EXCHANGE ARRANGEMENTS ENTERING THE TWENTY-FIRST CENTURY: WHICH ANCHOR WILL HOLD?*

ETHAN ILZETZKI
CARMEN M. REINHART
KENNETH S. ROGOFF

This article provides a comprehensive history of anchor or reference currencies, exchange rate arrangements, and a new measure of foreign exchange restrictions for 194 countries and territories over 1946–2016. We find that the often cited post–Bretton Woods transition from fixed to flexible arrangements is overstated; regimes with limited flexibility remain in the majority. Even if central bankers' communications jargon has evolved considerably in recent decades, it is apparent that many still place a large implicit weight on the exchange rate. The U.S. dollar scores as the world's dominant anchor currency by a very large margin. By some metrics, its use is far wider today than 70 years ago. In contrast, the global role of the euro appears to have stalled. We argue that in addition to the usual safe assets story, the record accumulation of reserves since 2002 may also have to do with many countries' desire to stabilize exchange rates in an environment of markedly reduced exchange rate restrictions or, more broadly, capital controls: an important amendment to the conventional portrayal of the macroeconomic trilemma. *JEL* Codes: E5, F3, F4, N2

I. INTRODUCTION AND OVERVIEW

The article explores the transformation of the global exchange rate system over the past two decades in light of the advent of the euro, the rise of the Chinese renminbi, the trend decline in exchange rate restrictions and capital controls, the shift toward inflation targeting, and greater exchange rate flexibility in a number of key emerging markets. Interestingly, we find that despite the widespread prediction that the world is evolving toward a

*We thank the editors, Pol Antràs and Robert Barro, and four anonymous referees for their useful comments. We thank Xavier Gabaix, Matteo Maggiori, Kevin O'Rourke, Vincent Reinhart, and seminar participants at the Bank of International Settlements, the International Monetary Fund, the AEA meetings, the NBER International Finance and Monetary Economics March 2017 meeting, Harvard University, the Bank of England, and the CEPR-SNB-BoI Conference on Foreign Exchange Market Intervention for helpful comments and suggestions. Lukas Althoff, Kenyi Cansino, Duygu Guven, Gonzalo Huertas, Patricio Merlani, Paul Schmelzing, and Jordan War provided outstanding research assistance. Country chronologies and data can be found at http://www.ilzetzki.com/irr-data.

The Quarterly Journal of Economics (2019), 599–646. doi:10.1093/qje/qjy033.
Advance Access publication on January 5, 2019.

more multipolar system, the U.S. dollar remains by far the most important anchor currency (or in the case of more flexible arrangements, reference currency), particularly when one considers the integration of China and the former Soviet bloc into the global financial system and greater macroeconomic stability in much of Latin America. Indeed, our analysis of de facto exchange rate arrangements suggests that dollar cross-rate stabilization is as widespread today as it was at the height of the postwar Bretton Woods fixed exchange rate system. We also argue that combining our results on de facto exchange rate stabilization with the comprehensive new measure of exchange rate controls developed here suggests the possibility that many central banks may be accumulating outsized quantities of "safe" advanced country bonds, partly as a substitute for the declining effective levels of exchange controls (see Farhi, Gourinchas, and Rey 2011; Obstfeld 2013; Farhi and Maggiori 2018).

Our findings are consistent with a growing recent literature that documents the increasing centrality of the dollar in global traded goods pricing and bond issuance, as well as the outsize influence of U.S. monetary policy on asset prices worldwide (Rey 2013; Bruno and Shin 2015; Gopinath 2015; Maggiori, Nieman, and Schreger 2018).[1] Indeed, the fact that exchange rate stabilization apparently remains an important consideration for so many central banks can be considered a portmanteau measure of the various impacts of dollar volatility, including liability dollarization and the sensitivity of a country's markets to shifts in global risk.

Our results are based on a comprehensive history of anchor or reference currencies, exchange rate arrangements, and a new measure of foreign exchange restrictions for 194 countries and territories over 1946–2016. Compared to earlier exchange rate classification efforts,[2] we focus much more on classifying countries' choice of anchor or "reference" currency (we also consider basket

1. We should note that rising dollar dominance is not a universal view, with some researchers arguing that because the share of the United States in the global economy is declining, the U.S. dollar's role as the de facto world currency is likely declining as well. Eichengreen (2011), for example, argues that the world is headed toward a multipolar system where the euro dominates in Europe, the U.S. dollar is the anchor in the Americas, and the Chinese renminbi becomes the main currency in Asia.

2. These include Reinhart and Rogoff (2004), Shambaugh (2004), Levy-Yeyati and Sturzenegger (2005, 2016), and Klein and Shambaugh (2010).

anchors). In principle, any exchange rate classification algorithm must simultaneously determine a country's choice of anchor currency (if any) and its degree of fixity. Because of changes to the global system listed above, including the proliferation of candidate anchors—particularly the euro—and greater exchange rate flexibility in some emerging markets, a significant modification and generalization of the classification algorithm was required, especially to tie down the anchor currency in several important cases.[3]

Section II develops our anchor/reference currency classification algorithm and our classification of exchange arrangements. We discuss why changes in the international monetary system require a new classification methodology. We pay particular attention to the relatively new question of how one distinguishes between freely floating exchange rates (in which the central bank essentially only looks at the effect of exchange rate changes through their effects on output and inflation) from managed floating regimes in which central banks take several broad actions to stabilize exchange rates, especially including significant intervention. The analysis goes beyond exchange rate–based indicators, for example, incorporating reserve holdings and goods pricing for borderline cases. Section III summarizes results for anchor classification and for measures of de facto exchange rate classification. Notably, although there is some tendency toward more intermediate regimes, the world remains heavily skewed toward less flexible exchange rate regimes instead of managed floating and freely floating. This section looks at the theory of anchor choice and explores why one does not see more evidence of an expansion of the euro's influence or the emergence of a nascent renminbi bloc. We also lay out a new data set on exchange rate controls, a key piece of the so-called exchange rate trilemma (see, e.g., Obstfeld and Taylor 2003 or Obstfeld, Shambaugh, and Taylor 2005). Although we do find evidence of a marked uptick in exchange rate controls over the past few years, the longer term shows a marked trend decline. Section IV proceeds to ask whether the trend decline in controls might help explain the rising demand for "safe assets."

3. Frankel and Wei (1994) made an early contribution in narrowing in on the anchor currency question, but their analysis is restricted to East Asia and uses a different methodology based on attempts to estimate weights in currency baskets. In contrast, we provide a "holistic" approach that treats the anchor currency as part of a broader exchange arrangement strategy.

The concluding section looks forward and discusses the possibility of the renminbi emerging as an alternative to the dollar in the future.

II. Anchor Currencies and Exchange Rate Regimes: Methodology

This section describes the classification framework that we apply to the 194 countries (or territories) that make up our sample in 2016. The raw exchange rate and inflation data are monthly and span January 1946 through December 2016, approximately seven decades. The classification algorithms perform two intertwined tasks. First, they identify the relevant anchor currency for each country over the course of the sample; second, they define the exchange rate arrangement by metrics that primarily (but not exclusively) measure the degree of flexibility. The approach expands on previous efforts to classify exchange arrangements (e.g., Reinhart and Rogoff 2004) in that we (i) explicitly determine the anchor or reference currency (we use "reference" in the case of managed floats), (ii) allow for de facto baskets of currencies as anchors, (iii) classify and analyze de jure inflation targeting cases, and (iv) pay explicit attention to the eurozone. Importantly, we are interested in classifying exchange rate regimes, rather than exchange rate practices at high frequency. Given that an exchange rate regime is a slow-moving phenomenon, the criteria for evaluating it almost always involve a multiyear window, typically of five years. However, we provide the data at monthly frequency, which gives high-frequency estimates of the timing of regime shifts.

II.A. The Changing Landscape

The evolution of the global monetary system during the first two decades of the twenty-first century presents a number of challenges to existing exchange rate classification algorithms, compelling us to significantly amend the earlier classification algorithm of Reinhart and Rogoff (2004).[4] First and foremost, the

4. The Reinhart and Rogoff (2004) classification has been extremely widely used in empirical macroeconomics across a wide variety of topics, for example, Aghion et al. (2009) and Rajan and Subramanian (2005) on growth; Aizenman and Lee (2007) and Jeanne and Rancière (2006) on reserve accumulation; Chinn and Wei (2013) and Ghosh, Qureshi, and Tsangarides (2013) on current account adjustment; Hau and Rey (2006) on capital flows and equity prices;

advent of the euro poses the question of whether exchange rate regime classification should be done at the supernational level, as the International Monetary Fund does (in which case any reasonable criterion will find the euro a floating exchange rate), or at the nation-state level, as we do (in which case the individual eurozone countries with their largely independent fiscal policies are better thought of as a system of fixed exchange rates). In addition, the euro has become a very important candidate anchor/reference currency. In several cases, we are forced to draw on additional information such as reserve holdings, pricing practices, and responses to extreme shocks to classify a country's anchor/reference currency as the dollar, euro, or a basket.

Second, a significant number of countries have shifted to some variant of inflation targeting. In some (but far from all) major emerging market economies, this has led to a notable increase in exchange rate volatility, despite extensive exchange market intervention in most cases.

Third, even as some emerging market exchange rates have become more volatile, major-currency cross–exchange rate volatility has gone through a relatively subdued period. Figure I shows the absolute value of the monthly change in the dollar-Deutschmark cross-rate from the end of Bretton Woods to today (the German DM is replaced by the euro after 1999). Despite volatility's countercyclical nature, a clear secular decline in exchange rate volatility is visible. (The dollar-yen cross-rate shows a similar trend.) The combination of relatively low exchange rate volatility among large advanced economies that do not intervene versus the relatively high volatility of some emerging markets that heavily intervene forces us to broaden our algorithm to draw on additional information, particularly on the nature and intent of foreign exchange market intervention.

II.B. Measuring Exchange Rate Flexibility

Assigning the anchor currency and determining the exchange rate classification is an interactive simultaneous process. For expositional purposes, we begin by describing the more familiar methodology of classifying exchange rate flexibility and then describe the anchor classification. We note that the full classification

Mendoza and Terrones (2008) and Jordà, Schularick, and Taylor (2015) on credit flows; Ball, Lopez, and Reyes (2013) on the effect of remittances on the macroeconomy; and Habib, Bützer, and Stracca (2016) on the effect of oil shocks.

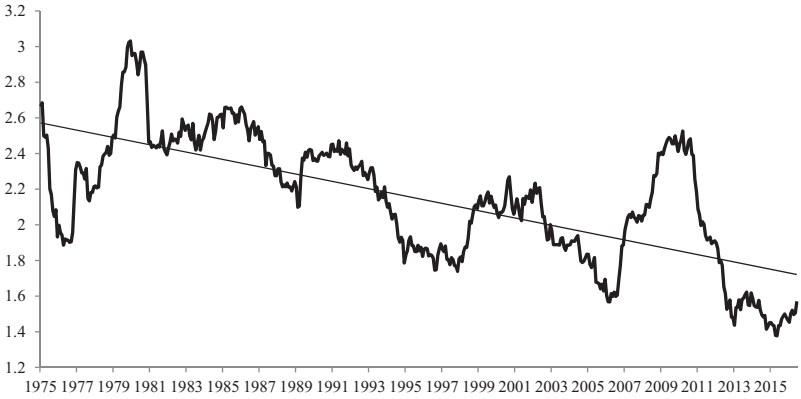


FIGURE I

Declining Volatility in Dollar-Deutschmark (Euro) Exchange Rate

The figure shows the four-year moving average of the absolute value of the change in the dollar-Deutschmark bilateral exchange rate from 1973 to May 2018. The euro replaces the Deutschmark from January 1999. The straight line represents the trend.

includes a coarse classification, including 6 categories of exchange rate flexibility, and a fine classification, including 15 categories. The categories are listed in Online Appendix Table A.1. For ease of exposition, the description here focuses primarily on the coarse categories.

For the 194 countries and territories studied, the raw data include the month-on-month rate of inflation and the absolute value of the monthly change in the (average) spot exchange rate. We denote the latter as $\varepsilon_{n,t}$ for country n in month t. The exchange rate is evaluated against 11 candidate anchor currencies.[5] The candidate anchors were chosen based on historical practice and currencies that are widely included in exchange rate baskets. Currencies that are classified as freely floating become candidate anchors in the relevant years.[6] In the current classification, the Chinese renminbi is not considered a candidate anchor because it has been strongly linked to the dollar and is not convertible. In Section III we discuss the possibility that some currencies may

5. The candidate anchors are the U.S. dollar, the Deutschmark and French franc (replaced by the euro following 1999), the Japanese yen, the British pound, the Russian ruble, the Swiss franc, the Australian dollar, the South African rand, and the Brazilian real.

6. This adds the Canadian dollar and the Turkish lira in some years.

be latently anchored to the renminbi, but for most of our sample, anchoring to the dollar and renminbi is observationally equivalent. Finally, we allow for de facto currency baskets as potential anchors. Baskets include dollar-euro, dollar-yen, euro-yen, and dollar-euro-yen, with equal weights on the anchors in each basket. We discuss de facto baskets in more detail in Section II.D.

The classification algorithm begins by separating currencies with parallel markets. Where data on parallel exchange rates are available, we use these data alongside the official data to classify the exchange rate arrangement.[7] We then separate freely falling currencies (category 5) as those whose year-on-year inflation exceeded 40% for 12 consecutive months. The freely falling regimes typically arise in the context of protracted (even chronic) economic crises.[8] We also include in this category "currency crashes," defined as months where the currency depreciated by 25% (month on month) and this rate of depreciation was 10 percentage points greater than that of the previous month. Furthermore, we classify the six-month window following such a crisis as freely falling. This dimension of our algorithm separates the cases where the exchange rate undergoes large fluctuations due to a lack of monetary control (often accompanied by the depletion of foreign exchange reserves and other crisis symptoms) from currencies that fluctuate freely in tranquil times.[9] Together, these features of the algorithm provide a classification that separates severe currency crisis periods (temporary or persistent) from tranquil times. The distinction between a currency "crash" and "turbulence" is a matter of degree. For example, Eichengreen, Rose, and Wyplosz (1996) consider both an extreme definition of a currency crisis (two or more standard deviations in their exchange market turbulence index)

7. Where data on the dual exchange rate are unavailable, we classify the country as having a parallel market with unavailable exchange rate data (category 6). Given the decline in parallel markets over time, the use of parallel market data also diminishes through our sample period from 50% of countries at the beginning of the sample to less than 5% at its end.

8. For example, freely falling is particularly widespread among the countries that defaulted on their sovereign debt in the early 1980s and remained in default for nearly a decade.

9. This dimension of the algorithm, for instance, places the South Korean won in the freely falling category from December 1997 through June 1998, and more recently, the Russian ruble from November 2014 through the beginning of 2016. During its famous 2007–2008 crisis, the Icelandic króna only just misses the crash cutoff.

and a milder version (turbulence rather than crisis).[10] For reasons we discuss later, our algorithm does not treat periods of elevated turbulence (which do not meet the crisis definitions) as a separate category.

Next, when a country had a preannounced exchange rate arrangement, we verify whether the exchange rate followed the announced rule. This includes cases where the central bank is anchored to a basket of currencies with basket weights that are publicly available. Otherwise, we use our algorithm to classify exchange rate arrangements into four categories that can be roughly described as pegs (category 1), narrow bands (category 2), broad bands and managed floating (category 3), and freely floating (category 4). We describe in Section II.C how the distinction between managed floats and freely floating is made.

Currencies whose absolute change vis-à-vis the anchor currency was less than 1% are classified as pegs. This follows the de jure convention of the Bretton Woods system, which allowed for 1% fluctuations within the system of fixed exchange rates. Specifically, we classify a currency as being pegged if the exchange rate changes by less than 1% in absolute value for 80% of consecutive monthly observations ($P(\varepsilon_{n,t} < 1\%) > 80\%$).[11] Bands are assessed in a five-year rolling window, but two-year windows are used to date start and end points.[12]

Narrow (wide) bands are defined as allowing fluctuations of 2% (5%) vis-à-vis the anchor currency. These bands were chosen based on common exchange rate practices.[13] Formally, we classify

10. One and a half standard deviations in the index is considered in their sensitivity analysis.

11. If these adjustments are mainly in one direction (70% of the time), we classify the currency as having a crawling peg (category 7) rather than a hard peg (category 4) in the fine classification.

12. In addition, currencies that had exactly 0% change for four consecutive months are classified as pegs in these months.

13. For example, the National Bank of Denmark has a de jure band of ±2.25% against the euro (although we find that the band is smaller in practice). Several euro accession countries have had 2% de jure bands (e.g., Cyprus, and the Czech and Slovak Republics). Similarly, the official policy of the People's Bank of China since 2015 has been to limit renminbi fluctuation with respect to a basket of currencies to be within a 2% band. In this period the renminbi exchange rate vis-à-vis this basket has always changed by less than 2% in absolute terms. In contrast, the renminbi saw monthly changes exceeding 1% in a quarter of all monthly observations. Thus a de facto classification that differentiates between a 1% and a 2% band would discriminate between these cases.

a currency as having a narrow band with respect to its anchor if the exchange rate changes by less than 2% in absolute value at least 80% of the time ($P(\varepsilon_{n,t} < 2\%) > 80\%$).[14] In the earlier literature, an 80% threshold proved a good rule of thumb for defining a wide band, yielding quite robust results.[15] However, as shown in Figure I, exchange rate volatility has been more muted recently than in the past, and essentially all currencies would be classified as fluctuating within a wide band based on this criterion. In fact, the bilateral dollar-euro-yen exchange rates all fluctuated by less than 5% 90% of the time in the past decade.

Accordingly, we have adapted the algorithm to the twenty-first century and defined a currency as fluctuating within a wide band if it showed absolute monthly changes of less than 5%, in 100% of observations ($P(\varepsilon_{n,t} < 5\%) = 100\%$).[16] This criterion determines a number of cases. For example, Ghana had an official policy of exchange rate intervention during and following the global financial crisis of 2008–2009, and the algorithm identifies that this central bank continues to have a wide band following the crisis. This criterion also helps classify South Korea as having a wide band with respect to the dollar in the early 2000s. This precedes a period when South Korea had a narrower band and is consistent with voluminous narrative evidence that the country

14. This category also includes crawling pegs (category 7 in the fine classification), as described in note 13. We note that the 80% criterion allows some flexibility for exchange rate movements—an average of two a year—within an otherwise fixed exchange rate regime. Allowing this wiggle room is important for several reasons. First, some central banks may have occasional parity changes within an otherwise fixed exchange rate regime. Second, central banks may evaluate exchange rate targets based on different criteria than we do (end of period instead of average exchange rates or at a different frequency than our monthly data). This would lead to some deviations from the bands when evaluated by our criteria. Third, parallel exchange rates may deviate from the band even in the context of a largely fixed exchange rate regime. If an exchange rate is within a 2% band but adjustments are mainly in one direction (70% of the time), we classify the currency as having a crawling band, similar to the definition of a crawling peg.

15. Reinhart and Rogoff (2004) used a similar procedure to classify wide bands as reflecting changes of less than 5% in absolute value at least 80% of the time.

16. We do not reclassify twentieth-century regimes retrospectively based on this criterion. This is intentional, as the definition was adapted to the lower exchange rate volatility in the twenty-first century. Determining the break point based on the turn of the millennium is perhaps arbitrary, but Figure I illustrates that the decline in volatility was a continuous process, giving no obvious breakpoint. This category also includes crawling bands (category 11 in the fine classification) as defined in note 14.

has attempted to limit exchange rate volatility vis-à-vis the dollar over the past two decades.

We note that it is too soon to determine whether the decline in volatility among advanced economy currencies is a temporary or longer-lasting phenomenon. Although it is beyond the scope of this article to investigate its causes, among possible explanations are the trend decline in inflation rates that has characterized this period possibly reinforced by the unusually high degree of synchronicity in monetary policy from the eruption of the crisis in 2008 up until the end of 2015, at which point the Federal Reserve embarked on the process of unwinding from the postcrisis policy stimulus ahead of the other major central banks.[17] Neither explanation rests on a change in the exchange rate arrangements of these countries. As to how international turbulence (as opposed to a domestic currency crash) affects exchange rate policy in emerging and developing economies, the range of observed outcomes is broad and heterogeneous; some countries have used turbulent times to allow for significant currency depreciation as a boost to competitiveness, while others have shown an increased "fear of floating" as concerns about capital flow reversals and balance sheet effects dominate the policy response. This cross-country heterogeneity in the behavior of the exchange rate in periods of heightened international turbulence suggests that a separate category is unwarranted. Furthermore, our emphasis is on the exchange rate regime (as our use of rolling five-year windows highlights), not in describing what are possibly short-lived changes in the policy reaction function of central banks during bouts of turbulence.

All remaining cases are classified as floating. The following section describes our procedure to separate currencies that are freely floating from managed floats.

II.C. Managed or Freely Floating?

Changes in the international monetary landscape pose new difficulties in distinguishing central banks that manage their floating exchange rate from those that allow their currency to float freely. In the twentieth century, it was rare for emerging markets to allow their currency to float freely (except during currency crises). In contrast, in the twenty-first century, we classify 17

17. The positive relationship between inflation levels and their volatility in Fischer and Modigliani (1978) can plausibly extend to exchange rate volatility.

currencies as floating (over at least part of the sample), the majority of which were from middle-income economies, and a number of which were from low-income economies. Earlier work (Reinhart and Rogoff 2004) used exchange rate volatility criteria to weed out exchange rates that were managed among floaters. However, floating emerging market currencies appear to be more volatile on average than those of advanced economies despite substantial intervention in foreign exchange markets. This makes it difficult to construct a counterfactual as to how volatile emerging market currencies would have been if they had been allowed to float freely.

Our new approach is based on a narrative assessment of central bank practices. The narratives are fully summarized in Online Appendix 1. Our point of departure is that a freely floating exchange rate regime is inconsistent with frequent exchange rate intervention with the explicit aim of managing the level, path, or variability of the exchange rate. The narratives provide evidence where central banks used either foreign currency reserves or capital controls as instruments to affect the exchange rate and where there is a preponderance of evidence that the intervention's intent was exchange rate management. Sources include central bank minutes, reports, and statements; the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions; OECD and BIS reports; the U.S. Treasury's biannual Report to Congress on International Economic Exchange Rate Policies; central bank data on reserve holdings and net foreign exchange purchases; press reports; and country-specific research. These narrative assessments are applied only to periods when a currency fluctuated outside of the 5% band described in Section II.B.

Our classification is conservative (potentially biased toward classifying countries as freely floating) for two reasons. First, central banks may manage the exchange rate using other instruments than the two mentioned, most notably the interest rate, but also by trying to manipulate expectations. For example, some of the countries classified as freely floating (e.g., Australia, South Africa) have a de jure managed floating policy in that the central bank explicitly reserves the right to intervene in foreign exchange markets to limit "extreme" volatility. Second, there may be cases where we are unable to detect intervention due to data limitations. For example, we have limited information about Brazil's foreign exchange interventions in the early 2000s and have therefore classified this episode as freely floating.

The main conclusions can be summarized as follows. In addition to the three main reserve currencies (dollar, euro, and yen), 14 currencies were classified as floating for at least one year since 2000. Floating exchange rate practices fall into three main categories. First, the central banks of Australia, Canada, South Africa, and the United Kingdom virtually never intervened in foreign exchange markets during this period[18] and held reserves an order of magnitude lower than other central banks in the sample. Second, two central banks (Brazil and Turkey) appear to have briefly attempted to float their currencies freely in the period 2000–2010 but reanchored their exchange rates and intervened regularly as the global financial crisis unfolded. The third category includes all remaining cases, where central banks intervened regularly both before and during the global financial crisis.

We classify Japan as a freely floating currency, but the narratives illustrate that this is a borderline case. The Bank of Japan increased its already vast war chest of foreign exchange reserves over the past decade. These may have been part of a broader quantitative easing strategy with no clear exchange rate objectives. However, it is very possible that foreign exchange interventions around 2012 were explicitly targeted at capping yen appreciation.

In concluding this section, it is important to note that the distinction between a managed float and freely floating is not terribly consequential for many macro issues, and in cases where it is important, our fine 15-bucket classification can be used where the weights are very similar, with a freely floating being a 13 and managed floating a 12.

II.D. Anchor or Reference Currency

Obviously, any classification scheme (e.g., Levy-Yeyati and Sturtzenegger 2005; Reinhart and Rogoff 2004; or Shambaugh 2004), needs to tackle the anchor issue, but as we have noted, the evolution of the global exchange rate system over the past two decades has made the issue less straightforward in many cases. Here we describe our approach.

Beyond the main anchor currencies, we also allow for the possibility that a currency is anchored to a basket of currencies. To do this, we first verify whether the central bank has an official basket. If this is the case, we include the official basket as a

18. There were rare and brief exceptions in the days following September 11, 2001, and the collapse of Lehman Brothers in September 2008.

candidate anchor. Second, we allow for the possibility that a currency was anchored de facto to a basket consisting of any pair among the dollar, yen, and euro or to a basket of the three. All de facto baskets have equal weights for included anchors.

Although these restrictions may appear arbitrary, we find them informative for a number of reasons. A more varied set of candidate baskets would lead to spurious classification of currencies to narrow bands. For any currency, one can find a basket with some anchor currency weights, to which a given currency is virtually pegged within a short enough window.[19] Although in principle baskets may contain any number of currencies, it is important to recognize that our classification shows that only seven are actually freely floating. This means that any currency anchored to a basket containing many currencies is implicitly anchoring to a far smaller number. For example, the People's Bank of China (PBC) publicized the weights in its reference basket in late 2015. The dollar had a 26% weight in the basket, but the basket also put substantial weights (nearly 20%) on currencies that were themselves pegged or closely anchored to the dollar (the Hong Kong and Singapore dollars, Myanmar ringit, and Thai baht). Hence a classification that took the basket weights at face value would grossly understate the extent to which the renminbi continues to be anchored to the dollar.[20] Finally, these simple baskets are informative and intuitive. It is interesting, for example, that the dollar-euro basket was the only one to which even a small number of currencies were anchored. No country has had a de facto dollar-yen basket or a dollar-euro-yen basket as its anchor. The rare cases of de facto basket anchors were also intuitive: for example, the Icelandic króna over the past decade and the Polish zloty as it transitioned from a dollarized economy in the late 1990s to a euro anchor in the early 2000s.[21]

19. Our aim is similar to Frankel and Wei (1994), Frankel (2008), and Frankel and Xie (2010), who attempt to estimate basket weights. We require a different approach due to the joint task of classifying anchors and exchange rate flexibility.

20. In the particular case of China, we also allowed for the possibility that the renminbi was anchored de facto to this de jure basket in the years before it was officially announced. It was not.

21. In future research, it will be interesting to assess the de facto basket corresponding to the renminbi's current de jure one. At the time of writing, it is too soon to tell: in the three years since the basket was announced, the de facto dollar-euro basket performs slightly better than the official basket itself, but one should note that this was a period of dollar appreciation and the algorithm would be best tested over a longer period, including dollar weakness.

Our algorithm for anchor currency classification proceeds as follows. If a currency is identified as freely floating (or falling) it is classified as having no anchor or reference currency (in the figures that follow it will be treated as anchored to itself). At the other end of the spectrum, countries with arrangements that are fully pegged can be classified unambiguously. With the relatively low volatility among anchor currencies in the past decade, it was possible to be within a 2% band of more than one anchor (or baskets thereof) for 80% or more of all observations. To arbitrate these cases, we used a procedure based on bands of ±1%, 2%, and 5% around the candidate anchors. If a currency was within a narrower band of a single anchor than any other, the currency was assigned this anchor.[22] If more than one anchor meets this criterion, the anchor is chosen based on the largest number of observations that are within an even narrower band.

For example, throughout the period 2000–2015, the Georgian iari satisfied our criterion for a 2% band against both the dollar and an equally weighted dollar-euro basket. However, it was within a 1% band of the dollar for 70% of observations compared with 50% relative to the basket. Georgia was therefore assigned a dollar anchor. In contrast, the Icelandic króna was within a 5% band of both the euro and the dollar-euro basket in the period 2009–2015. However, it was within a 2% band only of the basket and was therefore assigned a dollar-euro basket anchor. In these borderline cases, we check whether the algorithm provides answers consistent with other sources of evidence. For example, the Georgian economy is highly dollarized, whereas Icelandic trade is denominated in dollars and euros in roughly equal shares.[23] Beyond providing a consistent summary statistic of the anchor currency, the algorithm often classified cases that might otherwise have been elusive.[24]

22. As in the discussion of exchange rate flexibility, a 1% or 2% band requires the currency to fluctuate within the band for 80% of observations, while the 5% band requires the currency to be within the band 100% of the time.

23. Our corroborative evidence is noted in the companion chronologies to this article (Ilzetzki, Reinhart, and Rogoff 2017, with updates at https://www.ilzetzki.com/irr-data).

24. A case in point is Madagascar, which was classified as a dollar-euro anchor. Based on narrative evidence alone, the dollar, euro, and a basket would all appear to be reasonable classifications. The algorithm provided an unambiguous answer (dollar-euro anchor). It is also reassuring that the algorithm classified a number of central banks with de jure baskets into the "basket" category.

In between exchange rate bands and freely floating exchange rates are managed floats, a relatively flexible arrangement in which the central bank explicitly (or implicitly) still places a significant weight on exchange rate stabilization. However, in these cases we refer to the dollar (or other anchor) as a "reference" currency rather than an "anchor" currency. It would be difficult to classify a reference currency for the 10 managed floating episodes in our sample using indicators of exchange rate volatility alone. We therefore use additional criteria to assign a reference currency for managed floats.

Table I lists these cases and the supplementary information used.[25] We use four separate criteria to assign a reference currency to these countries. First, in which currency is the majority of foreign trade invoiced? Second, in which currency is the largest share of external (public and publicly guaranteed) debt denominated? Third, which currency makes up the largest share of central bank foreign reserves? Finally, which was the most recent anchor currency? Conveniently, all four indicators point to the same reference currency in almost all countries in the table. In Online Appendix 2, we propose an indicator for reference classification that aggregates these four measures. However, the four measures are strategic complements, and we think it is no coincidence that they give consistent predictions.[26]

For completeness, we assess the robustness of our anchor choice by studying two recent natural experiments. There have been two large recent swings in the bilateral dollar-euro exchange rate (see Online Appendix Figure A.1). These movements can be traced back to monetary policy shocks in Europe and the United States. First, on July 22, 2012, ECB President Mario Draghi made his now famous speech in which he stated that the ECB stood ready to do "whatever it takes" to preserve the euro. Following his pronouncements, spreads on sovereign bonds of peripheral eurozone governments declined and the euro appreciated by about 10% relative to the dollar through the end of the year. Second, the minutes of the FOMC meeting of June 17–18, 2014, increased market perceptions that the Federal Reserve would initiate its tightening cycle, a perception that gathered momentum throughout the rest

25. Due to data limitations, this methodology is only applied to managed floating currencies since 2000.

26. Leaving these 10 cases unclassified (i.e., no anchor or reference currency) would not affect any of the article's conclusions.

TABLE I

CLASSIFYING REFERENCE CURRENCIES FOR MANAGED FLOATING CURRENCIES WITH SUPPLEMENTARY DATA

Country (reference currency)	Years	Indicators
Brazil (dollar)	2000–2002 2008–	94% of exports and 84% of imports priced in dollars. 90% of foreign currency public and publicly guaranteed (PPG) debt in dollars. Prior anchor: dollar.
Chile (dollar)	2008–	Invoicing data n.a., but given large share of copper in exports and the denomination of copper prices in dollars, the lion's share of exports are likely denominated in dollars. Prior anchor: dollar.
Colombia (dollar)	2008–	Close to 100% of invoicing and 100% of PPG debt in dollars. Previous anchor: dollar.
Iceland (dollar-euro)	2006–2009	Very diversified invoicing between dollar, British pounds, and euro. Central bank FX reserves very diversified. Anchored to dollar-euro basket subsequently.
South Korea (dollar)	2004–2009	Previous and subsequent anchor: dollar. Other data unavailable.
Mexico (dollar)	2009–	Invoicing data n.a, but with more than 80% of exports and nearly half of imports from the United States, the dollar is certainly the main invoicing currency. Majority of debt invoiced in dollars. Previous anchor: dollar.
Paraguay (dollar)	2011–2013	Invoicing data n.a. Nearly 90% of PPG debt in dollars. Previous and subsequent anchor: dollar.
Russia (dollar-euro)	2009–2012	Previous anchor: dollar-euro basket and de jure policy of managing its float around a basket of 55% dollar and 45% euro. Other data unavailable.
Turkey (dollar)	2011–	Diversified invoicing with the majority in dollars. PPG debt is 60% dollar and 40% euro. Previous and subsequent anchor: dollar.
Uruguay (dollar)	2009–2012	Previous and subsequent anchor: dollar. Other data unavailable.

Sources. Gopinath (2015), World Bank international debt statistics, national central banks, and authors' calculations.

of the year. As a result, the dollar appreciated by a cumulative 30% relative to the euro through March 2015.[27] Currencies we classify with a dollar anchor or reference move more closely with the dollar in both episodes. While Online Appendix 3 provides the details for the full exercise, we highlight here that all in all, these two event studies strongly corroborate our anchor and reference classifications.

III. The "Big Picture"

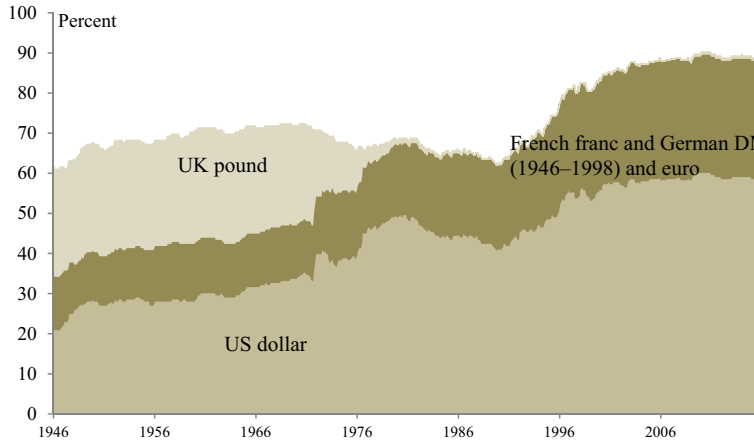
This section quantifies to what extent a handful of major currencies serve as anchors or reference currencies for the rest of the world. Apart from documenting the exit of old anchors, the emergence of new ones, and the resilience of some, our study attempts to shed light on the factors determining which currencies prevail or fail as anchors. Although the renminbi is not an anchor currency in our historical analysis, we nevertheless devote attention to the possibility that it might be emerging as a new pole of the international monetary order. We then shift our focus to the evolution of exchange rate arrangements in the seven decades since World War II. Of particular interest is the emergence of new types of de jure monetary and exchange rate arrangements and their degree of exchange rate flexibility. We ask whether these arrangements are characterized by trends toward greater exchange rate flexibility or by long cycles with no clear-cut tendency. We supplement our discussion with an extensive measure of exchange rate restrictions and controls, which helps capture the extent to which governments attempt to circumvent the impossible trinity (open capital markets, exchange rate stabilization, and independent monetary policy) and sets the stage for a later discussion of how countries' desire to stabilize the exchange rate may be affecting safe asset accumulation.

III.A. Anchor Currency

Figure II presents the evolution of four major anchor currencies from 1946 through 2015. The top panel shows the

27. This differs from the proverbial "taper tantrum" of the previous year, when the Federal Reserve indicated plans to slow down and eventually reverse asset purchases as part of its quantitative easing policies. Although this announcement did create some volatility in emerging market currencies, it had a relatively muted effect on the bilateral euro-dollar exchange rate.

Share of countries, 1946–2015, excludes freely falling cases



Number of countries weighted by their share in world GDP, 1950–2015, excludes freely falling cases

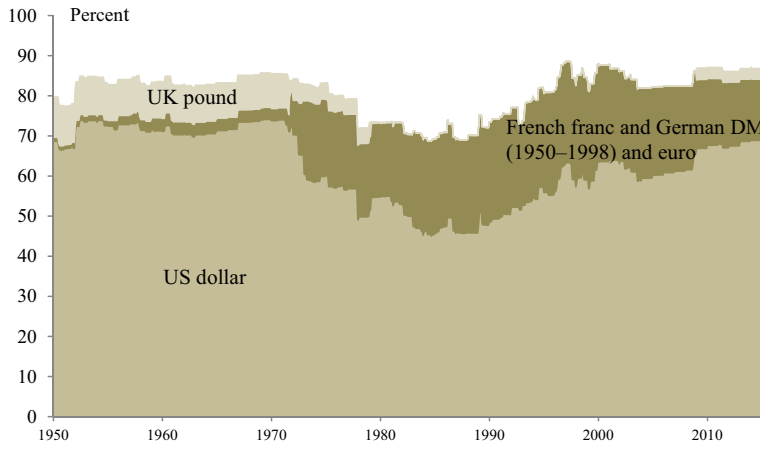


FIGURE II

Post–World War II Major Anchor Currencies

Top: Share of countries, 1946–2015, excludes freely falling cases. Bottom: Number of countries weighted by their share in world GDP, 1950–2015, excludes freely falling cases.
Sources: The Conference Board, *Total Economy Database*; International Monetary Fund, *International Financial Statistics*; Reinhart and Rogoff (2004) and sources cited therein; and authors' calculations. Currency baskets were allocated proportionally to the anchors represented in the basket. The Country Chronologies that supplement this article show the evolution of the anchor currency on a country-by-country basis.

(unweighted) share of countries anchored to each anchor currency.[28] The bottom panel presents the same information but weights the observations by countries' GDP. The French franc and German DM, which both transitioned to the euro in January 1999, are combined into a single zone for 1946–1998. As the figure illustrates, the dollar remains dominant in the twenty-first century and by some measures is even more central to the international monetary system today than in the heyday of the Bretton Woods system.[29] Importantly, however, and as we discuss, the geography of dollar influence has evolved considerably, and regimes of intermediate flexibility have become more prevalent.

The Bretton Woods system institutionalized the role of the U.S. dollar as the main anchor currency and, until the 1970s, about 70% of global GDP was anchored to the dollar. The remainder was split roughly evenly between the British pound and the Soviet ruble. As the figure illustrates, the influence of the pound fell in the years after World War II, accentuated by the United Kingdom's periodic economic crises. At the end of the Bretton Woods era, the DM emerged as the dominant European currency in the 1970s, as many European countries began to shadow the actions of the Bundesbank, explicitly or otherwise.

While the U.S. dollar was the currency of choice among the former British colonies exiting the sterling zone, the loss of comparatively high-income Europe to the DM led to a shrinking of the dollar zone by 1980. This dent to the U.S. dollar zone is apparent in Figure II. At this time, another trend was the falling share of countries with a tight exchange rate link to the U.S. dollar.

The dollar's anchor currency status received a boost in the early 1990s after the collapse of the former Soviet Union

28. This and subsequent figures include only independent (sovereign) states, which means that the total number of entities more than doubles over the course of the sample, from 79 in 1946 to 188 in 2016. There are 6 territories for which we have a full classification, bringing the total to 194. The data set also includes pre-independence de facto exchange rate arrangements so that it includes monthly data for 194 countries from 1946 to 2016.

29. The figure combines anchor and reference currencies. A figure restricted to anchors (i.e., excluding managed floating currencies) looks almost identical and is shown in Online Appendix Figure A.3. The share of world GDP anchored to the dollar is 65%, and an additional 5% of world GDP has the dollar as a reference currency. Online Appendix Figure A.4 reweights anchors based on the degree of exchange rate flexibility, giving a higher weight to more fixed exchange arrangements. Given that the eurozone members receive the highest weight, the euro bloc increases in size, but the dominance of the dollar bloc remains.

dismantled the sizable ruble bloc. Russia and most of the former Soviet republics have since anchored to the dollar (or used it as their reference currency). On the other hand, most Eastern European nations that were either a part of the Soviet Union (the Baltics) or satellites in the Soviet sphere left the ruble to embrace first the German DM and later the euro. Estonia, Latvia, Lithuania, the Slovak Republic, and Slovenia are now a part of the 19-country eurozone. As the chronologies document, a number of others in the region have tight links to the euro via de facto pegs, crawling pegs, or narrow corridors.

By the late 1970s and into the 1990s, a significant proportion of countries in Latin America and Africa (and elsewhere, like Vietnam, in Asia or Turkey, in Europe) had freely falling currencies.[30] Chronic and high inflation, and in numerous cases hyperinflation, meant that these countries were "anchorless" with regard to their exchange rate, which steadily plummeted in value versus nearly all other currencies. As inflationary crises became much less common in the twenty-first century (to date), nearly all the countries with freely falling currencies in the late 1970s–1990s have reanchored to the dollar. Arguably, one can plausibly reinterpret the history of the freely falling cases and conclude that these countries maintained a U.S. dollar anchor even during the years of very high inflation, as their trade, debts, and hard-currency reserves continued to be denominated in U.S. currency. During these long and chronic high inflation bouts, many of these countries became significantly dollarized domestically.[31] The one place that the dollar link was not apparent was in the sinking value of their currencies.

The French franc zone, which had its largest roots in French Africa, most explicitly in the CFA currency arrangement, held a steady share throughout this period until it was replaced by the euro in 1999. The DM zone, which in 1999 was consolidated with the French franc area under the aegis of the euro, expanded to peak at approximately 20% of global GDP by the start of the twenty-first century. Since then, the proportion of world GDP anchored to the euro has declined. The shrinking euro area (as a

30. As noted in Section II.B, freely falling captures all the cases where the 12-month inflation rate exceeds 40%. The incidence of freely falling over 1946–2016 is discussed later in this section.

31. On de facto dollarization see, for instance, Calvo and Vegh (1999), Ize and Levy-Yeyati (2003), and Reinhart, Rogoff, and Savastano (2014).

share of world GDP) has both external causes—the growth of China and other emerging market economies (an issue we take up in Section IV)—and internal ones, such as the global financial crisis, which affected eurozone members especially severely (see Reinhart and Rogoff 2014).

III.B. Drivers of Anchor Currencies

The role of a dominant international currency has evolved over time along with the coming and going of great powers and the evolution of international finance. In the fifth century BCE, when Athenian "silver" owls began to circulate widely outside of Greece, the appeal of widely known and recognized standardized coinage was that traders could expect a relatively uniform silver content. For over 300 years up until the mid-nineteenth century, Spanish pieces of eight were widely used in international commerce. Indeed, Spanish silver coins were legal tender in the United States until near the time of the Civil War. Spain's currency dominance partly owed to the quality of the coinage but also to the fact that her colonies, including Mexico, Bolivia, and Peru, accounted for four-fifths of global silver production between 1493 and 1850 (see Chalmers 1893; Piatt 1904). But the international role of Spain's currency was also catalyzed by the country's role as the dominant global trading and military power in the sixteenth century. Once entrenched, the centrality of the Spanish silver dollar (and later Mexican silver dollar) persisted long after Spain had otherwise faded to the periphery of Europe after the Napoleonic Wars. Spanish coinage did have competition at times. During parts of the seventeenth and eighteenth centuries, the Dutch guilder circulated far outside the Netherlands, reflecting the country's vast influence in trade and finance over the period (Denzel 2010). Of course, as Reinhart and Rogoff (2009) document, few countries could resist gradually diluting the silver content of their coinage over time, although the rate of debasement was generally modest compared to the great inflations of the fiat money era.

During the nineteenth century, the United Kingdom emerged as the world's dominant trade, military, and banking superpower. The gold-backed British pound in turn became the international currency, a position it retained long after the United States had far surpassed the United Kingdom in global trade and manufacturing production. Even after the devastation of World War I, the

pound managed to retain nearly coequal status with the dollar.[32] Only after World War II did the dollar emerge as the single international currency; indeed, European currencies were illiquid amid tight postwar financial controls. The dollar, of course, was placed at the official center of the Bretton Woods system of fixed exchange rates, which collapsed in the early 1970s.

It is very common in the literature to mark a currency's dominance by its share in foreign central bank reserves. Foreign exchange reserves are a relatively modern phenomenon dating back to the late nineteenth-century gold standard era, when central banks began holding a modest share of reserves in gold-backed currencies, mainly the pound sterling. The modern construct of the anchor or reference currency, however, is much broader and also reflects a currency's role in trade invoicing, global bond issuance, and exchange rate management. Our article particularly emphasizes measures of the latter, because the currency countries choose as an anchor (or reference) for monetary stabilization is likely indicative of the overall extent of exposure to the exchange movements against various anchors.

What is the gravitational pull toward a (single) anchor currency? Why do so many central banks choose to place a significant weight on dollar exchange rate stability, far out of proportion to the size of the United States in global trade or financial markets? The outsize role of the dollar reflects a number of mutually reinforcing factors, mostly (but not entirely) deriving from the fact that the global currency is a natural monopoly in both goods and financial markets. Economists have long noted the convenience factor firms and consumers derive when the bulk of trade is invoiced in a common currency (e.g., Swoboda 1969). Recent trends in global trade toward increasingly large multicountry supply chains, most notably within Asia, have reinforced the convenience advantage of dollar pricing. Bacchetta and van Wincoop (2005) and Goldberg and Tille (2008) emphasize the importance of strategic complementarities and pricing to market in the choice of currency

32. Ahamed (2009) emphasizes how the United Kingdom's dominance in banking and trade finance continued to reinforce the centrality of the pound up until World War I long after the United States had vastly surpassed the United Kingdom in economic size, with U.S. bankers remaining mainly domestically focused until after World War I, when UK banks' capacity to raise capital had been sharply diminished.

in highly competitive markets. Goldberg and Tille find that firms are more likely to price in the dominant currency the higher the demand elasticity for their products.

As He, Krishnamurthy, and Milbradt (2016) emphasize, there is also a natural tendency in bond markets to price in the dominant currency, thanks to the liquidity advantages bestowed by market size. Among other advantages, increased liquidity reduces rollover risk, thereby contributing to making dominant currency bonds a safer asset. With a significant share of their countries' trade and finance priced in dollars, central banks have an incentive to try to stabilize dollar exchange rates, particularly to the extent that goods prices are sticky and financial risks cannot be perfectly hedged. (For example, if a country's corporates and financial firms are heavy net borrowers in dollars, a depreciation of the domestic currency raises debt burdens to the extent that the real side of the economy is not dollarized.)

Hassan, Mertens, and Zhang (2016) offer another explanation for why central banks might want to commit to stabilizing dollar exchange rates, above and beyond goods pricing and liquidity mismatch. By shadowing a large country's exchange rate, a small country can effectively make domestic currency bonds less risky in real terms for global investors, allowing the small country to enjoy some of the "safe asset" advantages that naturally accrue to a large currency (see Hassan 2013).

Gopinath and Stein (2018) develop a comprehensive model that emphasizes the self-reinforcing advantages of the dominant currency in goods and asset pricing. Their model demonstrates how high demand for "safe" dollar-denominated U.S. Treasury bonds leads to a reduced interest rate that induces non-U.S. corporates to issue dollar debt as well. As firms issue dollar-denominated debt, they have more incentive to hedge by pricing exports in dollars. The more their export goods are priced in dollars, in turn, the lower the premium they have to pay to issue dollar debt.

It is important to note that the modern literature cited above features the natural monopoly advantages of being a dominant currency but largely abstracts from political economy considerations. Rogoff (2001) argues that a world with one dominant currency is less robust to misbehavior by the center country and potentially less stable (a theme we return to in our discussion of safe assets and the Triffin dilemma). Relatedly, the stalling of the euro as an anchor currency (as we document) probably

has much to do with political instability within the euro system and lingering uncertainty over the future of the single currency. The natural advantages of the dollar might seem much less so in a world where national political shifts did not continuously raise questions about the long-term sustainability of alternatives. Political factors may be at least as important as the natural monopoly advantages stressed in the literature. Indeed, one cannot rule out that rising stability in the eurozone (should that occur) would cause a broader range of interlinked countries to move from dollar to euro currency anchoring, or that someday China might be able to press smaller countries into renminbi anchoring much faster than they might otherwise choose, particularly in Asia. (We discuss the potential rise of renminbi anchoring in Section III.C.)

The multiple roles of the anchor currency are evident in Table II. It studies four major reserve currencies (dollar, euro, pound, and yen) and reports the share of countries anchored to each and a number of other factors reflecting their centrality in the international monetary system. These factors include the share of world reserves held in this currency, the share of external debt that is denominated in the anchor currency, and an index that summarizes the extent to which world trade is denominated in the anchor currency.[33]

The picture emerging from Table II is fairly consistent across indicators and confirms our assessment that the U.S. dollar stands out as the dominant anchor. Based on the classification approach outlined in Section II, the dollar serves as the anchor or reference currency for 60% of the countries in our study in 2015. About two-thirds of the world's foreign exchange reserves are held in U.S. dollars, and a comparable share of developing and emerging market economies' external debt is denominated in greenbacks (Faudot and Ponsot 2016).[34] Both in magnitude and relative importance, these numbers align with our own estimates on exchange rate arrangements. Finally, the United States scores 69% on the trade

33. The trade-invoicing index is based on trade-invoicing data from Gopinath (2015) and is detailed in Online Appendix 4. It averages the percent of countries with any trade invoiced in a given anchor currency with the share of all trade invoiced in that currency.

34. Currency denomination of reserves is available in the aggregate but not on a country-by-country basis.

TABLE II

MARKERS OF AN ANCHOR CURRENCY

	Percent
Panel A: Anchor measure or criteria: U.S. dollar	
Share of countries with a U.S. dollar anchor in their exchange rate arrangements	59
Share of world's reserves (excluding gold) in U.S. dollars	65
Share of developing country external debt denominated in U.S. dollars. (This does not include debt owed to China denominated in U.S. dollars)	64
Trade invoicing "index"	69
Memorandum item:	
Share of the U.S. in world GDP	18
Panel B: Anchor measure or criteria: euro	
Share of countries with a euro anchor in their exchange rate arrangements	29
Share of world's reserves (excluding gold) in euros	20
Share of developing country external debt denominated in euros	13
Trade invoicing "index"	56
Memorandum item:	
Share of the eurozone in world GDP	11.8
Share of France and Germany in world GDP	5.6
Panel C: Anchor measure or criteria: British pound	
Share of countries with a pound anchor in their exchange rate arrangements	Nil
Share of world's reserves (excluding gold) in pounds	4
Share of developing country external debt denominated in pounds	<1
Trade invoicing "index"	8.5
Memorandum item:	
Share of UK in world GDP	2.7
Panel D: Anchor measure or criteria: Japanese yen	
Share of countries with a yen anchor in their exchange rate arrangements	Nil
Share of world's reserves (excluding gold) in yen	4
Share of developing country external debt denominated in yen	6
Trade invoicing "index"	9.6
Memorandum item:	
Share of Japan in world GDP	5

Notes. Figures for 2015 unless otherwise noted.

Sources. The Conference Board, *Total Economy Database*; Gopinath (2015); International Monetary Fund, *International Financial Statistics*; Reinhart and Rogoff (2004) and sources cited therein; World Bank; and authors' calculations. The Country Chronologies that supplement this article show the evolution of the anchor currency on a country-by-country basis. GDP in millions of 1990 US$ (converted at Geary Khamis PPPs).

invoicing index, a score that exceeds that of any other anchor currency.

The only other major anchor currency, by our classification, is the euro, to which almost 30% of countries are anchored. This figure somewhat overstates the euro's global reach, as the euro's sphere of influence appears to be confined to Europe (including emerging Europe). The factors show a similarly consistent picture on the role of the euro as a distant second. While the trade-invoicing indicator has a fairly high reading, the other indicators on reserves and external debt are considerably lower than their readings for the U.S. dollar. In Asia, Latin America, the Middle East, and much of Africa (the CFA zone notwithstanding), dollar reserves dominate.

No country pegs to or shadows the yen or pound at present. Indeed, apart from its colonies prior to World War II or its occupied territories during that war, Japan's currency has served as an anchor only for the domestic economy. Even for Japanese trade invoicing it competes with the dollar. The trade-invoicing indicator gives some insight why the pound and yen have very limited status as world anchor currencies during this period. For each of the factors, the score is less than one-seventh of the dollar's combined score. The late Ronald McKinnon, in several of his papers on what he called East Asia's dollar standard, emphasized this point (see. e.g., McKinnon and Schnabl 2004). As Gopinath's (2015) data highlight, about 50% of Japan's exports and over 70% of its imports are denominated in U.S. dollars. Furthermore, Japan's link to the U.S. dollar lasted longer than Europe's and well past the breakdown of the Bretton Woods arrangements, as Japan maintained a narrow de facto band until 1977. (See the companion country chronologies to this article.)

Invoicing notwithstanding, its lack of international resonance remains puzzling. In its heyday, prior to the banking crisis of the early 1990s, Japan accounted for nearly 10% of world GDP; it had low levels of public debt; it had higher ratings than the United States according to institutional investors, and, in the 1980s, it was *the* country to emulate. Perhaps regulatory measures or the structure of domestic banking, postal saving, and pension funds never gave the rest of the world an opportunity to hold yen assets (specifically yen government bonds). It remains a case for further study.

III.C. The Renminbi as a Future Anchor?

In the future, the role of the Chinese renminbi in international finance will be a central question.[35] The renminbi is now included in the IMF's Special Drawing Rights Basket, and Chinese policy makers appear to be intent on internationalizing the renminbi over the long run. Are there any indications that a latent renminbi bloc is already emerging? The difficulty in assessing whether the renminbi is a latent anchor should be immediately apparent. The renminbi has been strongly anchored to the dollar, so that shadowing the dollar and the renminbi are observationally equivalent. In 2005, the PBC slightly loosened its peg to the dollar; since 2015 it has allowed the renminbi to float slightly more freely. We note, however, that the renminbi-dollar cross-rate remains well within a 2% band, making it nearly impossible to distinguish anchoring to the renminbi from anchoring to the dollar.[36] On other dimensions, there are still no signs that the renminbi has emerged as an alternative anchor. Only 30% of Chinese trade is denominated in renminbi, and it has not served as a vehicle currency for any other country. Only a small share of international reserves is denominated in renminbi, and to our knowledge, virtually no external debts (even those owed to China) are denominated in China's currency.

It is too early, however, to write off the possibility of the renminbi as a latent anchor. The experience of the German DM under Bretton Woods is a case in point. The DM was pegged to the dollar as part of the rules of the Bretton Woods game, so that anchoring to the dollar and the DM was almost observationally equivalent. There were, however, a number of DM revaluations in the late Bretton Woods period, and these could have provided hints that a proto-European Exchange Rate Mechanism (EERM) was in the making. The top panel of Online Appendix Figure A.5 shows the last of these revaluations, leading to a nearly 10% appreciation

35. Prasad (2016) discusses China's ambitions and policies to make the renminbi an international currency over the long run.

36. Applying our anchor classification algorithm over the brief period since 2016 detects two candidate renminbi anchors: the Malaysian ringgit and Thai baht. This may be spurious and result from these currencies having some weights in the PBC's official basket (4.6% and 3.3%, respectively), or because these Southeast Asian central banks are putting larger euro weights in their implicit baskets, rather than a renminbi anchor.

of the DM relative to the dollar in October 1969. The figure also presents the French franc–dollar and Dutch guilder–dollar cross-rates, showing no sign that these currencies were anchored to the DM as late as 1969.[37] The lower panel of the figure shows that with the end of Bretton Woods—just months later—the franc, guilder, and DM were highly correlated. Nearly a decade before the DM anchor was formalized as part of the EERM, these currencies were already moving in tandem with the DM. In summary, a DM anchor emerged rapidly following the end of Bretton Woods, but there were no signs of this bloc only months before.

In the immediate future, the PBC appears intent on maintaining a relatively managed exchange rate anchored to the dollar or a basket, intervenes daily in foreign exchange markets, and does not allow full convertibility of the renminbi. It is unlikely to compete as a major anchor currency with these practices in place. The more immediate implication of PBC policy on anchor currencies may be its recent announcement in December 2015 that it will be anchoring its currency to a basket. This article's sample ends in 2016 and a full assessment of the PBC's de jure basket goes beyond the scope of this work. Applying our anchor classification algorithm to the brief period since 2016 raises the possibility that the renminbi is now anchored to a dollar-euro basket (this 50-50 basket performs slightly better than the de jure basket). We note that this has been a period of strong dollar appreciation and a longer window is required to fully classify the PBC's new exchange rate practices. Given the size of the Chinese economy, reclassifying China to a basket will have some effect on the share of world GDP anchored to the dollar and euro (with the dollar bloc declining from 70% to 61% and the euro bloc increasing from 15% to 23%) and even more so if other major emerging markets follow suit. We return to the possibility of a latent renminbi anchor in the conclusions.

III.D. Exchange Rate Arrangements

Having described the trends in anchor currencies, we turn to the global evolution of exchange arrangements. Figure III shows the evolution of exchange rate arrangements over 1946–2016 in three panels. Panel A traces the evolution of the least flexible arrangements (coarse classifications 1 and 2); Panel B presents

37. The Belgian franc was the single European currency that shadowed the German revaluation of 1969.

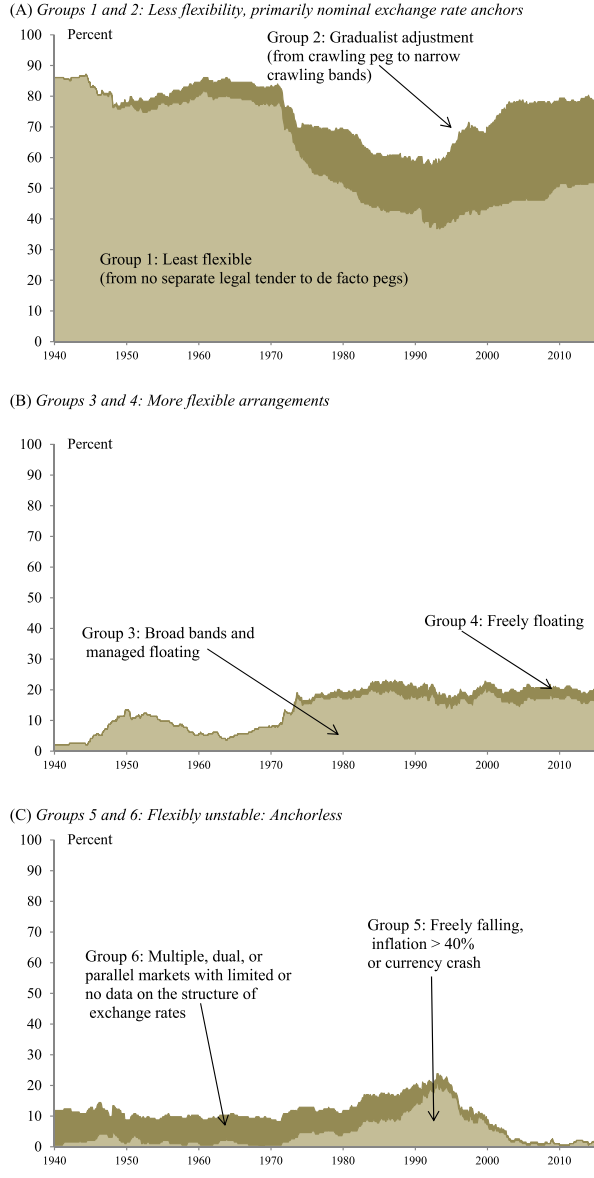


FIGURE III

De Facto Exchange Rate Arrangements, Coarse Classification, 1946–2016: Share of (Independent) Countries in Each Group

the more flexible arrangements (coarse classifications 3 and 4); and Panel C traces out the incidence of the dysfunctional freely falling category and those few cases where there are dual or multiple exchange rate practices or an active parallel market and we do not have time-series data on the parallel market exchange rate. To offer a clearer picture of the incidence of regimes across countries and avoid presenting a picture dominated by a handful of large economies, we first report the unweighted tally for each regime.

The most striking feature of the first panel is that combining the two least flexible arrangements (coarse classifications 1 and 2), the share of countries living with limited exchange rate flexibility is about the same today as at the outset of the sample under Bretton Woods.[38] Admittedly, this aggregate masks a significant migration from the explicit de jure pegs of the Bretton Woods era to the still limited flexibility arrangements (coarse grid 2) that have more "escape valves".[39] It is evident in Figure III that crawling pegs and narrow bands were virtually nonexistent until well into the 1950s, only to gain in popularity post-1980s.

The incidence of managed and free floats (Figure III, Panel B) reinforces the finding that flexible arrangements are not as common since the breakdown of Bretton Woods as one might have thought. Freely floating exchange rates are still largely confined to a handful of economies. True, if instead of focusing on the share of countries in each category, we weight the aggregation by the country shares in world GDP, as in Figure IV, then the share of floaters nearly doubles to somewhere between 30% and 40%. Since the United States and Japan float freely, this already accounts for 23% of world GDP. Thus, to develop a sense of country practices around the world, the unweighted share of countries of Figure III is more suited to the task.

Figure V uses our fine exchange rate classification index to weigh countries by their degree of flexibility (so a free float gets a

38. The classification regime studied by Klein and Shambaugh (2010) is broadly similar in spirit to ours and (we believe) would also show a similar recent rise in less flexible exchange rate regimes. Another widely used system, Levy-Yeyati and Sturzenegger (2005), gives this result to some extent by construction, since it includes reserve accumulation (where available) in its algorithm for detecting exchange rate inflexibility.

39. In addition to 2% bands, this category includes de jure and de facto crawling pegs, as described in note 13. These allow for more flexibility than a hard de jure peg.

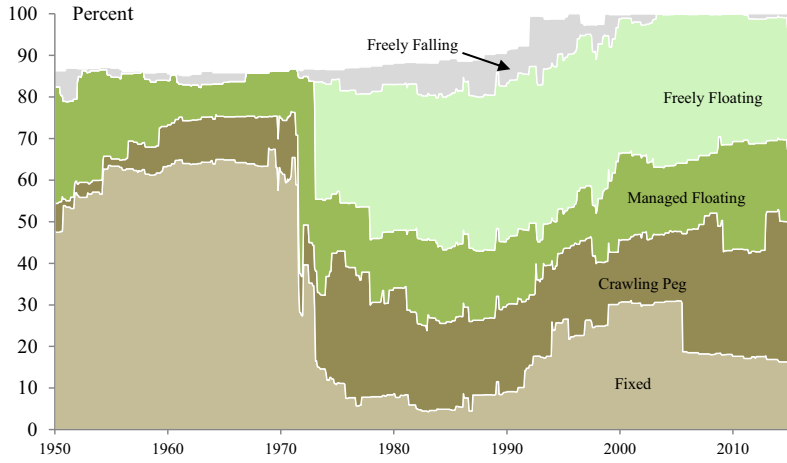


FIGURE IV

De Facto Exchange Rate Arrangements, Coarse Classification, 1946–2016: Share of World GDP in Each Group

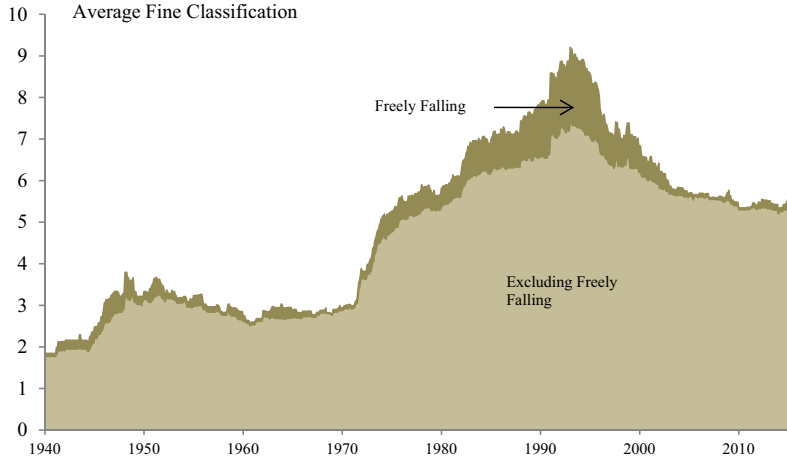


FIGURE V

Average Fine Exchange Rate Arrangement Classification: Weighted by (Independent) Countries' Fine Classifications 1–13

Sources: International Monetary Fund, *International Financial Statistics* and *Exchange Arrangements and Exchange Restrictions*; Reinhart and Rogoff (2004) and sources cited therein; numerous detailed country sources listed in the Online Appendix; and authors' calculations.

weight of 13, a managed float a weight of 12, and a de jure hard peg a weight of 2). This produces an aggregate measure of the flexibility of the global exchange rate system, which again shows that the amount of exchange rate flexibility in the system has declined substantially in the past two decades. This figure shows that the tendency for some currencies to move to more flexible exchange rate arrangements has been fully offset by others moving to less flexible ones.[40]

Figure III, Panel C highlights that freely falling went into a hiatus early in the twenty-first century. The wave of hyperinflations that spread across former Soviet republics came to an end. The resolution of the debt crisis of the 1980s in the mid-1990s reopened international capital markets for many large emerging markets (Brazil, Mexico, and Poland, among others), which meant that these countries that had relied heavily on inflationary finance had other options. The spread of inflation targeting to emerging markets that began in the late 1990s (Online Appendix Table A.4) has also contributed to the lower global incidence of inflationary crises. Some resurgence of high inflation should not be ruled out; now in the third year of a sharp decline in oil and commodity prices, losses in revenues, depleted foreign exchange reserves, and markedly slowing economic activity may drive some countries back to inflationary finance. The most extreme case is Venezuela (where estimated inflation exceeded 1,000% in 2017 and entered severe hyperinflation territory in 2018) but a number of African countries are also experiencing inflation deep into double digits, including the Democratic Republic of the Congo, South Sudan, and Angola.

As noted earlier, our classification algorithm takes into account parallel exchange rate markets, which have at times been quite important. In the early post-World War II years, the majority of countries participated in the Bretton Woods system, pegging their currencies to the U.S. dollar, which itself was convertible to

40. Of course it is possible that some countries may have relatively stable exchange rates for extended periods simply because they face relatively small global and domestic macroeconomic shocks. Although we do not have space to tackle the issue here, it has been addressed in a number of papers in the classification literature, including Calvo and Reinhart (2002) and Reinhart and Rogoff (2004). The general finding is that most countries that stabilize their exchange rates do so despite facing considerable volatility in external conditions (especially commodity exporters) that would normally induce large adjustments in a flexible exchange rate environment.

gold at a fixed rate. But large tracts of Europe are classified as having more flexible managed arrangements over this period. The reason for this follows directly from the first question we pose in our classification algorithm, discussed in Section II: is the exchange rate unitary? In nearly all of postwar Europe through the mid-1950s, the answer to that question was a resounding no. Although there was an official parity registered with the IMF, in practice this was an era of comprehensive and widespread foreign exchange and capital account restrictions of multiple exchange rate practices, as discussed at length in De Vries (1969, 1987). A widespread dollar shortage at the time (see Reinhart 2016) drove parallel market premia sky high (often into triple digits). The gyration in the parallel market created what Reinhart and Rogoff (2004) called backdoor floating.

On the other side of the Iron Curtain, many of the remaining countries were in the Soviet bloc and had pegs to the ruble. If Western Europe's exchange arrangements at that time were decidedly opaque, the arrangements of the Eastern bloc were outright inscrutable. Multiple exchange rate practices were the norm, and the Soviet Union and Yugoslavia could, at any point in time, list a dozen administered exchange rates. Continued scarcity meant that black currency markets were active despite repression. Unlike Western European countries, for which we have the parallel market exchange rate data, we do not have as complete a dataset in the Soviet bloc. Hence, we leave these cases under the label "parallel markets—no data".

Last, since the eurozone comprises more than 15% of world GDP, any conclusion about the evolution of global exchange rate arrangements and their degree of flexibility in recent decades depends importantly on how the exchange rate practices of eurozone members are treated. We discuss the classification of the eurozone in Online Appendix 5. Our main rationale for classifying its members in the least flexible exchange rate category is that our analysis is at the country level and eurozone member countries do not have a separate legal tender. We also believe that this classification is apt for many macroeconomic questions (e.g., fiscal-monetary interactions, debt crises). Obviously the euro itself is a freely floating currency and is in fact a major anchor currency, as our previous analysis suggests. For completeness, Online Appendix Figure A.8 repeats Figure III, while replacing eurozone members with the eurozone as a whole, classified as freely floating. The general patterns remain intact.

III.E. Is Inflation Targeting a New Anchor?

A major development in monetary management over the past several decades has been the proliferation of inflation targeting (IT) regimes. This is not explicitly incorporated in earlier exchange rate regime classification exercises, and we explore the idea here. To integrate IT frameworks into our classification scheme, we begin by taking stock of the global emergence of IT and the countries that adopted these policies. IT regimes are far from homogeneous, with differences across regions, income levels, and exchange rate policies. The proliferation of IT as a de jure monetary regime has been a development of the past two to three decades, with a more recent history in emerging markets. Since New Zealand adopted an inflation target in 1989, close to 30 countries have followed suit. Online Appendix Table A.4 lists the countries that have adopted an IT policy framework, the dates of its inception, and the de facto exchange rate regime classification on the basis of exchange rate behavior.

As the table highlights, there is considerable variation in de facto exchange rate practices with a de jure IT policy framework. Among this group (as with non-IT cases), exchange rate practices range from the freely floating currencies of Australia and the United Kingdom to Romania's de facto peg to the euro since 2012. The more flexible arrangements (categories 3 and 4 in the coarse-grid classification) include freely floating, managed floating, and moving bands that are narrower than or equal to ±2%.[41] Slightly less than two-thirds of the IT group (17 of 27) falls into this basket. De facto pegs, crawling pegs, and narrow crawling bands (categories 1 and 2 in the coarse-grid classification) make up the remaining 10 IT countries. More than half of the Fix-IT group is from emerging Europe.

These insights suggest that IT is too vague and encompassing to constitute a separate category of exchange rate arrangement. The de facto exchange rate classification appears to do a far better job in predicting exchange rate variability in IT countries than the de jure classification of inflation targeting. Online Appendix 6 studies inflation targeting and exchange rate classifications in more detail, with further evidence that the

41. A moving band refers to the cases where periods of sustained appreciations are also evident; with crawling bands, changes are always in the direction of depreciation.

inflation targeting label is not a sufficient statistic for exchange rate classification.

III.F. Capital Mobility, Multiple Exchange Rates, and Parallel Markets

In most of the literature on classifying exchange rate arrangements, the related issue of capital mobility has been ignored altogether. This omission is at odds with recurrent discussions of the impossible trinity and the macroeconomic policy trilemma or dilemma (Obstfeld and Taylor 2003; Obstfeld, Shambaugh, and Taylor 2005; Gourinchas and Obstfeld 2012; Rey 2013). These papers pointedly connect the choice of exchange rate regime not only to the ability to conduct independent monetary policy but also to the extent of capital mobility.

To address this issue, we compile a {0,1} index of exchange rate restrictions that spans 1946–2016, offering a much longer coverage than prior studies. Our index, which places significant emphasis on parallel exchange market premia, is admittedly narrow compared with earlier indexes that aggregate a wide variety of (mostly) de jure capital flow and exchange restrictions.[42] However, because our measure is market based (drawing on our parallel premium data and country chronologies), and focuses on the exchange rate itself, it is a natural complement to our classification algorithm and is intended to be particularly useful in studies designed to compare (or control for) the effects of different exchange rate regimes. We emphasize further in Online Appendix 7 that the new index captures different features of controls than existing indexes and should be viewed as a complement, not a substitute.

As described in Section II.B, the first step of our exchange rate arrangement classification is to determine whether the exchange rate is unitary. The IMF's AREAER (Annual Report on Exchange Arrangements and Exchange Restrictions) provides an annual update on whether a country has an official dual market or multiple exchange rate practices.[43] However, AREAER information only pertains to the de jure system in place, which in different

42. Kose et al. (2003) develop a de facto model of capital market openness but do not focus on exchange rate restrictions.

43. The IMF report is complemented with the publications by Franz Pick and later his firm (International Currency Analysis) and Pick and Sédillot (1971). The AREAER report also offers detailed information on a wide class of capital and

situations may either understate or overstate the extent to which capital is mobile across borders.

Illegal (or informal) parallel markets not recorded in the IMF report have been common at various stages of the post–World War II era and have often accounted for a significant share of the activity in foreign exchange markets (see the country chronologies in the Online Appendix). In these cases, relying on AREAER exclusively would understate the importance of de facto exchange controls. Furthermore, market imperfections (illiquidity, for instance) will also tend to depress capital mobility. Limited capital mobility, whatever its cause, is often accompanied by persistent or chronic high parallel market premia, a market-based signal we incorporate in our index.[44] At the same time, it is also the case that the legal restrictions detailed in the IMF's annual report may be routinely circumvented in practice (see Mathieson and Rojas–Suarez 1992), so that relying exclusively on de jure chronologies can also potentially overstate the effectiveness of controls and therefore underestimate the actual degree of capital mobility.

In this context, information on parallel market exchange rates and premia can provide a "de facto" sense of the effectiveness of controls and complement the chronology on the de jure unitary/dual/multiple exchange rates. The monthly index we construct for 192 countries or territories from 1946 through 2016 is therefore based on both a de jure and de facto component and on the answers to three questions: (i) is there a de jure (official) dual market?; (ii) is there a de jure system of multiple exchange rates?; (iii) is there an informal parallel market (tolerated or outright illegal), and, if there is, is the parallel market premium above 10% over the majority of a moving 12-month period? If the answer is yes to any of these questions, the index takes on the value of 1. It is 0 otherwise.[45]

How do the various approaches to measuring capital mobility compare? Conceptually at least, a country can have a plethora of capital account restrictions and still have a de facto and a de jure unified exchange rate; the converse is not true. If the answers

current account restrictions, which serve as a common starting point for many of the available indexes of capital mobility, as discussed in Online Appendix 7.

44. The premium is defined as $\frac{s_t^p - s_t}{s_t}$, the percentage difference between the parallel market and the official exchange rate.

45. Refinements to the index that allow for values between 0 and 1 are certainly a possible extension.

to questions (i) and (ii) are yes, these are de jure controls. If the answer to question (iii) is yes, it is difficult to see how a significant and sustained gap between the official and the parallel market exchange rate can persist in a country where capital moves freely and rapidly across its borders.[46] Therefore, there must be restrictions or market imperfections that prevent this from happening.

In practice, our assessment is that by limiting our focus to the structure of the foreign exchange market, the index may provide a lower bound on capital controls in some cases. For instance, measures, such as those introduced by Iceland (while maintaining a unified exchange rate) during its 2007 crisis, are not captured in our IRR index. Based on the extensive information from parallel markets we include in this study, we have reason to conclude that other indexes in this literature periodically suffer from the opposite bias. Specifically, the importance of controls appears overstated by the exclusive reliance on a de jure policy narrative; this upward bias in capital control indexes seems particularly acute, for instance, among the many small island states that are otherwise globally integrated.[47]

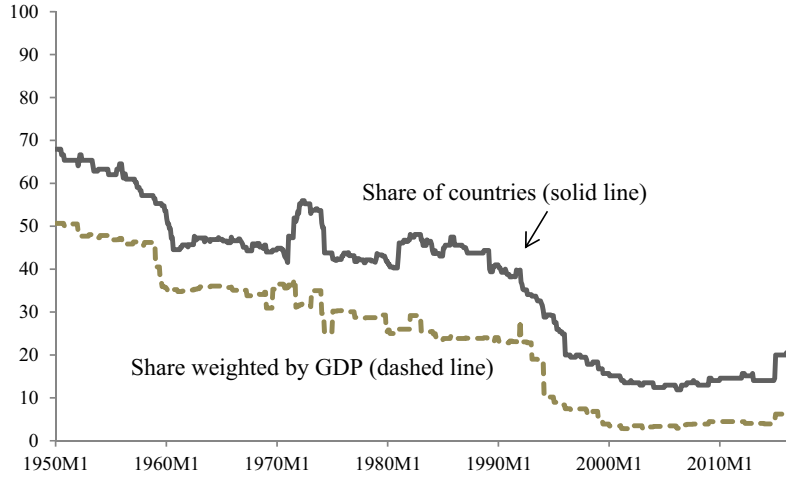
With these caveats in mind, the top panel of Figure VI plots the index (as a share of all independent countries) with and without weights that reflect country shares in world GDP. Although the index is available since 1946, GDP weights are only available for many countries since 1950. About 70% of all countries did not meet the criteria of a unified exchange market in 1950. In the 1960s, that share drops to around 50%, as many advanced economies moved to eliminate multiple exchange rate practices (an important goal of the IMF at the time, as discussed by De Vries 1969, and shown in Figure III, Panel C). The next round of capital market integration occurred in the 1990s, as the former Soviet bloc joined global capital markets alongside those emerging markets that regained capital market access after long debt crises.

Since mid-2014, many developing and emerging markets, particularly (but not exclusively) those that rely on primary commodity exports, have seen foreign exchange reserves dry up and

46. De facto capital mobility refers here to cases where the existing de jure controls are not binding, either because these are being circumvented or because they have become outmoded or obsolete.

47. See Online Appendix 7 and Online Appendix Figure A.13.

All independent countries



Advanced economies

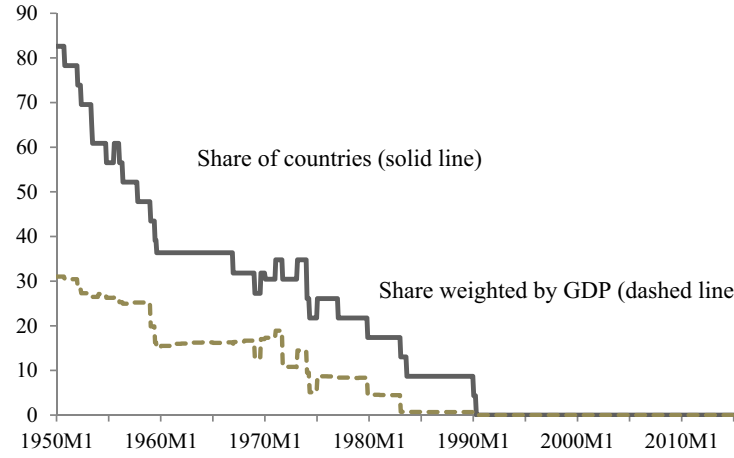


FIGURE VI

Share of Independent Countries with Dual, Multiple, or Parallel Exchange Rates, January 1950–September 2016

Sources: International Monetary Fund, *International Financial Statistics* and *Exchange Arrangements and Exchange Restrictions*; Reinhart and Rogoff (2004) and sources cited therein; and authors' calculations. The Country Chronologies that supplement this article show the evolution of the anchor currency on a country-by-country basis and whether a system of dual, multiple, or parallel exchange rates was in place. The number of countries increases from 72 in 1946 to 184 in 2016.

governments have turned once again to capital controls. Under these conditions, parallel markets have reemerged, particularly in Africa, the Middle East, and Central Asia. Parallel market premia have risen, into the three- and four-digit range in several cases. Despite this recent revival of foreign exchange controls, which has been mostly confined to lower-income countries, global capital mobility (by this measure) is higher since the mid-1990s. Perhaps the combination of increasingly mobile capital across borders and the stubbornly high share of countries that continue with limited flexibility exchange rate arrangements (Figure III, Panel A) can help explain the sustained and unprecedented rise in the emerging world's demand for reserves. The next section takes up this and related issues.

The trend toward financial globalization is also evident in Chinn and Ito's (2006, 2008) indexes (henceforth CI), which figure among the most widely cited measures of capital mobility. Subsequently updated and expanded, CI covers 182 countries over 1970–2015. Indeed, the time-series correlation of the CI Index and ours is 0.97 for the full sample (see Online Appendix Figure A.12). We suggest the CI index should be interpreted as an upper bound on the presence of controls, while the IRR index introduced here provides the lower bound (see Online Appendix 7 for details).

IV. Exchange Rate Stabilization and the Demand for Anchor Currency Assets

Having developed a quantitative assessment of the global evolution of the world's anchor currencies, exchange rate arrangements, and exchange rate restrictions over seven decades, we turn our attention to the implications of these trends in the current global financial system. One application is to a topic that has attracted the attention of scholars and policy makers alike for more than a decade now: the surge in reserve accumulation since the early 2000s by emerging markets in general and by China in particular. The self-insurance rationale for accumulating reserves (often referred to as the demand for safe assets, e.g., Caballero, Farhi, and Gourinchas 2017) is well known. We conjecture that the persistence of less flexible exchange arrangements may be an important contributing factor to the safe asset buildup, which has likely been amplified in recent decades by the trend loosening of capital and exchange controls (until recently). As exchange and capital market restrictions are reduced, it probably requires

larger reserve interventions to achieve the same degree of stabilization (as Ito and Yabu 2007 note for the case of Japan, which until 2003 made significant use of intervention to reduce exchange rate volatility vis-à-vis the dollar).[48]

It is well understood that countries wanting to stabilize exchange rates have a strong incentive to maintain substantial foreign exchange reserves. This is the subject of a large theoretical and empirical literature going back to the 1980s (see the discussion in Obstfeld and Rogoff 1996).[49] More recent work by Korinek (2013), Bussière et al. (2015), and Heathcote and Perri (2016) has explored the trade-off between using sterilized intervention to stabilize the exchange rate versus using capital controls to maintain monetary independence. One likely reason for the trend decline in capital controls is that there has been a continuing rise in trade relative to income in most countries, often involving complex supply chain networks. As trade becomes more integrated, capital controls become easier to evade, and therefore much less effective. That countries with relatively inflexible exchange rates would hold substantial foreign exchange reserves is hardly a controversial proposition. What has become apparent in recent years is that even countries with relatively more flexible managed floating exchange rate systems find it helpful to have significant reserves on hand, particularly to help stabilize exchange rates during periods of duress. (As Gabaix and Maggiori 2015 point out, a small country pegging to the dollar does not necessarily have to hold all its hard currency reserves in dollars.) Of course, in many ways, Japan's pre-2003 successful foreign exchange intervention has been a model for many managed floating regimes.

IV.A. The Impossible Trinity and the 2003–2013 Reserve Surge

Since the IMF was established at the end of World War II, no period has witnessed a comparable surge in the stock of reserves held by central banks across the world. As is well known, this war chest of reserves was built primarily by emerging markets, notably Asia and most famously China. A fast-growing

48. Obstfeld, Shambaugh, and Taylor (2010) and Aizenman, Chinn, and Ito (2013, 2016) also investigate how the trilemma interacts with the Triffin dilemma in light of the high demand for exchange rate management.

49. Virtually all countries with relatively inflexible exchange rate regimes in our data set maintain significant levels of reserves, and these levels have increased as capital account restrictions have fallen in recent years.

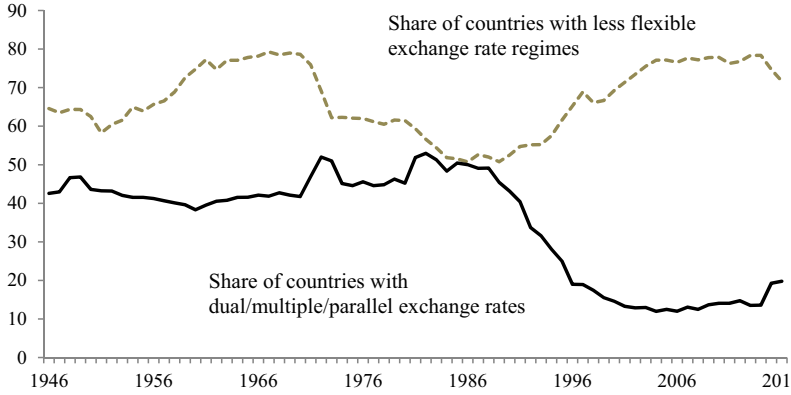


FIGURE VII

Exchange Rate Arrangements and Capital Mobility, 1946–2016

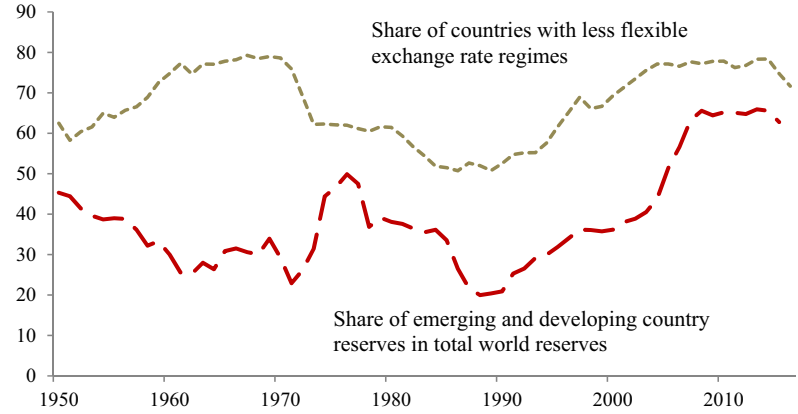
Source: Authors' calculations based on Figures IV and V.

literature has examined the causes of that growth. Some papers have stressed the precautionary, self-insurance motive (see Gourinchas and Obstfeld 2012), while others have highlighted the mercantilist motive and the desire to avoid or limit exchange rate appreciation (Dooley, Folkerts-Landau, and Garber 2003; Aizenman and Lee 2007).

Connecting this discussion to the data, we recall that it was shown in the previous section (Figure III, Panel A) that limited flexibility arrangements still dominate the landscape. At the same time, we estimated that about 80% of all countries had abandoned the kinds of exchange controls that led to a fragmented foreign exchange market (Figure VI, top panel). Combining information from Figures III and VI, these two trends in exchange rate arrangements and capital market integration are connected in Figure VII. Because we are focusing on the unweighted measures, the series start in 1946. Figure VIII, top and bottom, connect reserve accumulation to the rising share of countries with limited exchange rate flexibility (top panel) and the decline in exchange controls, or rising capital mobility (bottom panel).[50]

50. The buildup in reserves may have been especially acute during this period when many emerging markets were also dealing with a severe capital inflow problem (as documented by Reinhart, Reinhart, and Trebesch 2016 and trying to avoid excessive currency appreciation as stressed by Levy-Yeyati, Sturzenegger, and Gluzmann 2013).

The incidence of limited exchange rate flexibility



Are reserves a substitute for capital controls?

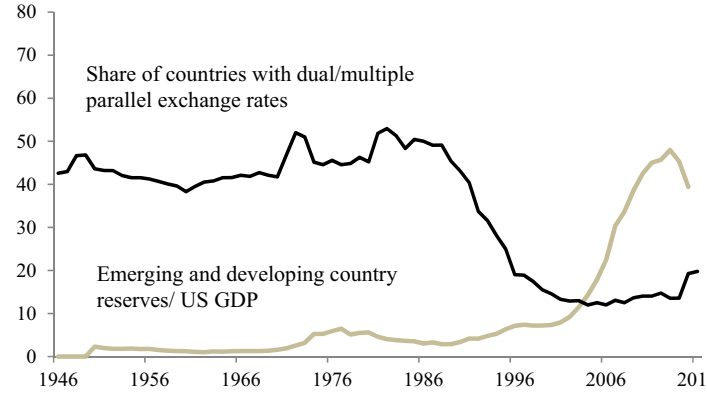


FIGURE VIII

Reserves and Two Sides of the Impossible Trinity, 1950–2015

Sources: International Monetary Fund, *International Financial Statistics*; Bureau of Economic Analysis; and authors' calculations.

The trends in reserves, exchange rate flexibility, and capital mobility shown here are not a substitute for popular explanations that stress self-insurance and mercantilist motives behind the 2003–2013 historic episode of reserve accumulation. Of course, it is also the case that this is a period of trend financial deepening, and the expansion of global capital markets is another reason

countries wanting to stabilize exchange rates might need larger reserves on hand. Nevertheless, the fact that such a large fraction of the world aims to stabilize its exchange rate to some degree, as we have demonstrated here, may be an underappreciated factor in the global trend toward higher reserves that merits further research, including panel analysis and country case studies. One interesting question is whether individual countries' incentives to stabilize their exchange rates around the dollar (or the euro or a basket) may produce longer systemic problems if the "safe" asset turns out to be less safe than investors imagine. The risk that short-term exchange rate stabilization exacerbates longer-term risks of exchange rate destabilization is a variant of the modern-day Triffin (1960) dilemma, recently addressed in Farhi, Gourinchas, and Rey (2011), Obstfeld (2013), and Farhi and Maggiori (2018).

V. Concluding Remarks: Which Anchor will Hold?

By placing the issue of anchor currencies in a comprehensive quantitative historical perspective, this article offers new insights into contemporary global finance issues ranging from the impossible trinity to the modern-day Triffin dilemma to the renewed primacy of the dollar as the world's most important anchor currency. Perhaps because of widespread hard-currency trade invoicing and debt denomination, the revealed preference of many of the world's central banks is that exchange rate stability remains a fundamental priority that has broad implications for how shocks transmit domestically and internationally. Countries' continuing desire to stabilize exchange rates despite generally reduced exchange rate restrictions and increasing capital mobility is potentially a key element of developing economies' vast accumulation of advanced economy reserves in addition to the usual "safe asset" rationale.

What topics and areas would enhance our understanding of the international financial system in general and the anchor currency question in particular? Although that list is long, we return to China and its rapidly expanding global role. Much more is known about China's global connections through trade of goods and services than about its growing international financial linkages. Chinese official lending to a broad range of emerging and developing country governments is not captured in the extensive databases of the World Bank, IMF, or Bank of International

Settlements. Much of this lending is done through its development banks, but credit lines and swap arrangements between the PBC and other central banks are also rapidly expanding. Given the opaqueness of these cross-border financial transactions, it is not clear whether the U.S. dollar or the renminbi is the dominant currency in this new source of lending.

Over time, one might expect the Chinese renminbi, with its far-reaching trade and finance network, to serve as an anchor for some countries. Indeed, it is possible that the Chinese renminbi has already become (or made significant inroads as) an anchor currency. In summer 2015, the modest devaluation of the renminbi triggered marked depreciations of several Asian currencies (and others outside Asia). By our exchange rate metric, however, China remains part of the dollar bloc, and it is unclear how many countries might move along with the renminbi if it were ever to separate from the U.S. dollar. We have shown that during the latter stage of Bretton Woods, a cursory inspection of exchange rate practices in Europe would have led one to conclude that the U.S. dollar was the across-the-board anchor. It was only when Germany's DM separated from the dollar that it became evident that the European economies had already transitioned from a dollar to a DM anchor. (An interesting parallel is that even as the rest of Europe followed the dollar until the end of Bretton Woods, Germany was already making substantial government-to-government loans in DM, laying the groundwork for the DM bloc that emerged as Bretton Woods fell apart.)

If indeed countries' desire to stabilize exchange rates is a contributing factor to emerging markets' reserve accumulation, then an emergence of the renminbi as a major reserve currency could have important implications for the value of the dollar and advanced country interest rates, and potentially even debt sustainability for some advanced economies.

Last, we reiterate that our algorithm for jointly determining a country's anchor currency and its degree of exchange rate flexibility shows a world where relatively inflexible exchange rate regimes remain extremely important, and where the dollar's dominance as an anchor/reference currency appears to be as great as it was under Bretton Woods. Whether this trend will continue is uncertain, but in any event, the approach to anchor classification developed here in principle should help detect future shifts, such as the emergence of the renminbi as a major anchor or reference currency.

LONDON SCHOOL OF ECONOMICS
HARVARD UNIVERSITY
HARVARD UNIVERSITY

SUPPLEMENTARY MATERIAL

An Online Appendix for this article can be found at *The Quarterly Journal of Economics* online. The data that generated tables and figures in this article can be found in Ilzetzki, Reinhart, and Rogoff (2018) in the Harvard Dataverse, doi:10.7910/DVN/IDEXPY.

REFERENCES

Aghion, Philippe, Philippe Bacchetta, Romain Rancière, and Kenneth Rogoff, "Exchange Rate Volatility and Productivity Growth: The Role of Financial Development," *Journal of Monetary Economics*, 56 (2009), 494–513.
Ahamed, Liaquat, *Lords of Finance: The Bankers Who Broke the World* (New York: Penguin Press, 2009).
Aizenman, Joshua, Menzie D. Chinn, and Hiro Ito, "The 'Impossible Trinity' Hypothesis in an Era of Global Imbalances: Measurement and Testing," *Review of International Economics*, 21 (2013), 447–458.
———, "Monetary Policy Spillovers and the Trilemma in the New Normal: Periphery Country Sensitivity to Core Country Conditions," *Journal of International Money and Finance*, 68 (2016), 298–330.
Aizenman, Joshua, and Jaewoo Lee, "International Reserves: Precautionary versus Mercantilist Views, Theory and Evidence," *Open Economy Review*, 18 (2007), 191–214.
Bacchetta, Philippe, and Eric van Wincoop, "A Theory of the Currency Denomination of International Trade," *Journal of International Economics*, 67 (2005), 295–319
Ball, Christopher P., Claude Lopez, and Javier Reyes, "Remittances, Inflation and Exchange Rate Regimes in Small Open Economies," *World Economy*, 36 (2013), 487–507.
Bruno, Valentina, and Hyun Song Shin, "Global Dollar Credit and Carry Trades: A Firm-Level Analysis," BIS Working Paper no. 510, 2015.
Bussière, Matthieu, Gong Cheng, Menzie D. Chinn, and Noëmie Lisack, "For a Few Dollars More: Reserves and Growth in Times of Crises," *Journal of International Money and Finance*, 52 (2015), 127–145.
Caballero, Ricardo, Emmanuel Farhi, and Pierre-Olivier Gourinchas, "The Safe Assets Conundrum," *Journal of Economic Perspectives*, 31 (2017), 29–46.
Calvo, Guillermo A., and Carmen M. Reinhart "Fear of Floating," *Quarterly Journal of Economics*, 117 (2002), 379–408.
Calvo, Guillermo A., and Carlos A. Vegh, "Inflation Stabilization and BOP Crises in Developing Countries," in *Handbook of Macroeconomics*, John B. Taylor and Michael Woodford eds. (Amsterdam: Elsevier, 1999), vol. 1, 1531–1614.
Chalmers, Robert, *A History of Currency in the British Colonies* (London: Eyre and Spottiswoode, 1893).
Chinn, Menzie D., and Hiro Ito, "What Matters for Financial Development? Capital Controls, Institutions, and Interactions," *Journal of Development Economics*, 81 (2006), 163–192.

———, "A New Measure of Financial Openness," *Journal of Comparative Policy Analysis*, 10 (2008), 309–322.
Chinn, Menzie, and Shang-Jin Wei, "A Faith-Based Initiative Meets the Evidence: Does a Flexible Exchange Rate Regime Really Facilitate Current Account Adjustment?," *Review of Economic Studies*, 95 (2013), 168–184.
De Vries, Margaret G., "Multiple Exchange Rates," in *The International Monetary Fund 1945–1965*, Margaret de Vries and J. Keith Horsefield, eds. (Washington, DC: International Monetary Fund, 1969).
———, *Balance of Payments Adjustment, 1945 to 1986: The IMF Experience* (Washington, DC: International Monetary Fund, 1987).
Denzel, Markus A., *Handbook of World Exchange Rates, 1590–1914* (London: Ashgate, 2010).
Dooley, Michael, David Folkerts-Landau, and Peter Garber, "An Essay on the Revived Bretton Woods System," NBER Working Paper no. 9971, 2003.
Eichengreen, Barry, *Exorbitant Privilege: The Rise and Fall of the Dollar and the Future of the International Monetary System* (Oxford: Oxford University Press, 2011).
Eichengreen, Barry, Andrew Rose, and Charles Wyplosz, "Contagious Currency Crises: The First Tests," *Scadinavian Journal of Economics* 98 (1996), 463–484.
Farhi, Emmanuel, Pierre-Olivier Gourinchas, and Hélène Rey, *Reforming the International Monetary System* (London: Centre for Economic Policy Research, 2011).
Farhi, Emmanuel, and Matteo Maggiori, "A Model of the International Monetary System," *Quarterly Journal of Economics*, 133 (2018), 295–355.
Faudot, Adrien, and Jean-François Ponsot, "The Dollar Dominance: Recent Episode of Trade Invoicing and Debt Issuance," *Journal of Economic Integration*, 31 (2016), 41–64.
Fischer, Stanley, and Franco Modigliani, "Towards an Understanding of the Real Effects and Costs of Inflation," *Weltwirtschaftliches Archiv*, 114 (1978), 810–833.
Frankel, Jeffrey, "Estimation of De Facto Exchange Rate Regimes: Synthesis of the Techniques for Inferring Flexibility and Basket Weights," IMF Staff Papers 55, 2008.
Frankel, Jeffrey, and Shang-Jin Wei, "Yen Bloc or Dollar Bloc? Exchange Rate Policies of the East Asian Economies," in *Macroeconomic Linkages: Savings, Exchange Rates, and Capital Flows, NBER East Asia Seminar on Economics*, Takatoshi Ito and Anne Krueger, eds. (Chicago: University of Chicago Press, 1994), volume 3.
Frankel, Jeffrey, and Daniel Xie, "Estimation of De Facto Flexibility Parameter and Basket Weights in Evolving Exchange Rate Regimes," *American Economic Review Papers and Proceedings*, 100 (2010), 568–572.
Gabaix, Xavier, and Matteo Maggiori, "International Liquidity and Exchange Rate Dynamics," *Quarterly Journal of Economics*, 130 (2015), 1369–1420.
Ghosh, Atish R., Mahvash S. Qureshi, and Charalambos G. Tsangarides, "Is the Exchange Rate Regime Really Irrelevant for External Adjustment?," *Economics Letters*, 118 (2013), 104–109.
Goldberg, Linda S., and Cédric Tille, "Vehicle Currency Use in International Trade," *Journal of International Economics*, 76 (2008), 177–192.
Gopinath, Gita, "The International Price System," Jackson Hole Symposium (Federal Reserve Bank of Kansas City), 2015.
Gopinath, Gita, and Jeremy Stein, "Banking, Trade, and the Making of a Dominant Currency," Mimeo, Harvard University, 2018.
Gourinchas, Pierre Olivier, and Maurice Obstfeld, "Stories of the Twentieth Century for the Twenty-First," *American Economic Journal: Macroeconomics*, 4 (2012), 226–265.

Habib, Maurizio Michael, Sascha Bützer, and Livio Stracca, "Global Exchange Rate Configurations: Do Oil Shocks Matter?," *IMF Economic Review*, 64 (2016), 443–470.
Hassan, Tarek A., "Country Size, Currency Unions and International Asset Returns," *Journal of Finance*, 68 (2013), 2269–2308.
Hassan, Tarek A., Thomas M. Mertens, and Tony Zhang, "Currency Manipulation," Mimeo, University of Chicago, 2016.
Hau, Harald, and Hélène Rey, "Exchange Rates, Equity Prices, and Capital Flows," *Review of Financial Studies*, 19 (2006), 273–317.
He, Zhiguo, Arvind Krishnamurthy, and Konstantin Milbradt, "A Model of Save Asset Determination," NBER Working Paper no. 22271, 2016.
Heathcote, Jonathan, and Fabrizio Perri, "On the Desirability of Capital Controls," *IMF Economic Review*, 64 (2016), 75–102.
Ilzetzki, Ethan, Carmen M. Reinhart, and Kenneth S. Rogoff, "Country Chronologies and Background Material to Exchange Rate Arrangements into the 21st Century: Will the Anchor Currency Hold?," NBER Working Paper no. 23135, 2017.
———, "Replication Data for: 'Exchange Arrangements Entering the Twenty-First Century: Which Anchor Will Hold?'," Harvard Dataverse (2018), doi: 10.7910/DVN/IDEXPY.
International Currency Analysis, *World Currency Yearbook* (Brooklyn, NY, various years).
Ito, Taketoshi, and Tomoyoshi Yabu, "What Prompts Japan to Intervene in the Forex Market? A New Approach to a Reaction Function," *Journal of International Money and Finance*, 26 (2007), 193–212.
Ize, Alain, and Eduardo Levy-Yeyati, "Financial Dollarization," *Journal of International Economics*, 59 (2003), 323–347.
Jeanne, Olivier, and Roman Rancière, "The Optimal Level of International Reserves for Emerging Market Countries: Formulas and Applications," IMF Working Paper no. 06, 2006.
Jordà, Oscar, Moritz Schularick, and Alan M. Taylor, "Betting the House," *Journal of International Economics*, 96 (2015), 2–18.
Klein, Michael, and Jay Shambaugh, *Exchange Rate Regimes in the Modern Era* (Cambridge, MA: MIT Press, 2010).
Korinek, Anton, "Currency Wars or Efficient Spillovers?," Mimeo, 2013.
Kose, Ayhan, Eswar Prasad, Kenneth Rogoff, and Shang-Jin Wei, "The Effects of Financial Globalization on Developing Countries: Some Empirical Evidence," IMF Occasional Paper no. 220, 2003.
Levy-Yeyati, Eduardo, and Federico Sturzenegger, "Classifying Exchange Rate Regimes: Deeds vs. Words," *European Economic Review*, 49 (2005), 1603–1635.
———, "Classifying Exchange Rate Regimes: Fifteen Years Later," Center for International Development Working Paper no. 319, 2016.
Levy-Yeyati, Eduardo, Federico Sturzenegger, and Pablo Alfredo Gluzmann, "Fear of Appreciation, " *Journal of Development Economics*, 101 (2013), 233–247.
Maggiori, Matteo, Brent Neiman, and Jesse Schreger, "International Currencies and Capital Allocation," Mimeo, 2018.
Mathieson, Donald J., and Liliana Rojas-Suarez, "Liberalization of the Capital Account: Experiences and Issues," IMF Occasional Paper no. 1-60, 1992.
McKinnon, Ronald, and Gunther Schnabl, "The East Asian Dollar Standard, Fear of Floating, and Original Sin," *Review of Development Economics*, 8 (2004), 331–360.
Mendoza, Enrique G., and Marco E. Terrones, "An Anatomy of Credit Booms: Evidence from Macro Aggregates and Micro Data," NBER Working Paper no. 14049, 2008.
Obstfeld, Maurice, "The International Monetary System: Living with Asymmetry," in *Globalization in an Age of Crisis: Multilateral Economic Cooperation in the Twenty First Century*, Robert C. Feenstra and Alan M. Taylor, eds. (Chicago: University of Chicago Press, 2013).

Obstfeld, Maurice, and Kenneth Rogoff, *Foundations of International Macroeconomics* (Cambridge, MA: MIT Press, 1996).
Obstfeld, Maurice, Jay C. Shambaugh, and Alan M. Taylor, "The Trilemma in History: Tradeoffs Among Exchange Rates, Monetary Policies, and Capital Mobility," *Review of Economics and Statistics*, 87 (2005), 423–438.
———, "Financial Stability, the Trilemma, and International Reserves," *American Economic Journal: Macroeconomics*, 2 (2010), 57–94.
Obstfeld, Maurice, and Alan M. Taylor, "Globalization and Capital Markets," in *Globalization in Historical Perspective*, Michael B. Bordo, Alan M. Taylor and Jeffrey G. Williamson, eds. (Chicago: University of Chicago Press, 2003).
Piatt, Andrew A., "The End of the Mexican Dollar," *Quarterly Journal of Economics*, 18 (1904), 321–356.
Pick, Franz, *Pick's World Currency Reports* (New York: Pick Publishing, various years).
Pick, Franz, and René Sédillot, *All the Monies of the World: A Chronicle of Currency Values* (New York: Pick Publishing, 1971).
Prasad, Eswar, *Gaining Currency: The Rise of the Renminbi* (Oxford: Oxford University Press, 2016).
Rajan, Raghuram G., and Arvind Subramanian, "What Undermines Aid's Impact on Growth?," NBER Working Paper no. 11657, 2005.
Reinhart, Carmen M., "The Return of Dollar Shortages," Project Syndicate, 2016.
Reinhart, Carmen M., Vincent Reinhart, and Christoph Trebesch, "Global Cycles: Capital Flows, Commodities, and Sovereign Defaults, 1815–2015," *American Economic Review*, 106 (2016), 574–580.
Reinhart, Carmen M., and Kenneth S. Rogoff, "The Modern History of Exchange Rate Arrangements: A Reinterpretation," *Quarterly Journal of Economics*, 119 (2004), 1–48.
Reinhart, Carmen M., and Kenneth S. Rogoff, *This Time Is Different: Eight Centuries of Financial Folly* (Princeton, NJ: Princeton University Press, 2009).
Reinhart, Carmen M., and Kenneth S. Rogoff. "Recovery from Financial Crises: Evidence from 100 Episodes," *American Economic Review*, 104 (2014), 50–55.
Reinhart, Carmen M., Kenneth S. Rogoff, and Miguel A. Savastano, "Addicted to Dollars," *Annals of Economics and Finance*, 15 (2014), 1–52.
Rey, Hélène, "Dilemma not Trilemma: The Global Financial Cycle and Monetary Policy Independence," in *Jackson Hole Symposium* (Federal Reserve Bank of Kansas City), 2013.
Rogoff, Kenneth, "Why Not a Global Currency?," *American Economic Review*, 91 (2001), 243–247.
Shambaugh, Jay C., "The Effect of Fixed Exchange Rates on Monetary Policy," *Quarterly Journal of Economics*, 119 (2004), 301–352.
Swoboda, Alexander, "Vehicle Currencies and the Foreign Exchange Market: The Case of the Dollar," in *The International Market for Foreign Exchange, Praeger Special Studies in International Economics and Development*, Robert Z. Aliber, ed. (New York: Praeger, 1969).
Triffin, Robert, *Gold and the Dollar Crisis: The Future of Convertibility* (New Haven, CT: Yale University Press, 1960).