

# A Safe-Asset Perspective for an Integrated Policy Framework\*

Markus K. Brunnermeier<sup>†</sup>  
Princeton University

Sebastian Merkel<sup>‡</sup>  
Princeton University

Yuliy Sannikov<sup>§</sup>  
Stanford University

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## Abstract

Borrowing from [Brunnermeier and Sannikov \(2016a, 2019\)](#) this policy paper sketches a policy framework for emerging market economies by mapping out the roles and interactions of monetary policy, macroprudential policies, foreign exchange interventions, and capital controls. Safe assets are central in a world in which financial frictions, distribution of risk, and risk premia are important elements. The paper also proposes a global safe asset for a more self-stabilizing global financial architecture.

**Keywords:** Safe asset, bubbles, international capital flows, capital controls, monetary policy, macroprudential policy, FX interventions, capital controls

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<sup>†</sup>Email: [markus@princeton.edu](mailto:markus@princeton.edu).

<sup>‡</sup>Email: [smerkel@princeton.edu](mailto:smerkel@princeton.edu).

<sup>§</sup>Email: [sannikov@gmail.com](mailto:sannikov@gmail.com).

# 1 Introduction

International monetary and financial systems have become inextricably entwined over the past decades, leading to strong and volatile cross-border capital flows as well as powerful monetary policy spillovers. The Integrated Policy Framework (IPF) proposed by the IMF seeks to address these issues by developing a unified framework to study optimal monetary policy, macroprudential policies, foreign exchange interventions, and capital controls in an interconnected global financial system.

In that framework, the key friction that gives rise to a role for monetary policy is price stickiness: monetary policy primarily serves to stabilize demand, and international capital market imperfections force central banks to trade off domestic demand against financial stability. [Basu et al. \(2020\)](#) and [Adrian et al. \(2020\)](#) present models of the current IMF New Keynesian approach. This paper will instead emphasize that certain assets serve as safe harbors to hedge risk and deliberately ignores any form of price rigidities, complementing the IPF's Keynesian view. Domestic money and government debt can possibly take on the role of safe assets, but they compete with other reserve assets like the US Treasury bond, the German Bund, and Japanese Government Bonds. Monetary policy, foreign exchange interventions, capital control policy, and macroprudential regulation will shape the international competition among safe assets and global risk appetites. These have first-order importance for emerging countries' integrated policy framework.

In this policy paper we combine insights from academic analysis in [Brunnermeier and Sannikov \(2016a, 2019\)](#). We first outline what determines monetary sovereignty and then argue that the two key characteristics of a safe asset are the good-friend analogy and the safe-asset tautology.

Importantly, we rely on a broader perspective of asset pricing. Not only are asset prices derived as a discounted stream of cash flows, but service flows also contribute to the value of assets. For example, they might relax collateral constraints, a safe asset can provide some better insurance through re-trading, and money assets relax in addition to the double-coincidence of wants constraint. These additional service flows push the prices of assets beyond their fundamental values. A bubble component emerges that results in a lower expected cash flow return. When risk in the economy rises, the safe-asset bubble component increases in value. To understand the important role safe

assets play, we go through the three key phases of the global financial cycle. Starting with a high US dollar interest rate phase (or risk-off phase), followed by a phase with low US interest rates dropping (or low perceived risk) in which emerging markets and development economies (EMDEs) are tempted to create their own bubbly safe asset for which the government's interest burden is lower. During that phase domestic citizens and firms hold the domestic bonds as safe assets to hedge their idiosyncratic risk and borrow at the low US interest rate in US dollars. The cheap US dollar borrowing rate boosts economic growth, making the safe-asset bubble sustainable. When fear of a possible subsequent US interest hike kicks in, the bubble becomes wobbly. A sudden stop might occur, and suddenly domestic citizens want to save in US Treasuries instead of borrowing in dollars and holding the EMDEs' bond for precautionary savings. Economic growth collapses, which further undermines the sustainability of the bubble.

The integrated policy framework has to take into account the interaction across various policy instruments. To protect the safe-asset status of a country, one can either boost the fundamentals or support the bubble component. Higher domestic interest rates supported with accompanying fiscal austerity measures typically improve the fundamentals if they don't stall growth. Bubble-supporting measures come in three flavors: (i) improving market liquidity of the government bond to facilitate re-trading, (ii) foreign exchange interventions, and (iii) importantly as an ultima ratio, imposing capital controls to prevent the competition with US Treasuries. Ex ante measures include limits on foreign capital inflows, the buildup of reserve buffers, and tighter overall borrowing limits.

To study macroprudential regulation one has to include a financial sector. Like in the I Theory, banks are good at diversifying away idiosyncratic risk. After an adverse shock, they scale back and push idiosyncratic risk on to the domestic citizens and firms, who then tilt their portfolios more toward the safe asset. When capital controls are in place, the domestic bond is the only safe asset and it rises in value during crisis times. That is, disinflationary pressures kick in. In contrast, when capital outflows into US Treasuries are possible, inflationary pressures are present, potentially killing the safe-asset status of the EMDE. Macroprudential measures and banks' capital requirements lower these forces. Hence, capital controls and bank capital requirements are substitute policy instruments. In contrast, both instruments are complementary to monetary policy: more stringent implementation of international capital controls and bank capital requirements creates a bigger space for monetary policy.

Our approach also provides a coherent framework for why the Mundell-Fleming trilemma collapses to a dilemma, as proposed in [Rey \(2013\)](#). Monetary policy might face a Catch-22 problem even when the exchange rate is freely floating, if it is not supported ex ante with macroprudential regulation or capital control.

The final section argues that tranching sovereign debt into a senior and a junior bond makes it easier for EMDEs to preserve their safe-asset status. To overcome commitment problems, the tranching should be done by establishing an international special-purpose vehicle that pools sovereign debt from several EMDEs and tranches the pool in a junior bond that protects the senior bond. The latter will enjoy the safe-asset status, which lowers overall funding costs for the EMDEs.

## 2 Safe asset definition and assets' value

Before going into details, it is necessary to define a safe asset in order to understand how it particular role and why money is a special form of safe asset. A safe asset can be characterized by two distinguishing features:

- The “good-friend analogy”: A safe asset is like a good friend in that it is there when one needs it, in times of market stress. This definition is in contrast to a risk-free asset, which pays a specified amount at a certain maturity but may fluctuate in value before it matures.
- The “safe-asset tautology”: A safe asset is safe because others perceive it to be safe. In times of financial distress, agents coordinate on investment in safe assets.

This definition of money appeals to some notion of multiple equilibria or “money as a bubble.” Henceforth, “money” can be thought of as safe assets denominated in a particular unit of account. As such, this definition of safe asset can be viewed as a definition of broad money: it includes a wide array of government-issued paper of different maturities as well as privately issued inside money.

Risk plays a central role in modern asset pricing. However, the focus is primarily on cash flow payoffs of assets and claims. The fundamental value of an asset is indeed derived from the discounted stream of future risky payoffs. However, in a world with financial frictions, several other aspects can boost the value of an asset (and hence lower its expected return).

First, an asset has an additional benefit if it can be used as a safe store-of-value that can be sold at a relatively stable price after an adverse shock. This “safe asset” component can significantly boost its value. For this benefit to arise, the asset must enjoy high market liquidity, i.e., it can be sold without a large discount, when one needs funds. Like a good friend, it is there when you need it. Safe assets provide an “insurance service” in a world when explicit insurance contracts are missing. Investors are willing to hold safe assets for precautionary reasons. Keynes (1936) referred to it as a speculative or bubble component of an asset’s value. Interestingly, an asset can be valuable even if it never pays any dividends or interest payments. Typically, government bonds take on this role within a country, and global reserve assets, like the US Treasury bond, German Bund, and Japanese Government Bonds, take on this role for international finance. Not surprisingly, countries are eager to issue safe assets since their low required return makes them a very cheap source of funding.

The extra safe-asset value derives from the fact that (i) the asset holds its value or even appreciates in times of need and (ii) it enjoys high market liquidity, i.e., it can be traded and re-traded with a low bid-ask spread. The former is self-fulfilling. In times of crisis, safe assets gain in value, which makes it easier for governments, which can issue a safe asset, to finance various stimulus measures in order to stabilize their economies. This, in turn, makes the country’s government bond more resilient against the macro shock. Viewing government debt as a safe asset that takes the form of a possibly “wobbly” bubble is the key novel element in our integrated policy framework. Of course, a country’s debt may lose its safe-asset status if, for example, a debt restructuring is seen as becoming increasingly likely. The competition among governments to issue bubbly safe assets delivers a different perspective on how to manage the macroeconomy.

Second, when an asset can be used as collateral, it loosens a borrower’s borrowing constraints, which is an additional service of the asset besides its payoffs.<sup>1</sup> A government bond that can be used to relax borrowing constraints, e.g., because it is the most common collateral for repo transactions, is valuable even if its cash flow payoff is negligible.

Third, if an asset serves as a medium-of-exchange to overcome the double-coincidence of wants that plagues barter economies, it takes on an even higher value (i.e., its expected real cash flow return is even lower). Formally, this is modeled in monetary

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<sup>1</sup>The extra value is given by the Lagrange multiplier on the collateral constraint.

theory through cash-in-advance constraints, money in the utility function, shopping time models etc.<sup>2</sup> In theory, many assets and objects can take on the role as a medium of exchange. Governments encourage coordination on a particular piece of paper, the domestic domestic currency, which we refer to as narrow money.

The fact that narrow money is a bubble is well understood since it takes on positive value even if the cash flow payoff is negative due to inflation. When dollarization occurs, the domestic safe asset is stripped of this characteristic.<sup>3</sup>

This (more narrow) form of money is largely provided by the banking sector in the form of deposits (inside money). Indeed, banks are profitable since they bundle and diversify a portfolio of typically illiquid (non-safe) assets and transfer them into liquid inside money.

Of course, the liquidity transformation process works only as long as the bank is regarded as solvent and shielded against liquidity runs. As soon as depositors doubt the solvency of a bank, the bank loses its transformative power, depriving it of profit opportunities, which justifies the initial solvency doubts. The self-fulfilling nature of insolvency illustrates the fragility of banking (even absent any maturity mismatch).

While a large part of monetary theory focuses on (the narrow form of) money, our proposed Integrated Policy Framework focuses on the safe-asset perspective. We have in mind a broader asset class than the narrow definition of money that primarily focuses on overcoming limitations due to barter. In sum, an asset value is given by the discounted stream of Future cash flows in the form of dividends and interest payments Insurance service operated through the safe-asset mechanism Relaxation of collateral constraints Medium-of-exchange service The additional “service payoffs” (points 2 to 4) explain what is often referred to as the liquidity premium or convenience yield of certain assets. The medium-of-exchange service depends on the degree of moneyness of an asset. Central bank reserves have a high degree of moneyness, while private bank deposits might lose it if the solvency of the bank is in doubt. Money is a special form of safe asset as it also acts as a medium of exchange. Government debt is typically a safe asset if it is considered to be default-free since people might simply hold it to be able to sell it (in times of need), i.e., for speculative reasons. In other words, a safe asset can contain a bubble component. Importantly, bubbles can burst and jump to another

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<sup>2</sup>See, e.g., Brunnermeier and Niepelt (2019).

<sup>3</sup>For digital dollarization concept see Brunnermeier et al. (2019).

asset, leading to large price swings and excess volatility.

Figure 1 illustrates the set of assets graphically.

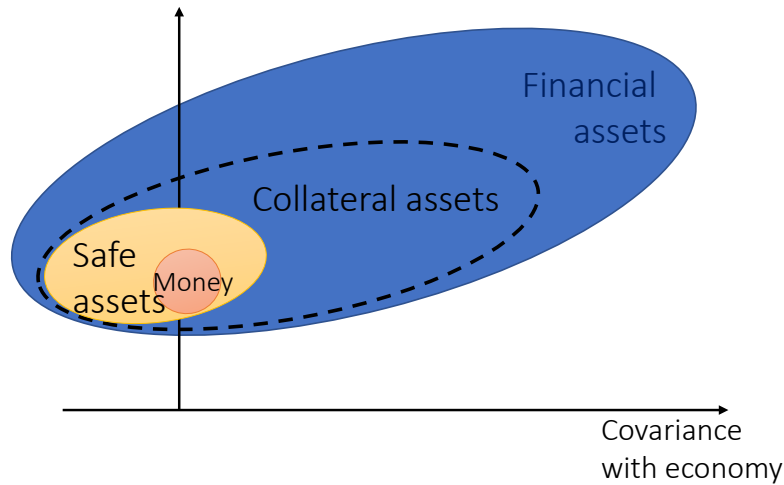


Figure 1: Various asset classes with different “service flows”

The price level, whose log-change determines inflation, can also be seen as an asset-pricing equation. We refer to it in this document as the Fiscal Theory of the Price Level (FTPL) equation.

$$\begin{aligned}
 &\text{Total real value of all government debt + money} = \\
 &= \mathbb{E}[\text{PV of primary surpluses}] \\
 &\quad + \mathbb{E}[\text{PV of future transaction services from narrow money}] \\
 &\quad + \mathbb{E}[\text{PV collateral services}] + \mathbb{E}[\text{PV insurances services}],
 \end{aligned}$$

where the last three terms are bubble terms as they do not reflect a cash flow payoff. For details, see Brunnermeier et al. (2020). That is, if one owns all government debt, one would receive from the government as cash flow only the future stream of primary surpluses.<sup>4</sup> Note that the present value (PV) cash and service flows are discounted with the stochastic discount factor (SDF). For example, if the insurance service of an asset primarily arises in states of crisis, then these services are discounted at a lower rate. In other words, the risk premium is negative, which makes the bubble term larger.

<sup>4</sup>Money can relax the double-coincidence of wants constraint and government can relax the collateral constraint. Its value is reflected by the corresponding Lagrange multiplier.

Keeping in mind that the bubble component can jump from one government safe asset to another, possibly to a foreign safe asset, the expectations operator in the FTPL equation is important.

### 3 Monetary Sovereignty

In order to understand the role of monetary policy, it is necessary to understand when it will be desirable for the national monetary authority to affect the real macroeconomy. In particular, the focus here will be on the conduct of optimal monetary and other policies in EMDEs when faced with spillovers from policy actions in a large developed economy (i.e., a dollar monetary policy). If an EMDE's optimal monetary policy is the same as the US dollar monetary policy, the central bank does not face a meaningful trade-off: it can achieve the optimum by implementing a currency board, which neutralizes all undesirable spillovers. Also, dollarization is not so costly aside from some forgone seigniorage profits. Therefore, going forward, we will assume that the EMDE faces shocks different from the US and that the EMDE's optimal policy is not the same as US monetary policy. In addition, domestic financial stability may be affected by US policy.

The role of domestic safe assets in this risk-based framework allows citizens to hedge the idiosyncratic risks they face. Hence, in addition to whatever value money has as a medium of exchange, the value of the domestic safe asset will stem from its store-of-value properties.

In [Brunnermeier and Sannikov \(2016b\)](#)'s I Theory of Money, monetary policy can have real effects through the revaluation of these safe assets when markets are incomplete: if citizens hold some long-term bonds in domestic safe assets, a change in interest rates will affect their net worth and risk-taking decisions. Monetary sovereignty is desirable to the extent that the central bank would like to redistribute risk and affect risk premia. Importantly, risk consists of unavoidable exogenous risk and endogenous risk that is generated by the economic system itself due to amplification effects, spirals, and adverse feedback loops. The central bank can moderate domestic financial stability and lower the amount of endogenous risk in the domestic economy, which then, in turn, lowers the price of risk and risk premia, as reflected by the equation



$$\begin{aligned} \text{Risk premium} &= \text{price of risk} * (\text{exogenous risk} + \text{endogenous risk}) \\ \text{Real risk-free rate, } r &= \text{time preference rate} + \mathbb{E}[\text{consumption growth rate}] \\ &\quad - \text{Consumption volatility} \\ &\quad - \text{Collateral interest rate differential} \end{aligned}$$

The real return on narrow money is even lower as one has to subtract the advantage it yields from being able to serve as a medium of exchange. Note that a safe asset is typically not risk-free. Hence, the expected return on the safe asset can be higher (lower) because it contains an additional (negative) risk premium. We deliberately mention the risk premia before the risk-free rate since monetary policy can work via the redistribution of risk and risk-bearing capacity/wealth and it has a larger impact by reducing the risk premium. In our view, the current emphasis on the risk-free rate and the step-child treatment of risk premia is lopsided. Note that collateral shortage due to the lack of other good collateral assets will lower the real risk-free asset if the risk-free asset—say, the government bond—can be used as collateral. Broadening the collateral set therefore increases the real risk-free rate.

## 4 Safe asset competition through the global financial cycle

So far, we have ignored the fact that the domestic safe asset is in competition with global safe assets, for which we use US Treasury bonds as a stand-in. Hence, US monetary policy complicates an EMDE's goal of providing a safe asset. For simplicity, we ignore narrow-money currency competition in this paper and simply assume that the domestic currency will always be used as a medium of exchange. That is, we assume that dollarization and digital dollarization do not threaten the domestic currency.<sup>5</sup>

It is instructive to analyze the competition among safe assets through the global financial cycle. Here we focus on the US monetary policy cycle, starting with a high US interest rate environment in phase 1. Phase 2 is characterized by a low US interest rate, while phase 3 leads us back to a higher US interest rate.

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<sup>5</sup>For a detailed discussion on digital dollarization, see [Brunnermeier et al. \(2019\)](#).

Note that we could have alternatively focused on a global financial cycle that is driven by shifts in risk (perceptions), which leads to associated movements in the price of risk. Phase 1 is characterized by a low (idiosyncratic) risk environment, and consequently the price of risk is also low. In phase 2 the risk is elevated, and in phase 3 it returns to the initial level. Finally, the global financial cycle and the associated price of risk could also be driven by shifts in risk aversion. Since the latter two scenarios lead to overall similar implications, we focus here primarily on the US monetary policy cycle.

The switch from one phase to the next is typically associated with large swings and excessive volatility in capital flows in and out of EMDEs. Let us illustrate the three phases and their potential disruptions in the context of US monetary policy movements. We label the three phases as the initial phase for a high-interest-rate environment, followed by the “temptation phase,” which ultimately leads to the “wobbly bubble” phase in which the EMDE’s safe asset might collapse when financial markets foresee a tightening of US monetary policy.

## 4.1 Initial phase

In the first phase, when US monetary policy is tight, agents in the EMDE view dollars as an attractive investment. When the US dollar interest rate is high, domestic government bonds face fierce competition from US Treasuries, which can also be used to hedge idiosyncratic risks. The competition between dollars and the domestic safe assets mitigates the bubbly store-of-value role of the domestic safe asset, so the value of government liabilities stems mostly from the expected fiscal primary surpluses. That is, the traditional FTPL equation holds without a bubble term. The bubble term is absent since the domestic interest rate  $r$  is too high.

## 4.2 Temptation phase

The “temptation phase” begins when the US lowers rates. Lower dollar rates make domestic safe-asset debt more attractive compared to the US Treasury bond as a safe asset. Citizens in the EMDE now facing a low dollar interest rate instead borrow in US dollars up to their collateral constraints (or a limit set by macroprudential policy) and use the domestic safe asset, say peso asset, as a hedge for their (idiosyncratic and other) risk. Cheap dollar funding leads to an investment boom, increasing the

growth rate of the economy and, with it, the growth rate of the (insurance) services provided by the safe asset. As soon as this growth rate,  $g$ , exceeds the real discount rate,  $r + \text{safe asset risk premium}$ , the safe asset can take on a bubble component. Hence, in general the (safe-asset) bubble condition is

$$r + \text{safe asset risk premium} < g.$$

Note that any bubble has to grow in expectations  $r + \text{safe asset risk premium}$ . If this were larger than  $g$ , then the bubble had to outgrow the economy, which is unsustainable. Four important remarks are in order: First, an increase in idiosyncratic risk depresses the real risk-free rate  $r$ , as discussed above. Second, the safe-asset risk premium can be negative if the safe asset appreciates in bad times. Both effects make it easier to satisfy the bubble condition. Third, the safe-asset risk premium reflects various risks, including bubble-bursting risk, default risk, and inflation risk.<sup>6</sup> The growth rate  $g$  reflects a weighted average of economic, collateral service, insurance service, and transaction volume growth. Economic growth is often a good proxy for this weighted average. Strictly speaking, if the growth rate of the aggregate economy is stochastic,  $g$  is the expected growth rate minus some ‘growth risk premium.

The bubbly value of government liabilities tempts the EMDE’s government into expanding the supply of debt, thereby “mining” the bubble. The government can mine the bubble by using its outstanding government debt to run an **ever-expanding Ponzi scheme**: letting the stock of government debt grow generates a steady revenue flow that does not have to be paid for by future taxes as long as a bubble term is present.

Figure 2 shows the balance sheet structure. Note that government debt is only partially backed by future primary surpluses and US dollar reserve holdings, since part of it can be attributed to the “bubble” component.

### 4.3 “Wobbly bubble” phase

The EMDE enters the final “wobbly bubble” phase when news arrives that dollar interest rates might rise. The prospect of increased rates raises the possibility of a depreciation of the domestic safe asset, again making the domestic safe asset a less desirable

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<sup>6</sup>The size of the bubble is determined in equilibrium since the bubble’s wealth effect creates extra goods demand, which has to equal goods supply.

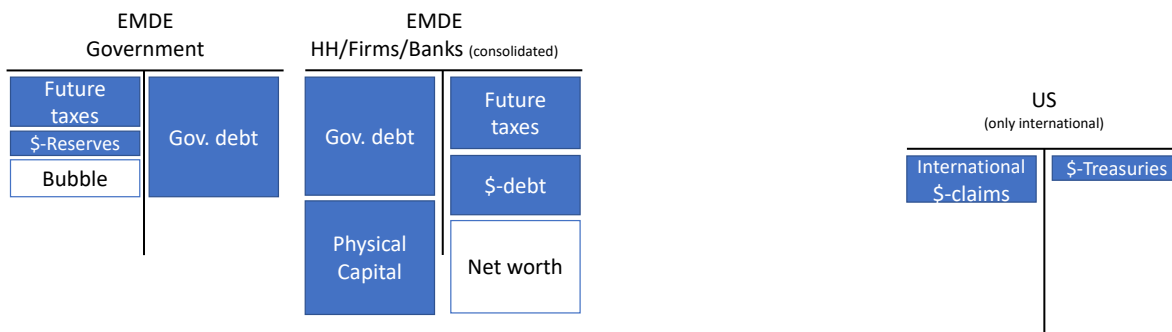


Figure 2: Balance sheets in temptation phase

store of value. An increase in dollar interest rates will make domestic agents rush out of the domestic safe asset and into dollars, causing a depreciation. This threatens the bubble value of government debt because, in order for a bubble to be possible, the expected return on the domestic safe asset, including the safe-asset risk premium, must be less than the growth rate of the economy. During this phase we focus on the component of the safe-asset risk premium that is due to the possible bursting of the bubble. Ignoring other risks, the bubble condition is simply

$$r + (\text{bursting bubble}) \text{ safe asset risk premium} < g.$$

When dollar interest rates are expected to rise,  $r$  of the EMDE bond has to rise to stay competitive with the US Treasuries, which makes it more difficult for the domestic safe asset to sustain a bubble, so the bubble begins to “wobble.” The pure possibility of bursting requires a risk premium, which again makes it tougher to satisfy the bubble condition. When the bubble bursts, the value of the safe asset falls back down to the fundamental, reducing risk-sharing between domestic agents. This, in turn, reduces domestic investment and asset prices, causing fire sales of capital in the EMDE and a recession. In other words, the growth rate  $g$  in the EMDE will also decline.

Note that with flexible prices there is perfect pass-through of exchange rate movements. That is, any depreciation is associated with domestic inflation as the price of imported goods rises.<sup>7</sup>

In fact, this argument suggests that expectations of a future depreciation can cause the bubble to wobble and can therefore be self-fulfilling. Hence, the bubble that emerges

<sup>7</sup>With price stickiness, exchange rate pass-through is not 100% and the inflationary effect is delayed.

during the temptation phase may become wobbly not only when foreign monetary policy is expected to tighten, but also during risk-off episodes when global investors are expected to rush out of EM currencies. Our framework shares some features of Calvo (1988) and also with the second-generation currency attack models initially pioneered by Obstfeld (1996), though with the difference that it builds on bursting bubbles.

When the EMDE loses its safe-asset status— i.e., the bubble burst, the government used up its foreign reserves, and firms sold part of their physical capital— the balance sheet structure ends up as depicted in Figure 3.

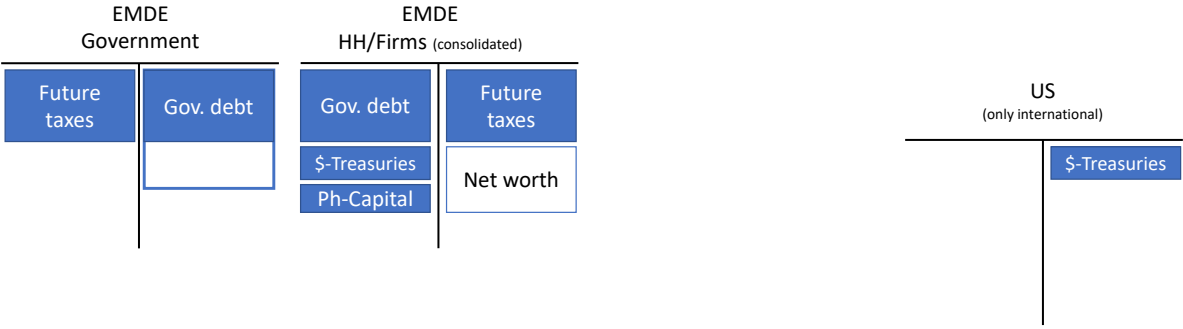


Figure 3: Balance sheets after sudden stop

## 5 Policies

The policy space is characterized by a set of various policy measures. Ex post policy instruments are employed in crisis times and include monetary policy, capital outflow controls, market liquidity support, or foreign exchange interventions. Ex ante policy measures are often commitment strategies, such as capital inflow controls, or signaling strategies, like the buildup of foreign reserves, that do not reduce the likelihood of a crisis as much. Domestic macroprudential policy measures that target the financial sector are discussed in the next section, in which we introduce the financial sector to the analysis.

The key to an integrated policy framework is to clearly spell out the interaction between the various policy instruments and highlight which measures are substitutes and which are complements.

## 5.1 Ex-post crisis management

### Propping up fundamentals: future tax hikes

The government can choose to support the safe asset directly by implementing traditional policies to prop up fundamentals of the government debt. For instance, the government could try to support the safe asset by raising the nominal interest rate. In an environment without price stickiness or heterogeneity among agents, though, this policy is ineffective without the supporting fiscal measures—nominal interest rate hikes without changes in fiscal policy are passed through one-to-one to inflation. By itself, this sort of policy can be useful only if there is heterogeneity in domestic agents' exposures to the safe asset. For instance, if systemically important domestic banks are exposed to deflation, the central bank can shore up the economy by changing rates and engineering an inflation. The government can also support the safe asset's fundamental value by increasing the present value of expected fiscal surpluses. In order to do so, the government must increase taxes, and it faces two potential problems. For one, distortion-free lump-sum taxation is typically politically infeasible. Hence, the government must resort to increasing distortionary taxes, which lower the growth rate of the economy. This, in turn, makes it more difficult for domestic safe assets to maintain their bubbly value. (Recall that the domestic interest rate must fall below the economy's growth rate, i.e.,  $r < g$ .)

Furthermore, a strategy that maintains the bubble's value by increasing taxes inevitably involves a great deal of commitment on the fiscal authority's behalf, which may not be credible. Indeed, a government with commitment power would usually be unconcerned with the possibility of self-fulfilling depreciations of its domestic safe asset.

### Supporting the bubble: Capital outflow controls and FX interventions

The government may choose to implement ex post measures that support the safe asset's bubbly value rather than its fundamental value. For example, it may impose **capital outflow controls** to restrict outflows during crises. These policies do not involve taxation and thus avoid the drawbacks discussed above. Capital control policies can prevent domestic citizens from purchasing US dollar safe assets and prevent foreigners from withdrawing funding. Capital controls support the value of the domestic

safe asset in a straightforward way: they restrict access to dollars for domestic agents, so the domestic safe asset (and money) remains the only available hedge against the idiosyncratic risk faced by domestic citizens. The source of the bubble is precisely the safe asset's value as a hedge against idiosyncratic risk, so the value of the bubble can be sustained through the global financial policy cycle.

Ex post capital controls also increase the bubble's value (as well as incentives for investment) from an ex ante perspective: if agents foresee that the bubble will remain even after the US raises rates, they will be more willing to hold the domestic safe asset beforehand as well. It may be especially valuable to commit to a conditional capital control policy that binds when US monetary policy is expected to tighten but then loosens over time. Such a policy can allow the government to support the bubble underlying its safe asset by precluding the possibility of a large devaluation. Nevertheless, this policy does encourage overaccumulation of domestic capital in the short run: if dollar interest rates rise, then some domestic divestment is, in fact, efficient.

Another way to support the bubble on the domestic safe asset is to ensure that it enjoys high market liquidity. Recall, the bubble's value relies on the fact that the asset can be easily traded with only a small bid-ask spread. It is therefore not surprising that central banks often act as the '**market maker of last resort**' to ensure the smooth functioning of government debt markets. Historically, many central banks, most prominently the Bank of England, were founded to take on the role of government debt managers. Most recently, the Fed intervened in order to improve market liquidity in the long-dated US Treasury market.

**Foreign exchange interventions** can also be used to maintain the value of the bubble ex post, but they do so through different channels. The main idea behind these policies is that US dollar reserves can be used to purchase domestic safe assets and fight outflows during the wobbly bubble phase. These reserves can also be managed over the global financial cycle in order to buffer smaller shocks to the domestic safe asset's value that, perhaps, do not merit the imposition of capital controls.

EMDEs are often subject to self-fulfilling speculative attacks on their currencies. By and large, the consensus in the literature is that such attacks are facilitated by coordination through price movements: when speculators are able to see a drop in the value of a safe asset that reveals an attack is occurring, they are more likely to attack the safe asset as well. Experimental evidence from "clock games" shows that markets in which

speculative attacks are possible behave in a radically different way when participants are unable to observe price signals of how others are behaving.<sup>8</sup> By the same token, if the central bank manages to support the value of its safe asset when some speculators attack, it prevents other speculators from joining the attack. Employing reserves, then, is an ideal tool to ward off sudden devaluations as it makes it more difficult for speculators to attack the safe-asset-status.

## 5.2 Ex ante crisis prevention policies

Good policy is forward-looking policy. Many of the problems in the wobbly' phase can be avoided by implementing ex ante safety measures that are expected to automatically spring into action should a crisis emerge. The emphasis is hereby on "are expected" since the pure expectation reduces the probability of a crisis.

### **Ex ante commitment to ex post crisis policies: Capital inflow controls and reserve holdings**

All the crisis policies discussed above are more effective if the government can credibly commit itself to them in advance.

**Capital inflow controls** during times when US interest rates are very low are very credible, but also costly since one deprives the economy of a possibly faster growth rate. The solution to allow only stickier FDI or foreign equity portfolio investors into the country is often regarded as an intermediate solution.

Holding international **reserves** to defend the domestic safe-asset bubble is the most prominent solution, which many EMDE countries adopted after the Southeast Asia crisis in the late 1990s. Having reserves enables a country to credibly signal its commitment to fend off a possible attack on its safe asset and to preserve its bubble component. Note that it is often worthwhile for the EMDE to hold large international reserves even when they are badly remunerated – the dollar interest rate is lower than the interest rate on the central bank's liabilities. Simply signaling the commitment makes attacks less likely and lowers the "wobbly bubble risk premium" the EMDE country has to pay on its public and private debt.

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<sup>8</sup>See [Abreu and Brunnermeier \(2003\)](#) and [Brunnermeier and Morgan \(2010\)](#).



Note that the effectiveness of accumulating official reserves might be partially undone via borrowing by private citizens and corporations in US dollars. This is another reason to limit private borrowing in US dollars. Absent any friction, a sort of Ricardian equivalence result might emerge, stating that an increase in official reserve holdings emboldens private agents to borrow more in US dollars, rendering reserve holdings ultimately ineffective. This shows the importance of domestic capital (inflow) control measures to limit borrowing by private firms and citizens in US dollars. That is, the government can implement ex ante preventive measures to support the value of its safe asset through international capital flow cycles.

## 6 Adding a financial sector to study domestic macroprudential policy

### 6.1 Amplification mechanisms

Capital control measures limit the international borrowing of private citizens and firms. Macroprudential measures limit borrowing more generally among domestic agents denominated in domestic currency as well as in foreign currency. Macroprudential policy can be applied to borrowers, such as by restricting the leverage of firms or households. However, it is often easier to implement by limiting the financial sector's lending activity.

To study macroprudential policies, we incorporate a financial sector in the international framework of [Brunnermeier and Sannikov \(2019\)](#). We follow the framework developed in "The I Theory of Money" ([Brunnermeier and Sannikov \(2016a\)](#)). Let us consider here an environment in which citizens may diversify some of their idiosyncratic risk away by issuing long-term, defaultable nominal debt to domestic banks. Domestic banks fund themselves using short-term nominal deposits (inside money) in domestic currency. In addition, firms and banks suffer from the "original sin" by issuing US dollar-denominated debt abroad. It is easiest to think of the US dollar as the numeraire asset.

Figure 4 depicts the same balance sheet structure as in Figure 2, except now the EMDE's consolidated balance sheet is split between the balance sheet of the consolidated household/firm sector and a balance sheet for the banking sector.

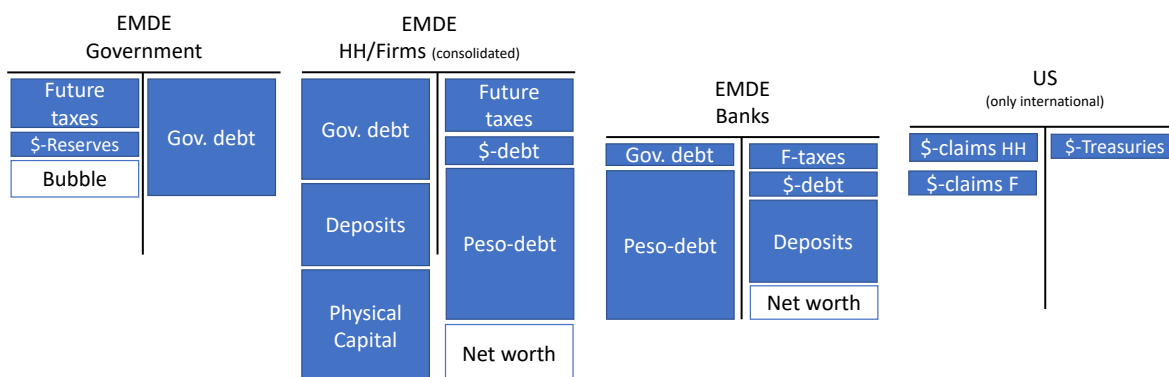


Figure 4: Balance sheets with financial sector in temptation phase

When the domestic currency depreciates, all domestic firms' and banks' assets and liabilities decline in value except for their US dollar-denominated liabilities— the consequence of the original sin. The firms' reduction in net worth increases their default probability, which hits banks' balance sheets on top of the initial shock they experience from their currency mismatch.

Amplification effects kick in due to the paradox of prudence on the side of the banks. Banks try to be micro-prudent, which makes the total system more risky, i.e., it is macro-imprudent. As banks scale back and shrink their balance sheets, they lend less. This lowers investment and growth, further increasing default risk. Banks then take additional losses on their balance sheets, which in turn makes them cut back further on lending and deposit-taking.

The reduction in deposits reduces money supply, a special form of domestic safe-asset supply. The fact that individuals and domestic firms can off-load less (default) risk to banks increases safe-asset demand. Without a foreign safe asset, the US Treasury bond, or capital (outflow) controls, this would lead to disinflationary pressure, which is the primary outcome in advanced countries like the US. Hence, without policy intervention, banks' liabilities (their deposits) increase in value, amplifying the adverse effects even further.

For EMDEs, the picture can look very different absent capital controls. Domestic safe assets (government bonds and deposits) compete with US Treasuries and might lose their safe-asset status (albeit not their money status as a medium-of-exchange instrument). This causes inflationary pressure, further devaluing the domestic currency and leading to capital flight to the US. Whether this is a mitigating or amplifying force

depends on the environment. It is worthwhile to separate various channels through which banks are affected.

If the inflationary devaluation is unexpected and doesn't trigger a policy tightening, banks' nominal assets and domestic-denominated liabilities decline almost in lockstep in real value. However, since firms owe less in real terms, their default risk declines. Hence, ignoring losses due to the original sin, banks' assets decline by less and banks' net worth benefits from that effect. If the policy rate reacts, then banks' assets and liabilities are affected. The change in the real value of banks' assets depends on whether they are floating or fixed, i.e., whether interest payments on the assets adjust or not. In the latter case, banks make capital losses on the asset side. Whether they can make up for this by holding the deposit rate down depends on banks' market power vis-à-vis depositors.<sup>9</sup>

The additional inflation amplifies the exchange rate depreciation, which, in turn, is due to the larger knock-on effects caused by the original sin of dollar-denominated liabilities.

Overall, the loss of banks' net worth amplifies the crisis, possibly triggering a twin crisis [Kaminsky and Reinhart \(1999\)](#). When sovereign debt loses its safe-asset status (i.e., its bubble component) and banks own domestic government bonds, a doom/-diabolic loop between banking risk and sovereign risk kicks in, which was prevalent during the Euro crisis. Since the doom loop reduces economic growth in the EMDE, the "bubble condition" for the safe asset,  $r < g$ , is even more difficult to satisfy.

## **6.2 Monetary policy and macroprudential policy interaction in the presence of capital outflow controls**

In a world in which capital is prohibited from flowing freely across international boundaries, it is easier for an EMDE to preserve the safe-asset status of its government debt. As long as the EMDE is not totally isolated and some banks have some dollar debt, a US interest rate hike hits their balance sheets. As they shrink their balance sheets, they diversify less idiosyncratic risk away and push the risk on to the firms and households. With increased (idiosyncratic) risk exposure, firms and households tilt

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<sup>9</sup>The market power of banks plays an important role in understanding the reversal rate of interest analyzed in [Brunnermeier and Koby \(2019\)](#).

their portfolios more toward the domestic safe asset. Given capital outflow controls, fleeing into US Treasuries is not feasible, and hence the only option domestic agents have is to flee into the domestic government bond. This makes it easy for the EMDE to preserve its safe-asset status. Indeed, (as in the I Theory paper) deflationary pressures instead of inflationary tendencies are the more likely outcome. Deflation (i.e., an appreciation in times of crisis) is one of the hallmarks of a safe asset– the good-friend analogy.

The objective of both monetary and macroprudential policy is to redistribute risk in such a way that endogenous risk is reduced. This lowers the overall amount of risk that agents have to bear and therefore reduces the price of risk. With lower total risk and a lower price of risk, the risk premium (which is the product of total risk and price of risk) is also reduced.

The obvious monetary policy in a world suffering from deflationary pressures is to stimulate and encourage higher inflation. The “inflation tax” makes holding domestic safe assets less attractive compared to physical capital. This also lowers the risk premium on physical capital and impacts the wealth distribution dynamics between banks and the rest of the economy. Quantitative easing (QE) measures involve the purchase of capital that can’t be sold short. QE can be used to redistribute wealth toward the balance-sheet-impaired sectors as long as it involves assets for which financial markets are not perfect, e.g., when the asset is subject to short-sale constraints.

Note that **monetary policy** distorts the portfolio choice by changing the risk-free rate and the risk premium. Importantly, when using monetary policy to distort the portfolio choice one has to reward the agents by granting them a risk premium. These agents earn this extra risk premium and hence become wealthier over time. That is, monetary policy has some impact on the wealth distribution. In contrast, quantity restrictions, like many **macroprudential measures**, directly limit portfolio choice and do not require a reward in the form of a risk premium. Hence, they can be implemented without inducing a particular dynamics of wealth. Of course, macroprudential policy also affects equilibrium prices and hence has redistributive effects.

### 6.3 Dilemma and the interaction between monetary policy, macroprudential policy, and capital controls

In this section we assume that no capital controls are imposed. That is, (i) firms and banks can borrow in US dollars in the boom phase and (ii) hold the US safe asset, i.e., they can move into US Treasuries as the global safe asset in times of crisis.

While macroprudential policy measures limit overall borrowing by firms or banks, capital controls limit foreign borrowing. The key difference is whether debt is denominated in the domestic currency or in US dollars. As an aside, even if international borrowing is denominated in a domestic currency, it is less stable since foreigners are more likely to withdraw their funds in times of crisis (due to asymmetric information and monitoring frictions).

Granting citizens and firms access to the foreign safe asset, the US Treasury bond, significantly complicates matters for policy makers, even though the exchange rate is fully floating. The first major difference is that now, in times of crisis, the economy experiences inflation pressures and a currency devaluation driven by the flight-to-safety into the foreign safe asset. Now, the government bond loses in real value during crisis times (when marginal utility is high), i.e., the covariance is reversed, destroying one of the hallmarks of a safe asset.

Our analysis that combines the I Theory of Money and the International Monetary Theory ([Brunnermeier and Sannikov \(2016a, 2019\)](#)) provides a nice framework for understanding why the Mundell-Fleming trilemma is more realistically a **dilemma**, as [Rey \(2013\)](#) puts it. That is, even though the exchange rate is fully flexible, the competition with the US Treasury severely limits the monetary policy space of the EMDE. Policy makers face a “Catch-22”: price stability calls for tighter monetary policy, but this hurts banks’ capitalization, triggering the adverse amplification loop described above. Or put differently, an accommodative monetary policy to help the banks is difficult to implement since it makes the domestic safe asset vulnerable to the loss of its safe-asset status. Accommodative monetary policy might trigger a sudden collapse (as the bubble component of the government debt bursts). The EMDE faces not a Mundell-Fleming trilemma but a dilemma since, despite a flexible exchange rate regime and an open capital account, redistributive monetary policy is severely restricted.

Are the other policy instruments also limited like monetary policy with open capital

accounts? Ex ante macroprudential policy measures that, for example, constrain leverage during booms still work well. Indeed, with a lower leverage ratio the economy is less prone to amplification and hence the EMDE is less likely to lose its safe-asset status. Having a tighter macroprudential regulatory framework during the boom phase makes it possible to fight capital outflows with a smaller amount of reserves.

Ex post macroprudential policy in the form of **financial repression** that requires banks to hold domestic government debt steers the demand for safe assets toward the domestic safe asset. In the extreme, financial repression that forces domestic agents to hold so much in domestic government bonds that they have no resources left to buy foreign assets implicitly also imposes capital controls.

In conclusion, the macroprudential and capital control policy measures are substitutes, though imperfect ones. In contrast, monetary policy is a complement to macroprudential policy and capital controls. Stricter macroprudential policy and/or capital controls creates needed policy space for monetary policy.

## 7 Improving the global financial architectures with GloS-Bies

Issuing a safe asset has a lot of advantage. The sudden erosion of the safe-asset status accompanied with a sudden stop and outflow of credit is very costly for EMDEs. The recent and most dramatic capital outflows out of EMDEs are an example case in point of the current instability of the financial architecture. Figure 5, Panel B compares the recent outflows of funds from emerging markets in billion US Dollars with amounts during previous crisis periods.

Active intervention can reduce the likelihood of sudden stops. However, a global financial architecture that is self-stabilizing and does not need active policy intervention would be superior. Note also that the core of the problem is typically not the shortage of safe assets per se but the fact that safe assets are not symmetrically supplied around the globe all the time.

So far, the focus of the international monetary system has been on leaning against these flight-to-safety capital flows. The International Monetary Fund offers various lending facilities that allow governments to borrow in order to counterbalance these

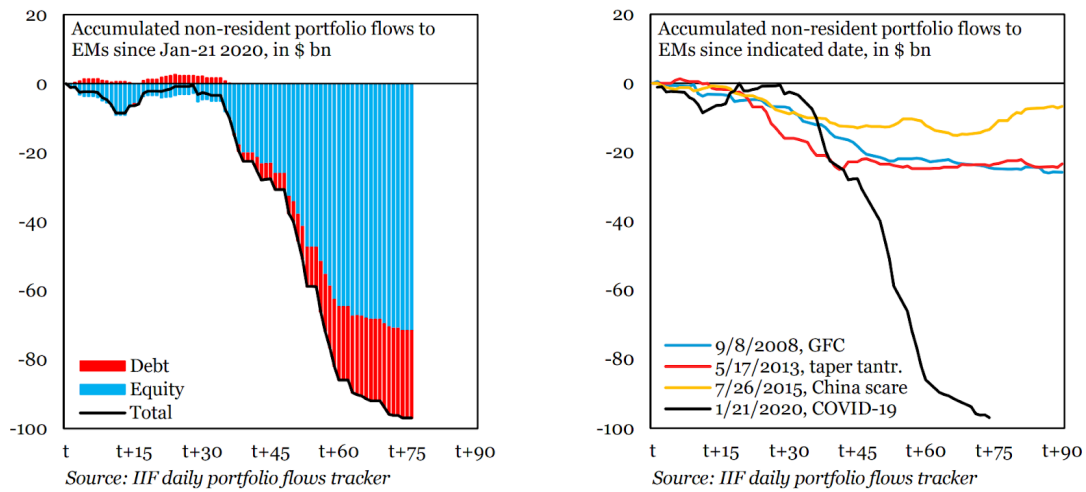


Figure 5: Capital outflows from Emerging Markets in \$ bn after Jan 21st, 2020. Source: IFF

capital outflows. Similarly, international swap line arrangements among various central banks allow central banks to offset sudden capital outflows. Indeed, recent interventions by the US Federal Reserve helped stabilize the situation significantly.

Absent these facilities, countries' primary precautionary strategy is to acquire large reserve holdings in good times, which they can deploy in crisis times in order to lean against sudden outflows. The Southeast Asia crisis in 1997 was a wake-up call for most emerging economies. IMF funding came attached with conditionality and hence was not very popular in Asia. Many EMDEs subsequently opted for a self-reliant precautionary **buffer approach** by building up large reserve holdings. Holding reserves also incurs carrying costs for the emerging economy, as the interest on safe foreign reserve assets is typically significantly lower than that on domestic assets. This drains resources, lowers a country's fiscal space, and hence, paradoxically, can make a crisis more likely.

An alternative, the more direct **rechanneling approach**, is to address the root of the problem—namely, that safe assets are asymmetrically supplied. The alternative institutional arrangement involves introducing Sovereign Bond Backed Securities (SBBS) in order to rechannel the destabilizing flight-to-safety capital flows as proposed in Brunnermeier and Huang (2019). Instead of facing cross-border flows from emerging economies to some advanced economies, one could redirect these capital flows to move across different asset classes. The “rechanneling approach” involves tranching

the domestic sovereign bond into a junior and a senior bond. Since the latter does not lose its safe-asset status, this is a strictly superior solution.

## 7.1 Tranching the National Asset

Inflation that arises when investors flee the currency devalues the bond exactly when good-friend safety is needed most. This makes it challenging to maintain safe-asset status. Outright default makes it equally challenging. Intuitively, the safe asset<sup>10</sup> can exist only if

$$r + \text{default risk premium} + \text{inflation risk premium} < g,$$

where  $r$  is the real risk-free rate. To obtain the quoted nominal yield on the government bond, one has to add the expected loss rate, expected inflation, and possibly risk premia for other sources of risk.

Note that for the US, inflation is depressed during the global financial downturn and hence the inflation risk premium is negative, making it easier for US dollar assets to satisfy the above inequality.

More importantly, for the EMDE this raises the question of whether it is possible to allow for default, avoid inflation, and nevertheless have the ability to issue a safe asset. The answer is yes, in theory, if one makes use of tranching. That is, EMDEs can issue junior bonds that are subject to default, which protects the other government bond, the senior bond. For the senior bond, a default on the junior bond is now good news, as it lowers the EMDE's overall debt level. In addition, investors can now flee into the EMDE's senior bond instead of the US Treasury bond, reducing the pressure on the exchange rate and, with it, the inflation push. In other words, the default risk premium is now off-loaded to the junior bond. The senior bond does not need to offer any default risk premium, making it easier to satisfy the above safe-asset condition.

If the EMDE were to offer an inflation-indexed senior bond, it becomes even easier to satisfy the above condition. The inflation indexing serves as a commitment to default on the junior bond instead of inflating the currency in order to repay both the junior and senior debt.

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<sup>10</sup>Let us focus on consol bonds.



So what is the catch? The EMDE government has to commit to (i) always first default on the junior bond and leave the senior bond unattached, and (ii) more important, the government has to commit not to issue a bond that is even more senior than the existing senior bond. This commitment problem is discussed in the corporate finance literature in ? and in international sovereign debt literature. Furthermore, it should not undermine the seniority structure by issuing bonds with shorter maturity that is de facto senior to the more long-dated senior bond, i.e., the government should avoid a maturity rat race as discussed in ?. The answer to this commitment challenge is GloSBies, discussed in the next subsection.

### 7.2 GloSBies

Instead of a single country offering both senior and junior bonds, an international special-purpose vehicle (SPV) could be established in order to buy a fraction of EMDEs’ sovereign bonds, pool them, and tranche them into a senior and a junior bond. The senior bond is then the Global Safe Bond (GloSBies) for and from emerging economies, as proposed in Brunnermeier and Huang (2019). Figure 6 depicts the balance sheet of the SPV.

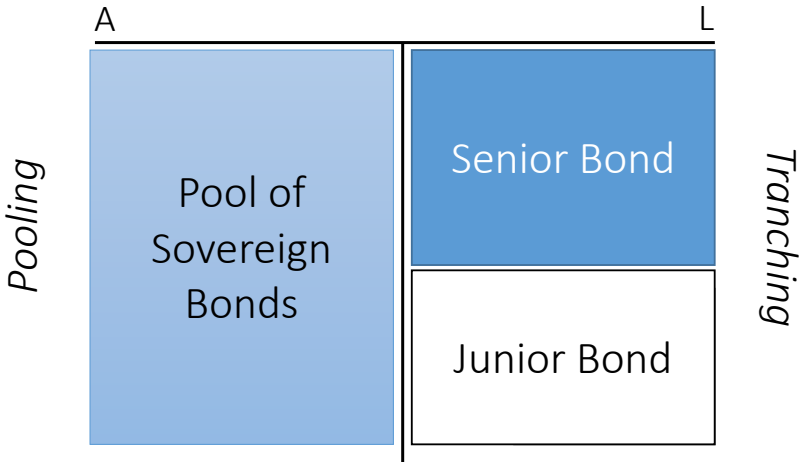


Figure 6: Global Safe Bond: GloSBies SPV balance sheet

This structure resolves the commitment problems discussed above, as the consortium running the SPV is now able to exclude an EMDE if it were to issue a super-senior bond. In addition, tranching a pool of emerging-market government bonds, instead

of those of a single country, exploits diversification benefits if the pool contains bonds from sufficiently heterogeneous EMDEs.

The GloSBies structure is analogous to the Sovereign Bond Backed Securities (SBBS) or to the European Safe Bonds (ESBies), proposed for the Euro area by [Brunnermeier et al. \(2011\)](#). The Euro area suffered similar flight-to-safety capital flows from its peripheral countries to a few core countries. While within the Euro area there is no exchange rate risk, for the global SBBS the junior bond also has to absorb currency risk if the underlying national bonds are denominated in local currency.

SBBS have a second advantage besides rechanneling flight-to-safety capital flows: as shown in [Brunnermeier et al. \(2016\)](#), SBBS can eliminate the doom (diabolic) loop between sovereign and banking risk that arises when banks hold domestic sovereign bonds that are subject to default risk. As default risk rises and the sovereign bond price tanks, banks suffer losses, thus increasing the likelihood that the government will have to bail them out, which in turn lowers the sovereign bond price. [Brunnermeier et al. \(2017\)](#) studies diversification and contagion interactions, carries out numerical simulations, and analyzes various implementation details of SBBS for Europe.<sup>11</sup>

In Asia, the Executives' Meeting of East Asia-Pacific Central Banks (EMEAP)<sup>12</sup> is involved in the so-called Asian Bond Fund. This fund pools bonds from 11 countries, but does not tranche the pooled cash flows into a senior bond that could serve as a regional safe asset<sup>13</sup>.

## 8 Conclusion and international policy coordination

In this paper we considered an integrated policy framework that studies the interaction between monetary policy, macroprudential regulation, foreign exchange interventions, and capital controls. Unlike existing IMF work such as [Basu et al. \(2020\)](#) and [Adrian et al. \(2020\)](#), we depart from the New Keynesian framework in which various forms of price stickiness play an important role. We think understanding various forms of price stickiness is important but here we deliberately take a safe asset and risk per-

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<sup>11</sup>The European Union Commission refined the SBBS proposal and in May 2018 proposed the necessary regulatory changes.

<sup>12</sup>See <http://www.emeap.org>.

<sup>13</sup>In 2009 the introduction of a similarly structured Latin America Bond Fund was studied.

spective.<sup>14</sup> Monetary policy tries to influence not only the risk-free rate but also various risk premia. Citizens save for precautionary reasons in the safe asset, which provides insurance services. This increases the value of the safe asset, i.e., it lowers its interest rate. When a country's government bond competes with the US Treasury bond as a safe store of value, deflationary pressures during crises reverse into inflationary pressures, undermining the EMDE debt's safe-asset status.

We outlined the subtle interactions between various policy instruments. Typically, ex ante bank capital requirements and macroprudential measures are substitutes, which together are complements to monetary policy. Interestingly, our approach provides a framework for understanding why the Mundell-Fleming trilemma reduces to a dilemma. That is, a floating exchange rate does not necessarily grant an EMDE the possibility of independent monetary policy. GloSBies that pool and tranche the sovereign debt of several EMDEs might be a way forward for a global financial architecture in which the supply of safe assets is more symmetrically distributed.

Our framework also raises important questions about any spillovers of US monetary policy and the desirability of international economic policy coordination. First, should debt bubbles be treated as desirable ways to expand financing to EMDEs, or should they be treated as signs of instability? Should the US take into account that raising US dollar rates might burst safe-asset bubbles in EMDEs? Is providing US swap lines an attractive alternative? Or should the US even try to prevent safe-asset bubbles from emerging in EMDEs? And second, how should EMDEs protect themselves against US monetary policy cycles?

All these questions are critical to understanding how international capital flows can promote global growth rather than threaten price and financial instability.

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<sup>14</sup>As an aside, let's highlight further similarities between the New Keynesian approach adopted in [Basu et al. \(2020\)](#) and [Adrian et al. \(2020\)](#) in which the form of the price stickiness plays the central role and a setting in which only financial frictions are at center stage. Issuing a long-term bond and committing to a periodic interest payment shares some aspects with wage stickiness.

To see this, consider a firm that produces a certain output by either buying a machine financed with fixed monthly annuity payments over, say, three years or by hiring a worker whose wage is fixed for the next three years. Both arrangements are indeed similar except that quantity adjustment might be more or less costly depending on whether firing a worker or selling off a used machine is more costly.

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