14TH JACQUES POLAK ANNUAL RESEARCH CONFERENCE
NOVEMBER 7–8, 2013

Currency Regimes, Capital Flows, and Crises

Paul Krugman
Princeton University

Paper presented at the 14th Jacques Polak Annual Research Conference
Hosted by the International Monetary Fund
Washington, DC─November 7–8, 2013

CURRENCY REGIMES, CAPITAL FLOWS, AND CRISES

Paul Krugman

Conference draft, 30 October 2013

Don't be fooled by today's low interest rates. The government could very quickly discover the limits of its borrowing capacity: An urgency to rein in budget deficits seems to be gaining some traction among American lawmakers. If so, it is none too soon. Perceptions of a large U.S. borrowing capacity are misleading. Despite the surge in federal debt to the public during the past 18 months—to $8.6 trillion from $5.5 trillion—inflation and long-term interest rates, the typical symptoms of fiscal excess, have remained remarkably subdued. This is regrettable, because it is fostering a sense of complacency that can have dire consequences …. Fortunately, the very severity of the pending crisis and growing analogies to Greece set the stage for a serious response.

- Alan Greenspan in the Wall Street Journal, June 10, 2010

[T]his is a problem we're going to have to face up to. It may be two years, you know, maybe a little less, maybe a little more. But if our bankers over there in Asia begin to believe that we're not going to be solid on our debt, that we're not going to be able to meet our obligations, just stop and think for a minute what happens if they just stop buying our debt.

- Erskine Bowles, co-chairman of President Obama's debt commission, in testimony to the Senate Budget Committee, March 8, 2011

In the immediate aftermath of the 2008 financial crisis and the global recession that followed, most economic policy debate focused on the downturn and how to stop it. In late 2009 and early 2010, however, a sea-change came over this discussion. I like to say that the discourse was "Hellenized" – suddenly, the paramount concern of many policymakers was no longer mass unemployment, but fear of triggering a Greek-style crisis of confidence in government solvency. In the euro area aggregate fiscal policy turned sharply contractionary, as debtor countries turned to harsh austerity and even creditor countries began cutting back as a precautionary measure. In the UK a new government turned to austerity policies justified explicitly by the alleged need to reassure markets about solvency. In the United States, while there was no comparable explicit shift in policy, warnings of a possible Greek-type crisis became a staple of political rhetoric, and may have played a role in a de facto turn to austerity not too far short of what was happening in Europe.

There was, as one might have expected, substantial pushback from Keynesian economists, and fierce debates took place over several propositions. One debate involved the notion of "expansionary austerity," the idea that cutting government spending could actually have positive effects on growth,

even in the short term, by raising confidence. Another debate concerned possible negative effects of high sovereign debt levels on growth that did *not* involve a Greek-style crisis of soaring interest rates, with many policymakers seizing on preliminary results that seemed to suggest a "cliff" in which growth drops sharply if debt exceeds 90 percent of GDP. At this point I think it's safe to say that both the expansionary austerity hypothesis and the proposition that there is a debt cliff have been strongly rejected by the data – but these debates are not what I want to talk about in this lecture.

What I want to talk about instead is a question that some of us have been asking with growing frequency over the last couple of years: Are Greek-type crises likely or even possible for countries that, unlike Greece and other European debtors, retain their own currencies, borrow in those currencies, and let their exchange rates float?

What I will argue is that the answer is "no" – in fact, no on two levels. First, countries that retain their own currencies are less vulnerable to sudden losses of confidence than members of a monetary union – a point effectively made by Paul De Grauwe (2011). Beyond that, however, even if a sudden loss of confidence does take place, countries that have their own currencies and borrow in those currencies are simply not vulnerable to the kind of crisis so widely envisaged. Remarkably, nobody seems to have laid out exactly how a Greek-style crisis is supposed to happen in a country like Britain, the United States, or Japan – and I don't believe that there is any plausible mechanism for such a crisis.

Incidentally, since this is the Mundell-Fleming lecture, it's probably worth noting that the central takeaway from Mundell and Fleming was that currency regimes matter enormously for macroeconomics – that the effects and effectiveness of monetary and fiscal policy are quite different under fixed and floating rates. Arguing, as I will, that currency regimes also have a large impact on the nature and probability of financial crises is very much in the Mundell-Fleming spirit.

The plan of this lecture is as follows. First, I will discuss empirical evidence suggesting that currency regimes make a huge difference to the risks affecting open economies, and discuss past efforts to make

sense of the conclusion, strongly suggested by this evidence, that countries with their own currencies are much less subject to Greek-style crises than countries that have given up their currencies. Second, I will turn to some simple modeling, in what amounts to a modernized version of Mundell-Fleming, suggesting not just that crises of confidence are unlikely to inflict major damage on countries with floating rates that borrow in their own currencies, but that under liquidity-trap conditions a loss of confidence is actually expansionary. Third, I lay out a "miniaturized" New Keynesian model – that is, a model with short-run price stickiness in which spending decisions reflect intertemporal optimization, as a kind of check on the first model. As we'll see, the same story holds, but in a way that offers what I consider a useful insight into what is really going on. Fourth, I examine possible objections to my seemingly sunny assessment. Finally, I offer two case studies – one from the interwar period, one from today's headlines – of countries experiencing something like the kind of confidence loss widely envisaged, and ask what lessons we learn.

1. *Currency regimes, debt, and interest rates*

Let me jump right in with two pictures – or, actually, two versions of the same picture – that may help to frame the issue.

What Figures 1 and 2 illustrate is the apparent relationship between debt levels and interest rates. To avoid any accusations of cherry-picking, I use someone else's data set – specifically, data from Greenlaw, Hooper, and Mishkin (2013), who argue, very much contra my theme in this lecture, that the United States may well be nearing a debt "tipping point." Figure 1 shows part of their data: gross debt levels of advanced nations as a percentage of GDP at end-2012 versus interest rates on 10-year government bonds. Japan, at the lower right, is an outlier, but otherwise the data seem to show a clear positive relationship between debt and borrowing costs, leading – or so Greenlaw et al suggest – to a possible

vicious circle of rising rates and exploding debt once debt gets beyond a critical level, probably less than 100 percent of GDP.

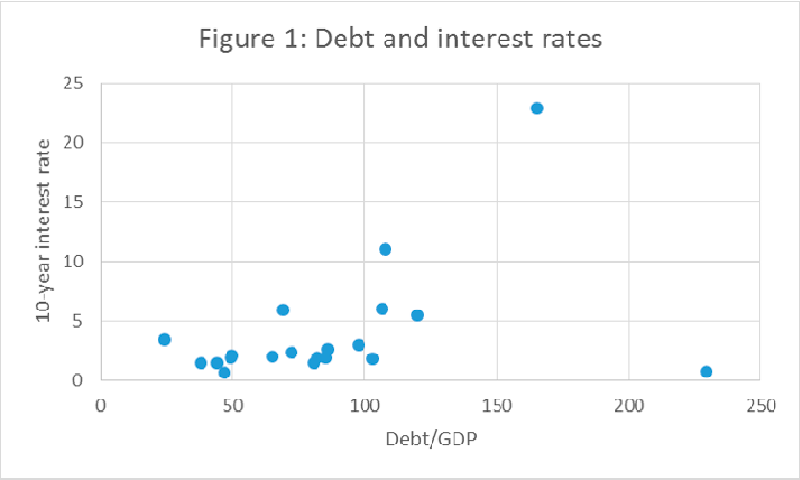
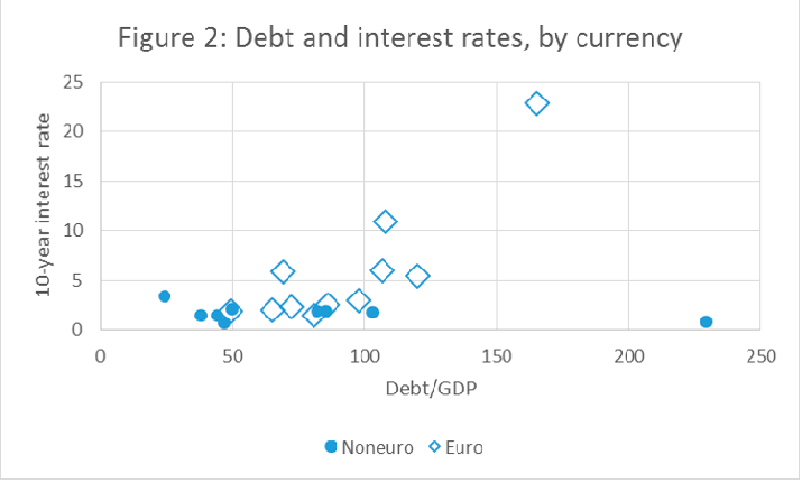


Figure 2 shows the same data, with just one difference: I've identified members of the euro area with different markers. Suddenly the picture looks quite different. There is indeed a strong relationship between debt and borrowing costs – but only for countries on the euro, with little sign of any such relationship for advanced nations that have retained their own currencies.



A simple regression, in which I include a dummy variable for euro membership both alone and interacting with debt, confirms this observation:

Interest rate = 2.206 - 0.006 * debt ratio -11.777 * euro dummy + 0.173 * (debt ratio * euro dummy)
(1.485) (0.015) (2.976) (0.030)

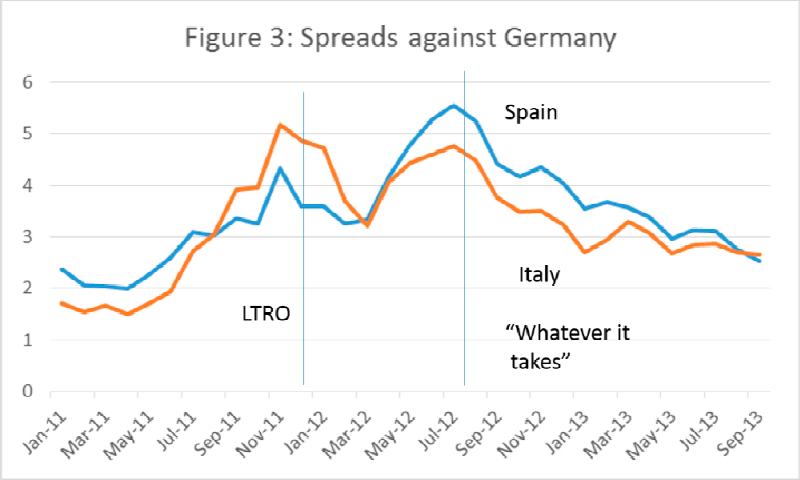
For non-euro countries, then, the effect of debt is both statistically and economically insignificant, even as it is strongly apparent for euro countries. It looks, in other words, as if the currency regime makes a huge difference to the stories we tell about debt. Of course, the absence of any apparent relationship between debt and borrowing costs outside the euro area might be an accident – or, if you like, America might be an accident waiting to happen. But I will argue otherwise.

I am by no means the first to make this argument. The seminal paper in this area is De Grauwe (2011), who pointed in particular to the comparison between Spain and Britain, which have similar levels of both debt and deficits, but pay very different interest rates. De Grauwe argued that the crucial difference was that Spain lacks a lender of last resort, leaving it vulnerable to self-fulfilling liquidity crises: investors might pull back from a euro zone nation's debt, fearing default, and in so doing drive that nation's borrowing costs so much higher (and depress that nation's economy so much, reducing revenues) that they provoke the very default investors fear. This can't happen in Britain, he suggested, because the Bank of England can always step in to buy government debt in a pinch.

Since De Grauwe circulated his analysis in May 2011, several developments have occurred that offer strong support for his hypothesis.

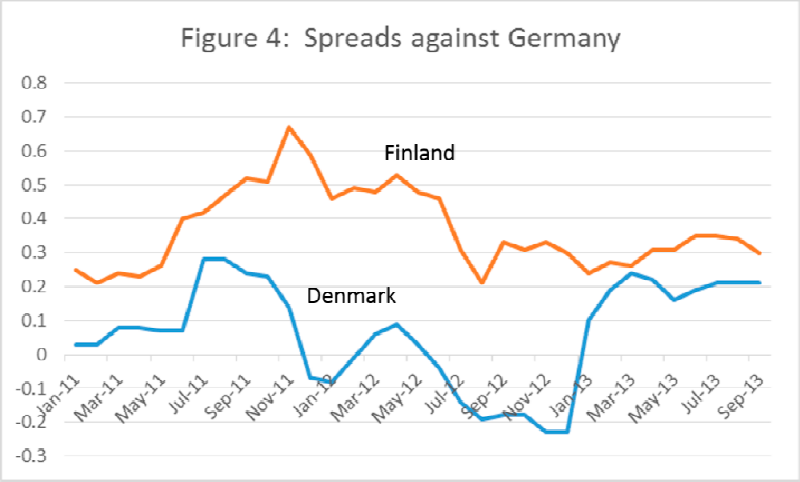
First, evidence of the importance of the lender of last resort issue comes from the dramatic effect on spreads every time the ECB has signaled increased willingness to take on at least some of that role. Figure 3 shows Italian and Spanish spreads against German 10-year bonds – useful indicators of the overall state of the euro crisis – since 2010. You can clearly see the two episodes of widespread speculation against peripheral nations, indeed near panic, in late 2011 and again in the summer of 2012. You can also see the dramatic reduction in spreads following ECB action. The first near-meltdown was contained via the LTRO (long-term refinancing operations) program, in which the ECB indirectly took on

the role of sovereign lender of last resort by offering to lend unlimited amounts, at relatively long maturities, to banks offering sovereign debt as collateral. The second near-meltdown was contained when Mario Draghi declared that the ECB was willing to do "whatever it takes" to save the euro, followed by an official declaration that the central bank would be willing, if necessary, to engage in Outright Monetary Transactions, i.e., direct purchases of sovereign debt.



The point here is that neither of these ECB interventions should have had a large impact if the problem of peripheral European debtors was one of solvency pure and simple. The fact that they did have so much impact is prima facie evidence that a substantial part of the interest premium in debtor nations reflected fear of self-fulfilling liquidity crises.

Another piece of evidence supporting De Grauwe's thesis is the curious case of Danish interest rates, which are a minor but revealing aspect of the European scene. Denmark – which has relatively low debt, and nobody considers a default risk -- is not on the euro, but it has been shadowing the common currency. You might therefore expect Danish interest rates to closely track rates in those of "safe" euro countries like Germany or Finland, perhaps with a small premium reflecting residual currency risk. What actually happened, however, is shown in Figure 4, which plots Danish and Finnish interest rate spreads against Germany. During periods when the euro was under stress – notably late 2011 – Finnish rates shot up but Danish rates didn't. In fact, at times Danish rates dropped below German rates.



What might cause this divergence? A natural answer, again, is to suggest that times of stress were times when investors feared liquidity crises due to the absence of euro lenders of last resort, and that Denmark benefited even though it was pegged to the euro because, unlike euro nations, it retained a central bank able to print money if necessary.

To sum up, then, evidence on interest rates – both from cross-section comparisons and from behavior over time – strongly suggests that the currency regime matters a great deal in determining the likelihood that nations will face crises of confidence over their debt. In the years since the Greek implosion brought sovereign debt to the center of economic policy discourse, debt crises have occurred exclusively in euro area nations or nations with large euro debts (about which more later), and the behavior of interest rates within Europe is consistent with the notion that euro nations are peculiarly vulnerable to self-fulfilling speculative attacks because they lack central banks able to perform the lender of last resort function. All this in turn suggests that non-euro nations, in particular the US, the UK, and Japan, should be much less worried than they are about Greek-style crises. Markets just aren't likely to experience such a sudden collapse of confidence in non-euro debt.

But suppose confidence in US or UK bonds were, nonetheless, to fall sharply. What would happen then? The answer, I'm going to argue next, is "Not at all what the debt worriers think."

2. *The macroeconomics of sudden stops I: IS-MP analysis*

When the crisis of 2008 struck, I think it's fair to say that domestically oriented macroeconomists were caught more or less flat-footed. True, there were models of bank runs, and some consideration had been given to the possibility of financial disruption, but there was no extensive literature on the domestic macroeconomics of financial crises.

Open-economy macroeconomics, by contrast, has a long history of thinking about and trying to model sudden crises, usually involving – although not necessarily restricted to – speculative attacks on currencies. Models in this area are generally grouped by "generation," reflecting the evolution of approaches to the analysis both of the motives for speculative attacks and the consequences of such attacks. First-generation models such as Krugman (1979) and Flood and Garber (1982) were, in effect, about the collision between exchange rate pegs and the attempt to extract seigniorage from money creation. The European Exchange Rate Mechanism crises of 1992-3 inspired a wave of empirical work, exemplified by Eichengreen, Rose, and Wyplosz (1995), plus the creation of "second-generation" models, exemplified by Obstfeld (1994) that, unlike first-generation models, emphasized policy tradeoffs as a motive both for devaluation and for speculative attacks on currency pegs. A key point of these models was the possibility of self-fulfilling crises, in which a fall in investor confidence could generate a currency depreciation that justified investor pessimism.

Finally, and most relevant to current events, the Asian crisis of 1997-8 inspired a number of "third-generation" analyses, including Krugman (1999), Aghion, Bachetta, and Banerjee (2004), and Calvo, Izquierdo, and Mejia (2004). Why was a new generation of models needed? Mainly because the trajectory of output was very different in Asia than it had been in Europe earlier in the decade. The ejection of the pound from the Exchange Rate Mechanism freed up British monetary policy and

promoted expansion, much like Britain's exit from the gold standard 60 years earlier. The forced depreciation of Asian currencies in the face of "sudden stops" in capital inflows, by contrast, had at least the initial effect of leading to severe slumps, indeed some of the worst slumps since the 1930s.

Is this literature useful in trying to make sense of the crises that have preoccupied policymakers since Greece hit the wall in late 2009? One might think at first that the international macro crisis literature is somewhat unrelated to the issues of the past four years, since it was overwhelmingly concerned with balance of payments and capital flow issues, not sovereign debt. However, I would argue that this distinction is more apparent than real, for two reasons.

First, the crisis in the European periphery – which remains the sole locus of current debt crises – is arguably best viewed largely as a balance of payments crisis rather than a sovereign debt crisis. Figure 5 shows a scatterplot of data for euro area nations, with their situation as of end-2009 measured by two variables: the ratio of gross government debt to GDP on the horizontal axis, and the cumulative current account deficit as a share of GDP since 1999 on the vertical axis. It is immediately apparent that there is at best a loose relationship between debt and getting caught up in crisis: a number of countries with high debt, such as Belgium, did not experience a crisis, while several countries with relatively low debt, such as Spain, did. On the other hand, every country that ran cumulative external deficits of more than 50 percent of GDP – Estonia, Slovakia, Spain, Malta, Cyprus, and Greece – did experience a crisis of confidence. In fact, we could almost dismiss debt as a factor if it weren't for Italy, which didn't run large external deficits but experienced a crisis nonetheless.

Second, whatever the source of sudden loss of confidence in the European periphery, this speculative attack drove up private as well as public borrowing costs. The data aren't very good here, but news reports make it clear that the initial crises drove up borrowing costs for the private sectors of the European periphery, and that the narrowing of spreads since the ECB signaled its willingness to take a more active role has reduced private borrowing costs too.

Figure 5

These two observations, taken together, suggest that we can, albeit with some caution, apply the insights from the currency crisis literature to recent crises in Europe and the potential for similar crises elsewhere, by at least provisionally thinking of the confidence problem as involving the risk of an Asian-style sudden stop. Indeed, that is exactly what Accominotti and Eichengreen (2013) do in drawing comparisons between the current European crisis and Europe's difficulties in the late 1920s and early 1930s, which they dub "the mother of all sudden stops."

So how should we model sudden stops in advanced economies? I adopt two complementary approaches. First, I use a simple, more or less off-the-shelf ad hoc textbook model of short-run fluctuations, based closely on Romer's (2013) "IS-MP" approach that replaces the old-fashioned LM curve with a Taylor-type central bank reaction function. In the next section I offer a sort of miniaturized New Keynesian model in which spending decisions reflect intertemporal optimization, and which suggests a slightly different and perhaps deeper slant on the nature of the thought experiment. Neither approach is "right"; IS-MP is much easier to work with, but many economists, myself included, like to verify that the conclusions from models in which spending behavior is simply assumed can be

reproduced in a maximizing framework. The takeaway here should be that both approaches point to a conclusion about the effects of a sudden stop that is very different from the conventional wisdom about the vulnerability of the United States and other nations to a loss of capital inflows.

Let me now lay out the ad hoc model, which is, as I said, based closely on a set of notes by David Romer. I use Romer's approach partly because it is clean and simple, but also because, just as I don't want to be accused of cherry-picking data, I don't want to be accused of devising a model to yield my conclusions. Romer's approach (intended mainly for teaching) has the virtue of having clearly been devised for other purposes, and it's also pretty close to the practical conventional wisdom of working macroeconomists today. His open-economy version is basically the Fleming version of Mundell-Fleming – that is, it treats the capital account as a flow rather than an arbitrage condition. This is not usually the most popular approach in international macro, but Romer is emphasizing the symmetry between domestic investment and net foreign investment, so it makes sense to do it his way. And as we'll see in a moment, that particular formulation turns out to be convenient for my purposes.

The first element in the model is an equation determining the demand for domestic goods. Domestic spending depends on the interest rate; net exports depend on income and the exchange rate:

(1) $y = A(r) + NX(y, e)$

Romer, incidentally, leaves out the effect of y on NX, for simplicity. I put it back in not because it makes any difference to the results in this model but to facilitate comparison to the miniature New Keynesian model of the next section.

Next, we have a balance of payments condition:

(2) $K(r,e) + NX(y,e) = 0$

where, as already indicated, capital inflows are taken to be an increasing function of the domestic interest rate. I have also added in the exchange rate as a determinant of capital flows, because funds

tend to flow into a country whose currency is seen as undervalued, out of one whose currency is seen as overvalued.

For international macro types: Yes, I'm aware that it's much more usual today to think in terms of a stock equilibrium, and that the more or less standard exchange rate equation at least since Dornbusch (1976) has been an arbitrage condition setting expected returns on domestic and foreign bonds – which depend on expected changes in the exchange rate as well as interest rates – equal. It is possible to carry out much the same analysis in that framework, by modeling a sudden stop as a rise in the risk premium. But for simplicity, and also to facilitate comparisons with the analysis in the next section, I have chosen to take this "flow" approach.

Back to the model: How should we interpret (2)? If a country has a fixed exchange rate, and a fortiori if it is part of a broader currency union, (2) should be seen basically as an interest-rate determination equation. As Fleming (1962) pointed out in a very similar framework 60 years ago, the money supply becomes endogenous, with monetary base flowing in or out until balance of payments equilibrium is restored. Notice that this restoration of equilibrium operates through two channels: A higher interest rate attracts capital inflows, but it also depresses the economy and reduces import demand.

Suppose, on the other hand, that a country has an independent currency and a floating exchange rate. In that case, (2) can be seen as an exchange-rate equation, determining *e* given the domestic interest rate, which is set by the central bank.

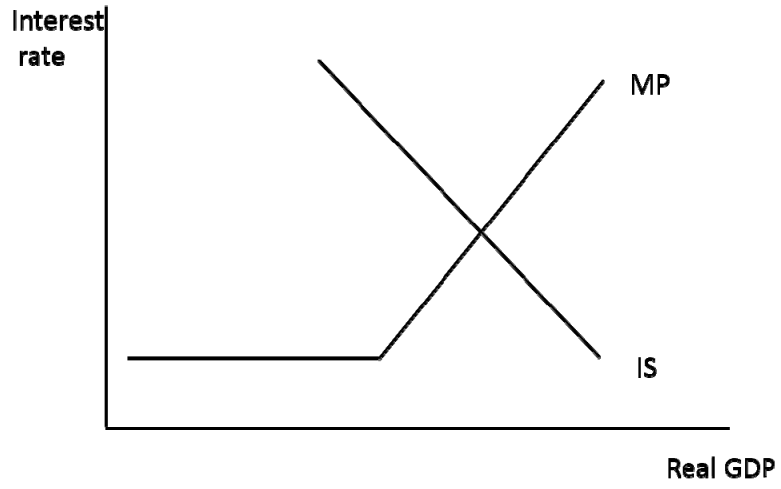
In that case, we need a description of the central bank's behavior. Romer suggests that we represent that behavior by a Taylor-type rule in which the central bank leans against fluctuations in output, possibly constrained by the zero lower bound. This translates into an interest-rate equation of the form

(3) $r = \text{Max}[0, T(y,e)]$

where T() involves both a Taylor-type response to changes in the output gap and, possibly, a leaning-against-the wind response to the exchange rate, as well, reflecting concerns about the inflationary impact of depreciation.

Graphically, we get a picture of short-run equilibrium in normal times that looks like Figure 6. The IS curve is an open-economy version, which takes into account the effect of a lower interest rate in causing currency depreciation and hence boosting net exports. The MP curve, taking the place of the old-fashioned LM curve, shows the central bank leaning against the wind on output, but possibly constrained by the ZLB. (Six or seven years ago most macroeconomists would probably have omitted that flat segment, viewing it as unlikely to matter except in Japan. But the Fed has now been constrained by the zero lower bound for five full years.)

Figure 6



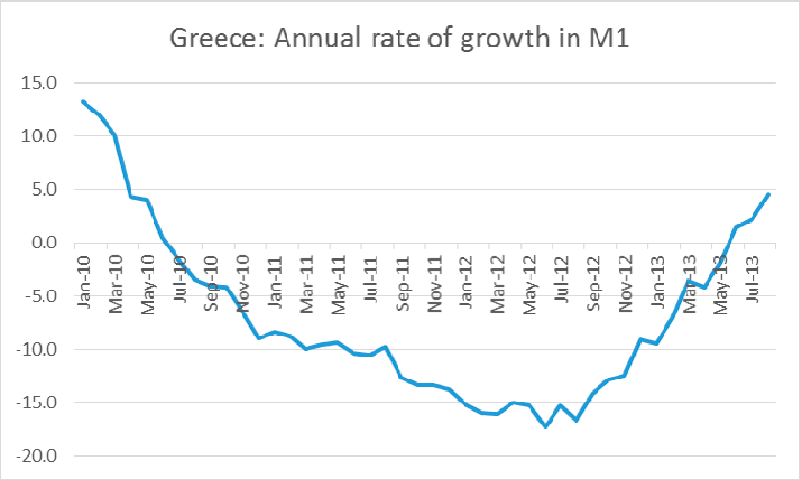
And now, finally, we can examine the effect of a loss of investor confidence in an open economy's bonds, which we can view as a sudden stop – a leftward shift in K(r,e), meaning a reduction in capital inflows at any given interest and exchange rate.

Consider first what happens in a country that is either committed to a fixed exchange rate, or lacks an independent currency. It is immediately apparent that in this case events will unfold in just the way conventional wisdom says: the decline in capital inflows will drive up domestic interest rates far enough

to make equation (2) continue to hold. The rise in rates will accomplish this through two channels: by offering investors more incentive to buy domestic bonds, but also by causing an economic downturn that increases net exports by reducing import demand. So here a loss of confidence, represented as a sudden stop in capital inflows, will indeed lead to a Greek-style scenario of higher rates and a slump in the real economy.

It's important to note, however, that there is also a monetary side to this story. Remember, there are two views of interest rate determination: loanable funds, which says that the interest rate must be such as to match desired savings to desired investment, and liquidity preference, which says that the interest rate must be such as to make people willing to hold the available supply of money. And as Hicks (1937) taught us 65 years ago, both conditions must be met. So how does the liquidity preference condition get satisfied in a Greek-style crisis? The answer is that both higher interest rates and lower GDP reduce the demand for money, so the money supply must contract to maintain equilibrium.

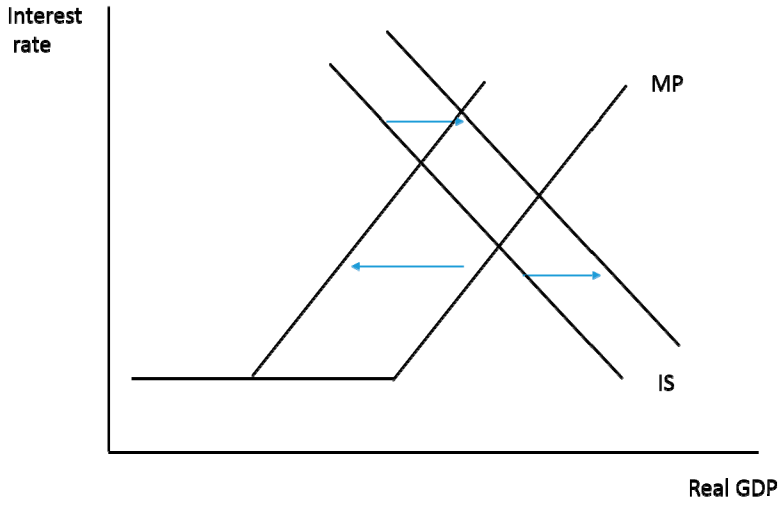
This is in fact what happened in Greece. Figure 7 shows the annual rate of change of Greek M1 since 2009; as you can see, it turned sharply negative for an extended period after crisis struck.



This observation should immediately make you suspicious of claims that a similar crisis could happen in the US or the UK. Why would the Fed or the Bank of England necessarily respond to a foreign loss of confidence by sharply reducing the money supply?

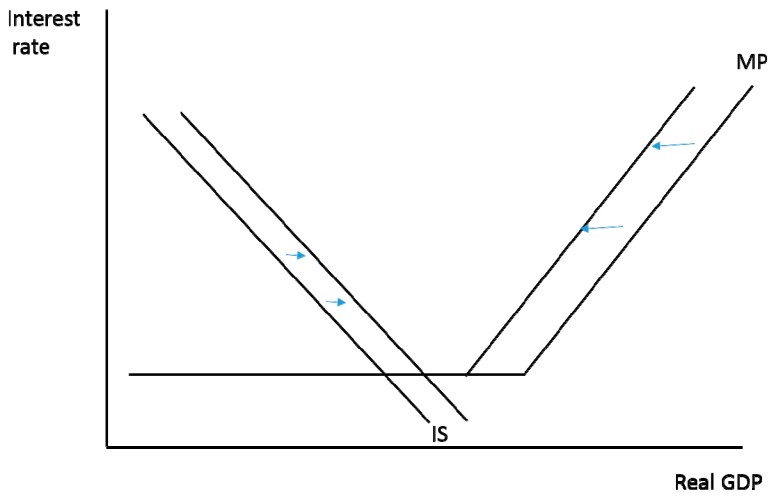
But then what would happen to a country with its own currency and a floating rate confronted with a foreign loss of confidence? Figure 8 illustrates what might happen in normal times. The depreciation of the currency at any given interest rate would increase net exports, and hence shift the IS curve out. This might be the end of the story. As I noted in writing down equation (3), however, the central bank might be concerned about the possible inflationary consequences of depreciation, and would therefore lean against it; in that case the MP schedule would shift up. So interest rates would rise due to rising demand for domestic goods and, possibly, tight money driven by inflation concerns. It is possible, if the latter motive is strong enough, that output could actually fall.

Figure 8



But this story – in which interest rates are driven up by economic expansion, fears of inflation, or both – is not at all the kind of story told by those who portray America as just a step from becoming Greece. And we should, furthermore, bear in mind that right now the US, the UK, and Japan are all stuck in the liquidity trap. (More about Japan later in this talk.) This means that policy is constrained by the zero lower bound – that interest rates are higher than the central bank wants. And this in turn means that any shift in the MP schedule, unless very large, won't lead to a rise in interest rates, as illustrated in Figure 9: all that matters is the rightward shift in the IS curve.

Figure 9



In short, under current conditions the much-feared loss of confidence by foreign investors would be unambiguously *expansionary*, raising output and employment in nations like the US, UK and Japan.

Many people will, I know, object to this conclusion, which seems very counterintuitive – even though it is derived from a standard, off-the-shelf model – and is very much at odds with what almost every policy maker and influential figure has been saying. I'll address some of the objections that have been raised shortly. First, however, let me try to deal with an objection that is more likely to come from economists, namely that the ad hoc representation of demand in this model, and in IS-LM type models in general, is inadequate. Do we get similar conclusions from a model in which spending decisions reflect intertemporal optimization?

3. *The macroeconomics of sudden stops II: A miniature New Keynesian model*

Back-of-the-envelope models like IS-MP still play an important role in economic thinking. My guess is that quite a few economists privately work out their thoughts on scrap paper using such models, before either writing up their insights in a way that avoids explicitly laying out any model at all, or recasting the

basic idea in terms of a model with perfectly rational, intertemporally optimizing agents. The truth is that it's far from clear that the optimizing models are any better as a description of reality than the ad hoc models, and they are in general much harder to work with. Nonetheless, when trying to work out new ideas in macro, especially ideas that conflict with conventional wisdom, the effort of casting those ideas in a New Keynesian framework is often useful, both as a check on the logical consistency of the analysis and as an additional intuition pump, adding to our understanding of the underlying issues.

Incidentally, what do I mean by New Keynesian? Corsetti (2008) defines New Open Economy Macroeconomics, which is generally considered to have begun with Obstfeld and Rogoff (1995) and is essentially just NK in an international context, as involving "general equilibrium models with imperfect competition and nominal rigidities." I would add that imperfect competition mainly plays a supporting role, helping to justify price stickiness as near-rational behavior and explaining why output can temporarily rise above long-run potential. Mainly, the point is to cast spending decisions as the result of optimization over time, while giving short-run analysis a Keynesian feel by assuming temporary price stickiness. Additional imperfections, such as the balance-sheet constraints in Eggertsson and Krugman (2012), can move such models closer to realism.

What I will do here is lay out a miniature NK-type model of sudden stops, as a kind of cross-check on the IS-MP approach of the last section. As we'll see, the model is a bit awkward. It does, however, both confirm the logic of the last section and suggest what I consider a sharper formulation of that logic.

Let us, then, consider an open economy that produces a single good (which we can think, NK-style, of as a composite of many differentiated goods produced by monopolistically competitive firms) that is both consumed domestically and exported. Individuals also consume an imported good. Their preferences may be represented by the utility function

(4) $U = \sum_{t=1}^{\infty} \ln (C_t)(1+\delta)^{-t}$

where δ is the rate of time preference, and

(5) $C = C_H^{(1-\mu)} C_M^{\mu}$

In these equations I have assumed, for simplicity, that both the elasticity of substitution between goods at a point in time and the elasticity of substitution between consumption in different periods are one.

We also need to specify foreign demand for the domestic good. Again for simplicity I assume that this demand is unit-elastic, with the volume of exports X depending on the real exchange rate:

(6) $X = A\frac{P^*}{EP}$

where E is the price of domestic currency in terms of foreign and P, P* are the own-currency prices of domestic and foreign goods. We then have the overall demand for domestic goods as

(7) $y = X + C_H$

Prices are assumed to be fixed one period in advance; the underlying structure of production, which in this kind of model normally involves imperfect competition, is left implicit. Since the only unanticipated shock we consider will be in period 1, this implies production at potential output y_{POT} in period 2 and thereafter.

Like the production side, the monetary side of this economy can be left largely implicit. All that we need is the following: (1) Under fixed exchange rates/common currency the exchange rate is constant at E and the interest rate is endogenous (2) Under floating rates the national central bank can set the one-period nominal interest rate *r* in period 1, and it stabilizes the price of the domestic good thereafter.

Finally, we need to model international capital flows in a way that lets us incorporate the possibility of a sudden stop. There are a number of ways this could be done; the simplest approach I have found is to assume a reverse-L shaped supply of foreign funds willing to hold domestic debt, with the supply perfectly elastic at a rate *r** in terms of foreign currency up to a maximum level of debt D_{MAX} measured in terms of the domestic good, and perfectly inelastic beyond that point. (It doesn't make any substantive difference to set the limit in terms of the foreign good instead.) I assume $r^* < \delta$, which

means that domestic consumption will tend to grow until it hits the upper limit of borrowing, and will in fact assume that the constraint is binding throughout.

It is now straightforward to describe the economy's steady state. Checking the first-order conditions subject to the requirements that output equal potential and that the current account be zero so that debt is unchanged at the maximum level, we find that the domestic interest rate $r = \delta$, and that steady-state consumption of the two goods is

(8) $C_H = (1-\mu)(y_{POT} - \delta D_{MAX})$

(9) $C_M = \mu(y_{POT} - \delta D_{MAX})\frac{PE}{P^*}$

Now, finally, we can consider the effects of a sudden stop. I will represent this shock as an unexpected permanent reduction in the level of debt foreigners are willing to hold, from D_0 to D_1. To achieve this reduction, in period 1 the country must move from a balanced current account to a surplus $D_0 - D_1$. Thereafter it will be in a new steady state, with higher consumption thanks to the reduction in debt. The question, however, is how the required move in the current account takes place in period 1.

Under fixed rates, the answer is clear and corresponds roughly to conventional wisdom: the domestic interest rate must rise, inducing a fall in spending on imports, which are linked to steady-state imports by an Euler condition:

(10) $C_M^1 = C_M^2 \frac{1+\delta}{1+r}$

Unfortunately, the interest rate rise also induces a fall in spending on domestic goods, so output in period 1 will fall. As I said, this more or less corresponds to the conventional wisdom.

But suppose instead that we have a flexible exchange rate, so that the central bank sets *r* and E is free to adjust. And suppose in particular that the central bank holds *r* constant, as it will if the economy is in

a liquidity trap and *r* is at the zero lower bound.[*] Then domestic consumption of domestic goods will actually rise, because of the Euler condition linking it to future consumption:

(11) $C_H^1 = C_H^2 \frac{1+\delta}{1+r}$

Meanwhile, the required external adjustment will take place via currency depreciation, which leads to a rise in exports. As a result, the sudden stop of capital unambiguously leads to *higher* output, not a slump. That is, the result more or less matches our results from the IS-MP approach of the last section.

What's more, this version suggests a quite simple, intuitive explanation of the difference between the two cases. Start from the balance of payments accounting identity:

Capital account + Current account = 0

A loss of foreign confidence produces a sudden stop – a sharp decline in the capital account. This must necessarily be matched by an equally sharp rise in the current account. But the mechanism of that rise is crucially dependent on the currency regime. Under fixed rates, interest rates must rise enough to achieve the current account change through import compression. Under floating rates, the adjustment takes place through depreciation and export growth. As a result, a shock that is contractionary under fixed rates or a common currency is actually expansionary under floating rates. A Greek-style crisis is not something that can happen to the United States or the UK.

[**] I am finessing a tricky issue here: the entry into the liquidity trap itself requires some kind of shock, since we do not think of the zero lower bound as binding in the steady state. The sudden stop must then be overlaid on this preexisting shock. The appendix deals with this complication.

4. *Alternative crisis stories*

In the last two sections I tried to show that the popular story about how a debt crisis might unfold in the United States or the UK doesn't hold together. Again, the usual argument is that a reduction in capital inflows (whose counterpart must be a rise in net exports) will drive up interest rates, causing the economy to slump. If you think about it, this is essentially the same as the classic fallacy of arguing that deficit spending will drive down demand by driving up interest rates; the logic is just wrong, because rates won't rise unless output rises.

But when I have tried laying out this argument to other economists, I have found that in general they recognize the point but argue that real-world complications mean that a sudden stop will nonetheless be contractionary even in countries with independent currencies and floating rates. Why? They offer a variety of reasons. None of these alternative stories resurrects the popular account in which the US or the UK could end up being just like Greece; still, whatever the mechanism, a crisis is a crisis. So how plausible are these alternatives?

In this section I will consider four alternative stories of crisis following a sudden shock. The first two, I will argue, do not hold together under scrutiny, while the rest could apply in some situations.

Long-term versus short-term interest rates

In both the IS-MP model of section 2 and the miniature NK model of section 3 I assumed that under floating rates the central bank can fix "the" interest rate. In reality, however, central banks only directly set short-term rates – yet longer-term rates are what mainly matter for investment decisions. So

couldn't a sudden stop drive up long-term rates regardless of what the central bank does? And couldn't this make the effect contractionary after all?

There are, I would argue, two problems with this proposition, which taken together remove most of its force.

First, the principal determinant of long-term rates is the expected path of short-term rates. Normally we would only expect a large rise in long rates if investors expect short rates to rise sharply in the future. So we're back to asking why the central bank would raise short-term rates; a Taylor rule would say that it will do so only if the economy booms or inflation rises (of which more below), and at the zero lower bound it would require a large shock before there would be any change. That is, focusing on the long rate does not seem to change the basic story.

Second, to the extent that foreign sales of long-term securities might raise long-term rates via changes in the term premium, this effect could easily be offset by actions either at the central bank or at the Treasury. The central bank could simply engage in quantitative easing, buying up long-term debt while selling or issuing short-term assets (including bank reserves); alternatively, the Treasury could engage in an Operation Twist-type move, buying back long term debt while issuing short-term debt. These would actually be equivalent policies if we consider the Treasury and the central bank as a consolidated entity.

It's useful to have a sense of the magnitudes here. Suppose we ask what would happen if the Chinese decided to dump all their U.S. bonds – surely an extreme scenario. But even in this extreme case, note that China's current holdings of long-term U.S. securities other than equities amount to approximately $1.5 trillion, compared with a current Federal Reserve balance sheet of $4 trillion. So the Fed should have no problem offsetting even a complete Chinese bond dump.

The bottom line is that the short-term/long-term interest rate distinction does not appear to offer any channel through which a nation with an independent currency can suffer a decline in output due to reduced foreign willingness to hold its debt.

Banking crisis

Several commentators – for example, Rogoff (2013) -- have suggested that a sudden stop of capital inflows provoked by concerns over sovereign debt would inevitably lead to a banking crisis, and that this crisis would dominate any positive effects from currency depreciation. If correct, this would certainly undermine the optimism I have expressed about how such a scenario would play out.

The question we need to ask here is why, exactly, we should believe that a sudden stop leads to a banking crisis. The argument seems to be that banks would take large losses on their holdings of government bonds. But why, exactly? A country that borrows in its own currency can't be forced into default, and we've just seen that it can't even be forced to raise interest rates. So there is no reason the domestic-currency value of the country's bonds should plunge. The foreign-currency value of those bonds may indeed fall sharply thanks to currency depreciation, but this is only a problem for the banks if they have large liabilities denominated in foreign currency, a topic I address below.

For what it's worth, the historical example that comes nearest to the kind of crisis so widely envisaged – France in the 1920s – involved a very steep currency depreciation, but did not involve a banking crisis. More on that example in the next section.

Private foreign currency debt

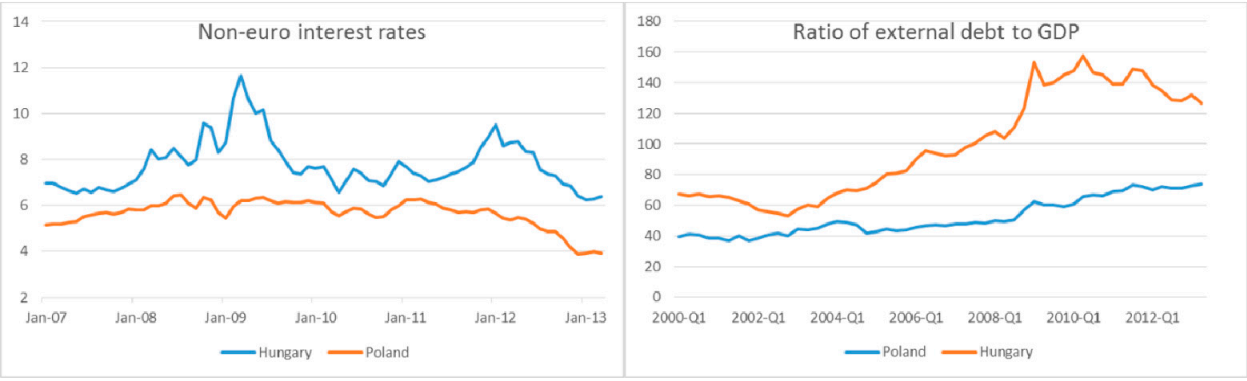
The term "sudden stop" was introduced by Guillermo Calvo in 1998, in an attempt to make sense of the Asian financial crisis then in progress – a crisis that was notable for the steep declines in output that struck economies that had up to that point been growing rapidly. Given this context, it may seem odd to be claiming here that sudden stops need not cause a slump. After all, the Asian crisis countries did not

try to defend fixed parities; all of them experienced large depreciations, with the largest being in Indonesia, which also experienced the deepest slump. Why is this time different?

The answer, however, is clear: Asian economies in 1997-1998, like Argentina in 2001-2002, had large private debts denominated in foreign currencies. As a result, currency depreciation produced large negative balance sheet effects, initially overwhelming any positive effect from rising net exports. Furthermore, private foreign-currency debts can act as a constraint on central banks, which may fear the financial consequences of depreciation and feel compelled to raise rates in an attempt to limit the extent of that depreciation.

In this context, it's worth noting the stark difference in experience among non-euro nations in the European periphery. The left panel of Figure 10 shows 10-year interest rates in Hungary and Poland. Hungary's experience looks not too different from (and not much better than) that of peripheral economies on the euro; although the florint is an independent currency and floats against the euro, it's hard to see much evidence either of policy independence or of insulation from euro-area financial shocks. Poland, on the other hand, has been essentially unaffected by euro area crises of confidence.

Figure 10



Why the difference? Poland does have lower official debt, and especially low net debt. However, Hungary's debt, at less than 80 percent of GDP, is no higher than that of the US or the UK, which have preserved monetary autonomy. On the other hand, as the right panel shows, Hungary has very high

levels of external debt, mainly private – and unlike the external debt of the US or the UK, this debt is denominated in foreign currency. Because of its foreign-currency denomination, Hungarian external debt spiked as a share of GDP in 2008-9 when the florint depreciated, and fear of such valuation effects has constrained Hungarian policy.

So foreign-currency debt, and particularly private-sector foreign-currency debt, can effectively remove monetary autonomy and leave nations vulnerable to severe damage from sudden stops. This is an important caveat to my earlier analysis. It is not, however, relevant to countries that, even though they may have substantial external debt, borrow in their own currencies – that is, to the US and the UK.

Inflation

I've already noted, in the IS-MP version of the theoretical analysis, that one way a sudden stop could lead to rising interest rates and economic contraction is via inflation fears. If the central bank is concerned that a jump in import prices might get built into core inflation and inflation expectations, it may choose to fight currency decline by raising rates so much as to offset the gains from a rise in net exports.

Such an outcome becomes less likely if the country starts in a liquidity trap, which is by definition a situation in which the central bank would like to cut rates but can't. In that case the central bank will see no reason to raise rates, even if it might potentially be worried about inflation, unless the depreciation is quite large; and the depreciation would have to be larger still before any rate rise is big enough to offset the positive effects of increased competitiveness. Still, inflation – and fear of inflation – is a potential channel through which sudden stops can end up being contractionary even for countries with independent currencies and domestic-currency debt. Again, however, it's important to realize that this

channel, if operative, is very different from the popular notion that a cutoff of capital inflows directly causes an interest rate spike and a recession.

And that is really the moral of this section. The conventional view about how a foreign loss of confidence can cause a severe slump in a country with its own currency doesn't hold together. Large foreign-currency debt can effectively undermine monetary independence, as can fears of depreciation-led inflation. However, the major nations with large debts but independent currencies don't have large foreign-currency debt, and are currently quite remote from inflationary pressure. So the crisis story remains very hard to tell.

But what does the historical record tell us? Can we find cases that bear out the debt-worriers' warnings?

5. *Case studies*

Fears of a debt crisis in the US, the UK, or Japan are often portrayed as being rooted in historical experience. When one surveys the historical record, however, examples that bear any resemblance to today's floating-rate debtors are remarkably hard to find. As I noted right at the beginning of this paper, all the current debt-crisis countries are Eurozone members, lacking currency independence. The Asian crisis of the late 1990s wasn't a sovereign debt crisis, and a crucial weakness of the Asian economies was large foreign-currency debt, lacking in the countries we're now looking at. Britain's troubles in the mid-1970s had little to do with sovereign debt, which was low and stable at around 50 percent of GDP, and reflected instead fears of a vicious circle that would worsen already high inflation. And so on down the line.

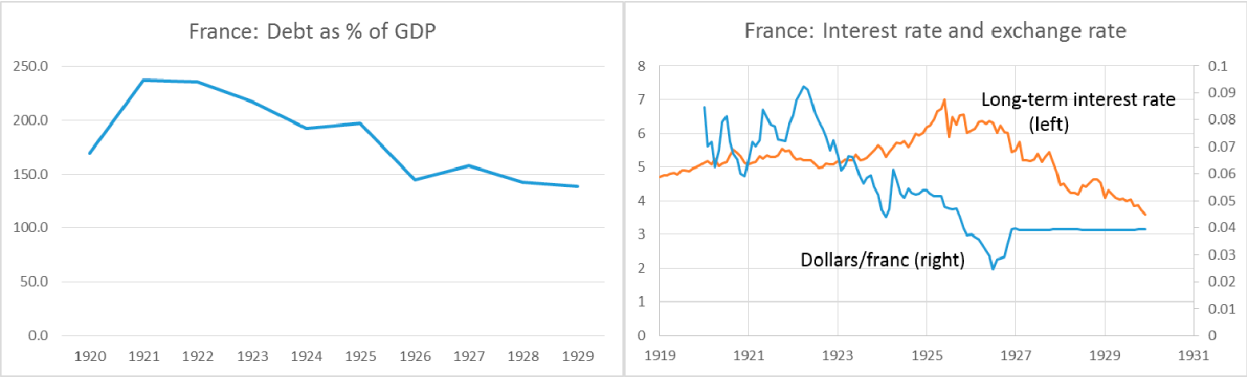
The closest one can come to historical situations at all resembling the situation of today's floating-rate debtors is that of France in the 1920s, which emerged from World War I with a large debt burden

that it had great political difficulty dealing with, and did in fact experience a run on the franc. To this, I will add a surprising modern example: Japan, which arguably has deliberately set out to reduce foreign investor confidence in its bonds. Let's consider these cases in turn.

France in the 1920s

The left panel of Figure 11 shows French sovereign debt as a percentage of GDP from 1920 to 1929. France was victorious, after a fashion, in World War I, but the war killed or disabled many of the nation's able-bodied men, even as it left the government with a debt burden far higher than that of either the US or the UK today, and with net debt well above even Japanese levels. Furthermore, the war had discredited the existing political order, and bitter political strife made it even harder to deal with the debt problem.

Figure 11



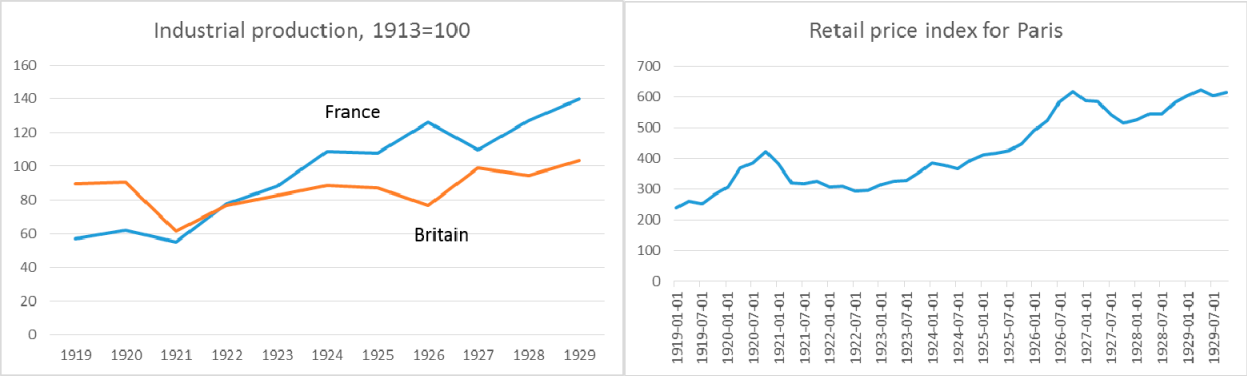
France, in short, might as well have been custom-designed to experience a crisis of confidence. But unlike today's problem debtors, France had a floating exchange rate from the Great War until the Poincare stabilization of 1926. How did its crisis of confidence play out?

The right panel of Figure 11 shows the French exchange rate, in francs per dollar, over the period, along with one measure of long-term interest rates. (Tracking true rates is tricky during this period.

Rogers (1929) showed little rise in commercial paper rates; Hautcoeur and Sicsic (1998), however, estimate a substantial rise in medium-term rates, but only by making strong assumptions). The run on the franc was indeed large, with the currency losing roughly two-thirds of its dollar/gold value between 1922 and 1926. There was, it seems, a rise in interest rates – but this is to be expected, even given the analysis here, in an economy not in a liquidity trap.

What about the real side of the economy? The left panel of Figure 12 shows the evolution of French industrial production, comparing it with British production over the same period. The basic insight is that France grew quite strongly as the franc slid due to loss of confidence. There was a sharp though brief recession in 1927 – but this came after the Poincare stabilization restored confidence and also generated an appreciation of the franc, not as a result of lost confidence.

Figure 12



Finally, France did experience substantial inflation due to the falling franc; the right panel of Figure 12 shows retail prices. It's important, again, to note that unlike today's floating-rate debtors, France was not in a liquidity trap, and indeed was more or less at full employment for much of the period. In context, the inflation was actually helpful, since it eroded the real value of wartime debt.

So what do we learn from France in the 1920s? Here we had a country that, if you believed currently dominant rhetoric, should have been primed for catastrophe: Public debt was over 200 percent of GDP, the political system was dysfunctional, and policymakers had little credibility. What actually happened,

however, was a sharp fall in the franc, substantial inflation, but nothing like a Greek-style crisis, and in fact a quite good performance in terms of real output. Nothing in that story validates the conventional wisdom.

Abenomics

Japan, which has been in a liquidity trap since the 1990s, has long been a problem for analysts who expect high debt levels to lead to high interest rates. We saw in Figure 1 that it is a major outlier if one plots debt against interest rates for all advanced countries, although Figure 2 showed that Japan is far less puzzling if one differentiates between euro and non-euro nations. Investors who have bet on an imminent jump in Japanese rates – and there have been many such investors, dating back at least to S&P's downgrade of Japan in April 2002 – have lost money so consistently that the trade has become known as the "widowmaker."

Interestingly, Japanese officials have never seemed concerned about who will buy their debt. In the United States, warnings that we need to worry about losing the confidence of Asian lenders, in particular China, are standard fare. In 2010, however, Japan's finance minister actually complained to China about its purchases of Japanese bonds, which it claimed were driving up the value of the yen and hurting the nation's exports.

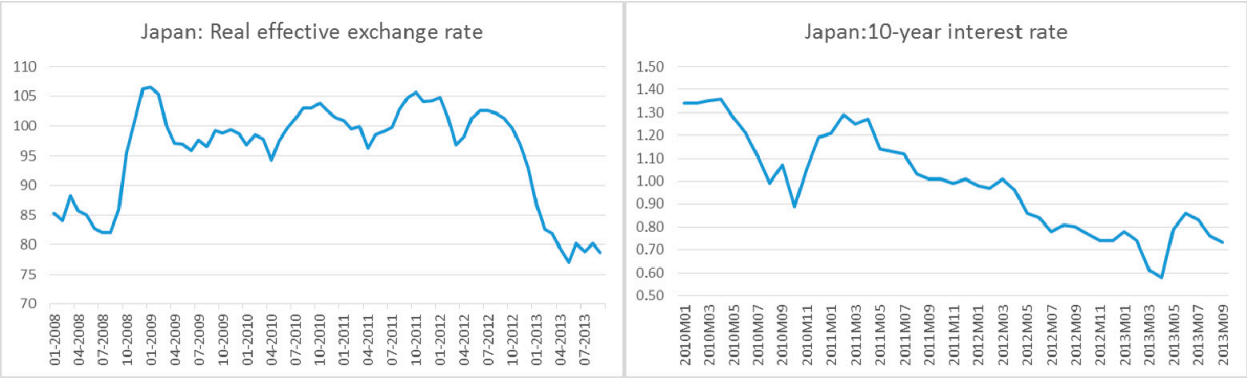
More recently, Prime Minister Shinzo Abe – who has surprised observers with his economic activism – has in effect put into action the long-standing recommendation that the Bank of Japan "credibly promise to be irresponsible" (Krugman 1998) and commit to achieving moderate inflation looking forward. While it's not usual to put it this way, the monetary side of Abenomics can be seen as an effort to engineer exactly the loss of confidence those concerned about a debt crisis fear. That is, it is an attempt to

convince investors in long-term Japanese bonds that part of their investment will be expropriated, albeit via inflation rather than via explicit default.

This effort appears to have been successful, so far. Measuring Japanese inflation expectations is tricky (Mandel and Barnes 2013), but a variety of measures suggest that expected inflation has risen substantially since 2012. My own calculations (Krugman 2013) suggest that Abenomics has raised expected inflation by about 200 basis points. On a 10-year bond with a low nominal interest rate, this amounts to around a 20 percent reduction in real present value.

How has this change in expectations, which other things equal makes Japanese bonds a less attractive investment, affected the Japanese economy? Figure 13 shows 10-year bond rates and the real effective exchange rate. Interest rates haven't risen at all, while Japan has experienced substantial real depreciation. This is what the IS-MP model would predict for a country that has monetary autonomy and starts with short-term interest rates constrained by the zero lower bound.

Figure 13



Meanwhile, it's very early to start assessing effects on the real economy, but for what it is worth Japan has shown considerable strength in 2013, with a dramatic pickup in growth driven largely by the weakened yen. Again, although few think of it this way, the Abe government has in effect engineered a loss of confidence in the real value of Japanese debt – and the results have been entirely positive for the Japanese economy.

6. *Conclusions*

Fear of a Greek-style fiscal and financial crisis has loomed over much of our policy discourse over the past four years, and has played a significant role in shaping actual policy, constituting the principal argument for austerity in countries that don't face any current difficulties in borrowing. However, despite repeated warnings that crises of confidence are imminent in floating-rate debtors – mainly the United States, the UK, and Japan – these crises keep not happening.

Part of the explanation for the failure of disaster to strike on schedule lies in the DeGrauwe point: countries that borrow in their own currencies are simply not vulnerable to the kind of self-fulfilling liquidity crises that have afflicted euro debtors. What I have pointed out in this lecture is that the difficulties with crisis warnings don't stop there. Rather remarkably, nobody seems to have laid out an explicit story about how the predicted crisis would play out. The claim is that interest rates would rise, causing a severe economic slump, but how is this to be reconciled with the ability of the central bank to set short-term rates?

My answer is that claims about the vulnerability of floating-rate debtors to crisis haven't been given any specificity because they do not, in fact, make sense. Simple macroeconomic models suggest that a loss of confidence in a country like the United States, taking place at a time when interest rates are at the zero lower bound, should, if anything, have an expansionary effect. Nor can one appeal to the lessons of history: cases resembling the hypothesized crisis scenario are rare, and those that exist don't support the notion that Greek-style crises can take place under a very different currency regime.

You may find it implausible that conventional wisdom, backed by so many influential people, could be wrong on so basic a point. But it's not the first time that has happened, and it surely won't be the last.

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APPENDIX: SUDDEN STOPS IN THE LIQUIDITY TRAP

In the model of section 3, I set up a hypothetical economy facing an L-shaped supply curve for its overall debt, and I assumed that the discount rate δ was less than the foreign interest rate r^*. In this case we had a steady state in which the domestic interest rate $r = \delta > r^*$, and we could assume that the constraint on foreign holdings of debt was binding.

When we look at the major floating-rate debtors today, however, we see that they are all in the liquidity trap, with nominal short-term interest rates close to zero and real rates negative (except until recently in Japan, thanks to expected deflation.) How can this be fitted into the framework?

First, to get the liquidity trap we need a shift factor on domestic demand, which stands proxy for the things we actually believe have created this situation (housing bust and deleveraging, mainly):

(A1) $C_M^1 = SC_M^2 \frac{1+\delta}{1+r}$

(A2) $C_H^1 = SC_H^2 \frac{1+\delta}{1+r}$

where S<1. We assume that the shift is large enough that the central bank cuts interest rates all the way to zero, and that this isn't enough to restore output to potential.

In that case, however, why are foreign investors willing to hold any domestic debt, ignoring the possibility of a sudden stop?

One realistic answer for the US and UK now is that the whole advanced world is in much the same state, so that we can say that r^* has dropped along with r. But that wasn't true of Japan in the 1990s, so we need to ask how it works when that doesn't happen. And the answer lies in Dornbusch-type logic: our country's currency must depreciate so much that expected appreciation offsets the interest differential, making foreigners willing to hold domestic debt after all.

But what happens to the borrowing constraint? If the demand shift is the whole story, it can't be binding: the combination of lower domestic demand and depreciation means that the country must run

a current account surplus in period 1, and given our assumption that prior to the shock the nation was in a steady state with debt at its maximum, this must mean that the constraint temporarily ceases to bind.

We can, however, now overlay a sudden stop on this situation, pulling in the debt constraint. If this sudden stop is severe enough, the debt constraint becomes binding again: the country is forced to run an even bigger current account surplus, and from that point on the analysis in section 3 carries forward.

So it's a bit messy to incorporate a liquidity trap into the miniature New Keynesian model, but it can be done, and the basic results remain.