The macroeconomics of financial crises: How risk premiums, liquidity traps and perfect traps affect policy options

Manfred Gärtner und Florian Jung

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Department of Economics University of St. Gallen

Editor: Martina Flockerzi
University of St. Gallen
Department of Economics
Varnbüelstrasse 19
CH-9000 St. Gallen
Phone +41 71 224 23 25
Fax +41 71 224 31 35
Email vwaabtass@unisg.ch

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University of St. Gallen
Varnbüelstrasse 19
CH-9000 St. Gallen
Phone +41 71 224 23 25
Fax +41 71 224 31 35

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Author's addresses:

Prof. Manfred Gärtner
Institute of Economics, University of St. Gallen
Bodanstr. 1
CH-9000 St. Gallen
Phone +41 71 224 2307
Fax +41 71 224 2874
Email manfred.gaertner@unisg.ch
Website http://www.fgn.unisg.ch

Florian Jung
Institute of Economics, University of St. Gallen
Bodanstr. 1
CH-9000 St. Gallen
Phone +41 71 224 2310
Fax +41 71 224 2874
Email florian.jung@unisg.ch
Website http://www.fgn.unisg.ch

Abstract

The paper shows that structural models of the *IS-LM* and Mundell-Fleming variety have a lot to tell about the macroeconomics of the current global crisis. In addition to demonstrating how the emergence of risk premiums in money and capital markets may drive economies into recessions, it shows the following: (1) Liquidity traps may occur not only when interest rates approach zero but at positive and/or rising rates as well; (2) Fiscal policy works even in a small, open economy under flexible exchange rates when the country is stuck in a liquidity trap; (3) Near the fringe of liquidity traps, the risk arises of perfect traps, in which neither monetary nor fiscal policy works when used in isolation, but policy coordination is called for; and (4) Massive financial crises in the domestic money market may even destabilize the economy.

Keywords

financial crisis, credit crunch, liquidity trap, zero lower bound, risk premiums, policy options, fiscal policy, monetary policy, open economy.

JEL Classification

E63, F01, F41.

1. Introduction

Micro-based models of the business cycle that were holding a firm grip on research and graduate schools provide little insight into what goes on and what should be done during the current economic crisis. In recognition of this, many renowned macroeconomists are calling for a shift towards a new paradigm.[1] This paper argues that this criticism does not extend to the more traditional explanations of the business cycle found in most intermediate macroeconomics textbooks. More old-fashioned, Keynesian-type models of the *IS-LM* and Mundell-Fleming variety that still feature strongly in many undergraduate curricula may provide valuable insight into why and how a crisis in the US housing market developed into an economic downturn of global dimensions. To gain such insight, we need to broaden our view of the money market to permit liquidity traps – a seasoned concept that has not received much attention of late. We also require a refined look at the financial sector which distinguishes between interest rates in money and capital markets and considers how each one is affected when risk premiums explode.

In a nutshell, we will model the crisis as a demand-side phenomenon using conventional buildings blocks and study the effects of risk premiums that arose in money and capital markets when households ceased to trust banks and banks' confidence in firms vanished. While dormant during normal times, liquidity traps may quickly come into play when such risk premiums grow large. An important lesson in this context is that liquidity traps, with their numbing effect on monetary policy, may crop up even when interest rates are well above zero. Small open economies that are exposed to a financial crisis in the rest of the world may even find themselves in what we will call a *perfect trap*, in which neither monetary nor fiscal policy works and a coordinated effort by the government and the central bank is called for. Finally, substantial risk premiums in the domestic money market may even destabilize the economy at large.

Section 2 introduces the specific perspective taken in this paper by considering a closed economy. Albeit not quite realistic, this provides a preliminary understanding of what happened in the United States of America. Alternatively, it may be understood as modeling how the crisis bears on the global economy. Section 3 looks at small open economies under flexible and fixed exchange rates. It starts with the assumption of a simultaneous eruption of financial crises in the domestic and foreign economies. However, asymmetries are also considered, in the sense that risk premiums at home and abroad may differ in one way or another or

[1] See, for example, Akerlof and Shiller (2009), Buiter (2009) and Wyplosz (2009).

may be limited to either the money or the capital market. While section 3 focuses on the standards tools of fiscal and monetary policy-making, section 4 comments on less orthodox proposals that were put forth during and after the dot-com bubble that climaxed in 2000. Many of these have encouraged policymakers to influence inflation and depreciation expectations. Section 5 provides a brief summary.

2. The closed economy

The seasoned workhorse for analyses of an economy's demand side combines stylized views of the money market and the goods market into the *IS-LM* model. Introduced by Hicks (1937) as a graphical interpretation of John Maynard Keynes' work, the positively sloped *LM* curve collects pairs of interest rates and income levels that match liquidity demand to an exogenous supply; the negatively sloped *IS* curve shows pairs that equate supply and demand in the goods market (figure 1). While there had been extended and often heated discussion about the implications and relevance of limiting cases in the 1950s and 1960s,[2] and in particular regarding the concept of a horizontal or vertical *LM* curve, nowadays most textbooks are content with a discussion of the standard case cut out by the grey rectangle in figure 1.

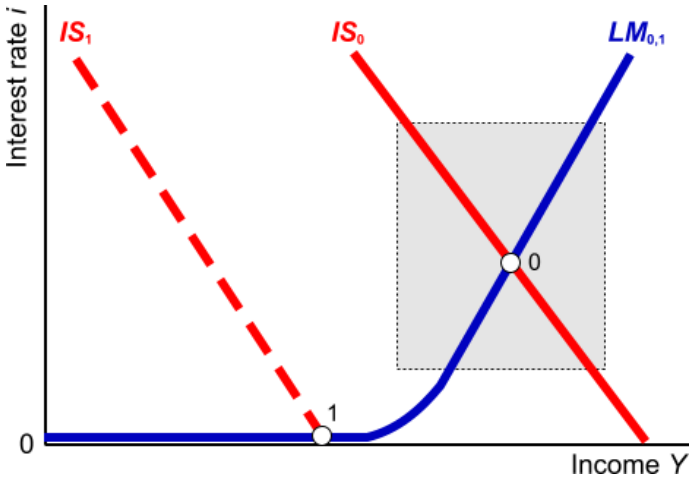

Figure 1: *IS-LM* with and without liquidity trap

[2] See, for example, Brunner and Meltzer (1968).

2.1. The liquidity trap

The policy implications of the limiting cases are revealed after writing both market equilibria in general terms, where the *LM* curve is implicitly determined by the money market equilibrium condition

$$\frac{M}{P} = L(i, Y) \tag{1}$$

and the *IS* curve is given by the goods market equilibrium condition

$$Y = C(Y) + I(i) + G - T \tag{2}$$

with *M*, *P*, *Y*, *G* and *T* and *i* denoting the money supply, the price level, real income, government spending, taxes and the nominal interest rate, respectively. *L*(.), *C*(.) and *I*(.) are functions relating consumption, investment and money demand, respectively, to the variable(s) given in parentheses. Using the implicit function rule, we find that fiscal and monetary policy, respectively, affect equilibrium income according to

$$\left.\frac{dY}{dG}\right|_{dT=dM=0} = \frac{L_i}{(1-C_Y)L_i + L_Y I_i} > 0 \tag{3}$$

and

$$\left.\frac{dY}{dM}\right|_{dG=dT=0} = \frac{I_i}{(1-C_Y)L_i + L_Y I_i} > 0 \tag{4}$$

due to L_i, I_i, $(1 - C_Y)L_i + L_Y I_i < 0$.

As eq. (4) shows, the money supply ceases to affect income when the interest elasticity of the demand for money becomes infinitely small, requiring $L_i \to -\infty$, which happens when the interest rate approaches zero and is the very reason why the *LM* curve turns horizontal. Since a horizontal *LM* curve also eliminates crowding out, fiscal policy becomes more potent when the economy finds itself in a liquidity trap.[3]

The case of an intersection between *IS* and *LM* on the horizontal segment of the *LM* curve was a topic included in Hicks' (1937) seminal contribution, but it was considered to be

[3] The direction of this effect can be extracted from eq. (3), where $\frac{\partial\left[\frac{L_i}{(1-C_Y)L_i + L_Y I_i}\right]}{\partial L_i} = \frac{L_Y I_i}{[(1-C_Y)L_i + L_Y I_i]^2} < 0$ and its limiting value is $\lim_{L_i \to -\infty}\left[\frac{L_i}{(1-C_Y)L_i + L_Y I_i}\right] = \frac{1}{(1-C_Y)}$, which is the full Keynesian multiplier.

of academic rather than practical relevance for quite some time. After all, nominal interest rates near zero were rarely observed. The only widely documented cases of such in major industrial countries were during Japan's lost decade, the 1990s, for which Paul Krugman offered a liquidity-trap interpretation in a number of contributions – and, of course, the US during the Great Depression in the 1930s.[4]

2.2. Risk premiums

Key elements that triggered the current economic crisis included the emergence of substantial risk premiums in various areas of the financial sector. An interesting and important consequence of the emergence of this kind of uncertainty is that the economy may fall into a liquidity trap and conventional monetary policy may become ineffective even if interest rates still hover way above zero.

Simplifications in the conventional *IS-LM* model camouflage the role of banks as financial intermediaries linking the *money market* and the *capital market*. This is because *i* denotes two interest rates at the same time. It is the money market rate i_M that banks pay to households and other players who optimize liquidity by parking money in short-term financial instruments, including bonds and savings accounts. And it is the interest rate i_C at which they provide long-term financing for the investment projects of firms in the capital market. If we assume that perfect competition prevents banks from charging a mark-up over their capital costs when they extend credit to firms, matters simplify such that $i = i_M = i_C$ and the capital market fades from the picture.

In addition, since default risk does not feature in textbook discussions of *IS-LM*, *i* also denotes the return that households may expect in the money market and that banks may expect in the capital market. This changes when one sector of the economy loses faith in another. Suppose that households expect one in ten banks not to survive this year. If they possess no information as to which banks will fail, they will expect a ten percent loss in the value of assets deposited with any of the banks. They will demand compensation for taking this risk, which is to come in the form of a risk premium of 10 percent, such that their expected return r_M equals the interest rate minus the risk premium RP_M, i.e. $r_M = i - RP_M$. Since it is this *expected* return that determines liquidity demand, the equilibrium condition in the money market, the *LM* curve reads $\frac{M}{P} = L(r_M, Y)$. In terms of the graphical *IS-LM* model, this means

[4] See Krugman (1998, 2000 and Boianovsky (2004), who looked at Krugman's contribution and the discussion triggered by this work, including Svensson (2001, 2003) and Coenen and Wieland (2003), from the wider perspective of the history of economic thought.

that when an emerging financial crisis undermines the public's trust in their banks, the *LM* curve shifts upwards by RP_M, the risk premium requested in the money market (figure 2).[5]

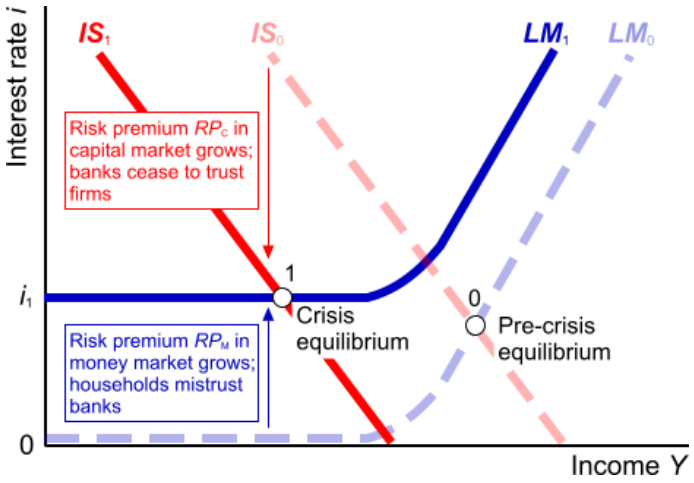

Figure 2: Risk premiums and the liquidity trap in *IS-LM*

During the current crisis, not only did the public's trust in banks deteriorate, but banks became increasingly uncertain as to which non-financial firms would be able to weather the storm that was in the making. Again, if banks expect one in five car companies to file for bankruptcy within twelve months, this creates a risk premium of 20 percent in this part of the capital market. Banks add this to their own capital costs, the interest rate i they pay in the money market. Generally, in the capital market, firms are charged an interest rate of

$$i_C = i + RP_C \qquad (5)$$

for their long-term financing.[6] This turns the investment demand equation into $I = I(i + RP_C)$ and has the effect that, in an *i-Y* diagram, the *IS* curve shifts *down* when the risk premium RP_C increases.[7] The intuition is that at any given interest rate i, which banks pay for deposits, firms

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[5] The macroeconomic effects are $\frac{dY}{dRP_M} = \frac{L_{r_M} I_i}{(1-C_Y)L_{r_M} + L_Y I_i} < 0$ and $\frac{di}{dRP_M} = \frac{L_{r_M}(1-C_Y)}{(1-C_Y)L_{r_M} + L_Y I_i} > 0$ for $dG = dT = dM = 0$ with $L_{r_M} < 0$. In this general perspective the zero bound that defines a liquidity trap no longer refers to the nominal interest rate but to expected nominal returns instead.

[6] Here and in what follows we assume that households cannot finance the investments of firms directly. If they could do so without or at low costs, they would bypass banks, undercut their interest rates and still expect a higher return than that from their bank deposits.

[7] The corresponding formal expressions read $\frac{dY}{dRP_C} = \frac{L_{r_M} I_{i_C}}{(1-C_Y)L_{r_M} + L_Y I_{i_C}} < 0$ and $\frac{di}{dRP_C} = \frac{-L_Y I_{i_C}}{(1-C_Y)L_{r_M} + L_Y I_{i_C}} < 0$ with $I_{i_C} < 0$ and $dG = dT = dM = dRP_M = 0$. Comparing these results with those given in footnote 5 yields two important insights. First, if both risk premiums increase, the change in the equilibrium interest rate depends on

have to pay a higher interest rate for loans from their bank and, therefore, reduce their investments.

Figure 2 reveals a number of important insights:

1. When a financial crisis erupts during which risk premiums increase substantially, the economy might be driven into a *liquidity trap at strictly positive interest rates*. In fact, if crisis developments in the money market dominate, *interest rates may even increase while such a liquidity trap forms*.

2. As in a conventional liquidity trap, *monetary policy does not work*. What may be puzzling and unfamiliar in the case of a liquidity trap that is triggered by a financial crisis, however, is that a trap forms and monetary policy becomes ineffective *even though the conventional signs of a liquidity trap are missing*.

3. Fiscal policy works. However, it has two drawbacks. First, if it attempts to keep income from falling below the pre-crisis level, it drives interest rates up to rather high levels, with serious negative consequences for economic development in the longer run. Second, deficit spending has to continue year after year as long as the crisis lasts, which then drives government debt higher and higher. Hence, while fiscal policy is an indispensable short-run remedy, it must be accompanied by measures that remove the very cause of the financial crisis, rebuilding confidence (in banks in particular) and thus easing risk premiums.[8]

2.3. Aggregate demand and looming deflation

Liquidity traps not only render monetary policy ineffective but also make real income immune to any increase in the real money supply, no matter whether it is caused by an expansion of the nominal money supply or a falling price level.

Under normal circumstances, when the economy is not in a liquidity trap, a decreasing price level moves the *LM* curve to the right and raises equilibrium income. This is the mechanism behind a downward-sloping aggregate demand (*AD*) curve in a price-income diagram, which intersects the aggregate supply curve, drawn as a vertical line for convenience in figure 3, at potential income and the equilibrium price level. Once the real money supply becomes large enough, however, because prices have dropped below a certain threshold, the interest rate is stuck and income ceases to respond. This equips the *AD* curve, any *AD* curve,

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the relative magnitude of those increases, whereas the effect on income is always negative. Second, the only impact that vanishes in a liquidity trap is that of the risk premium in the capital market on the interest rate.

[8] Measures that can and have been taken in this context include outright bailouts, the creation of bad banks, government guarantees, or even nationalization.

with a vertical segment.[9] This element is routinely ignored because normal macroeconomic equilibria occur at the downward-sloping segment of *AD* (see the pre-crisis equilibrium in figure 3).

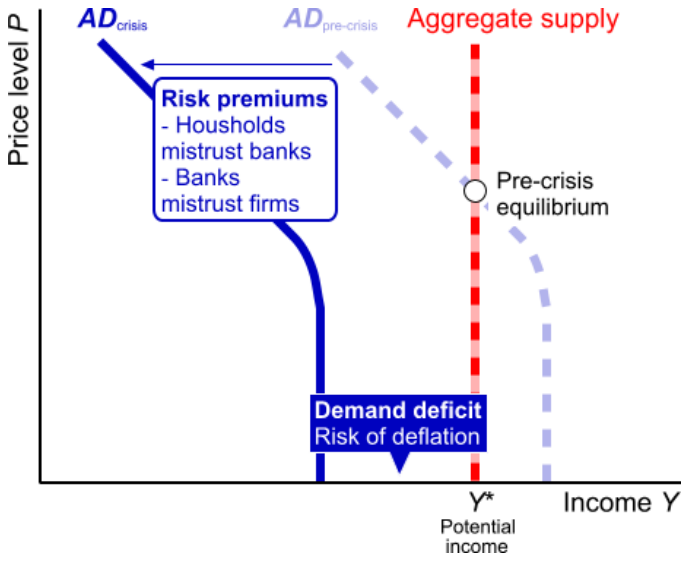

Figure 3: A financial crisis in the *AD-AS* model

A financial crisis caused by increasing risk premiums in the money and/or the capital markets reduces demand-side equilibrium income at any given price level. This is tantamount to shifting the *AD* curve to the left. Under normal circumstances, this is not a severe problem, since while this happens, falling prices (which raise the real money supply and drive interest rates down) can keep aggregate demand in line with aggregate supply. The only caveat is that prices are even stickier downward than upward. This may require policy intervention—which could include fiscal or monetary policy—even during normal times, when full employment equilibrium exists.

If a serious financial crisis hits and the shift of the *AD* curve is massive, however, *AD* may lose contact with the *AS* curve. This would erase the full-employment equilibrium and render the economy inherently unstable. In such a case, unemployment not only features and persists in the fixed-price world of the *IS-LM* model, but even when prices are permitted to be perfectly flexible.[10] We will return to this important result below and show that it has additional and interesting implications for the options of policy makers in small open economies.

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[9] There is even a possibility that the *AD* curve becomes positively sloped, bending away from the *AS* curve, when prices move down. This is because deflation drives up real interest rates once nominal interest rates are stopped by the lower bound of zero for nominal rates.

[10] Krugman (2000) elaborates on this and shows in the context of a basic optimizing model that even taking into account the wealth effects of falling prices, which the *IS-LM* model ignores, is not enough to prevent deflation.

3. The open economy

Countries or regions that may be studied as isolated entities and for which the concept of a closed economy fits at least as a first approximation are rare. Normally, financial crises have cross-border repercussions through international trade and capital flows. For such an economy, the Mundell-Fleming model is a much better abstraction than the *IS-LM* model, from which the international capital market is lacking.

3.1. A global financial crisis

Suppose a global financial crisis emerges, which we define as the kind of risk and uncertainty that were described in section 2, not only in one isolated country but in major parts of the world. These parts may exclude or include our own small open economy. We study the latter case first.

3.1.1. *A global financial crisis that includes our country*

Let our small open economy be represented by the Mundell-Fleming model in the left panel of figure 4 and the rest of the world by the *IS-LM* model in the panel on the right. Both regions are linked via international capital markets and trade. Perfect capital mobility ensures that expected returns in capital markets are equalized across borders, which provides the equilibrium condition $i_C - RP_C = i_C^W - RP_C^W$. Under the assumption that these expected returns equal the capital costs that banks incur in their respective domestic money markets [see also eq. (5)], we have $i = i_C - RP_C$ and $i^W = i_C^W - RP_C^W$, which permits us to write the foreign exchange market equilibrium condition as $i = i^W$. This means that money market interest rates, the rates that graphical *IS-LM* and Mundell-Fleming models routinely feature on the vertical axis, are the same in all countries, even when risk premiums occur in and differ between money and capital markets, and both are permitted to vary between countries.

These two regions have settled into their pre-crisis equilibria, in which the rest of the world determines the world interest rate i^W and, thus, the position of the foreign-exchange-market equilibrium line, the *FE* curve, for the small open economy. The equilibrium condition for the goods market in this small open economy then reads

$$Y = C(Y) + I(i_C) + G - T + EX(R, Y^W(RP_C^W, RP_M^W)) - IM(R, Y) \qquad (6)$$

with $i_C = i^W(RP_C^W, RP_M^W) + RP_C$, where R and Y^W denote the real exchange rate and world income, respectively, and the money market equilibrium is given by

$$M = L(r_M, Y) \tag{7}$$

with the expected return at home now determined by $r_M = i^W(RP_C^W, RP_M^W) - RP_M$.[11]

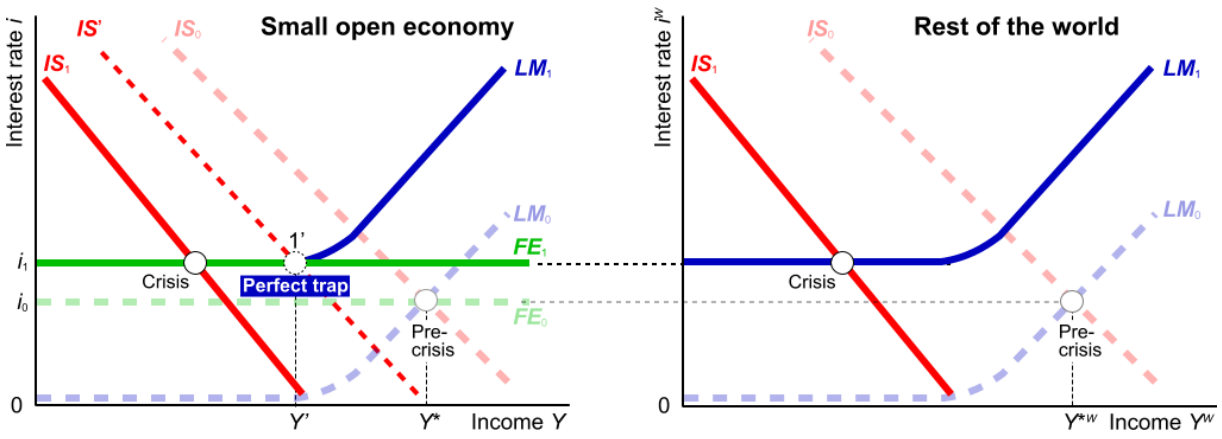

Figure 4: A global financial crisis

Now we see a global financial crisis erupting that affects money and capital markets in all parts of the world in a similar fashion. Let the effects on the capital markets be strong enough to move the rest of the world into a *IS-LM* liquidity trap as described in section 2. With more or less the same effects in the small open economy, this moves the *FE* curve into a position on top of the horizontal segment of the small open economy's *LM* curve, generating a *Mundell-Fleming liquidity trap*.[12] The crisis affects the rest of the world's policy options the same way it did in the closed-economy scenario discussed above: a fiscal expansion stimulates income, but a monetary expansion does not. The options associated with the small open economy may differ significantly, however, and depend on the exchange rate system.

Under flexible exchange rates, *the usual options for a small open economy are reversed*. With a liquidity trap, conventional *monetary policy does not work* any longer. A mon-

[11] The analysis carried out in section 2 now applies to the rest of the world, as captured by the *IS-LM* model. Therefore, we already know the effects of the two foreign risk premiums on world income and on the world interest rate. Since our focus is on the consequences of financial disruptions, we refrain from showing other exogenous global variables.

[12] Only when there are no transaction costs in financial markets does the Mundell-Fleming liquidity trap require the positioning of the *FE* curve exactly on top of the horizontal segment of the *LM* curve. In a more realistic setting, when financial investors do face transaction costs, these costs define a zone around the *LM* curve's horizontal section in which liquidity traps occur.

etary expansion shifts *LM* to the right. However, since this affects neither the interest rate nor the exchange rate when the equilibrium is located on the horizontal segment of the *LM* curve, it does not transmit to the market for goods and services and, therefore, does not bear on demand-side equilibrium income. *Fiscal policy*, on the other hand, *works*. Because the domestic interest rate does *not* respond when an increase in government spending moves *IS* to the right, no foreign capital is attracted. The exchange rate does not appreciate, as it would under normal circumstances, and therefore, crowding out is avoided.[13,14]

This is not the whole story, however. Since the argument as to why fiscal policy works only applies as long as the equilibrium point remains on the horizontal section of the *LM* curve, a fiscal stimulus package may at best dampen the recession in the small open economy, but it cannot prevent it. In order to keep income at potential income *Y**, the government would have to move the *IS* curve all the way back and even beyond its original locus, labeled IS_0. But as soon as the *IS* curve reaches the position *IS*', intersecting the *LM* curve exactly where its horizontal segment ends, *crowding out* via exchange rate appreciation sets in. Any further increases in government spending would go entirely at the cost of reduced exports.

An equilibrium with the properties of point 1' may be labeled a *perfect trap*, since neither monetary nor fiscal policy works. Fortunately, this is still not the end of the story. To see this, we recall our discussion of the *AD* curve in figure 3 and bring monetary policy back into play:

1. When the economy is trapped in a point such as 1' in figure 4, the *AD* curve turns vertical at income *Y'*.[15] Aggregate demand falls significantly short of aggregate supply and exercises downward pressure on prices. As we have learned, price reductions cannot remedy

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[13] The small open economy's *Mundell-Fleming liquidity trap* warrants a few comments. Since this crisis equilibrium is located where the *IS* curve intersects the horizontal segment of the *LM* curve, which coincides with the horizontal *FE* curve, we are down to two independent equations to use in determining three endogenous variables. Mathematically, this leaves the (real) exchange rate and, hence, the position of the *IS* curve undetermined. One way to solve this problem is by drawing on the path that led the economy into this trap. Suppose the economy sits in pre-crisis equilibrium at time t_0, with a unique exchange rate. Now risk premiums explode and push the economy into the liquidity trap associated with the crisis equilibrium. Since along the horizontal segment of the *LM* curve no market forces bear on the exchange rate, we may safely assume that it remains where it was before risk premiums exploded, actually making it an exogenous variable for as long as the economy remains caught in this trap.

[14] For a formal analysis of the impact of various forms of financial crises (as reflected in exploding risk premiums) on domestic income when the small open economy is not caught in a Mundell-Fleming liquidity trap, see the Appendix.

[15] Only when the economy is stuck in a perfect trap, where fiscal policy also ceases to work, does the *AD* curve turn vertical at income *Y'*. If the economy is liquidity-trapped at other income levels to the left of Y', it is these particular incomes, which reflect fiscal policy, risk premiums and other factors, at which the *AD* curve bends into a vertical line.

the spending deficit. However, if the *LM* curve is shifted to the right, falling prices play an important passive role, extending the income range at which fiscal policy is still effective. And once prices have fallen enough (and the real money supply has risen enough to extend the horizontal segment of the *LM* curve all the way to potential income *Y**), fiscal policy may even spend the economy out of the recession entirely.

This mechanism might take time, however—considerable time. If the required patience is not there, or if it appears too risky to let deflation begin, given that it may spiral out of control, or if the side-effects of a severe temporary recession are considered too costly, monetary policy may be used to the same effect as falling prices.

2. When the economy is trapped and fiscal policy has become ineffective in a point such as 1', the central bank may pave the way for further successful fiscal stimulation. While providing the economy with more liquidity does not directly bear on aggregate demand, it invigorates fiscal policy and may extend the range over which it can be implemented successfully all the way towards potential income *Y**. So the lesson to be drawn from this is that the best bet for a small open economy to end a recession triggered by a global financial crisis is a coordinated effort by the government and the central bank, in which monetary policy adopts a passive, accommodating role and fiscal policy has the task of using the provided leeway to directly boost the demand for goods and services.

As an alternative to our treatment of fiscal and monetary policy, a small open economy driven into a liquidity trap by a global financial crisis can also *fix the exchange rate* and then devalue its currency. This would have the same aggregate effect as a fiscal expansion under flexible or fixed exchange rates, though the resulting composition of aggregate demand would differ. Note, however, that this option only works if other countries do not respond in the same fashion. If a small state's devaluation triggers competitive devaluation among other countries, this effect vanishes.[16]

3.1.2. *A global financial crisis that happens in the rest of the world*

Assume next that the crisis is not symmetric but generates risk premiums in the rest of the world only, sparing out our country's banks and industry.

Starting with flexible exchange rates, figure 5 shows how the small open economy responds to a banking crisis in the rest of the world. This crisis drives up the world interest

[16] This proposal is related to but differs from the advice to generate depreciation and inflation expectations, which has received some attention in the aftermath of the bursting of the dotcom bubble. We will take a brief look at this aspect in section 4.

rate, and the unexciting standard result applies where the home currency depreciates and stimulates exports, generating a boom.[17]

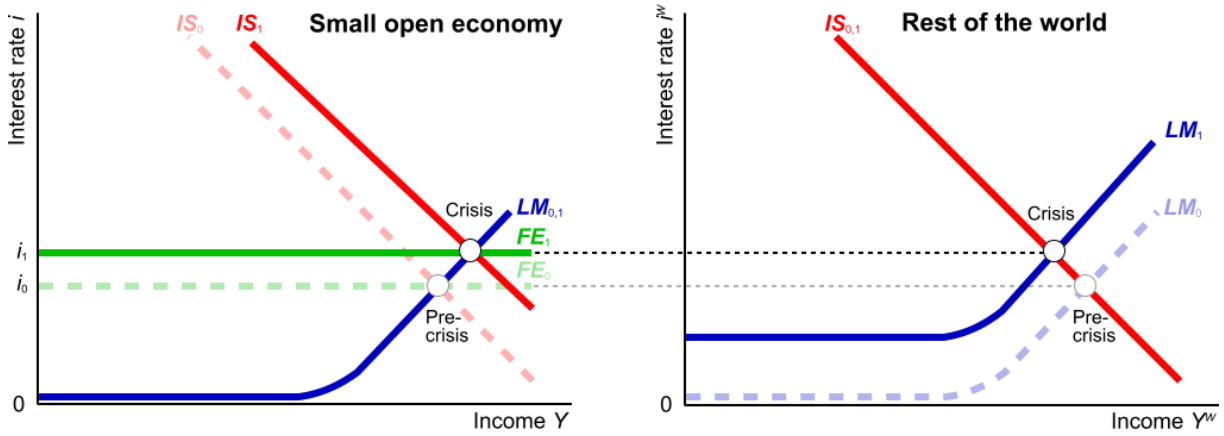

Figure 5: Foreign banks in crisis; flexible exchange rates

If confidence in foreign firms deteriorates, affecting the rest of the world's capital markets and driving the world interest rate down, the same mechanism discussed before drives the home country into recession (figure 6). As long as interest rates at home and abroad remain positive, standard results and policy options continue to apply. Once interest rates approach zero, however, the small open economy gets caught in a *perfect trap* in which neither monetary nor fiscal policy works. As already described above, the only way to stimulate aggregate demand in such a situation is by means of a coordinated effort on the part of the government and the central bank, in which fiscal policy plays an active and monetary policy a supporting role.

[17] Note that, for the sake of transparency, figure 5 and the discussions below ignore the effect of changes in foreign income on the domestic economy. In most cases this does not affect the aggregate response in qualitative terms, often not even quantitatively. In figure 5, for example, the global recession would shift the domestic *IS* curve to the left. Again, however, a (now even stronger) depreciation of the home currency would shift the goods market equilibrium line into the position IS_1.

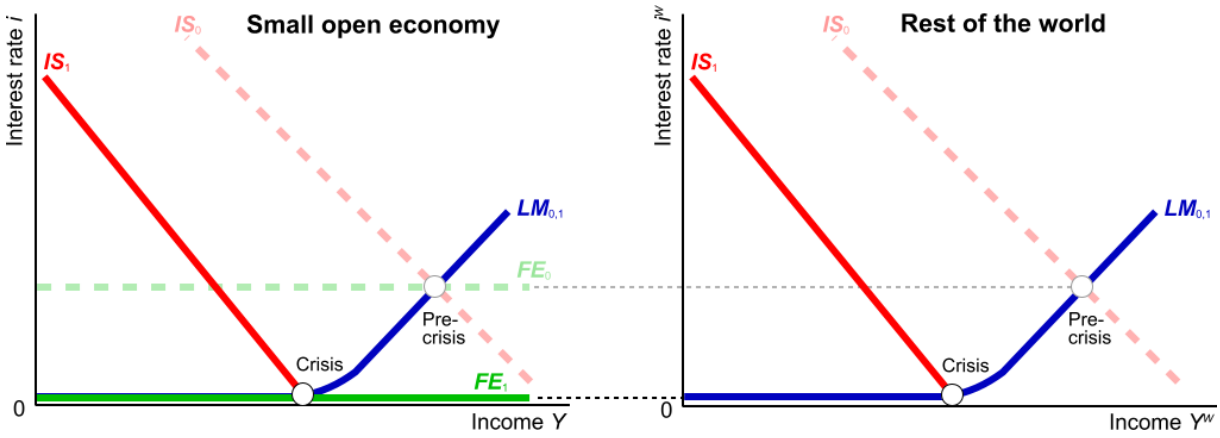

Figure 6: Foreign firms in crisis; flexible exchange rates

Under fixed exchange rates established, well-known results from open economy macroeconomics also obtain. When a banking crisis abroad raises the world interest rate, the small open economy is forced to defend the exchange rate by purchasing home currency and, thereby, reducing the money supply. The result is a recession with reduced investment spending (figure 7) that can only be avoided or cushioned by means of fiscal policy or a devaluation of the domestic currency.

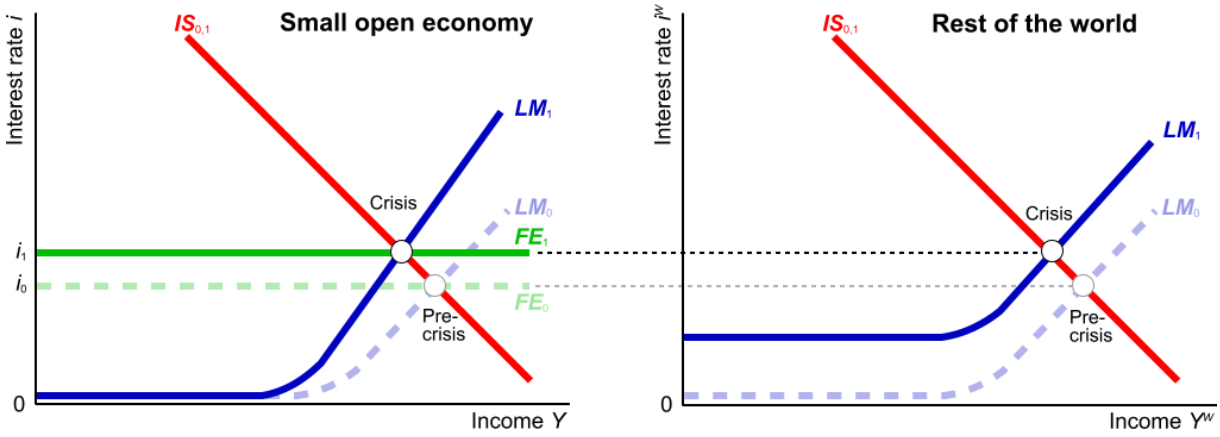

Figure 7: Foreign banks in crisis; fixed exchange rates

Again, when foreign firms run into serious trouble instead, and the world interest rate drops towards zero, this drags the home country into a liquidity trap. This is because mandatory foreign exchange market intervention forces the central bank to expand the money supply until the home money market rate approaches zero (see figure 8). Technically, a *perfect trap* obtains, since neither monetary nor fiscal policy works. The difference between this scenario and the *perfect traps* discussed above is that the economy booms and the main threat is looming inflation rather than unemployment.

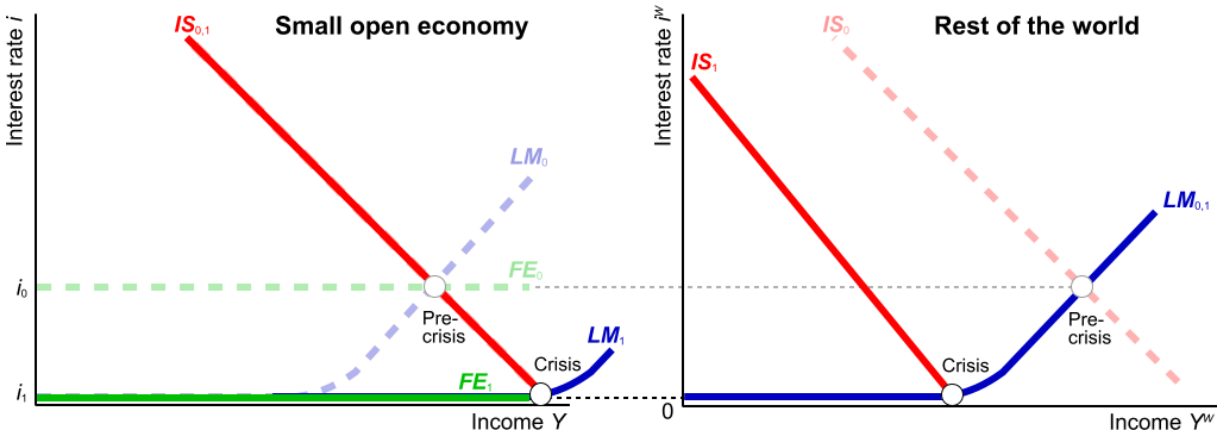

Figure 8: Foreign firms in crisis; fixed exchange rates

3.2. A domestic financial crisis

We now turn to asymmetric scenarios in which financial crises occur in domestic money or capital markets. Common to all four cases discussed below is the fact that the global interest rate and, hence, the position of the *FE* curve remains fixed.

3.2.1. *Flexible exchange rates*

Depending on the magnitude of the evolving risk premium, a crisis in a small open economy's money market involves a moderate case with standard policy options and a much more serious case in which standard recipes fail and the economy may slide into a depression of epic dimensions.

Consider figure 9, where a modest confidence crisis in the money market would push the domestic *LM* curve into LM_1. Because of the resulting exchange rate, appreciation exports shrink and the economy slides into a recession. However, expansionary monetary policy can be used to counteract this downturn.

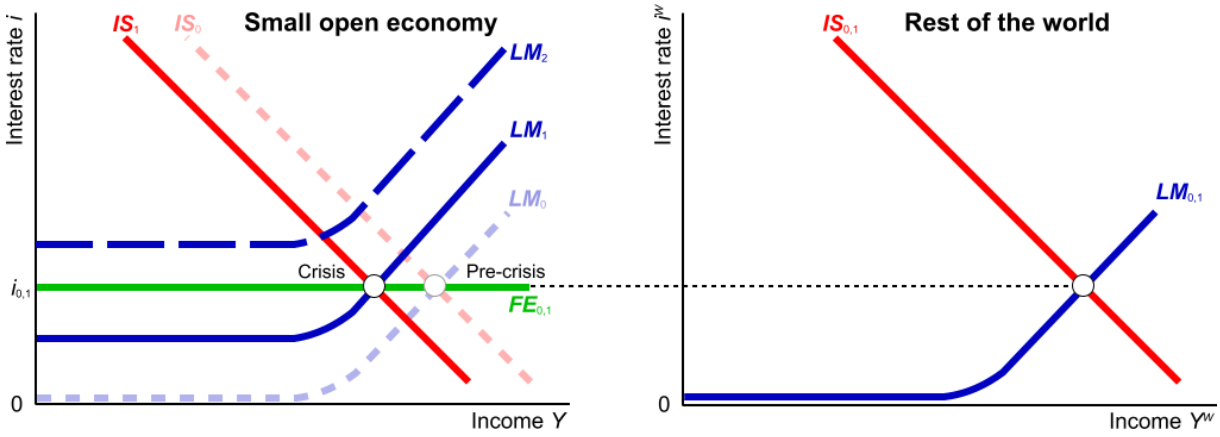

Figure 9: Domestic banks in crisis; flexible exchange rates

A more serious and widespread banking crisis could breed a risk premium large enough to push the *LM* curve into a position such as LM_2. Since this makes *LM* and *FE* lose contact, no more simultaneous equilibrium in the money and capital markets exists. With an incipient equilibrium in the domestic money market at the point of intersection between IS_0 and LM_2, domestic interest rates and expected returns exceed those abroad and thereby attract foreign capital, which makes the home currency appreciate. As a result, the *IS* curve shifts left, and it keeps doing so as long as policymakers do not intervene, driving the economy from the initial recession into a full-scale depression. Fiscal policy may be used to counteract this downturn, but since it cannot re-establish stability, it will eventually run out of ammunition. In order to bring the economy back from the abyss of a depression, unconventional structural measures are needed that can help overcome the confidence crisis in domestic banks.

There is a special case that lies between the two described cases, in which a *perfect trap* looms. For this to occur, the risk premium in the domestic money market would have to equal the world interest rate in order to push the horizontal segment of the *LM* curve exactly onto the *FE* curve.

If the crisis originates in the domestic capital market, the rising risk premium depresses investment demand. But since the flexible exchange rate permits the home currency to depreciate, there is full crowding-in via export demand, and aggregate income remains where it was before the crisis hit.

3.2.2. *Fixed exchange rates*

As was the case under flexible exchange rates, the consequences of a financial crisis originating in the domestic money market depend on its magnitude. If the risk premium remains moderate, moving the *LM* curve only as far as LM_1, the requirement of defending the exchange rate forces the central bank to expand the money supply so as to keep the economy in the initial equilibrium (see figure 10).

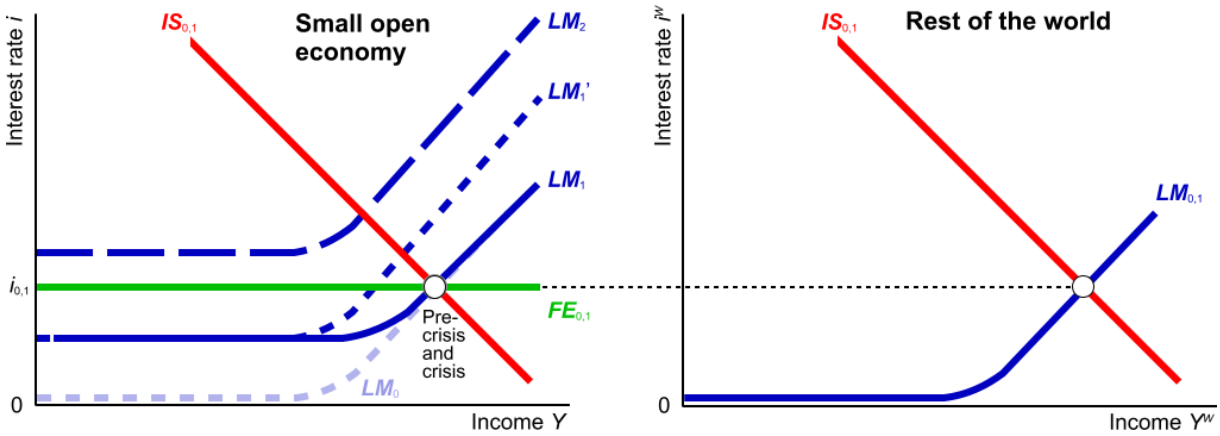

Figure 10: Domestic banks in crisis; fixed exchange rates

On the other hand, a more substantial crisis, one that generates a risk premium in the domestic money market that exceeds the interest rate in the global money market, destabilizes the small open economy. With the money market equilibrium line in position LM_2, the central bank is obliged to continue expanding the money supply. Initial effects on aggregate income cease to accrue once the shifting *LM* curve intersects the *IS* curve on its own expanding horizontal segment. After this has happened, fiscal policy may take over and stimulate demand without affecting the interest rate. This does not stop money supply growth, however, and policymakers need to keep an eye on the latent inflation potential embedded in this enormous supply of money once the crisis is overcome and risk premiums ease down.

Standard recipes apply again when confidence in domestic firms deteriorates and the risk premium in the capital market grows (figure 11). Relying on market mechanisms alone, the small open economy would be driven into a recession. An increase in government spending might prevent this from happening, but in order to return investment spending to levels observed before the crisis, the confidence crisis must be solved.

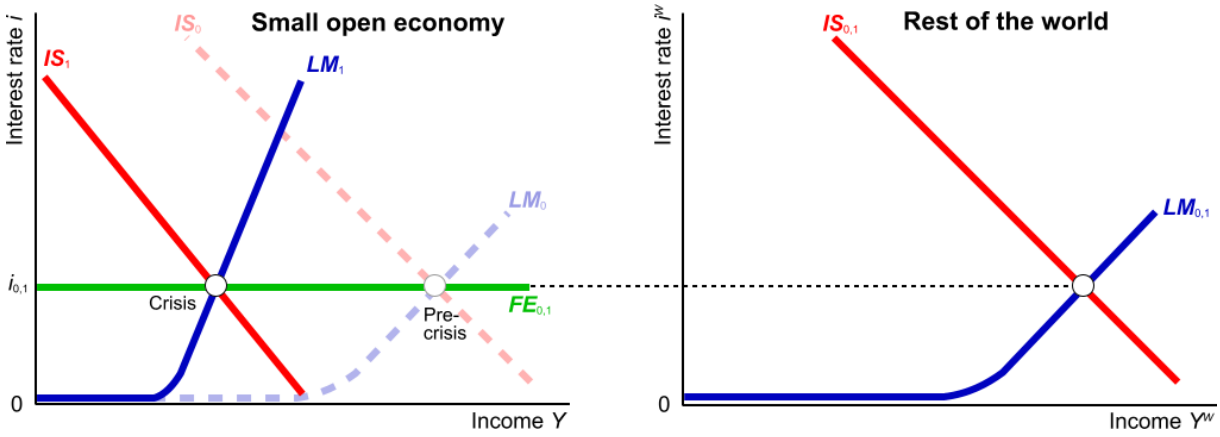

Figure 11: Domestic firms in crisis; fixed exchange rates

4. Other policy measures

The economies considered in the above discussion have stationary price levels, meaning that there is no inflation and no sustained movement of the exchange rate. Replacing these assumptions with scenarios with ongoing inflation provides escape routes from liquidity and perfect traps that are not included among conventional fiscal and monetary policy tools. Pertinent propositions have been forwarded by Krugman (1998, 2000) and refined in subsequent discussions that have included papers by Coenen and Wieland (2003) and Svensson (2001, 2003). While such measures are not the explicit focus of this paper, we round off our discussion by briefly discussing their merits and limitations in the above context.

Inflation and currency depreciation, expected or actual, bear on the Mundell-Fleming model's *FE* and *IS* curves. Regarding the foreign exchange market, and ignoring risk premiums for now, expected returns at home and abroad are equalized when the domestic interest rate i equals the world interest rate i^W plus the expected rate of depreciation ε. Thus, the vertical position of the *FE* curve is determined by $i = i^W + \varepsilon$, and to the extent that the government or the central bank succeeds in generating depreciation expectations, it may actually move the economy out of the traps or instabilities sketched in figures 4, 6, 9 or 10.

In a related vein, investment demand depends on expected real interest rates rather than nominal ones. So if the central bank succeeds in generating expected inflation π, it can indeed lower the expected real interest rate even when the nominal rate has been driven against a zero bound. As a result, with $I = I(i - \pi)$, the *IS* curve moves up when inflation expectations rise, generating the same effect on income that may be achieved through fiscal expansion or currency depreciation.

The scenarios proposed in figures 4 and 6 may illustrate the conditions under which an increase in inflation expectations and/or depreciation expectations could work. Suppose the small open economy is in a perfect trap, with aggregate demand lagging far behind potential output. Expectations of imminent inflation initially manage to move the *IS* curve to the right indeed, as intended. However, this causes an incipient increase of the domestic interest rate, which triggers an appreciation of the home currency. As a result, there is full crowding out of exports, and at the end of the day, the economy is stuck again where it started. In fact, once the market realizes that inflation will not arrive after all, the *IS* curve may even move into a position to the left of IS_1, and income may consequently be lower than before the ill-fated attempt at an escape from the perfect trap via inflation expectations.

However, if the rise in inflation expectations is accompanied either by an increase in depreciation expectations or by an increase in inflation expectations in the rest of the world, both of which move *FE* up along with the *IS* curve, there is no crowding out. Technically, the only drawback is that the relief from the liquidity trap is only temporary. Once it is discontinued—say, because the price level (and/or the exchange rate) has risen and come to rest at some higher targeted rate—the economy will ease back into the trap. Therefore, as with other measures discussed above, such a policy would have to be accompanied by measures that remove the very cause of the financial crisis.

An obvious problem with measures that target inflation or depreciation expectations is that these expectations are endogenous, formed by more or less rational individuals with minds of their own. Thus, the only realistic chance to influence them appears to be furnished by means of an actual policy change or commitment that credibly extends well beyond the aspired escape from the trap and warrants the emergence of inflation or depreciation expectations. This appears difficult to achieve for two reasons:

First, many of the world's major central banks, and others too, have worked long and hard to earn a reputation for price stability. In many cases, this has been helped by legal or statutory provisions that explicitly forbid the pursuit of macroeconomic objectives other than price stability by the central bank.[18] It is difficult to see how such a central bank might convince the market that it would really tolerate or could even deliberately create inflation.

Second, a key feature of a liquidity trap is that inflation is severed from money growth. Barring the expectation of other policy measures or crisis reversals, the persistent income gap that comes with such a trap justifies deflation expectations rather than an expectation of inflation, no matter what the money supply does. This disconnect between developments in the money supply and expected inflation characterizes empirical patterns found during the current crisis, as illustrated in figure 12 with data for inflation expectations, and the annual growth rates of M1 and the monetary base in the United States.

[18] The European Central Bank (ECB) is a case in point. According to Article 105.2 of the Treaty on European Union, the primary objective of the ECB is to maintain price stability. Other economic goals shall only be pursued as far as this is without prejudice to the objective of price stability.

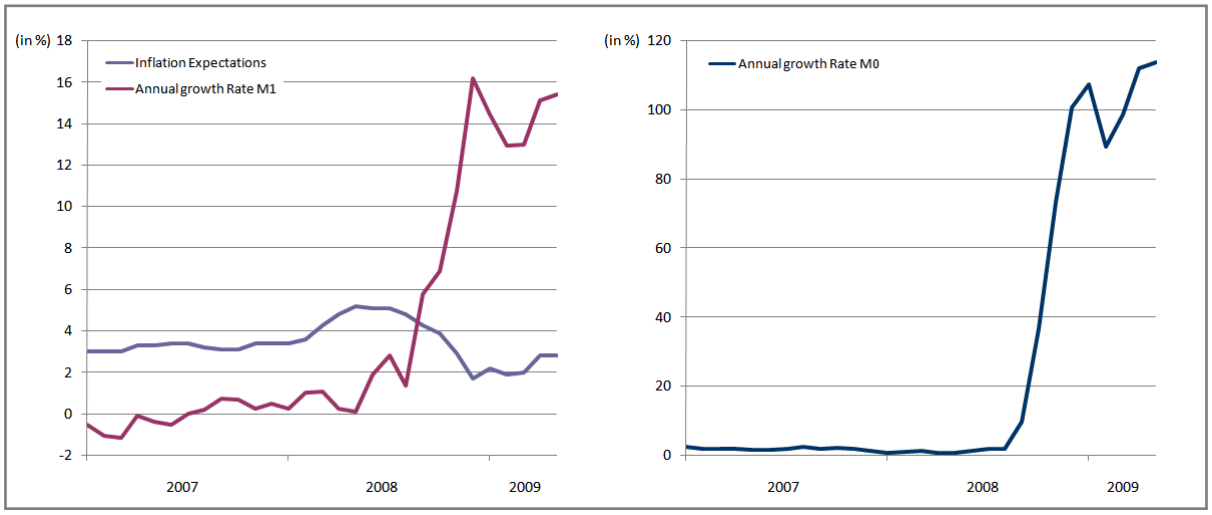

Figure 12: Annual growth rates of M1 and M0. Inflation expectations reflect the expected change of prices within the next year, Sources: Fed, University of Michigan

5. Summary and conclusions

Dusting off the seasoned yet neglected concept of liquidity traps and adding the possibility of risk premiums in money and capital markets transforms the *IS-LM* and Mundell-Fleming models into simple yet powerful and sophisticated tools for understanding and dealing with global and national financial crises. Depending on whether crises occur in money or capital markets, at home or abroad, and under flexible or fixed exchange rates, a wealth of different scenarios exist. In some of these, well-known results regarding policy options and the transmission of shocks remain valid. These include closed economies, where monetary policy becomes ineffective. The novel result here is that due to lost confidence in banks, this may happen far away from the zero bound that has been widely discussed in the literature, at strictly positive interest rates.

A number of scenarios involving small open economies, however, require a rethinking of the established results. Most noteworthy is that monetary policy and fiscal policy switch roles when the country is driven into a liquidity trap, in the sense that only the latter may affect aggregate demand. Even this effect is limited, however, and may cushion but not prevent an economic downturn. Eventually, the economy ends up in a *perfect trap*, a situation in which, left to its own devices, neither the government nor the central bank succeeds in stimulating aggregate demand. The only escape is a well-coordinated effort on the part of the two institutions, in which fiscal policy actively stimulates spending and monetary policy provides the liquidity to prevent crowding-out.

Really serious confidence crises in the domestic money market may even destabilize the economy at large and, without government interference, lead to an outright depression or looming hyperinflation.

In addition to such policy recommendations aimed at immediate but short-run crisis relief, the analysis points to the necessity of rebuilding confidence in monetary and capital markets as a precondition for long-run success.

References

Akerlof, George A. and Robert J. Shiller (2009). *Animal Spirits: How Human Psychology Drives the Economy, and Why It Matters for Global Capitalism*. Princeton, N.J., Princeton University Press.

Boianovsky, Mauro (2004). The IS-LM Model and the Liquidity Trap Concept: From Hicks to Krugman. *History of Political Economy* 36, 92-126.

Buiter, Willem (2009). The unfortunate uselessness of most 'state of the art' academic monetary economics. 6 March 2009, http://www.voxeu.org.

Brunner, Karl and Allan H. Meltzer (1968). Liquidity traps for money, bank credit, and interest rates. *Journal of Political Economy* 76(1), 1–37.

Coenen, Gunter and Volker Wieland (2003) The Zero-Interest-Rate Bound and the Role of the Exchange Rate for Monetary Policy in Japan. *Journal of Monetary Economics* 50, 1071-1101.

Hicks, John R. (1937). Mr. Keynes and the "Classics": A suggested interpretation. *Econometrica* 5(2), 147-159.

Krugman, Paul (1998). It's baaack: Japan's slump and the return of the liquidity trap. *Brookings Papers On Economic Activity* 2, 137-205.

Krugman, Paul (2000). Thinking about the liquidity trap. *Journal of the Japanese and International Economies* 14, 221-237.

Svensson, Lars E.O. (2001). The Zero Bound in an Open-Economy: A Foolproof Way of Escaping from a Liquidity Trap. *Monetary and Economic Studies* 19(S-1), 277-312.

Svensson, Lars E.O. (2003). Escaping from a Liquidity Trap and Deflation: The Foolproof Way and Others. *Journal of Economic Perspectives* 17, 145-166.

Wyplosz, Charles (2009). *Macroeconomics after the crisis: Dealing with the Tobin curse*. Walter Adolf Jöhr Lecture 2009, Contributions to Economics, No. 10, Institute of Economics, University of St. Gallen.

Appendix

When a small open economy with flexible exchange rates is *not* caught in a Mundell-Fleming liquidity trap, confidence crises in financial markets at home and/or abroad affect domestic income as follows.

1. Domestic Crises

1.1. *A crisis in the domestic money market*

$$\frac{dY}{dRP_M} = \frac{L_{r_M}}{L_Y} < 0$$

since $L_{r_M} < 0$.

1.2. *A crisis in the domestic credit market*

$$\frac{dY}{dRP_C} = 0$$

1.3. *A crisis in both domestic financial markets* ($dRP_M = dRP_C$)

$$\left|\frac{dY}{dRP_M}\right| > \left|\frac{dY}{dRP_C}\right|, \text{ i.e. } \left.\frac{dY}{dRP_M}\right|_{dRP_M = dRP_C} < 0 .$$

2. Foreign Crises

2.1. A crisis in the foreign money market

$$\frac{dY}{dRP_M^W} = \frac{-L_{r_M} i^W_{RP_M^W}}{L_Y} > 0 \text{ due to } i^W_{RP_M^W} > 0.$$

2.2. A crisis in the foreign credit market

$$\frac{dY}{dRP_C^W} = \frac{-L_{r_M} i^W_{RP_C^W}}{L_Y} < 0 \text{ due to } i^W_{RP_C^W} < 0.$$

2.3. Crises in both foreign financial markets ($dRP_M^W = dRP_C^W$)

a) $\left|\frac{dY}{dRP_M^W}\right| \geq \left|\frac{dY}{dRP_C^W}\right|$, i.e. $\left.\frac{dY}{dRP_M^W}\right|_{dRP_M^W = dRP_C^W} \geq 0$ for $i_{RP_M^W}^W \geq \left|i_{RP_C^W}^W\right|$,

b) $\left|\frac{dY}{dRP_M^W}\right| < \left|\frac{dY}{dRP_C^W}\right|$, i.e. $\left.\frac{dY}{dRP_M^W}\right|_{dRP_M^W = dRP_C^W} < 0$ for $i_{RP_M^W}^W < \left|i_{RP_C^W}^W\right|$.

3. Global Crises

3.1. Crises in the global money markets ($dRP_M^W = dRP_M$)

a) $\left|\frac{dY}{dRP_M^W}\right| \geq \left|\frac{dY}{dRP_M}\right|$, i.e. $\left.\frac{dY}{dRP_M^W}\right|_{dRP_M^W = dRP_M} \geq 0$ for $i_{RP_M^W}^W \geq 1$,

b) $\left|\frac{dY}{dRP_M^W}\right| < \left|\frac{dY}{dRP_M}\right|$, i.e. $\left.\frac{dY}{dRP_M^W}\right|_{dRP_M^W = dRP_M} < 0$ for $i_{RP_M^W}^W < 1$.

3.2. Crises in the global credit markets ($dRP_C^W = dRP_C$)

$$\left|\frac{dY}{dRP_C^W}\right| > \left|\frac{dY}{dRP_C}\right|, \quad \text{i.e. } \left.\frac{dY}{dRP_C^W}\right|_{dRP_C^W = dRP_C} < 0 .$$

3.3. Crises in all global financial markets ($dRP_M^W = dRP_M = dRP_C^W = dRP_C$)

a) $\left.\frac{dY}{dRP_M^W}\right|_{dRP_M^W = dRP_M = dRP_C^W = dRP_C} \geq 0$ for $i_{RP_M^W}^W \geq 1 + \left|i_{RP_C^W}^W\right|$,

b) $\left.\frac{dY}{dRP_M^W}\right|_{dRP_M^W = dRP_M = dRP_C^W = dRP_C} < 0$ for $i_{RP_M^W}^W < 1 + \left|i_{RP_C^W}^W\right|$.