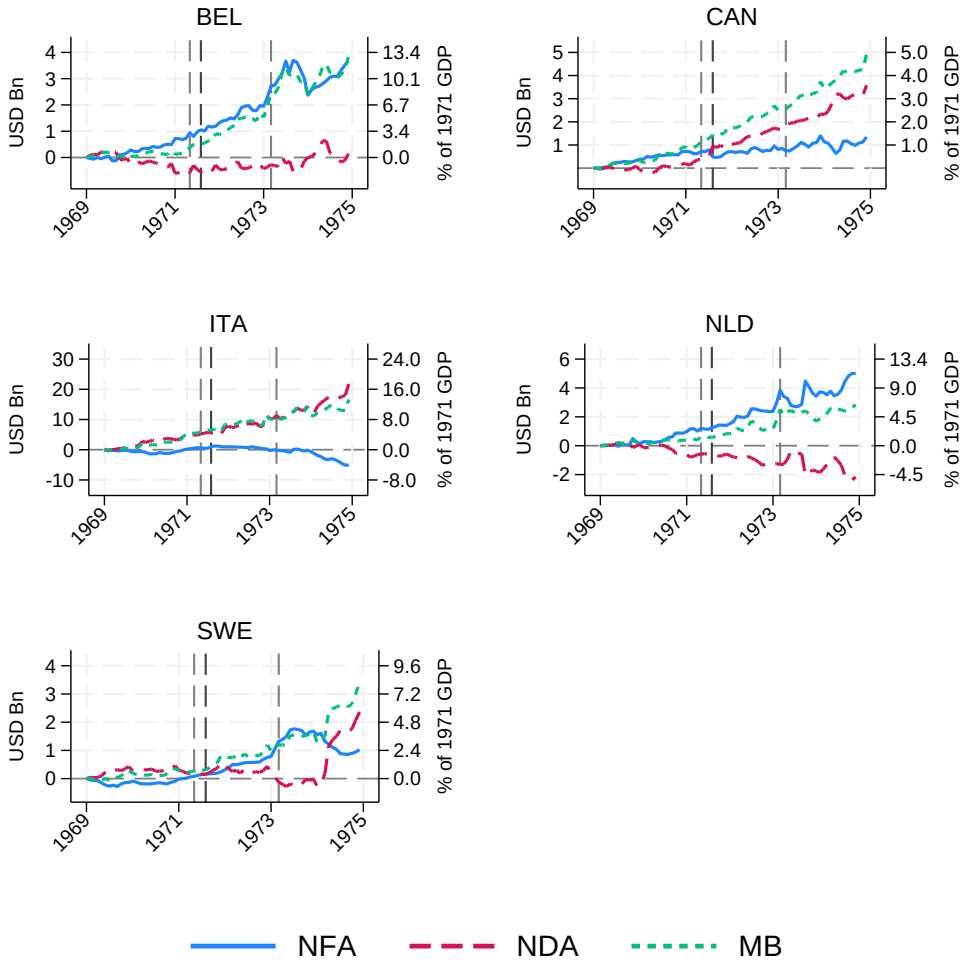
Source: Bank for International Settlements. Real exchange rates are constructed as the nominal exchange rate adjusted for relative CPIs. A positive log change represents a real appreciation of the US dollar vis-à-vis the currency indicated in the legend.

Figure A.7: G-10 Central Banks' Balance Sheet (1969–1974), Changes as % of GDP



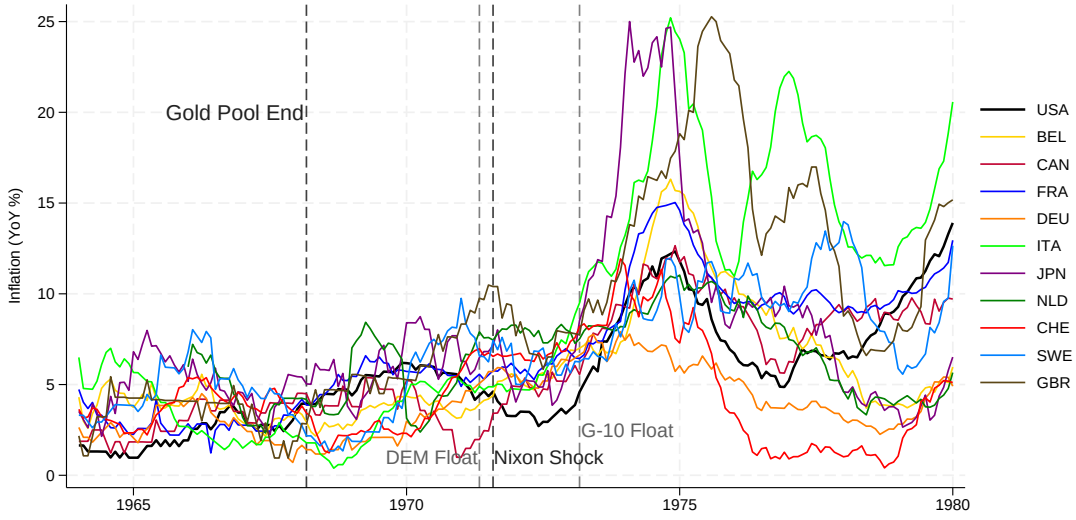
Sources: IMF Monetary and Financial Statistics (central bank balance sheets) and World Bank World Development Indicators (GDP). NFA denotes net foreign assets (foreign assets net of foreign liabilities). Net domestic assets (NDA) are computed as reserve money (monetary base, MB) minus NFA. Balance-sheet variables are expressed as changes in ratios relative to the base year (i.e., $100 \times [(X_t/GDP_t) - (X_0/GDP_0)]$). Annual GDP (in local currency units) is linearly interpolated in logs to obtain monthly (or quarterly, for the United Kingdom) observations for scaling purposes. Dashed lines represent the May 1971 DEM float, August 1971 Nixon Shock, and March 1973 G-10 float.

Figure A.8: G-10 Central Banks' Balance Sheet (1969–1974) — Additional Countries



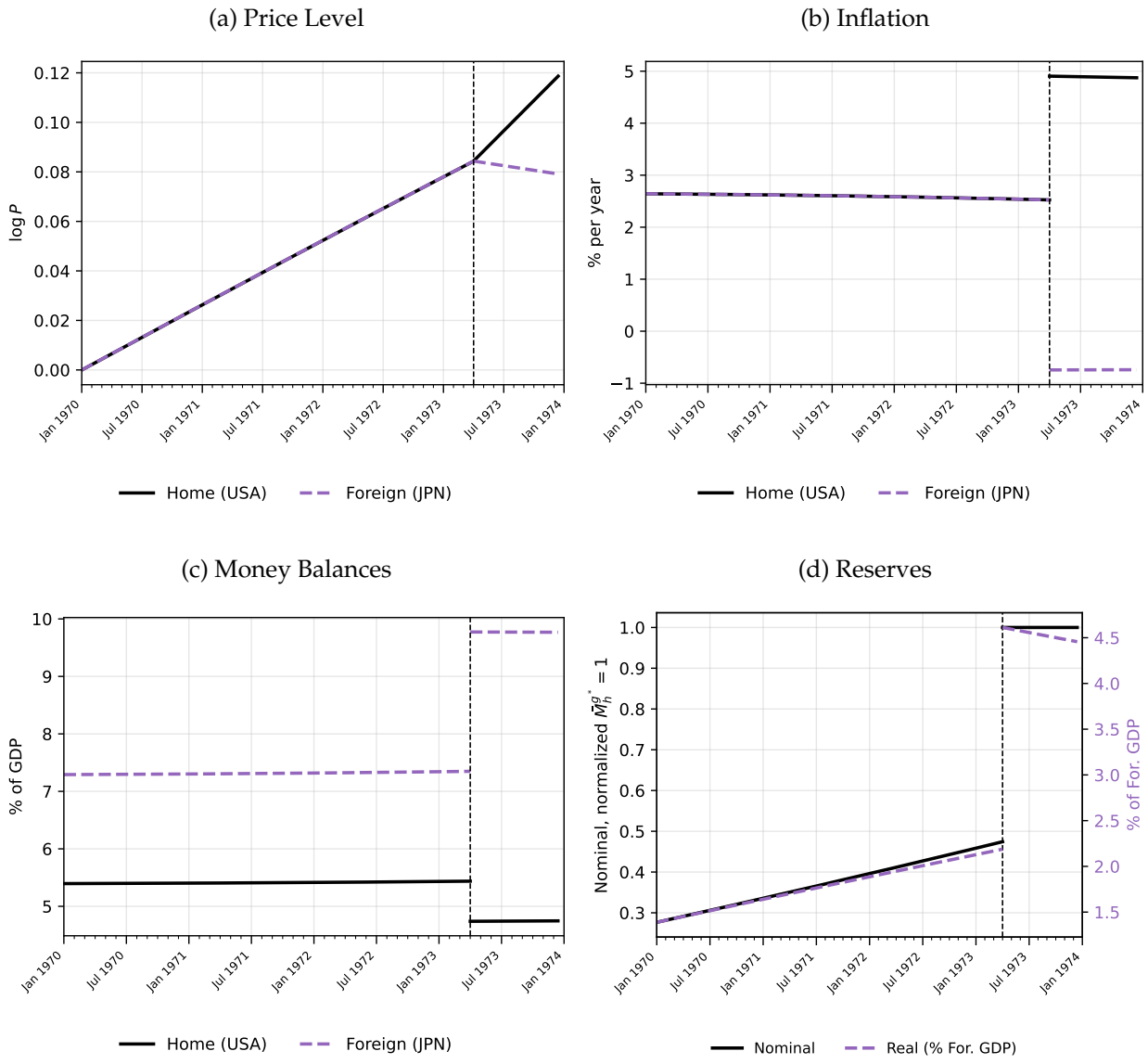
Sources: IMF Monetary and Financial Statistics (central bank balance sheets), Bank for International Settlements (exchange rates) and World Bank World Development Indicators (GDP). NFA denotes net foreign assets (foreign assets net of foreign liabilities). Net domestic assets (NDA) is computed as reserve money (monetary base or MB) minus NFA. Balance-sheet variables are expressed as changes relative to the base year and scaled by 1971 GDP (in current USD). Dashed lines represent the May 1971 DEM float, August 1971 Nixon Shock, and March 1973 G-10 float.

Figure A.9: Inflation



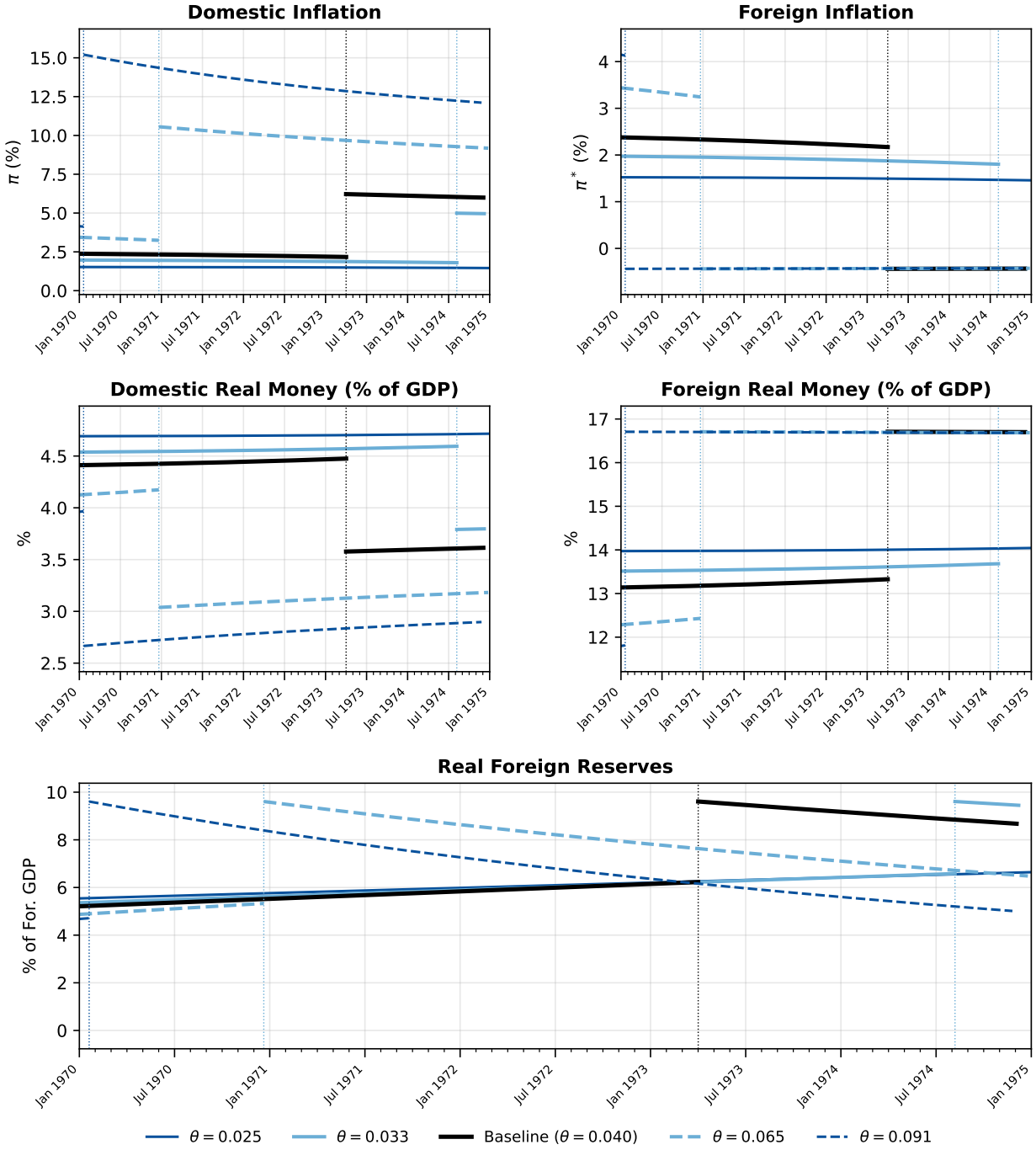
Source: Bank for International Settlements.

Figure A.10: Calibrated Model Results — Japan, March 1973 Crisis



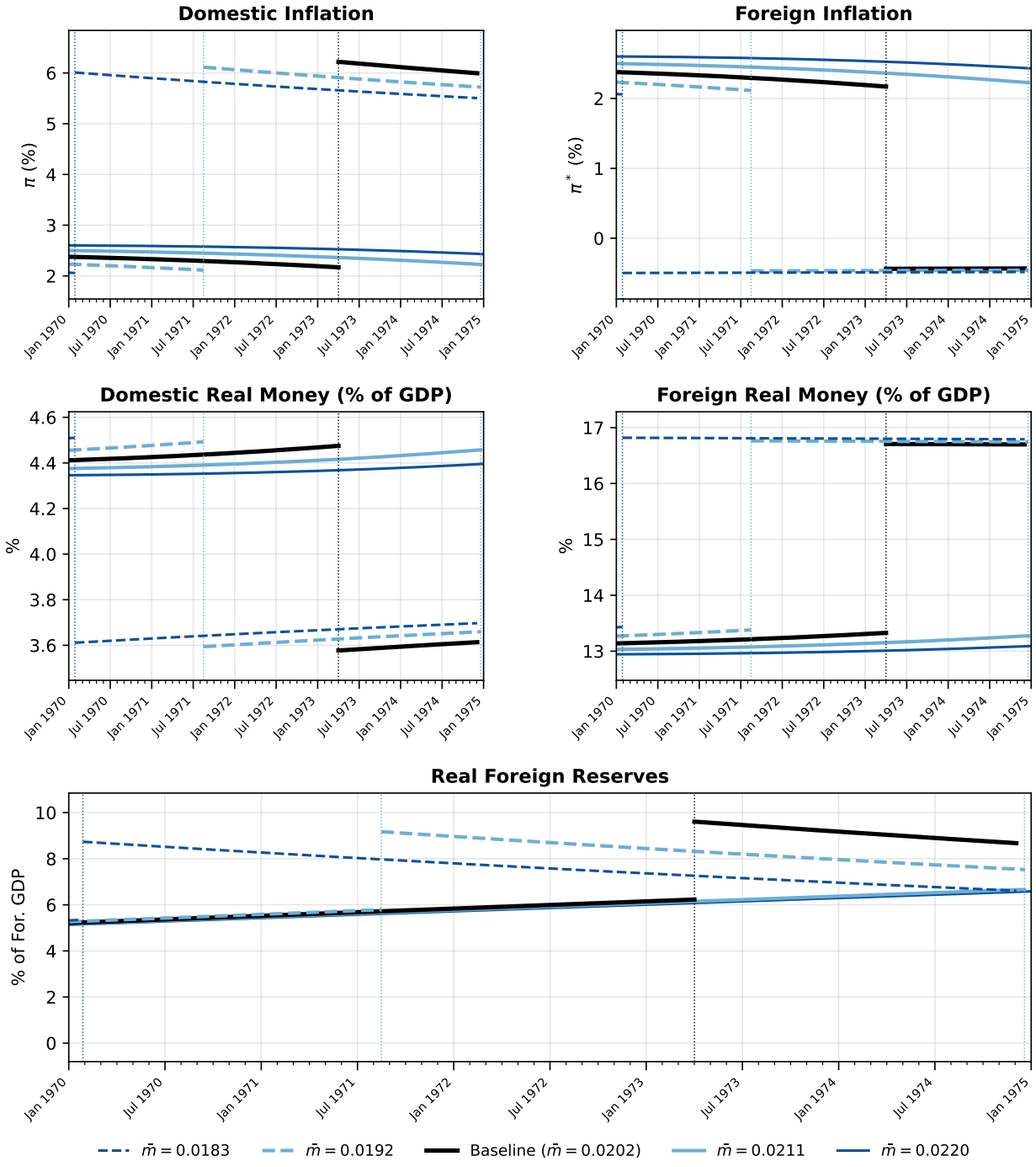
Notes: Paths are computed from the baseline Japan (March 1973) calibration.

Figure A.11: Calibrated Model Results — Comparative Statics θ



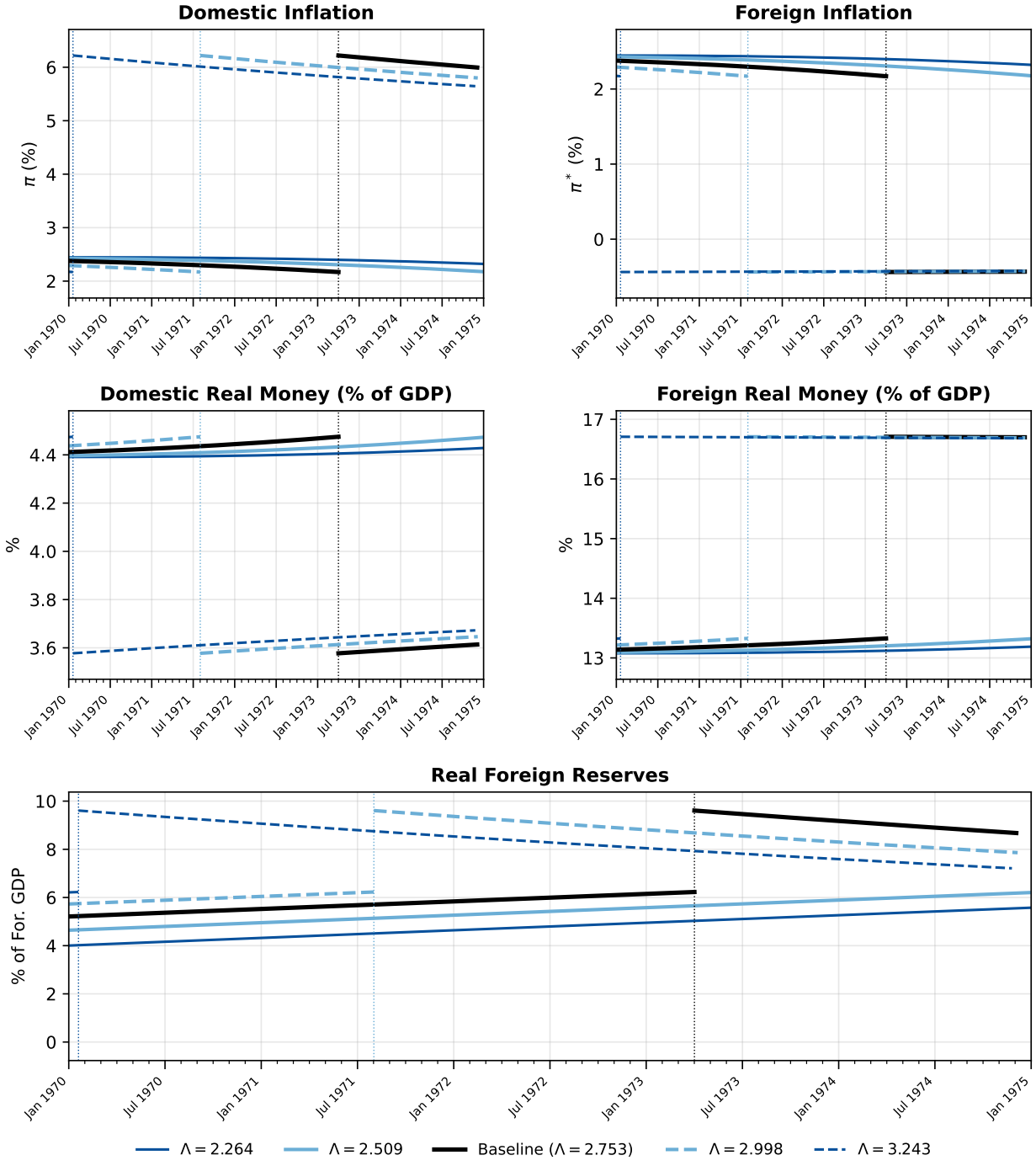
Notes: Comparative statics are computed using the Germany (March 1973) baseline calibration.

Figure A.12: Calibrated Model Results — Comparative Statics $\bar{m}_h^{g^*}$



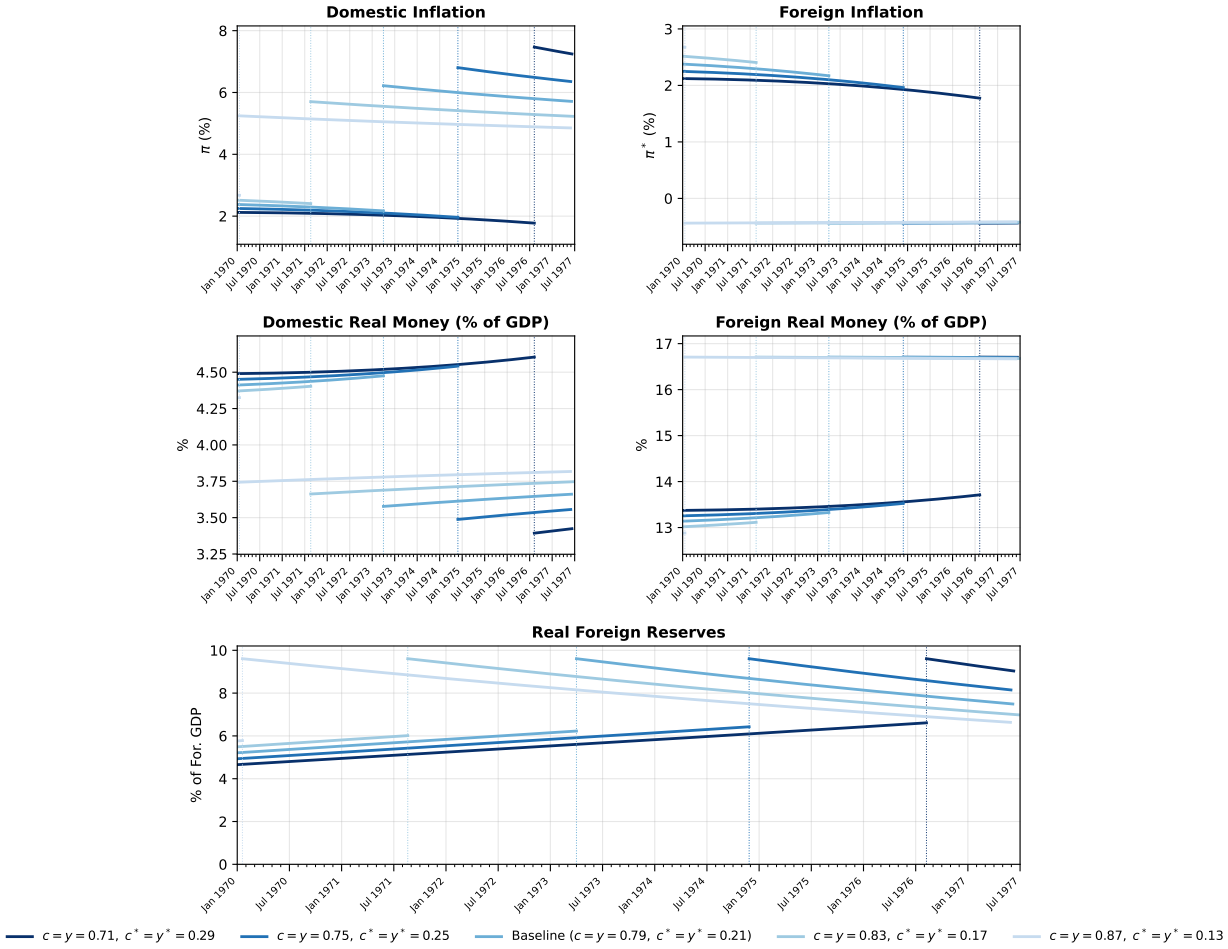
Notes: Comparative statics are computed using the Germany (March 1973) baseline calibration.

Figure A.13: Calibrated Model Results — Comparative Statics $\Lambda \equiv \frac{D_{h,0}}{ED^*_{f,0}}$



Notes: Comparative statics are computed using the Germany (March 1973) baseline calibration.

Figure A.14: Calibrated Model Results — Comparative Statics Size



Notes: Comparative statics are computed using the Germany (March 1973) baseline calibration.

A.3 Proofs

A.3.1 Derivation of Prices and Inflation

A.3.1.1 Home prices and inflation under floating exchange rate — $P_t, t \geq T$. Under a float, nominal reserve positions are constant and money market clearing in the home country is

$$M_t \equiv D_{h,0}e^{\theta t} - P_T \bar{m}_h^{g^*} = P_t\, m(\rho + \pi_t, c), \qquad t \geq T. \tag{A1}$$

Substituting CES money demand equation (15):

$$M_t = P_t\, c\left(\frac{\alpha}{\rho + \pi_t}\right)^{1/\sigma} \quad \Rightarrow \quad \alpha\left(\frac{M_t}{c}\right)^{-\sigma} = P_t^{-\sigma}\,(\rho + \pi_t)\,. \tag{A2}$$

Using $\pi_t = \dot{P}_t/P_t$,

$$P_t^{-\sigma}\,(\rho + \pi_t) = \rho P_t^{-\sigma} + \dot{P}_t\, P_t^{-(\sigma+1)}. \tag{A3}$$

Combining equation (A2) and equation (A3) and letting $z_t \equiv P_t^{-\sigma}$, so that $\dot{z}_t = -\sigma P_t^{-(\sigma+1)}\dot{P}_t$, yields the linear ODE

$$\dot{z}_t - \rho\sigma z_t = -\sigma\alpha\left(\frac{M_t}{c}\right)^{-\sigma}. \tag{A4}$$

The general solution to equation (A4) is

$$z_t = Ce^{\rho\sigma t} + \sigma\alpha\int_t^\infty \left(\frac{M_s}{c}\right)^{-\sigma} e^{-\rho\sigma(s-t)}\, ds, \tag{A5}$$

where C is a constant of integration. Since $M_s = D_{h,0}e^{\theta s} - P_T\bar{m}_h^{g^*}$ is strictly increasing in s (as $\dot{M}_s = \theta D_{h,0}e^{\theta s} > 0$), for all $s \geq t$ we have $M_s \geq M_t$, so $(M_s/c)^{-\sigma} \leq (M_t/c)^{-\sigma}$. Hence the particular solution satisfies

$$\sigma\alpha\int_t^\infty \left(\frac{M_s}{c}\right)^{-\sigma} e^{-\rho\sigma(s-t)}\, ds \leq \frac{\alpha}{\rho}\left(\frac{M_t}{c}\right)^{-\sigma} \to 0 \quad \text{as } t \to \infty,$$

since $M_t = D_{h,0}e^{\theta t} - P_T\bar{m}_h^{g^*} \to \infty$. So $Ce^{\rho\sigma t}$ dominates z_t for large t. If $C < 0$, then $z_t < 0$ for all sufficiently large t, contradicting $z_t = P_t^{-\sigma} > 0$. If $C > 0$, then $z_t \to \infty$, implying $P_t \to 0$ and hence $m_{h,t} = M_t/P_t \to \infty$. Since $a_t = m_{h,t} + b_{h,t} + b_{f,t}$, if $a_t \to \infty$ the home household's transversality condition is violated. Hence $b_{h,t}$ or $b_{f,t}$ must diverge to $-\infty$ to offset the divergence of $m_{h,t}$. Without loss of generality suppose $b_{h,t} \to -\infty$. By home bond market clearing equation (14d) and Assumption 2, which keeps $b_{h,t}^g$ bounded, we have $b_{h,t}^* \to +\infty$. But then foreign real wealth $a_t^* = m_{f,t}^* + b_{h,t}^* + b_{f,t}^* \to \infty$, violating the foreign household's transversality condition. Hence $C = 0$ and the unique equilibrium price path is

$$P_t = \left[\sigma\alpha c^\sigma \int_t^\infty \left(D_{h,0}e^{\theta s} - P_T\bar{m}_h^{g^*}\right)^{-\sigma} e^{-\rho\sigma(s-t)}\, ds\right]^{-1/\sigma} \qquad \text{for } t \geq T. \tag{A6}$$

P_T is defined implicitly:

$$P_T = \left[\sigma\alpha c^\sigma \int_T^\infty \left(D_{h,0}e^{\theta s} - P_T\bar{m}_h^{g^*}\right)^{-\sigma} e^{-\rho\sigma(s-T)}\, ds\right]^{-1/\sigma}. \tag{A7}$$

The inflation rate is the derivative of $\log(P_t)$, with the prices in equation (A6), that is,

$$\pi_t = -\rho + \frac{1}{\sigma} \frac{\left(D_{h,0} e^{\theta t} - P_T \bar{m}_h^{g^*}\right)^{-\sigma}}{\displaystyle\int_t^{\infty} \left(D_{h,0} e^{\theta s} - P_T \bar{m}_h^{g^*}\right)^{-\sigma} e^{-\rho\sigma(s-t)}\, ds}. \tag{A8}$$

As $t \to \infty$, the constant reserve term $P_T \bar{m}_h^{g^*}$ becomes negligible relative to $D_{h,0} e^{\theta t}$, so $\pi_t \to \theta$.

Moreover, differentiating equation (A8) with respect to time yields $\dot{\pi}_t = \sigma(\pi_t + \rho)(\pi_t - \mu_t)$, where $\mu_t = \theta \dfrac{D_{h,0} e^{\theta t}}{D_{h,0} e^{\theta t} - P_T \bar{m}_h^{g^*}} > \theta$ is decreasing in t with $\mu_t \to \theta$. Suppose, for contradiction, that $\pi_{t_0} \geq \mu_{t_0}$ at some $t_0 \geq T$. Then $\dot{\pi}_{t_0} \geq 0$ while $\dot{\mu}_{t_0} < 0$, so $\pi_t - \mu_t$ is strictly increasing through t_0, $\dot{\pi}_t$ becomes strictly positive and bounded away from zero, and π_t diverges — contradicting $\pi_t \to \theta$. Hence $\pi_t < \mu_t$ and $\dot{\pi}_t < 0$ for all $t \geq T$, so π_t decreases monotonically from $\pi_{T^+} > \theta$ (established in the proof of Lemma 1) to θ.

A.3.1.2 Foreign prices and inflation under floating exchange rate — P^*_t, π^*_t, $t \geq T$. Under a float, nominal reserve positions are frozen at their time-T values. The foreign central bank balance sheet equation (9a) and Assumption 1 imply that valuation changes in the reserve position are absorbed by net worth, so that foreign money market clearing reduces to

$$M^*_t \equiv D^*_{f,0} e^{\theta^* t} + P^*_T \bar{m}^{g^*}_h = P^*_t m^*(\rho + \pi^*_t, c^*), \qquad t \geq T. \tag{A9}$$

Following Appendix Section A.3.1.1 and applying the same transversality argument, the unique equilibrium foreign price and inflation paths are

$$P^*_t = \left[\sigma \alpha^* (c^*)^\sigma \int_t^\infty (M^*_s)^{-\sigma} e^{-\rho\sigma(s-t)}\, ds\right]^{-1/\sigma}, \qquad t \geq T, \tag{A10}$$

$$\pi^*_t = -\rho + \frac{1}{\sigma} \frac{\left(M^*_t\right)^{-\sigma}}{\int_t^\infty \left(M^*_s\right)^{-\sigma} e^{-\rho\sigma(s-t)}\, ds}. \tag{A11}$$

A.3.1.3 Home prices under fixed exchange rate — $P_t, t \le T$. Under the peg, PPP implies $P_t = EP_t^*$ and inflation is common across countries, given $\epsilon_t = 0$. World money market clearing under the peg is

$$M_t^W \equiv D_{h,0}e^{\theta t} + ED_{f,0}^* e^{\theta^* t} = P_t\Big(m(\rho + \pi_t, c) + m^*(\rho + \pi_t, c^*)\Big). \tag{A12}$$

Under CES with country-specific money-demand shifters α (home) and α^* (foreign),

$$\begin{aligned} m(\rho + \pi_t, c) + m^*(\rho + \pi_t, c^*) &= c\left(\frac{\alpha}{\rho + \pi_t}\right)^{1/\sigma} + c^*\left(\frac{\alpha^*}{\rho + \pi_t}\right)^{1/\sigma} \\ &= \left(\frac{1}{\rho + \pi_t}\right)^{1/\sigma}\Big(c\,\alpha^{1/\sigma} + c^*(\alpha^*)^{1/\sigma}\Big). \end{aligned} \tag{A13}$$

Define the constant

$$\kappa \equiv c\,\alpha^{1/\sigma} + c^*(\alpha^*)^{1/\sigma}.$$

Substituting equation (A13) into equation (A12) yields

$$M_t^W = P_t\,\kappa\left(\frac{1}{\rho + \pi_t}\right)^{1/\sigma} \quad \Rightarrow \quad \kappa^\sigma M_t^{W-\sigma} = \rho P_t^{-\sigma} + \dot{P}_t\,P_t^{-(\sigma+1)}. \tag{A14}$$

Let $z_t \equiv P_t^{-\sigma}$. Then z_t solves the linear ODE

$$\dot{z}_t - \rho\sigma z_t = -\sigma\,\kappa^\sigma\,M_t^{W-\sigma}.$$

Using the terminal condition P_{T^-} inherited from the post-crisis solution and integrating from t to T,

$$z_t = \sigma\,\kappa^\sigma \int_t^T M_s^{W-\sigma} e^{-\rho\sigma(s-t)}\,ds + e^{-\rho\sigma(T-t)} z_T, \qquad z_T = {P_{T^-}}^{-\sigma}.$$

Hence the pre-switch price level is

$$P_t = \left[\sigma\,\kappa^\sigma \int_t^T \left(D_{h,0}e^{\theta s} + ED_{f,0}^* e^{\theta^* s}\right)^{-\sigma} e^{-\rho\sigma(s-t)}\,ds + e^{-\rho\sigma(T-t)}{P_T}^{-\sigma}\right]^{-1/\sigma}, \qquad t < T, \tag{A15}$$

and $P_t^* = P_t/E$.

A.3.2 Proof of Lemma 1

Under Assumptions 1–4, with $\theta > \theta^*$, $\bar{m}_h^{g^*} < m^*(\rho, c^*)$, and $\widetilde{P} < E\widetilde{P^*}$, the path for inflation has the following properties:

1. Floating exchange rate regime:
   (a) Home country: for all $t \geq T^+ : \pi_t > \theta$ and $\lim_{t\to\infty} \pi_t = \theta$.
   (b) Foreign country: for all $t \geq T^+ : \pi_t^* = 0$ when $\theta^* = 0$, $\pi_t^* \in (-\rho, \max(\theta^*, 0))$ for $\theta^* \neq 0$, and

$$\lim_{t\to\infty} \pi_t^* = \begin{cases} \theta^* & \text{for } \theta^* \geq 0 \\ 0 & \text{for } \theta^* \leq 0. \end{cases}$$

2. Fixed exchange rate regime:
   (a) For all $t \leq T^-$, $\pi_t < \pi_{T^+}$. If, in addition, $\theta D_{h,0} + \theta^* E D_{f,0}^* \geq 0$, then also $\pi_{T^+}^* < \pi_t$.
   (b) For all $t \leq T^-$:

$$\theta^* < \pi_t < \theta \iff \frac{c\alpha^{1/\sigma} + c^*(\alpha^*)^{1/\sigma}}{D_{h,0}/\widetilde{P} + D_{f,0}^*/\widetilde{P^*}} \in \left((\rho+\theta^*)^{1/\sigma}, (\rho+\theta)^{1/\sigma}\right), \tag{A16}$$

   where $\widetilde{P}, \widetilde{P^*}$ satisfy equation (22).

Proof We rely on the price solutions derived in Appendix Section A.3.1. Differentiating $\log P_t$ and $\log P_t^*$ from equation (19a)–equation (21) yields

$$\pi_t = -\rho + \frac{1}{\sigma} \frac{M_t^{-\sigma}}{\int_t^\infty M_s^{-\sigma} e^{-\rho\sigma(s-t)}\, ds}, \qquad t \geq T, \tag{A17}$$

$$\pi_t^* = -\rho + \frac{1}{\sigma} \frac{(M_t^*)^{-\sigma}}{\int_t^\infty (M_s^*)^{-\sigma} e^{-\rho\sigma(s-t)}\, ds}, \qquad t \geq T, \tag{A18}$$

$$\frac{1}{\rho + \pi_t} = \sigma \int_t^T \left(\frac{M_t^W}{M_s^W}\right)^\sigma e^{-\rho\sigma(s-t)}\, ds + \frac{e^{-\rho\sigma(T-t)}}{\rho + \pi_{T^-}} \left(\frac{M_t^W}{M_T^W}\right)^\sigma, \qquad t \leq T, \tag{A19}$$

where $M_t \equiv D_{h,0}e^{\theta t} - P_T \bar{m}_h^{g^*}$, $M_t^* \equiv D_{f,0}^* e^{\theta^* t} + P_T^* \bar{m}_h^{g^*}$, and $M_t^W \equiv D_{h,0}e^{\theta t} + E D_{f,0}^* e^{\theta^* t}$. Since $\theta > \theta^*$ and both nominal credit stocks are positive,

$$e^{-\theta(s-t)} < \frac{M_t^W}{M_s^W} < e^{-\theta^*(s-t)}, \qquad s > t. \tag{A20}$$

Part 1: inflation under the float.

Part 1(a): home country. Since $M_t = D_{h,0}e^{\theta t} - P_T \bar{m}_h^{g^*}$ with $\bar{m}_h^{g^*} > 0$, $M_s - M_t e^{\theta(s-t)} = P_T \bar{m}_h^{g^*}\left(e^{\theta(s-t)} - 1\right) > 0$ for $s > t \geq T$, so $M_s > M_t e^{\theta(s-t)}$. Hence $(M_s)^{-\sigma} < (M_t)^{-\sigma} e^{-\theta\sigma(s-t)}$ and

$$\int_t^\infty M_s^{-\sigma} e^{-\rho\sigma(s-t)}\, ds < \frac{M_t^{-\sigma}}{(\rho+\theta)\sigma}.$$

Substituting into equation (A17) gives $\pi_t > \theta$ for all $t > T$. As $t \to \infty$, $P_T \bar{m}_h^{g^*}/M_t \to 0$, so $M_t \sim D_{h,0}e^{\theta t}$ and the ratio in equation (A17) converges to $(\rho+\theta)\sigma$, giving $\pi_t \to \theta$.

Part 1(b): foreign country. Evaluating equation (A18) at $t = T^+$ with CES money demand gives $\rho + \pi_{T^+}^* = \alpha^*(c^*/m_{f,T^+}^*)^\sigma > 0$, so $\pi_{T^+}^* > -\rho$. For $\theta^* > 0$, $M_t^* e^{\theta^*(s-t)} - M_s^* = P_T^* \bar{m}_h^{g^*}\left(e^{\theta^*(s-t)} - 1\right) > 0$ for $s > t$, so $M_s^* < M_t^* e^{\theta^*(s-t)}$.

The same argument as for the home country then gives $\pi_t^* < \theta^*$ for all $t > T$ and $\pi_t^* \to \theta^*$. For $\theta^* = 0$, M_t^* is constant, so the integral in equation (A18) equals $(M_t^*)^{-\sigma}/(\rho\sigma)$, giving $\pi_t^* = 0$ for all $t \geq T$. For $\theta^* < 0$, M_t^* is strictly decreasing ($\dot{M}_t^* = \theta^* D_{f,0}^* e^{\theta^* t} < 0$), so $(M_s^*)^{-\sigma} > (M_t^*)^{-\sigma}$ for $s > t$ and

$$\int_t^\infty (M_s^*)^{-\sigma} e^{-\rho\sigma(s-t)}\, ds > \frac{(M_t^*)^{-\sigma}}{\rho\sigma},$$

giving $\pi_t^* < 0 = \max(\theta^*, 0)$. As $t \to \infty$, $D_{f,0}^* e^{\theta^* t} \to 0$ so $M_t^* \to P_T^* \bar{m}_h^{g^*} > 0$; the integral then converges to $(P_T^* \bar{m}_h^{g^*})^{-\sigma}/(\rho\sigma)$ and $\pi_t^* \to 0 = \max(\theta^*, 0)$.

Part 2: inflation under the peg.

Part 2(a): behavior at the switch date. Adding the home and foreign floating money-market conditions at $t = T^+$, the reserve terms $\pm P_T \bar{m}_h^{g^*}$ cancel and give

$$M_T^W = P_T\Big[c\,\alpha^{1/\sigma}(\rho + \pi_{T^+})^{-1/\sigma} + c^*(\alpha^*)^{1/\sigma}(\rho + \pi_{T^+}^*)^{-1/\sigma}\Big]. \tag{A21}$$

The world money-market condition under the peg at $t = T^-$ gives

$$M_T^W = P_T\,\kappa\,(\rho + \pi_{T^-})^{-1/\sigma}, \tag{A22}$$

where $\kappa \equiv c\alpha^{1/\sigma} + c^*(\alpha^*)^{1/\sigma}$. Equating equation (A21) and equation (A22),

$$(\rho + \pi_{T^-})^{-1/\sigma} = w\,(\rho + \pi_{T^+})^{-1/\sigma} + (1 - w)\,(\rho + \pi_{T^+}^*)^{-1/\sigma}, \tag{A23}$$

where $w \equiv c\alpha^{1/\sigma}/\kappa \in (0, 1)$. Since $f(x) \equiv (\rho + x)^{-1/\sigma}$ is strictly decreasing and $\pi_{T^+} > \pi_{T^+}^*$ (part 1), equation (A23) expresses $f(\pi_{T^-})$ as a strict convex combination of the distinct values $f(\pi_{T^+})$ and $f(\pi_{T^+}^*)$. Hence $\pi_{T^+}^* < \pi_{T^-} < \pi_{T^+}$.

Part 2(a), upper bound: $\pi_t < \pi_{T^+}$ for $t < T$. Apply the left inequality in equation (A20) to both the integral and the terminal term in equation (A19):

$$\frac{1}{\rho + \pi_t} > \frac{1 - e^{-(\rho+\theta)\sigma(T-t)}}{\rho + \theta} + \frac{e^{-(\rho+\theta)\sigma(T-t)}}{\rho + \pi_{T^-}}.$$

Since $\pi_{T^+} > \theta$ (part 1(a)) and $\pi_{T^+} > \pi_{T^-}$, both $(\rho + \theta)^{-1}$ and $(\rho + \pi_{T^-})^{-1}$ strictly exceed $(\rho + \pi_{T^+})^{-1}$, so

$$\frac{1 - e^{-(\rho+\theta)\sigma(T-t)}}{\rho + \theta} + \frac{e^{-(\rho+\theta)\sigma(T-t)}}{\rho + \pi_{T^-}} > \frac{1 - e^{-(\rho+\theta)\sigma(T-t)} + e^{-(\rho+\theta)\sigma(T-t)}}{\rho + \pi_{T^+}} = \frac{1}{\rho + \pi_{T^+}},$$

hence $\pi_t < \pi_{T^+}$.

Part 2(a), lower bound: $\pi_t > \pi_{T^+}^*$ under $\theta D_{h,0} + \theta^* E D_{f,0}^* \geq 0$. Apply the right inequality in equation (A20) and use $\pi_{T^-} > \pi_{T^+}^*$:

$$\frac{1}{\rho + \pi_t} < \frac{1 - e^{-(\rho+\theta^*)\sigma(T-t)}}{\rho + \theta^*} + \frac{e^{-(\rho+\theta^*)\sigma(T-t)}}{\rho + \pi_{T^+}^*}. \tag{A24}$$

For $\theta^* > 0$: $\pi_{T^+}^* < \theta^*$, so $(\rho + \theta^*)^{-1} < (\rho + \pi_{T^+}^*)^{-1}$ and the right-hand side of equation (A24) is strictly below $(\rho + \pi_{T^+}^*)^{-1}$. For $\theta^* = 0$: $\pi_{T^+}^* = 0$ and equation (A24) equals $\rho^{-1} = (\rho + \pi_{T^+}^*)^{-1}$. For $\theta^* < 0$: assuming $\theta D_{h,0} + \theta^* E D_{f,0}^* \geq 0$ ensures $\dot{M}_t^W \geq 0$, so $M_t^W/M_s^W \leq 1$ for $s \geq t$. Applying this to equation (A19) and using $\pi_{T^-} > \pi_{T^+}^*$:

$$\frac{1}{\rho + \pi_t} < \frac{1 - e^{-\rho\sigma(T-t)}}{\rho} + \frac{e^{-\rho\sigma(T-t)}}{\rho + \pi_{T^+}^*} = \frac{1}{\rho + \pi_{T^+}^*} - \underbrace{(1 - e^{-\rho\sigma(T-t)})}_{>0}\underbrace{\left[\frac{1}{\rho + \pi_{T^+}^*} - \frac{1}{\rho}\right]}_{>0 \text{ since } \pi_{T^+}^* < 0} < \frac{1}{\rho + \pi_{T^+}^*}.$$

In all cases $(\rho + \pi_t)^{-1} < (\rho + \pi^*_{T^+})^{-1}$, so $\pi_t > \pi^*_{T^+}$.

Part 2(b): $\theta^* < \pi_t < \theta$ for $t \le T^-$. Equation (23) is equivalent to $\pi_{T^-} \in (\theta^*, \theta)$. To see this, note that the parity condition at collapse $P_T = E_T P_T^*$ and the definitions $\widetilde{P} \equiv e^{-\theta T} P_T$, $\widetilde{P}^* \equiv e^{-\theta^* T} P_T^*$ give

$$D_{h,0} e^{\theta T} = \frac{D_{h,0}}{\widetilde{P}} \cdot P_T, \qquad D_{f,0}^* e^{\theta^* T} = \frac{D_{f,0}^*}{\widetilde{P}^*} \cdot P_T / E,$$

so the world credit stock satisfies $M_T^W = P_T\left(D_{h,0}/\widetilde{P} + D_{f,0}^*/\widetilde{P}^*\right)$. The world money-market condition at T^- gives $M_T^W = P_T \kappa (\rho + \pi_{T^-})^{-1/\sigma}$. Combining:

$$(\rho + \pi_{T^-})^{1/\sigma} = \frac{\kappa}{D_{h,0}/\widetilde{P} + D_{f,0}^*/\widetilde{P}^*}. \tag{A25}$$

Hence equation (23) is equivalent to $\pi_{T^-} \in (\theta^*, \theta)$.

For sufficiency, we first apply the lower bound $M_t^W / M_s^W > e^{-\theta(s-t)}$ from equation (A20) to equation (A19):

$$\frac{1}{\rho + \pi_t} > \frac{1 - e^{-(\rho+\theta)\sigma(T-t)}}{\rho + \theta} + \frac{e^{-(\rho+\theta)\sigma(T-t)}}{\rho + \pi_{T^-}}.$$

Since $\pi_{T^-} < \theta$, $(\rho + \pi_{T^-})^{-1} > (\rho + \theta)^{-1}$ and the right-hand side strictly exceeds $(\rho + \theta)^{-1}$, so $\pi_t < \theta$. Applying the upper bound $M_t^W / M_s^W < e^{-\theta^*(s-t)}$ from equation (A20) to equation (A19):

$$\frac{1}{\rho + \pi_t} < \frac{1 - e^{-(\rho+\theta^*)\sigma(T-t)}}{\rho + \theta^*} + \frac{e^{-(\rho+\theta^*)\sigma(T-t)}}{\rho + \pi_{T^-}}.$$

Since $\pi_{T^-} > \theta^*$, $(\rho + \pi_{T^-})^{-1} < (\rho + \theta^*)^{-1}$ and the right-hand side is strictly less than $(\rho + \theta^*)^{-1}$, so $\pi_t > \theta^*$. Hence $\theta^* < \pi_t < \theta$ for all $t \in [0, T)$.

For necessity, suppose $\theta^* < \pi_t < \theta$ for all $t \in [0, T^-]$, including the limit $t = T^-$. Then in particular $\pi_{T^-} \in (\theta^*, \theta)$, and equation (A25) yields equation (23) immediately.

A.3.3 Derivation of Reserves

The home real central bank balance sheet equation (6) is

$$d_{h,t} = m_{h,t} + m^{g^*}_{h,t} \qquad \Rightarrow \qquad m^{g^*}_{h,t} = d_{h,t} - m_{h,t}.$$

Differentiating gives

$$\dot{m}^{g^*}_{h,t} = \dot{d}_{h,t} - \dot{m}_{h,t}. \tag{A26}$$

Domestic credit obeys $\dot{D}_{h,t} = \theta D_{h,t}$. Since $d_{h,t} \equiv D_{h,t}/P_t$,

$$\dot{d}_{h,t} = \frac{\dot{D}_{h,t}}{P_t} - \frac{D_{h,t}}{P_t}\frac{\dot{P}_t}{P_t} = (\theta - \pi_t)d_{h,t}. \tag{A27}$$

Money demand under the peg is $m_{h,t} = c(\alpha/(\rho + \pi_t))^{1/\sigma}$, so with constant c,

$$\dot{m}_{h,t} = -\frac{1}{\sigma} m_{h,t}\frac{\dot{i}_t}{i_t} = -\frac{1}{\sigma} m_{h,t}\frac{\dot{\pi}_t}{\rho + \pi_t}. \tag{A28}$$

Combining equation (A26)–equation (A28),

$$\dot{m}^{g^*}_{h,t} = (\theta - \pi_t)d_{h,t} + \frac{1}{\sigma} m_{h,t}\frac{\dot{\pi}_t}{\rho + \pi_t}, \qquad t < T. \tag{A29}$$

It is useful to rewrite equation (A29) in terms of the growth rate of world nominal money under the peg. We take logs of the market clearing condition $M^W_t = P_t\,\kappa\,(\rho + \pi_t)^{-1/\sigma}$—the first equality in equation (A14)—and differentiate:

$$\frac{\dot{M}^W_t}{M^W_t} = \pi_t - \frac{1}{\sigma}\frac{\dot{\pi}_t}{\rho + \pi_t}. \tag{A30}$$

Define the growth rate of world nominal money under the peg as

$$\theta^W_t \equiv \frac{\dot{M}^W_t}{M^W_t} = \frac{\theta D_{h,0} e^{\theta t} + \theta^* E D^*_{f,0} e^{\theta^* t}}{D_{h,0} e^{\theta t} + E D^*_{f,0} e^{\theta^* t}} < \theta, \tag{A31}$$

where the inequality uses $\theta > \theta^*$. Then equation (A30) implies

$$\frac{1}{\sigma}\frac{\dot{\pi}_t}{\rho + \pi_t} = \pi_t - \theta^W_t. \tag{A32}$$

Substituting equation (A32) into equation (A29),

$$\dot{m}^{g^*}_{h,t} = (\theta - \pi_t)d_{h,t} + m_{h,t}\left(\pi_t - \theta^W_t\right). \tag{A33}$$

Using $d_{h,t} = m_{h,t} + m^{g^*}_{h,t}$, we obtain

$$\begin{aligned}\dot{m}^{g^*}_{h,t} &= (\theta - \pi_t)\left(m_{h,t} + m^{g^*}_{h,t}\right) + m_{h,t}\left(\pi_t - \theta^W_t\right) \\ &= (\theta - \theta^W_t)m_{h,t} + (\theta - \pi_t)m^{g^*}_{h,t}.\end{aligned} \tag{A34}$$

We can divide by $m_{h,t}^{g^*}$ and obtain:

$$\frac{\dot{m}_{h,t}^{g^*}}{m_{h,t}^{g^*}} = (\theta - \theta_t^W)\,\frac{m_{h,t}}{m_{h,t}^{g^*}} + (\theta - \pi_t), \qquad t < T. \tag{A35}$$

A.3.4 Proof of Proposition 1

In an economy satisfying Assumptions 1–4 in which the reserve bound, whenever finite, satisfies $\bar{m}_h^{g^*} < m^*(\rho, c^*)$ and the associated unique solution $(\widetilde{P}, \widetilde{P}^*)$ of equation (22) satisfies $\widetilde{P} < E\widetilde{P}^*$, the fixed exchange rate regime collapses at a unique finite date $0 < T < \infty$ if, and only if,

(i) $\theta > \theta^*$, and

(ii) $\bar{m}_h^{g^*} < \infty$,

in which case the collapse date and the size of the attack are

$$T = \frac{\ln\left(E\widetilde{P}^*/\widetilde{P}\right)}{\theta - \theta^*}, \qquad \Delta \;=\; m(\rho + \pi_{T^-}, c) - m(\rho + \pi_{T^+}, c) \;=\; m^*(\rho + \pi^*_{T^+}, c^*) - m^*(\rho + \pi^*_{T^-}, c^*) \;>\; 0.$$

Proof Given the fixed-point equations equation (22), we divide the home equation by $D_{h,0}$ and the foreign equation by $D^*_{f,0}$, such that $\hat{P} \equiv \widetilde{P}/D_{h,0}$ and $\hat{P}^* \equiv \widetilde{P}^*/D^*_{f,0}$ solve

$$\hat{P} = \left[\sigma\alpha c^\sigma \int_0^\infty \left(e^{\theta u} - \hat{P}\,\bar{m}_h^{g^*}\right)^{-\sigma} e^{-\rho\sigma u}\, du\right]^{-1/\sigma}, \qquad \hat{P}^* = \left[\sigma\alpha^*(c^*)^\sigma \int_0^\infty \left(e^{\theta^* u} + \hat{P}^*\bar{m}_h^{g^*}\right)^{-\sigma} e^{-\rho\sigma u}\, du\right]^{-1/\sigma},$$

so $\hat{P}$ depends only on $(\theta, \bar{m}_h^{g^*})$ and $\hat{P}^*$ only on $(\theta^*, \bar{m}_h^{g^*})$, given $(\alpha, \alpha^*, c, c^*, \rho, \sigma)$. For any θ, θ^*,

$$\frac{P_T}{P^*_T} = \frac{\widetilde{P}}{\widetilde{P}^*}\, e^{(\theta-\theta^*)T} \tag{A36}$$

so the switch condition $P_T = EP^*_T$ is equivalent to $e^{(\theta-\theta^*)T} = E\widetilde{P}^*/\widetilde{P}$.

(If) Suppose $\theta > \theta^*$ and $0 < \bar{m}_h^{g^*} < \infty$. We first show that the fixed-point system has a unique solution, with $\hat{P} \in (0, 1/\bar{m}_h^{g^*})$ and $\hat{P}^* \in (0, \infty)$.

Home. The integrand is well defined only if $e^{\theta u} - \hat{P}\,\bar{m}_h^{g^*} > 0$ for all $u \geq 0$; since $\theta > 0$ (Assumption 1), the constraint binds at $u = 0$, so the admissible domain is $\hat{P} \in (0, 1/\bar{m}_h^{g^*})$. The fixed point is equivalent to $\Psi(\hat{P}) = 1$, where

$$\Psi(\hat{P}) \equiv \sigma\alpha c^\sigma \int_0^\infty \left(\frac{e^{\theta u}}{\hat{P}} - \bar{m}_h^{g^*}\right)^{-\sigma} e^{-\rho\sigma u}\, du.$$

The integrand is strictly increasing in $\hat{P}$ for every u, so Ψ is strictly increasing, and it is continuous, with $\Psi(0^+) = 0$ since the integrand vanishes pointwise as $\hat{P} \to 0^+$. As $\hat{P} \uparrow 1/\bar{m}_h^{g^*}$ the integrand increases pointwise to $(\bar{m}_h^{g^*})^{-\sigma}\left(e^{\theta u} - 1\right)^{-\sigma} e^{-\rho\sigma u}$, which, since $e^{\theta u} - 1 \sim \theta u$ as $u \to 0$, behaves as $(\bar{m}_h^{g^*}\,\theta u)^{-\sigma}$ near $u = 0$ and is therefore not integrable for $\sigma \geq 1$; by monotone convergence, $\Psi(\hat{P}) \to \infty$. By the intermediate value theorem and strict monotonicity, Ψ crosses 1 exactly once: the home equation has a unique solution $\hat{P} \in (0, 1/\bar{m}_h^{g^*})$ for *every* $\bar{m}_h^{g^*} \in (0, \infty)$.

Foreign. The same rearrangement makes the foreign equation equivalent to $\Phi(\hat{P}^*) = 1$, where

$$\Phi(\hat{P}^*) \equiv \sigma\alpha^*(c^*)^\sigma \int_0^\infty \left(\frac{e^{\theta^* u}}{\hat{P}^*} + \bar{m}_h^{g^*}\right)^{-\sigma} e^{-\rho\sigma u}\, du,$$

which is well defined for all $\hat{P}^* > 0$ because the reserve claim enters with a positive sign, so the integrand is bounded by $(\bar{m}_h^{g^*})^{-\sigma} e^{-\rho\sigma u}$. As above, Φ is continuous and strictly increasing with $\Phi(0^+) = 0$, and by monotone

convergence

$$\lim_{\hat{P}^*\to\infty} \Phi(\hat{P}^*) = \sigma\alpha^*(c^*)^\sigma(\bar{m}_h^{g^*})^{-\sigma}\int_0^\infty e^{-\rho\sigma u}\,du = \frac{\alpha^*(c^*)^\sigma}{\rho\,(\bar{m}_h^{g^*})^\sigma}.$$

The foreign equation has a (unique) solution if, and only if, it exceeds one, that is, if and only if $\bar{m}_h^{g^*} < c^*(\alpha^*/\rho)^{1/\sigma} = m^*(\rho, c^*)$, which holds by assumption.

Both fixed points therefore exist and are finite and positive, so $E\widetilde{P}^*/\widetilde{P} > 1$ by assumption, and $T = \ln\!\left(E\widetilde{P}^*/\widetilde{P}\right)/(\theta - \theta^*)$ is the unique solution of the switch condition, with $0 < T < \infty$.

(Only if)

(i) $\theta > \theta^*$ **is necessary.** If $\theta \le \theta^*$ and $\bar{m}_h^{g^*} < \infty$, the ratio equation (A36) is non-increasing in T and equals $\widetilde{P}/\widetilde{P}^* < E$ at $T = 0$, so the switch condition is never satisfied and $T = \infty$.

(ii) $\bar{m}_h^{g^*} < \infty$ **is necessary.** With no finite reserve ceiling, the regime switch of Assumption 3 is never triggered: reserves accumulate under the peg without ever reaching a bound, so the peg never collapses and $T = \infty$. Moreover, the collapse date diverges as the ceiling approaches its admissible limit: as $\bar{m}_h^{g^*} \uparrow m^*(\rho, c^*)$, $\lim_{\hat{P}^*\to\infty}\Phi(\hat{P}^*) = \alpha^*(c^*)^\sigma/\left(\rho\,(\bar{m}_h^{g^*})^\sigma\right) \downarrow 1$, so the root of $\Phi(\hat{P}^*) = 1$ diverges, $\hat{P}^* \to \infty$; since $\hat{P}$ is bounded, $E\widetilde{P}^*/\widetilde{P} \to \infty$ and $T \to \infty$.

Size of the attack. Under Assumptions 1 and 3, $m_{f,t}^g = 0$ and $nw_{h,t} = nw_{f,t}^* = 0$ at the switch, so the central bank balance sheets equation (6) and equation (9a) reduce to $m_{h,t}^{g^*} = d_{h,t} - m_{h,t}$ and $m_{f,t}^* = d_{f,t}^* + m_{h,t}^{g^*}$ on both sides of the switch. Since domestic credit and prices are continuous at T,

$$\Delta \equiv m_{h,T^+}^{g^*} - m_{h,T^-}^{g^*} = m_{h,T^-} - m_{h,T^+} = m_{f,T^+}^* - m_{f,T^-}^*.$$

Households are on their money demand curves throughout, $m_{h,t} = m(\rho + \pi_t, c)$ and $m_{f,t}^* = m^*(\rho + \pi_t^*, c^*)$, which gives the expression in the proposition. Positivity follows from part 2(a) of Lemma 1: $\pi_{T^-} < \pi_{T^+}$ and money demand is strictly decreasing in the nominal interest rate, so $m_{h,T^-} - m_{h,T^+} > 0$; the foreign-side expression is then also positive, as it equals the home-side expression by the identity above.

A.3.5 Proof of Lemma 2

Under Assumptions 1–4, with $\theta > \theta^*$, $\bar{m}_h^{g^*} < m^*(\rho, c^*)$, and $\widetilde{P} < E\widetilde{P}^*$:

(a) The collapse date $T(\Lambda, \bar{m}_h^{g^*}, \theta, \theta^*)$ satisfies, where $\Lambda \equiv \frac{D_{h,0}}{E\, D^*_{f,0}}$,

$$\frac{\partial T}{\partial \Lambda} = -\frac{1}{(\theta - \theta^*)\,\Lambda} < 0, \qquad \frac{\partial T}{\partial \bar{m}_h^{g^*}} > 0, \qquad \frac{\partial T}{\partial \theta} < 0, \quad \frac{\partial T}{\partial \theta^*} > 0.$$

(b) The size of the reverse speculative attack Δ, as defined in equation (28), is independent of Λ and satisfies $\partial\Delta/\partial\theta > 0$. If, in addition, $\theta^* \geq 0$, then $\partial\Delta/\partial\bar{m}_h^{g^*} > 0$.

Proof (a) Comparative statics for T. Recall from the proof of Proposition 1 that $\hat{P} \equiv \widetilde{P}/D_{h,0}$ and $\hat{P}^* \equiv \widetilde{P}^*/D^*_{f,0}$. The rescaled equations show that $\hat{P}$ depends on $(\theta, \bar{m}_h^{g^*})$ and $\hat{P}^*$ on $(\theta^*, \bar{m}_h^{g^*})$. Taking logs of equation (A36) and using $P_T/P^*_T = E$ at the collapse date,

$$(\theta - \theta^*)\, T = -\ln \Lambda + \ln \hat{P}^* - \ln \hat{P}, \qquad \Lambda \equiv \frac{D_{h,0}}{E\, D^*_{f,0}}. \tag{A37}$$

Effect of Λ. Differentiating equation (A37) implicitly:

$$(\theta - \theta^*)\,\frac{\partial T}{\partial \Lambda} = -\frac{1}{\Lambda} \quad \Longrightarrow \quad \frac{\partial T}{\partial \Lambda} = -\frac{1}{(\theta - \theta^*)\Lambda} < 0.$$

Effect of θ. Define

$$F(\widetilde{P}, \theta) \equiv \widetilde{P}^{-\sigma} - \sigma\alpha c^\sigma \int_0^\infty \left(D_{h,0} e^{\theta s} - \widetilde{P}\,\bar{m}_h^{g^*}\right)^{-\sigma} e^{-\rho\sigma s}\, ds.$$

The implicit function theorem gives $\widetilde{P}_\theta = -F_\theta / F_{\widetilde{P}} > 0$, since

$$F_\theta = \sigma^2 \alpha c^\sigma \int_0^\infty \left(D_{h,0} e^{\theta s} - \widetilde{P}\,\bar{m}_h^{g^*}\right)^{-\sigma-1} D_{h,0}\, s\, e^{\theta s} e^{-\rho\sigma s}\, ds > 0,$$

$$F_{\widetilde{P}} = -\sigma \widetilde{P}^{-\sigma-1} - \sigma^2 \alpha c^\sigma\, \bar{m}_h^{g^*} \int_0^\infty \left(D_{h,0} e^{\theta s} - \widetilde{P}\,\bar{m}_h^{g^*}\right)^{-\sigma-1} e^{-\rho\sigma s}\, ds < 0.$$

Hence $\partial \ln \hat{P}/\partial\theta > 0$, and $\hat{P}^*$ does not depend on θ, so differentiating equation (A37) in θ:

$$T + (\theta - \theta^*)\,\frac{\partial T}{\partial \theta} = -\frac{\partial \ln \hat{P}}{\partial \theta} \quad \Longrightarrow \quad \frac{\partial T}{\partial \theta} = -\frac{T + \partial \ln \hat{P}/\partial\theta}{\theta - \theta^*} < 0.$$

For θ^*, we can use the monotone form Φ from the proof of Proposition 1: $\hat{P}^*$ is the unique root of $\Phi(\hat{P}^*) = 1$, where Φ is continuous and strictly increasing in $\hat{P}^*$ and, pointwise in $u > 0$, strictly decreasing in θ^* (a higher θ^* raises $e^{\theta^* u}/\hat{P}^*$ and lowers the integrand). The root therefore satisfies $\partial \ln \hat{P}^*/\partial\theta^* > 0$, and differentiating equation (A37) in θ^*,

$$-T + (\theta - \theta^*)\,\frac{\partial T}{\partial \theta^*} = \frac{\partial \ln \hat{P}^*}{\partial \theta^*} \quad \Longrightarrow \quad \frac{\partial T}{\partial \theta^*} = \frac{T + \partial \ln \hat{P}^*/\partial\theta^*}{\theta - \theta^*} > 0.$$

Effect of $\bar{m}_h^{g^*}$. Recall from the proof of Proposition 1 that $\hat{P}$ and $\hat{P}^*$ are the unique roots of $\Psi(\hat{P}) = 1$ and $\Phi(\hat{P}^*) = 1$, with Ψ and Φ strictly increasing in their arguments. Pointwise in u, the integrand of Ψ is strictly increasing in $\bar{m}_h^{g^*}$ and that of Φ strictly decreasing, so a higher $\bar{m}_h^{g^*}$ shifts Ψ up and Φ down: $\hat{P}$ is strictly

decreasing and $\hat{P}^*$ strictly increasing in $\bar{m}_h^{g^*}$. Differentiating equation (A37):

$$\frac{\partial T}{\partial \bar{m}_h^{g^*}} = \frac{1}{\theta - \theta^*}\left[-\frac{\partial \ln \hat{P}}{\partial \bar{m}_h^{g^*}} + \frac{\partial \ln \hat{P}^*}{\partial \bar{m}_h^{g^*}}\right] > 0.$$

(b) Comparative statics for Δ. From the proof of Proposition 1, $\Delta = m_{h,T^-} - m_{h,T^+}$. Let $u \equiv m_{h,T^+}$ and $v \equiv m^*_{f,T^+}$. Under the peg both countries face the common nominal interest rate $\rho + \pi_{T^-}$, so CES money demand gives

$$\frac{m_{h,T^-}}{m^*_{f,T^-}} = \frac{c\,\alpha^{1/\sigma}}{c^*(\alpha^*)^{1/\sigma}} = \frac{w}{1-w},$$

where $w \equiv c\alpha^{1/\sigma}/\kappa \in (0,1)$ and $\kappa \equiv c\alpha^{1/\sigma} + c^*(\alpha^*)^{1/\sigma}$ are as in the proof of Lemma 1. From the post-switch money-market conditions :

$$P_T u + E\,P^*_T v = (D_{h,0}e^{\theta T} - P_T\bar{m}_h^{g^*}) + (E\,D^*_{f,0}e^{\theta^* T} + E\,P^*_T\bar{m}_h^{g^*}) = D_{h,0}e^{\theta T} + E\,D^*_{f,0}e^{\theta^* T} = P_T(m_{h,T^-} + m^*_{f,T^-}),$$

where the last equality uses the peg money market clearing. We can now see that $m_{h,T^-} = w(u+v)$ and then:

$$\Delta = w(u+v) - u = w\,v - (1-w)\,u. \tag{A38}$$

From the home money-market condition at T^+, $P_T\,u = D_{h,0}e^{\theta T} - P_T\bar{m}_h^{g^*}$, so $\widetilde{P} = D_{h,0}/(u+\bar{m}_h^{g^*})$, where $\widetilde{P} = e^{-\theta T}P_T$ as defined in the proof of Proposition 1. Substituting into the fixed-point equation:

$$\widetilde{P}^{-\sigma} = \sigma\alpha\,c^\sigma \int_0^\infty \left(D_{h,0}e^{\theta s} - \widetilde{P}\,\bar{m}_h^{g^*}\right)^{-\sigma} e^{-\rho\sigma s}ds,$$

both sides scale homogeneously in $D_{h,0}^{-\sigma}(u+\bar{m}_h^{g^*})^\sigma$, so we get:

$$G(u,\theta,\bar{m}_h^{g^*}) \equiv 1 - \sigma\alpha\,c^\sigma \int_0^\infty \left[(u+\bar{m}_h^{g^*})e^{\theta s} - \bar{m}_h^{g^*}\right]^{-\sigma} e^{-\rho\sigma s}ds = 0. \tag{A39}$$

Analogously, $\widetilde{P}^* = D^*_{f,0}/(v - \bar{m}_h^{g^*})$ and the foreign rescaled equation:

$$H(v,\theta^*,\bar{m}_h^{g^*}) \equiv 1 - \sigma\alpha^* c^{*\sigma} \int_0^\infty \left[(v-\bar{m}_h^{g^*})e^{\theta^* s} + \bar{m}_h^{g^*}\right]^{-\sigma} e^{-\rho\sigma s}ds = 0. \tag{A40}$$

We differentiate:

$$\begin{aligned}
G_u &= \sigma^2\alpha\,c^\sigma \int_0^\infty \left[(u+\bar{m}_h^{g^*})e^{\theta s} - \bar{m}_h^{g^*}\right]^{-\sigma-1} e^{\theta s}e^{-\rho\sigma s}ds > 0,\\
G_\theta &= \sigma^2\alpha\,c^\sigma \int_0^\infty \left[(u+\bar{m}_h^{g^*})e^{\theta s} - \bar{m}_h^{g^*}\right]^{-\sigma-1} (u+\bar{m}_h^{g^*})\,s\,e^{\theta s}e^{-\rho\sigma s}ds > 0,\\
G_{\bar{m}_h^{g^*}} &= \sigma^2\alpha\,c^\sigma \int_0^\infty \left[(u+\bar{m}_h^{g^*})e^{\theta s} - \bar{m}_h^{g^*}\right]^{-\sigma-1} (e^{\theta s}-1)\,e^{-\rho\sigma s}ds > 0,
\end{aligned}$$

where the sign of $G_{\bar{m}_h^{g^*}}$ follows from $\theta > 0$, which makes $e^{\theta s} - 1 > 0$ for $s > 0$. Then by IFT we get:

$$u_\theta = -G_\theta/G_u < 0, \qquad u_{\bar{m}_h^{g^*}} = -G_{\bar{m}_h^{g^*}}/G_u < 0.$$

We also have $u_\Lambda = 0$. Then for H:

$$H_v = \sigma^2 \alpha^* c^{*\sigma} \int_0^\infty \left[(v - \bar{m}_h^{g^*}) e^{\theta^* s} + \bar{m}_h^{g^*} \right]^{-\sigma-1} e^{\theta^* s} e^{-\rho\sigma s} ds > 0,$$
$$H_\theta = 0,$$
$$H_{\bar{m}_h^{g^*}} = \sigma^2 \alpha^* c^{*\sigma} \int_0^\infty \left[(v - \bar{m}_h^{g^*}) e^{\theta^* s} + \bar{m}_h^{g^*} \right]^{-\sigma-1} (1 - e^{\theta^* s})\, e^{-\rho\sigma s} ds.$$

The sign of $H_{\bar{m}_h^{g^*}}$ is strictly negative when $\theta^* > 0$ (since $1 - e^{\theta^* s} < 0$ for $s > 0$), identically zero when $\theta^* = 0$, and strictly positive when $\theta^* < 0$. Hence

$$v_\theta = v_\Lambda = 0, \qquad v_{\bar{m}_h^{g^*}} \begin{cases} > 0 & \text{if } \theta^* > 0, \\ = 0 & \text{if } \theta^* = 0, \\ < 0 & \text{if } \theta^* < 0. \end{cases}$$

From equation (A38) with $w \in (0,1)$ constant: $\Delta_\Lambda = 0$, since u and v are independent of Λ (they solve the rescaled fixed-point equations G and H, which contain no Λ). Then $\Delta_\theta = -(1-w)\, u_\theta + w\, v_\theta = -(1-w) u_\theta > 0$ (since $u_\theta < 0$ and $v_\theta = 0$ when θ^* is held fixed). For $\Delta_{\bar{m}_h^{g^*}}$: when $\theta^* \geq 0$ the foreign channel $v_{\bar{m}_h^{g^*}} \geq 0$, so both terms in $\Delta_{\bar{m}_h^{g^*}} = -(1-w) u_{\bar{m}_h^{g^*}} + w\, v_{\bar{m}_h^{g^*}}$ are nonnegative and the home channel is strictly positive; hence $\Delta_{\bar{m}_h^{g^*}} > 0$. When $\theta^* < 0$ the two channels have opposite signs, and $\Delta_{\bar{m}_h^{g^*}} > 0$ holds whenever the home channel dominates.

A.4 Calibration Algorithm

The following algorithm recovers the five parameters (α, α^*, $D_{h,0}$, $D^*_{f,0}$, $\bar{m}^{g^*}_h$) from the four data moments (δ_h, δ_f, μ_f, T_{obs}) defined below.

A.4.1 Inputs

The following objects are treated as known: endowments and consumption y, y^*, with $c = y$ and $c^* = y^*$; domestic credit growth rates: θ (home) and θ^* (foreign), satisfying $\theta > \theta^*$; preference parameters ρ and σ. The four observed data moments are:

$\delta_h \equiv d_{h,0}/y$	initial real NDA to GDP, home
$\delta_f \equiv d^*_{f,0}/y^*$	initial real NDA to GDP, foreign
$\mu_f \equiv m^*_{f,0}/y^*$	initial real monetary base net of non-FX reserves to GDP, foreign
$T \equiv T_{\text{obs}}$	observed collapse date (years from initial condition)

We normalize $P_0 = E = 1$.

A.4.2 Nominal Credit, Initial Reserves and Home Money Share

Under $P_0 = 1$, the nominal credit stocks are:

$$D_{h,0} = \delta_h \cdot y, \qquad D^*_{f,0} = \delta_f \cdot y^* \tag{A41}$$

The foreign balance sheet identity reduces to $m^{g^*}_{h,0} + d^*_{f,0} = m^*_{f,0}$ which implies the initial stock of home-currency reserves held by the foreign central bank is observable:

$$m^{g^*}_{h,0,\text{data}} = m^*_{f,0} - d^*_{f,0} = (\mu_f - \delta_f) \cdot y^* \tag{A42}$$

The home balance sheet identity then implies:

$$m_{h,0,\text{data}} = d_{h,0} - m^{g^*}_{h,0,\text{data}} = \delta_h \cdot y - (\mu_f - \delta_f) \cdot y^* \tag{A43}$$

From equation (15) at $t = 0$, the individual money demands are $m_{h,0} = c(\alpha/(\rho + \pi_0))^{1/\sigma}$ and $m^*_{f,0} = c^*(\alpha^*/(\rho + \pi_0))^{1/\sigma}$, so $c\alpha^{1/\sigma} = (\rho + \pi_0)^{1/\sigma} m_{h,0}$ and $\kappa \equiv c\alpha^{1/\sigma} + c^*(\alpha^*)^{1/\sigma} = (\rho + \pi_0)^{1/\sigma}(m_{h,0} + m^*_{f,0})$. Hence $c\alpha^{1/\sigma} = \kappa w$ and $c^*(\alpha^*)^{1/\sigma} = \kappa(1 - w)$, where

$$w \equiv \frac{c\alpha^{1/\sigma}}{\kappa} = \frac{(\rho + \pi_0)^{1/\sigma}\, m_{h,0}}{(\rho + \pi_0)^{1/\sigma}(m_{h,0} + m^*_{f,0})} = \frac{m_{h,0}}{m_{h,0} + m^*_{f,0}} \tag{A44}$$

Substituting, we get:

$$w = \frac{\delta_h \cdot y - (\mu_f - \delta_f) \cdot y^*}{\delta_h \cdot y + \delta_f \cdot y^*} \tag{A45}$$

A.4.3 Finding P_T

Define the rescaled home price $\widetilde{P} \equiv e^{-\theta T} P_T$ following the proof of Proposition 1. Every remaining unknown is a function of $\widetilde{P}$ alone.

The world money supply under the peg is $M^W_t \equiv D_{h,0} e^{\theta t} + D^*_{f,0} e^{\theta^* t}$. We define:

$$I_1(T) \;\equiv\; \int_0^T \left(D_{h,0}\, e^{\theta s} + D^*_{f,0}\, e^{\theta^* s} \right)^{-\sigma} e^{-\rho\sigma s}\, ds \tag{A46}$$

We evaluate the pre-collapse price formula equation (A15) at $t = 0$, substituting $P_0 = 1$ and $P_T = \widetilde{P} e^{\theta T}$:

$$1 = \sigma \kappa^{\sigma} I_1(T) \; + \; e^{-\rho\sigma T} \left(\widetilde{P} \, e^{\theta T} \right)^{-\sigma} \tag{A47}$$

Rearranging:[40]

$$\kappa(\widetilde{P}) = \left[\frac{1 \; - \; e^{-(\rho+\theta)\sigma T} \, \widetilde{P}^{-\sigma}}{\sigma \, I_1(T)} \right]^{1/\sigma} \tag{A48}$$

From the CES money demand equation (15) at $t = 0$, together with the decomposition $c\alpha^{1/\sigma} = \kappa w$ and $c^*(\alpha^*)^{1/\sigma} = \kappa(1 - w)$, we get:

$$\alpha(\widetilde{P}) = \left(\frac{\kappa(\widetilde{P}) \, w}{c} \right)^{\sigma}, \qquad \alpha^*(\widetilde{P}) = \left(\frac{\kappa(\widetilde{P}) \, (1 - w)}{c^*} \right)^{\sigma} \tag{A49}$$

Define $\widetilde{P}^* \equiv e^{-\theta^* T} P_T^*$, as in the proof of Proposition 1, where equation (A36) states:

$$\frac{P_T}{P_T^*} = \frac{\widetilde{P}}{\widetilde{P}^*} \, e^{(\theta - \theta^*)T} \tag{A50}$$

The continuity of the exchange rate at the switch requires $P_T = E \cdot P_T^* = P_T^*$. Substituting:

$$\widetilde{P}^*(\widetilde{P}) = \widetilde{P} \cdot e^{(\theta - \theta^*)T} \tag{A51}$$

With $\widetilde{P}^*$ in hand, $\bar{m}_h^{g^*}$ is recovered from the rescaled foreign post-collapse fixed-point equation stated in the proof of Proposition 1:

$$\left(\widetilde{P}^* \right)^{-\sigma} = \sigma \, \alpha^*(\widetilde{P}) \, (c^*)^{\sigma} \int_0^{\infty} \left(D_{f,0}^* \, e^{\theta^* u} + \widetilde{P}^*(\widetilde{P}) \cdot \bar{m}_h^{g^*} \right)^{-\sigma} e^{-\rho\sigma u} \, du \tag{A52}$$

The integrand is strictly decreasing in $\bar{m}_h^{g^*}$, so equation (A52) has at most one solution and is solved by scalar root-finding for any given $\widetilde{P}$.

A.4.4 Finding $\widetilde{P}$

With all parameters expressed as functions of $\widetilde{P}$, the home post-collapse fixed-point equation from the proof of Proposition 1 becomes a single equation in $\widetilde{P}$:

$$\widetilde{P}^{-\sigma} = \sigma \, \alpha(\widetilde{P}) \, c^{\sigma} \int_0^{\infty} \left(D_{h,0} \, e^{\theta u} - \widetilde{P} \cdot \bar{m}_h^{g^*}(\widetilde{P}) \right)^{-\sigma} e^{-\rho\sigma u} \, du \tag{A53}$$

Define the residual:

$$R(\widetilde{P}) \; \equiv \; \widetilde{P}^{-\sigma} \; - \; \sigma \, \alpha(\widetilde{P}) \, c^{\sigma} \int_0^{\infty} \left(D_{h,0} \, e^{\theta u} - \widetilde{P} \cdot \bar{m}_h^{g^*}(\widetilde{P}) \right)^{-\sigma} e^{-\rho\sigma u} \, du \tag{A54}$$

Find numerically $\widetilde{P}^o$ such that $R(\widetilde{P}^o) = 0$.

[40] Feasibility requires the bracket in equation (A48) to be positive, which imposes the lower bound $\widetilde{P} > e^{-(\rho+\theta)T}$ on the root search.

A.5 Primary Source Archive

The following passages are drawn from IMF Executive Board and staff documents, Swiss National Bank *Direktoriumsprotokolle*, Deutsche Bundesbank *Zentralbankrat* minutes, Banque de France *Procès-verbaux du Conseil général*, and published memoirs. Sources are cited in full above each extract.

Trilemma in Practice

International Monetary Fund, Staff Report SM/71/140, § IV, 1971 (IMF Archives, doc. 169161):

> "... as interest rates abroad continued to decline, it became increasingly difficult to maintain the high level of domestic rates considered necessary to reduce the rate of domestic growth, and continuing inflows of funds prevented the monetary authorities from maintaining effective control over the monetary aggregates."

International Monetary Fund, Staff Report for the 1972 Article VIII Consultation, 1972 (IMF Archives, doc. 212137):

> "The independence of the authorities was, however, seriously compromised by the continuing inflows of funds from abroad initially induced from early 1970 onward by the persistence of interest rate differentials in favor of Germany. ... Thus, since, for domestic reasons, further cuts in interest rates could not be tolerated, the role of the Bundesbank in the main was reduced to that of seeking to neutralize the impact of the foreign inflow on bank liquidity."

International Monetary Fund, Minutes of Executive Board Meeting 70/49, June 8, 1970 (IMF Archives, doc. 176656)—Mr. Lieftinck (Netherlands) on Germany:

> "... monetary policy seemed to have reached the ceiling of its effectiveness; if monetary restrictions were applied more vigorously, by increasing interest rates, the German rate would rise above the international rate and capital would be attracted to Germany. Of course, lowering the rediscount ceiling would be a step in the right direction, but it was doubtful whether the monetary policy of the authorities could be made any more effective."

Günther Schleiminger, *Statement on the Federal Republic of Germany*, Executive Board Meeting 71/60, July 7, 1971, § 7 (BUFF/71/79; IMF Archives, doc. 298134):

> "The German authorities themselves characterized their efforts to absorb the liquidity created by the net inflows of foreign exchange during the past 16 months as a case of *'Sisyphus labours'*. Indeed, out of a liquidity creation of DM 46 billion during that period, an amount of DM 12 billion was absorbed by fiscal policy and DM 17 billion by the contractive effects of credit policy ... Thus, in spite of an offsetting effect ... the banks, in early May, held roughly DM 15 billion more of highly liquid assets ... almost twice as much as they did in early 1970."

Deutsche Bundesbank, Protokoll der 335. Sitzung des Zentralbankrats, March 31, 1971 (Historisches Archiv der Deutschen Bundesbank, B330/6157-1)—Vice President Emminger:

> "Die im Augenblick recht hohen zinsinduzierten Bewegungen kurzfristigen Kapitals seien mitverantwortlich für die sich zuspitzende Vertrauenskrise um den Dollar, die ihrerseits wiederum die spekulative Bewegung kurzfristiger Gelder aus dem Dollar in europäische Währungen, vorzugsweise in die D-Mark, verstärke und die Autonomie der Bundesbankpolitik immer mehr in Frage stelle. Eine Fortsetzung der gegenwärtigen Hochzinspolitik der Bundesbank könne sich also in zweierlei Hinsicht als 'self-defeating' erweisen: einmal könnte der dadurch verursachte Devisenzustrom die Liquiditätsbasis der Wirtschaft und der Banken immer mehr aufweichen ...; zum anderen könnte ... das schon angeschlagene Vertrauen in die gegenwärtige Wechselkursstruktur so schwer gestört werden, daß unsere Kreditpolitik durch spekulative, also nicht-zinsinduzierte Auslandsgelder völlig überrollt würde."
>
> ("The currently quite high interest-induced movements of short-term capital are partly responsible for the intensifying crisis of confidence around the dollar, which in turn reinforces the speculative movement of short-term funds out of the dollar into European currencies, preferably the D-Mark, and increasingly calls into question the autonomy of Bundesbank policy.

A continuation of the Bundesbank's present high-interest-rate policy could thus prove 'self-defeating' in two respects: first, the resulting inflow of foreign exchange could increasingly soften the liquidity base of the economy and the banks . . . ; second . . . the already shaken confidence in the present exchange-rate structure could be so severely disturbed that our credit policy would be completely overrun by speculative—that is, non-interest-induced—foreign funds.")

Deutsche Bundesbank, Protokoll der 337. Sitzung des Zentralbankrats, May 5, 1971 (Historisches Archiv der Deutschen Bundesbank, B330/6158-1)—Mr. Irmler, on the day of the float:

"[Das vordringliche ökonomische Problem bestehe darin], ob und unter welchen Bedingungen eine autonome restriktive Kreditpolitik der Bundesbank möglich sein wird, eine Politik also, die nicht die amerikanische Politik niedriger Zinsen nachvollzieht. Im Interesse der Brechung der sich rasch verbreitenden Inflationsmentalität müsse die Bundesbank die Kontrolle über die Zentralbankgeldschöpfung und damit über die Liquidität des Bankenapparates zurückgewinnen."

("[The pressing economic problem is] whether, and under what conditions, an autonomous restrictive credit policy by the Bundesbank will be possible—a policy, that is, that does not merely replicate the American policy of low interest rates. In the interest of breaking the rapidly spreading inflation mentality, the Bundesbank must regain control over central-bank money creation and thereby over the liquidity of the banking system.")

Schweizerische Nationalbank, Direktoriumsprotokoll Nr. 460, May 13, 1971:

"In diesem Geschehen spielte der amerikanische Dollar eine besonders wichtige Rolle. Seit der zweiten Hälfte 1970 haben die amerikanischen Behörden begonnen, ihre bisherige restriktive Geldpolitik zu lockern. Die dadurch bedingten Aenderungen in den Zinsrelationen . . . führten dazu, dass immer mehr Mittel insbesondere in die Bundesrepublik Deutschland, aber auch in die Schweiz flössen."

("In this episode the American dollar played a particularly important role. Since the second half of 1970 the American authorities have begun to loosen their previously restrictive monetary policy. The resulting changes in interest-rate relations between major money markets caused ever-greater funds to flow above all into the Federal Republic of Germany, but also into Switzerland.")

Banque de France, Procès-verbal du Conseil général, February 15, 1973 (Archives historiques de la Banque de France, folio 58)—Governor Olivier Wormser, on the 10% dollar devaluation:

"Du fait des attaques spéculatives dont le dollar a fait l'objet, les Gouvernements des pays dont les monnaies se sont trouvées concernées, parce qu'elles étaient les plus fortes, ont dû faire un choix entre les trois solutions suivantes : ou bien réévaluer les monnaies visées, soit en fixant tout de suite de nouvelles parités, soit en les laissant flotter jusqu'à ce qu'elles retrouvent l'équilibre ; ou bien se refuser à tout changement de parité et demander aux autorités américaines de dévaluer purement et simplement le dollar ; ou bien, enfin, conserver le 'serpent' à l'intérieur duquel évoluent entre elles les monnaies européennes, tout en le laissant cependant sortir du 'tunnel', c'est-à-dire des limites que les pays de la Communauté s'étaient fixées par rapport à la parité afin de défendre la devise américaine."

("Because of the speculative attacks of which the dollar has been the object, the Governments of the countries whose currencies were concerned—because they were the strongest—had to choose among the following three solutions: either revalue the targeted currencies, whether by fixing new parities at once or by letting them float until they return to equilibrium; or refuse any change of parity and ask the American authorities purely and simply to devalue the dollar; or, finally, keep the 'snake' within which the European currencies move among themselves, while nonetheless letting it leave the 'tunnel'—that is, the limits the Community countries had set relative to parity in order to defend the American currency.")

Otmar Emminger, *D-Mark, Dollar, Währungskrisen* (Stuttgart: Deutsche Verlags-Anstalt, 1986), p. 174:

"Nicht mehr die deutschen Währungsbehörden, sondern die von der amerikanischen Kreditpolitik ausgehenden liquiditätspolitischen Wechselbäder sowie das spekulative Hin und Her der vagabundierenden Dollar-Massen entschieden in diesem Zeitraum weitgehend über die Geldversorgung der deutschen Volkswirtschaft und damit auch über Erfolg oder Mißerfolg der deutschen Stabilitätspolitik."

("It was no longer the German monetary authorities, but rather the liquidity-policy oscillations originating in American credit policy, as well as the speculative back-and-forth of the wandering dollar masses, that during this period largely determined the money supply of the German economy and thereby also the success or failure of German stabilization policy.")

Speculative Attack: Upper Limit on Reserves

International Monetary Fund, Staff Report SM/71/140, 1971 (IMF Archives, doc. 169161):

"During April, when the inflows reached massive proportions, very large support operations were again undertaken in the forward dollar market, but on April 28 the Bundesbank concluded that it could no longer continue to add indefinitely to this commitment."

International Monetary Fund, Staff Memorandum: Germany—Exchange Action of May 1971 (IMF Archives, doc. 228046)—Karl Klasen letter, transmitted by IMF staff:

"In view of the size of the recent movements of foreign exchange, they have decided that in present conditions they will not ensure that rates for exchange transactions involving the D-Mark will be maintained . . . this step will prevent the disturbances in the exchange markets and the strains on the international monetary system which have been caused by the recent excessive flows of short-term capital."

Deutsche Bundesbank, Protokoll der 337. Sitzung des Zentralbankrats, May 5, 1971 (Historisches Archiv der Deutschen Bundesbank, B330/6158-1)—Mr. von Schelling:

"Da die Bundesbank mit der Anhäufung von Dollar bis an die Grenze des Erträglichen gegangen sei, dürfte Verständnis für eine derartige Maßnahme zu erwarten sein."

("Since the Bundesbank had gone, in its accumulation of dollars, to the limit of what is bearable, understanding for such a measure [the suspension of intervention] could be expected.")

Deutsche Bundesbank, Fischer-Erlach, "Das Für und Wider von Interventionen am US-Dollar-Terminmarkt," July 27, 1977, § 4 b) (Historisches Archiv der Deutschen Bundesbank, B330/21812)—on the forward intervention conducted through New York in spring 1971:

"Die Intervention, der zunächst ein gewisser Überraschungserfolg beschieden war, wurde nach knapp zwei Wochen eingestellt, da offenbar wurde, daß wir angesichts der Intensität der Spekulation auf eine D-Mark-Aufwertung und der Größe des internationalen Dollarangebots gezwungen gewesen wären, US-Dollar in einem Ausmaß aufzunehmen, das uns währungspolitisch als nicht vertretbar erschien."

("The intervention, which at first met with a certain element of surprise success, was discontinued after barely two weeks, once it became apparent that, given the intensity of speculation on a D-Mark revaluation and the size of the international supply of dollars, we would have been forced to take in US dollars on a scale that appeared to us not defensible in monetary-policy terms.")

Deutsche Bundesbank, Scholl, "Bemerkungen zu einigen Wechselkursfragen," May 17, 1971, § VIII (Historisches Archiv der Deutschen Bundesbank, B330/21812):

"Ein echtes Problem stellen die Terminengagements der Bank dar. Die Bundesbank hat per Termin Dollars im Gegenwert von insgesamt 9,8 Mrd DM gekauft. Über die verschiedenen 'Quellen' dieser Terminengagements und über die Fälligkeiten der Terminkontrakte informiert die folgende Tabelle:"

("The bank's forward commitments constitute a real problem. The Bundesbank has bought dollars forward to a total value of DM 9.8 billion. The following table gives the various 'sources' of these forward commitments and the maturities of the forward contracts:")

In millions of D-Mark:

		Maturing in		
Forward purchases . . .	Total	June	July	August
. . . through the Federal Reserve Bank of New York	1,961	1,961	—	—
. . . under swaps with German commercial banks	2,227	—	2,227	—
. . . under "outright" transactions	5,628	—	5,187	441
Total	9,816	1,961	7,414	441

Schweizerische Nationalbank, Direktoriumsprotokoll Nr. 460, May 13, 1971:

> "In den letzten Tagen kam es zu einer akuten Währungskrise. Enorme Dollarbeträge wurden der Deutschen Bundesbank verkauft, die sich gezwungen sah, die Annahme von Dollars vergangenen Mittwochvormittag einzustellen. Die Spekulation übertrug sich auf den Schweizerfranken. Die Nationalbank musste, um die Stabilität des Frankens zu sichern, innert kurzer Zeit gegen 1,5 Milliarden Dollar übernehmen, wovon allein am letzten Mittwochmorgen 600 Millionen."
>
> ("In recent days an acute currency crisis broke out. Enormous dollar amounts were sold to the Bundesbank, which was forced to suspend dollar purchases last Wednesday morning. The speculation spilled over onto the Swiss franc. The National Bank had to take in close to 1.5 billion dollars in a very short time to safeguard the franc—600 million on last Wednesday morning alone.")

Banque de France, Procès-verbal du Conseil général, February 15, 1973 (Archives historiques de la Banque de France, folio 60)—Governor Olivier Wormser:

> ". . . sans avoir souscrit une obligation de caractère juridique et sans avoir attaché évidemment beaucoup d'importance aux règles de fonctionnement du système monétaire international — qui ne sont, la plupart du temps, plus respectées—, les Ministres des Finances des pays de la Communauté Européenne se sont tout de même plus ou moins engagés à continuer d'acheter une monnaie inconvertible, en quantités pratiquement illimitées, dans la mesure où serait maintenu le principe du tunnel."
>
> (". . . without having entered into any legal obligation, and evidently without attaching much importance to the operating rules of the international monetary system—which are, most of the time, no longer respected—, the Finance Ministers of the European Community countries had nonetheless more or less committed to continue buying an inconvertible currency, in practically unlimited quantities, so long as the principle of the tunnel was maintained.")

May 1971 DEM and CHF Float

International Monetary Fund, Staff Memorandum: Germany—Exchange Action of May 1971 (IMF Archives, doc. 228046):

> "In view of the problems posed to stabilization policies caused by the rapid pace at which additions were being made to the foreign exchange reserves, the German authorities have decided for the time being not to maintain the exchange rate of the deutsche mark within the present margins."

International Monetary Fund, Staff Report for the 1972 Article VIII Consultation, 1972 (IMF Archives, doc. 212137):

> "The decision to float was taken primarily for reasons of domestic monetary policy. In the months immediately after the May decision, the German authorities were in fact able to enjoy a considerably greater degree of autonomy than in the past in implementing a restrictive monetary policy."

International Monetary Fund, Staff Report SM/71/140, 1971 (IMF Archives, doc. 169161):

"... the German authorities were faced with the urgent need in May 1971 to take effective action. Given the recent experience of incomes policy and given the Government's intense reluctance on all grounds to envisage a system of internal controls, the possibility of prices and incomes controls was dismissed ... There were two avenues open, namely, either a system of controls over capital, or action on the exchange rate."

Deutsche Bundesbank, Protokoll der 337. Sitzung des Zentralbankrats, May 5, 1971 (Historisches Archiv der Deutschen Bundesbank, B330/6158-1)—Vice President Emminger:

"Die progressiv anschwellenden Dollarzuflüsse in die Bundesrepublik, für die es betragsmäßig kaum Grenzen gebe, hätten nunmehr zu einer akuten Notlage geführt, die dazu zwinge, die Bundesbank vorübergehend von der Ankaufspflicht für den Dollar zu befreien."

("The progressively swelling dollar inflows into the Federal Republic, for which there are virtually no quantitative limits, have now led to an acute emergency that compels the temporary release of the Bundesbank from the obligation to purchase dollars.")

Schweizerische Nationalbank, Direktoriumsprotokoll Nr. 460, May 13, 1971—Federal Council statement:

"Dieser Entscheid ist dem Bundesrat nicht leichtgefallen. Unsere traditionelle Politik stabiler Wechselkurse hat zweifellos viel zur starken wirtschaftlichen Stellung unseres Landes beigetragen ... Sie zwang uns, die Aufwertungsfrage auch im Interesse der langfristigen Teuerungsbekämpfung zu prüfen."

("This decision did not come easy to the Federal Council. Our traditional policy of stable exchange rates has undoubtedly contributed much to the strong economic position of our country ... [the situation] forced us to examine the question of revaluation also in the interest of long-term inflation-fighting.")

Peter Jäggi, memorandum in *Direktoriumsprotokoll Nr. 120*, Schweizerische Nationalbank, February 8, 1973:

"Rechtlich befinden wir uns daher seit August 1971 in einem 'Niemandsland', was bedeutet, dass wir schon damals wider Willen von einem rechtlich fundierten System fester Wechselkurse in ein ungeregeltes System gedrängt wurden, das nichts anderes als ein grundsätzliches Regime des Floatens sein kann."

("Legally, therefore, we find ourselves since August 1971 in a 'no man's land,' which means that we were already then pushed against our will from a legally founded system of fixed exchange rates into an unregulated system, which can be nothing other than a fundamental regime of floating.")

"Kommt aber ein massiver Rutsch in Gang—was wegen des riesigen 'Lawinenhangs' der Eurodollarmasse leicht möglich ist—, so lässt sich die unbeschränkte Uebernahme von Dollars meines Erachtens nicht verantworten; auch dann nicht, wenn sie von Sekundärmassnahmen flankiert wird (wie Blockierungen), da diese die Grundsituation doch nicht zu ändern vermögen ..."

("But if a massive slide gets underway—which is easily possible because of the huge 'avalanche slope' (*Lawinenhang*) of the Eurodollar mass—then the unrestricted takeover of dollars cannot in my view be justified; not even when flanked by secondary measures such as blockages, since these cannot change the fundamental situation.")

Jelle Zijlstra, *Dr. Jelle Zijlstra: Gesprekken en Geschriften* (Strengholt, 1978), p. 191:

"Wij hielden dollars slechts aan tot een bedrag dat wij als een werkvoorraad beschouwden. Wat daar bovenuit ging wensten wij om te wisselen in goud of iets wat daarmee op één lijn kon worden gesteld."

("We held dollars only up to an amount that we considered a working stock. What exceeded that, we wished to exchange for gold or something that could be put on a par with it.")

The Smithsonian Agreement

Schweizerische Nationalbank, Direktoriumsprotokoll Nr. 120, February 8, 1973 (Jäggi memorandum):

"Die jüngsten Vorkommnisse haben einmal mehr bestätigt, wie labil die währungspolitische Grundsituation ist. Das Smithsonian Abkommen vom Dezember 1971 war nichts mehr als eine Art 'gentlemens agreement' der massgebenden Währungsbehörden. Es konnte nur eine vorübergehende Beruhigung schaffen. Die mit der Aufhebung der Konvertibilität des Dollars in Gold geschaffene Rechtslage blieb bestehen, desgleichen die Ursache, die zu dieser Aufhebung geführt hatte, der durch das USA-Zahlungsbilanzdefizit angereicherte Dollarüberfluss der übrigen Industrieländer."

("Recent events have once more confirmed how unstable the basic monetary-policy situation is. The Smithsonian Agreement of December 1971 was nothing more than a kind of 'gentlemen's agreement' between the leading monetary authorities. It could only produce a temporary calm. The legal situation created by the suspension of the dollar's gold convertibility remained, as did the cause that had led to that suspension—the dollar overhang in the other industrial countries, swollen by the US balance-of-payments deficit.")

Banque de France, Procès-verbal du Conseil général, December 23, 1971 (Archives historiques de la Banque de France, folio 881), report on the Washington Agreement:

"... Il s'agit du caractère provisoire des parités nouvelles. Ce caractère provisoire ne cessera en principe que le jour où le Congrès américain aura ratifié la dévaluation du dollar par rapport à l'or. ... Pour l'instant, on ne peut les considérer que comme des parités provisoires et c'est la raison pour laquelle on ne leur donne pas en fait le nom de parités, mais de 'taux centraux'."

("... It concerns the provisional character of the new parities. This provisional character will in principle cease only on the day the American Congress has ratified the devaluation of the dollar against gold. ... For the time being, they can only be regarded as provisional parities, and that is why they are not in fact given the name of parities, but of 'central rates.' ")

The EMS Escape Clause (November 1978)

The following passages are drawn from two separate archival documents: Emminger's letter to the federal government of November 16, 1978 (Historisches Archiv der Deutschen Bundesbank, B330/9656), and the conversation transcript of the 521st meeting of the Bundesbank Zentralbankrat, November 30, 1978 (Historisches Archiv der Deutschen Bundesbank, Nachlass Emminger, N2/269).

Deutsche Bundesbank, Emminger letter to the Federal Government, November 16, 1978 (Historisches Archiv der Deutschen Bundesbank, B330/9656):

"Die geldpolitische Autonomie der Bundesbank kann in besonderer Weise gefährdet werden, wenn sich bei starken Ungleichgewichten im künftigen EWS übermäßige Interventionsverpflichtungen ergeben, durch welche die innere Geldwertstabilität bedroht wird. Dies würde die Erfüllung der gesetzlichen Aufgabe der Bundesbank unmöglich machen. Die Bundesbank geht, unter Hinweis auf mehrfache mündliche Zusicherungen des Herrn Bundeskanzlers und des Herrn Bundesfinanzministers, davon aus, daß die Bundesregierung in einem solchen Falle die Bundesbank vor einer derartigen Zwangslage bewahrt, entweder durch eine Korrektur der Paritäten im EWS oder erforderlichenfalls auch durch eine mindestens vorübergehende Entbindung von der Interventionspflicht."

("The monetary-policy autonomy of the Bundesbank may be particularly endangered if, under strong imbalances in the future EMS, excessive intervention obligations arise that threaten internal monetary stability. This would make it impossible for the Bundesbank to fulfil its statutory task. Relying on repeated oral assurances of the Chancellor and the Finance Minister, the Bundesbank proceeds on the assumption that in such a case the federal government will protect the Bundesbank from such a predicament, either by a correction of the parities in the EMS or, if necessary, by at least a temporary release from the intervention obligation.")

Deutsche Bundesbank, conversation transcript of the 521st meeting of the Zentralbankrat, November 30, 1978 (Historisches Archiv der Deutschen Bundesbank, Nachlass Emminger, N2/269)—Chancellor Schmidt, on paragraph 3 of the Emminger letter, declining to commit the intervention release to paper:

"Was mich hier interessiert, ist ein Teil des dritten Punktes Ihres Briefes. Ich muß Ihnen offen sagen, ich habe ganz erhebliche Bedenken gegen eine schriftliche Fixierung dieser Art, eine schriftliche Fixierung der Möglichkeit einer mindestens vorübergehenden Entbindung von der Intervention. Lassen Sie uns einmal annehmen, das stünde morgen in einer französischen Zeitung oder in einer italienischen. Welche Vorwürfe würden die Zeitungen dann im Kommentar anknüpfen an eine Regierung, die sich auf ein so windiges Versprechen mit der deutschen einließe. . . . In der Sache selbst stimme ich Ihnen zu, meine Herren, aber ich halte es für ausgeschlossen, das aufzuschreiben. In der Sache ist es doch so, daß es den schönen Spruch in der Welt gibt seit 2000 Jahren: 'ultra posse nemo obligatur.' . . . Meine Vermutung ist, daß wenn es zu wirklichen Krisen käme . . . daß die Schuldnerländer zuerst Leine ziehen und nicht die Gläubigerländer. Aber es kann durchaus sein, daß der Gläubiger Bundesrepublik mal Leine ziehen müßte; es ist alles denkbar, nur so etwas kann man nicht aufschreiben."

("What interests me here is a part of the third point of your letter. I must tell you frankly that I have quite considerable reservations about a written fixing of this kind—a written fixing of the possibility of at least a temporary release from the intervention obligation. Suppose it appeared tomorrow in a French or an Italian newspaper. What reproaches those papers would then attach to a government that had entered into so flimsy a promise with the German one. . . . On the substance I agree with you, gentlemen, but I regard it as out of the question to write it down. For there is that fine saying, 2,000 years old: 'ultra posse nemo obligatur.' . . . My conjecture is that, if it ever came to real crises . . . the debtor countries would pull back first, not the creditor countries. But it may well be that the creditor Federal Republic would one day have to pull back; anything is conceivable—only one cannot write such a thing down.")

Deutsche Bundesbank, conversation transcript of the 521st meeting of the Zentralbankrat, November 30, 1978 (Historisches Archiv der Deutschen Bundesbank, Nachlass Emminger, N2/269)—Chancellor Schmidt, on the spring 1973 precedent:

"Es sind mindestens zwei Dinge, die ich Ihnen vor Augen halten möchte, die Sie kontrollieren können aus Ihrer eigenen Erinnerung. Die Herren Klasen/Emminger auf der einen Seite und Schmidt/Pöhl auf der anderen, zu viert, manchmal auch nur zu zweit agierend, haben aus Rücksicht auf binnenwirtschaftliche Stabilität im Frühjahr 1973 nicht nur ein Abkommen unter Notenbanken außer Kraft gesetzt, sondern gegen das Völkerrecht verstoßen, gegen das geltende Vertragsvölkerrecht, indem sie die Bundesbank davon entbanden, weiterhin in amerikanischen Dollar zu intervenieren. Und haben es noch nicht einmal dem IWF vorher gesagt, geschweige denn ihm die Möglichkeit gelassen, diesen Entschluß zu beeinflussen. . . . Wir haben die Bundesbank entbunden von der Pflicht, gegen den Dollar zu intervenieren, ausschließlich aus dem Motiv heraus, im Innern unseres Landes Spielraum zu gewinnen für eine stabile, auf Stabilität gerichtete Politik . . . wir haben es nicht einmal aufgeschrieben, wir haben es gemacht, als es nicht mehr anders ging."

("There are at least two things I would like to put before you, which you can verify from your own recollection. Messrs. Klasen and Emminger on the one side and Schmidt and Pöhl on the other, acting as a foursome, sometimes only as a pair, out of regard for domestic economic stability, in the spring of 1973 not only set aside an agreement among central banks but violated international law, the treaty law then in force, by releasing the Bundesbank from continuing to intervene in American dollars. And they did not even tell the IMF beforehand, let alone give it the opportunity to influence that decision. . . . We released the Bundesbank from the obligation to intervene against the dollar, solely out of the motive of gaining room, within our country, for a stable, stability-oriented policy . . . we never even wrote it down; we did it when there was no other way.")

A.6 Contemporary Press Coverage

The following passages are drawn from contemporaneous newspapers, accessed via ProQuest Historical Newspapers.

May 5–6, 1971 — The DEM float.

Wall Street Journal, May 5, 1971 ("Bonn Is Forced to Absorb $1.2 Billion In Frantic Speculative Bidding for Marks"):

> "West Germany's central bank was forced to sop up a massive $1.2 billion of US currency yesterday as international speculators bid frantically for marks in the hope that they would soon be allowed to float upward in value. [...] In the first 10 minutes of trading, dealers said, the Bundesbank was compelled to absorb fully $100 million to keep the dollar from sinking below the floor level set by IMF rules."

New York Times, May 6, 1971 ("Bonn Says It Will Decide By Tomorrow on Action," Lawrence Fellows):

> "Within 40 minutes of trading on the foreign-exchange markets today, a billion dollars came into the country, according to Dr. Karl Klasen, the Bundesbank's president. This was not an accurate count, but an estimate based on the raucous sound and ominous appearance of the descending avalanche. The Government moved swiftly to relieve the Bundesbank of its burden of buying dollars."

Wall Street Journal, May 6, 1971 ("Bundesbank Triggers Wide Abandonment Of Dollar Prop"):

> "From the opening of trading yesterday on the Frankfurt currency exchange, the dimensions of the monetary crisis could be read in the frenzied bidding of speculators pushing to dump US dollars for West German marks. In the first hour, West Germany's central bank, the Bundesbank, was forced to sop up $1 billion of US currency to keep the dollar from collapsing below the floor level set by International Monetary Fund rules. This only a day after it had absorbed $1.2 billion. Then the Bundesbank called it quits."

Wall Street Journal, May 11, 1971 ("Currency Traders Largely Sit Out Day After Storm"):

> "Alfred Schaefer, president of the Union Bank of Switzerland, complained that 'once again the good boy is being punished.' He bemoaned that Switzerland, which had kept its monetary house in order, was forced to raise the value of its currency because of US monetary policy. 'European disunity capitulated to the US which subjugates its international currency obligations to domestic and electoral considerations,' he declared."