

Modeling Financial Crises: A Schematic Approach

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What is now known as Post Keynesian economics began with John Maynard Keynes' efforts to explain the greatest crisis in the history of capitalism. Among his conclusions were that such incidents were systemic and that, unless serious reforms were implemented, they would tend to grow in frequency and severity. Today, we once again find ourselves in the midst of global financial collapse. Addressing our current problems and protecting ourselves from repeat performances requires that we properly understand the essential character of crises.

The opening stage of a crisis may take a number of forms: collapsing currency prices, the bankruptcy of financial intermediaries, Minsky moments, stock market crashes, et cetera. Such events actually arise from a common set of fundamental factors, but follow different paths. A crisis may build in one sector of the economy but not another, or developments may be parallel. And even if initially isolated, once realized the crash may trigger similar events in otherwise-sound areas of the economy.

The goal of this paper is to build a model of crises that captures both the unique characteristics of each type and their common roots. We will employ a schematic method that will allow us to trace the processes in time and show how events become interrelated and mutually causal. This permits us, as much as possible, to see everything at once, a necessity when the build up to a crisis may manifest itself in so many places. In addition, we hope to highlight an overlooked factor that arises from Keynes' explanation of the business cycle in chapter twenty-two of the *General Theory*, that is, the impact of the saturation of the demand for physical capital.

The paper will proceed as follows. In the next section, the stages of crisis will be outlined. Following that, the character of the first stage, shock, is explained, and then the process by which each type of crisis affects the economy is described. Subsequently, all of the individual schematics are then combined into a single model and the dynamics are described. We conclude with general observations

and some suggestions for policy.

Stages of Crisis

A financial crisis is a sudden, catastrophic, and far-reaching economic event. Crises are systemic. They arise time and again not as a result of stochastic shocks or “outside interference,” but because the forces that create them are integral parts of capitalism. Furthermore, though their outward manifestations may vary, all such events have at their heart the same cause: *the development of increasingly optimistic forecasts alongside economic forces that cannot justify those expectations*. A crisis consists of three stages:

shock => negative repercussions => contagion

The first represents the point at which agents suddenly and dramatically conclude that their expectations were significantly out of line with reality. This leads to panic. In order for it to evolve into a crisis, the affected agents must then act on their disappointment by taking actions that have negative repercussions for the economy. These may be the anxious sale of a now presumably overvalued asset or currency or the declaration to creditors that a scheduled debt repayment will not be met. Contagion extends the panic and negative consequences to those not initially affected. If sufficiently widespread, the crisis can threaten the stability of the entire macroeconomy.

Stage One: Shock

Because it is the first step in a crisis, we will begin by dissecting “shock.” Its character is the same regardless of the diverse paths crises may subsequently take and it occurs because of two parallel

processes: 1) the formation of increasingly optimistic forecasts on the part of economic agents and 2) the inability of the economy to satisfy those expectations. The former is a function of the psychology of the market, while the latter is tied to Keynes' investment-capital cycle. We will begin with first.

Economic decisions are made in an environment of uncertainty. The importance and implications of this are well known to Post Keynesian scholars (see Dunn 2001 for an extended discussion). For present purposes, the core issue is that, because of uncertainty, agents necessarily lack sufficient information to create objective forecasts:

The outstanding fact is the extreme precariousness of the basis of knowledge on which our estimates of prospective yield have to be made. Our knowledge of the factors which will govern the yield of an investment some years hence is usually very slight and often negligible. If we speak frankly, we have to admit that our basis of knowledge for estimating the yield ten years hence of a railway, a copper mine, a textile factory, the goodwill of a patent medicine, an Atlantic liner, a building in the City of London amounts to little and sometimes to nothing; or even five years hence (Keynes 1964: 149-50).

Forecasts are, therefore, "the outcome of the mass psychology of a large number of ignorant individuals" and are "liable to change violently as the result of a sudden fluctuation of opinion due to factors which do not really make much difference to the prospective yield" (Keynes 1964: 154).

Agents have little confidence in their forecast because there are "no strong roots of conviction to hold it steady" (Keynes 1964: 154).

If this is true, why would anyone in their right mind undertake anything more significant than a

street-vendor's cart? They would not, except for the influence of our animal spirits, or our spontaneous optimism or urge to action rather than inaction (Keynes 1964: 161). These overcome our misgivings and impel us to act despite the lack of a firm basis. It is akin to thinking, "It can't happen to me!" and while this enables economic activity to take place despite uncertainty, it also inspires agents to anticipate increasingly favorable economic outcomes in times of plenty. For this contention, not only do we have Keynes' conjecture but a wealth of research from modern psychology. Kahneman and Tversky write, for example, that people tend to anchor forecasts to "plans and scenarios of success rather than on past results, and are therefore overly optimistic" (Kahneman and Tversky 1979:17). Closer to the subject of this paper, Weary cites research that shows that Wall Street professionals consistently overestimate future returns (Weary 1998: 54), and Oberlechner and Osler provide direct evidence of overconfidence based on their survey of currency market professionals (Oberlechner and Osler 2008). This appears to be part of the basic character of those socialized in western-style, industrial-capitalist cultures, if not homo sapiens in general, and it plays an important role in the creation of crises.

We are not the first to make the above observations, but in explaining this stage of crisis most theories go little further than this. They imply that the ever-rising optimism is sufficient because eventually even a mundane event is capable of bursting the bubble. We do not deny this possibility and understand that if expectations become progressively more positive then it is inevitable that reality must eventually disappoint; however, this *and-then-something-happens* method both detracts from the theme that crises are systemic and it is completely unnecessary given Keynes' argument that, over the business cycle, realized profits tend to fall as physical investment opportunities are exhausted. Emerging events are not merely stochastic, they become increasingly negative.

At the core of this sequence is physical investment. As is well known in Post Keynesian economics, it is the primary driver of economic activity and the force that creates expansions and recessions. What determines investment is firms' expectation of profit from undertaking such projects.¹ When the economy first emerges from recession, entrepreneurs are encouraged and they begin to upgrade their forecasts, leading to increasing levels of investment. This causes a general rise in the level of economic activity. This is destined to end, however, as capital can be built far faster than it depreciates or tastes and technology change. Realized profits decline because as one adds to the stock of capital a) firms can be expected to undertake the most profitable projects first, leaving less profitable ones as the expansion matures, and b) the general rise in the stock of physical capital means that capacities are reaching the point that demand can be supplied and further additions are unnecessary.

Figure 1, the investment-capital cycle, illustrates this process.² In the diagram, p_i^e is entrepreneurs' expectation of profit from investment, I is investment, K is the stock of capital, K_T is the level of productive capacity that would enable firms to meet current demand, K_D is the amount by which capital depreciates each time period, and GDP is gross domestic product.³ Assume we are at a point where expectations of profit are rising and this is driving investment higher. On the one hand, this is creating economic expansion (see the effect on GDP); on the other, it is eating away at the profitability of the remaining projects and leading inevitably to a fall in investment and GDP . The

¹Interest rates, too, play a role, but only a minor one.

²Note that, because we want to highlight what is going on elsewhere, we opted to keep this part of the model fairly simple. For a more in depth analysis see Harvey 2002.

³Arrows indicate causation from the base to the head and the positive or negative sign shows the direction of impact.

sequence (based on the investment-capital cycle outlined in Figure 1) is shown in Figure 2. The top row illustrates the near-term relationships and the positive impact on economic activity, while the bottom traces the background forces that lead eventually to recession.

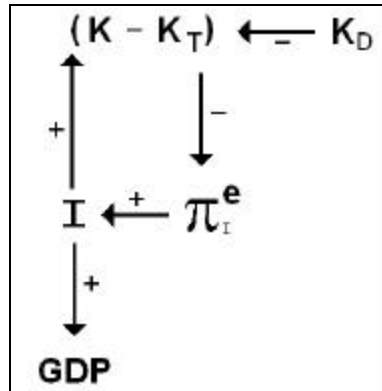


Figure 1: The investment-capital cycle.

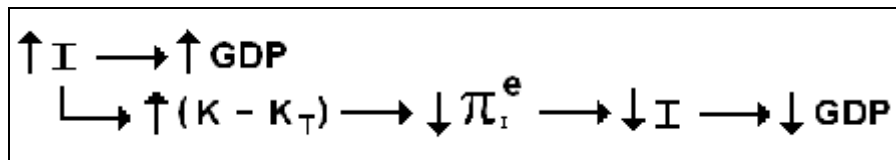


Figure 2: Investment-capital cycle in action.

Together with the psychological factors discussed earlier, the investment-capital cycle creates the conditions for shock. In summary, expectations become increasingly optimistic while prospects for profits from real economic activity decline. This leads to disappointment, sometimes catastrophic. Note that this explicit tying of shock to the investment-capital cycle is not meant to imply that crises occur solely as the product of the business cycle. The catalyst can instead be some exogenous boost to expectations. A dramatic event such as capital market liberalization can serve to jump start

expectations. Still, even in this scenario the financial market boom is invariably accompanied by at least some up tick in the level of real economic activity. Therefore, even when a crisis is not directly related to the peak of a business cycle, the tendency of physical investment projects to become saturated nevertheless comes into play. Realized nonfinancial returns eventually fail to justify forecast financial ones because systemic forces lead the former to decline over precisely the same period that the latter rises. We, therefore, believe that it is vital to include the investment-capital cycle in any theory of crisis. Figure 1 will serve at the core of the larger schematic we build.⁴

Negative Repercussions and Contagion in Crises and the Taxonomy of Collapse

To this point of the paper we have outlined the conditions necessary for the first stage of crisis: shock. In particular, we discussed the tendency of expectations to become increasingly optimistic while realized non-financial profits declined. To proceed to an explanation of negative repercussions and contagion, it is necessary to begin tracing out the specific routes by which these forces are manifesting themselves. All crises begin with overly-optimistic expectations, but of what? Because this may vary

⁴Note that were it not for the volatility of expectations, the investment-capital cycle might settle into a stable equilibrium wherein investment stayed at the level just sufficient to offset any changes in $(K - K_T)$ caused by K_D . That this does not happen is due to the fact that when the shock occurs, p_i^e collapses, leaving the current $(K - K_T)$ well above that which agents believe is profitable (oscillation requires a negative feedback loop and a delay (Sterman 2000: 114)). This is true even if further investment would, in an objective sense, have been worthwhile. We must then wait for $(K - K_T)$ to deteriorate to the point that p_i^e can recover, at which point the latter will tend to rise to unsustainable levels, thereby setting up the next disappointment and collapse. In that sense, the investment-capital cycle is, in itself, driven by the similar forces to financial crises, a fact that is not surprising given Keynes believe that asset markets and that for new capital must be related. This is modeled using a computer simulation in Harvey 2002.

considerably, we have divided such events into four types based on the focal point of the forecast. These are, as shown in Table 1, Minsky, asset market, flexible exchange rate, and fixed exchange rate crises. The first represents a type of crisis wherein agents' unrealistic expectations of manageable debt loads end with default; in the second, overly optimistic forecasts of asset prices lead to a collapse in those prices; and in the last two, currency prices are bid higher and higher until they come crashing down (the process is somewhat more complicated with a pegged exchange rate but the same forces are at work). As each is explained below, a new schematic will be developed. These will eventually be combined into a single diagram so that the interrelationships and mutually causal factors can be seen and understood.

A Minsky crisis is one in which economic agents, encouraged by lenders, repeatedly revise upward the level of debt they think they can safely manage. This puts them closer and closer to default (Minsky 1982 and 1992). Because production takes time, firms, consumers, financial institutions, and governments undertake massive amounts of debt-financed spending. This creates layers of interlocking debt such that if one set of agents fails to meet its payments, this may set into motion a wave of default and create the potential for financial collapse.

Table 1: Types of Crises.

Crisis type	focus of expectations	negative repercussion	initial contagion	secondary effects
Minsky	manageable debt load	default	chain default	credit crunch
asset market	asset price	collapse in asset price	downward revision of related price forecasts	fall in expectation of profit from investment, fall in aggregate expenditures, fall in mpc
flexible exchange rate	currency price	currency depreciation	capital flight	inflation, FX loan default, fall in aggregate expenditures
fixed exchange rate	currency price	currency devaluation	capital flight	inflation, FX loan default, fall in aggregate expenditures

In a Minsky crisis, the relevant expectations are those of “safe” debt levels (see Table 1).

Minsky hypothesized that as agents (particularly during an economic expansion) find that they are able to meet the repayment schedule dictated by their current debt levels, they increase their ratios of debt to income. Unfortunately, however, because they do so out of proportion to their past successes, they find themselves moving from hedge to speculative to Ponzi debt-income structures:

Hedge financing units are those which can fulfill all of their contractual payment obligations by their cash flows: the greater the weight of equity financing in the liability structure, the greater the likelihood that the unit is a hedge financing unit. Speculative finance units are units that can meet their payment commitments on "income account" on their liabilities, even as they cannot repay the principle out of income cash flows. Such units need to "roll over" their liabilities: (e.g. issue new debt to meet commitments on maturing debt). Governments with floating debts, corporations with floating issues of commercial paper, and banks are typically hedge units.

For Ponzi units, the cash flows from operations are not sufficient to fulfill either the repayment of principle or the interest due on outstanding debts by their cash flows from operations. Such units can sell assets or borrow. Borrowing to pay interest or selling assets to pay interest (and even dividends) on common stock lowers the equity of a unit, even as it increases liabilities and the prior commitment of future incomes (Minsky 1992: 7).

If they move steadily toward becoming Ponzi units, at some point agents must default.

It is not necessary for everyone to go to the extreme for this to occur for, however, because (as

shown in Figure 1) the economy is simultaneously moving to a point where real returns and, therefore, incomes are bound to decline. Thus, even hedge and speculative units can find themselves in trouble (and Ponzi units certainly will) if the economy contracts. Shock results because the rising expectations and falling profits and income are thrown into dramatic contrast. The negative repercussion, as noted in Table 1, is debt default. Depending on the level of interlock and the fragility of the system at the point of collapse (determined by the relative hedge/speculative/Ponzi position of agents in the macroeconomy), this can lead to chain defaults and a severe restriction in the ability/willingness of the financial sector to make loans; a credit crunch. Because, as Keynes said, banks play a key role in allowing the level of economic activity to move to a higher level, this can cause an economy-wide contraction.

Figure 3 illustrates a Minsky crisis. On the right, it shows that rising GDP will increase incomes (both household and business). As incomes rise, agents find that they can meet debt obligations successfully. With an accumulation of successive on-time payments, debtors begin to believe that their current debt-income ratios are unnecessarily conservative. They therefore, with banks' cooperation, take on more debt. Because the link between "successive debt repayments" and "estimated ability to service debt" is strongly affected by the animal spirits/spontaneous optimism discussed above, margins of safety (as represented by debt/income) tend to be eroded with more enthusiasm than is warranted. A point of tension then emerges between agents' debt burden and their income. As the former rises or the latter falls, so it is more likely that agents find that they cannot meet their debt repayment schedule. A crisis then occurs. Note that it ultimately does not matter which half of the tension point is the culprit. With debt burden rising on one side and agent income destined to fall on the other, a crisis will

eventually (*ceteris paribus*) emerge. Overly optimistic expectations combine with the investment-capital cycle to create shock.

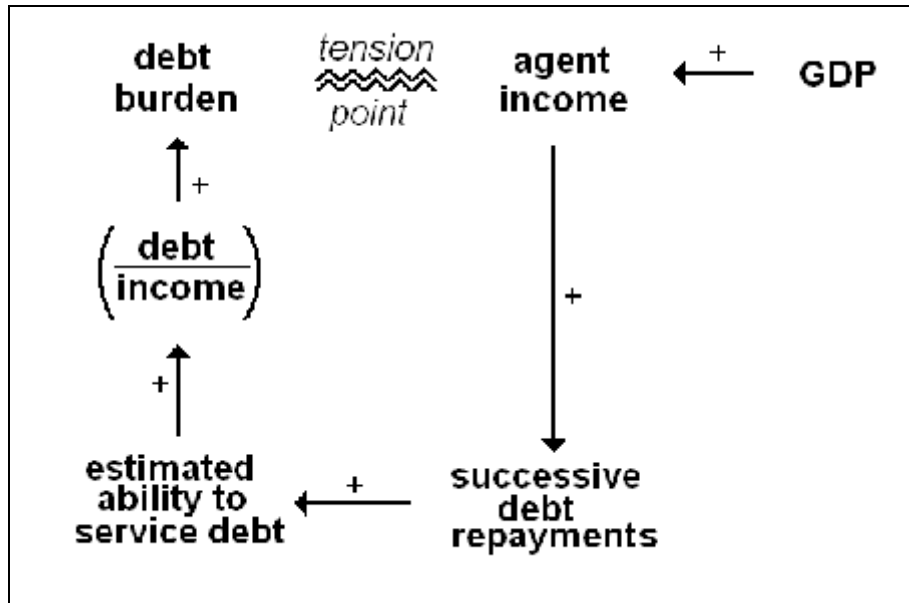


Figure 3: A Minsky Crisis.

This is not the only sector in the economy where spontaneous optimism and the saturation of the market for physical capital sow the seeds of collapse. Indeed, the arena that captures the most attention is the asset market. By this, we mean anything used to save, and especially grow, purchasing power. This would include stocks, real estate, commodities futures, and derivatives, for example. Here, the role of unfounded optimism in the formation of forecasts creates a positive-feedback loop that can move prices well out of line with those justified by profits in the real economy. This is shown in Figure 4. Rising GDP increases the profitability of various real assets (p_{real}). This causes a bump (see “initial impulse”) in the value of their financial counterparts ($P_{\text{financial}}$): stock prices increase because the issuers’ profits have risen, real estate prices move up with new demand, commodities become more

expensive as the economy shifts into higher gear, and so on. At this point, however, the overly-optimistic expectations of speculators take over and price increases begin to feed on themselves, moving them out of line with what p_{real} would reasonably suggest. In Figure 4, the positive feedback loop linking $p_{\text{financial}}^e$ to $P_{\text{financial}}$ (where the former is the rate of profit agents expect from holding financial assets) represents the process by which this takes place. The boost in $P_{\text{financial}}$ created by the initial impulse from p_{real} leads agents to expect further increases in the profitability of holding financial assets, which of course raises $P_{\text{financial}}$ again since market participants act on those expectations.

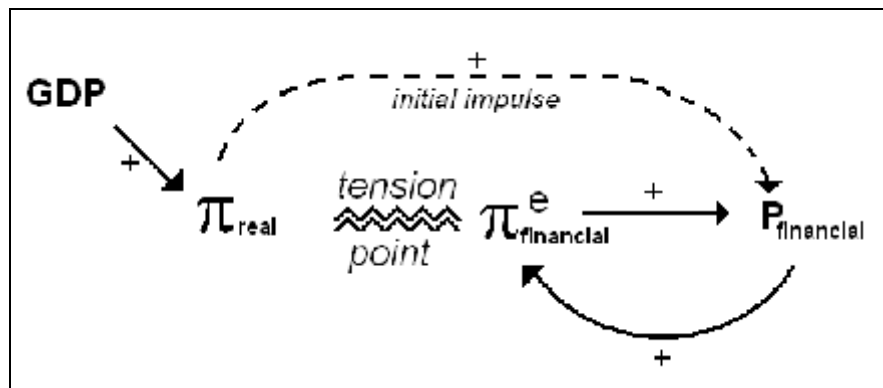


Figure 4: Asset-market crisis.

The tension point that is created is in the gap between the rate of profits agents expect to earn from their speculative activities ($p_{\text{financial}}^e$) and that actually earned by asset issuers (p_{real}). While the former is driven up by the positive-feedback loop made possible by animal spirits, the conditions creating the initial rise in the latter are steadily deteriorating due to the operation of the investment-capital cycle. At some point, an indicator of non-financial profits (e.g., a corporate quarterly report, a decline in the demand for housing in some key market, et cetera) will show results so far out of line with

what was expected of the financial counterpart, $p_{\text{financial}}^e$, that shock will result. Agents, whose confidence was always shaky because of fundamental uncertainty, then hurriedly dump the presumably overvalued assets and the feedback loop quickly reverses direction (and overreacts in the opposite direction). This leads, as shown in Table 1, to a collapse in the expectations of profit from investment and a further decline in aggregate demand, the latter both from a decrease in household consumption and an additional collapse of investment as animal spirits are no longer adequate to offset firms' uncertainty. Just as with a Minsky crisis, expectations have become too optimistic given the inevitable fall in economic activity created by the investment-capital cycle.

Exchange rates, too, may fall victim to this process. To see this, it must be understood that modern currency markets are driven, first and foremost, by financial capital flows. In 2005, for example, foreign exchange transactions were “enough to accommodate world trade 40 times over” (Harvey 2009: 2). Trade flows are certainly a determinant of currency prices, but they are, without question, secondary. In fact, one sees more of a market reaction to the *announcements* of trade balances than to the balances themselves. The currency market is, therefore, simply a branch of the asset market discussed above.

As a consequence, Figure 5, showing flexible exchange rate crises, repeats a portion of Figure 4. In particular, the initial impulse from p_{real} to $P_{\text{financial}}$ is still relevant. What has been added is the fact that a rise in the latter will likely attract foreign financial capital inflows (“foreign capital inflows”) that then drive up the price of domestic currency (measured as $\text{FX}/\text{\$}$, where the U.S. is assumed to be the home country). Similar to domestic asset markets, this sets into motion a positive feedback loop that permits overly-optimistic expectations to inflate expected financial returns (which here manifest themselves in the price of domestic currency) out of proportion to non-financial ones. Financial capital inflows cause domestic currency appreciation, which then encourages foreign agents to believe that their earlier forecasts had been accurate. This leads to a new round of capital inflows, another appreciation, and so on. Though we chose to

represent it in a slightly differently manner, it is essentially the same process as that shown in Figure 4. Market participants purchase an asset in anticipation of its appreciation, which causes it to appreciate. Flushed with their success, they buy more.

However, just as before, if the driving force

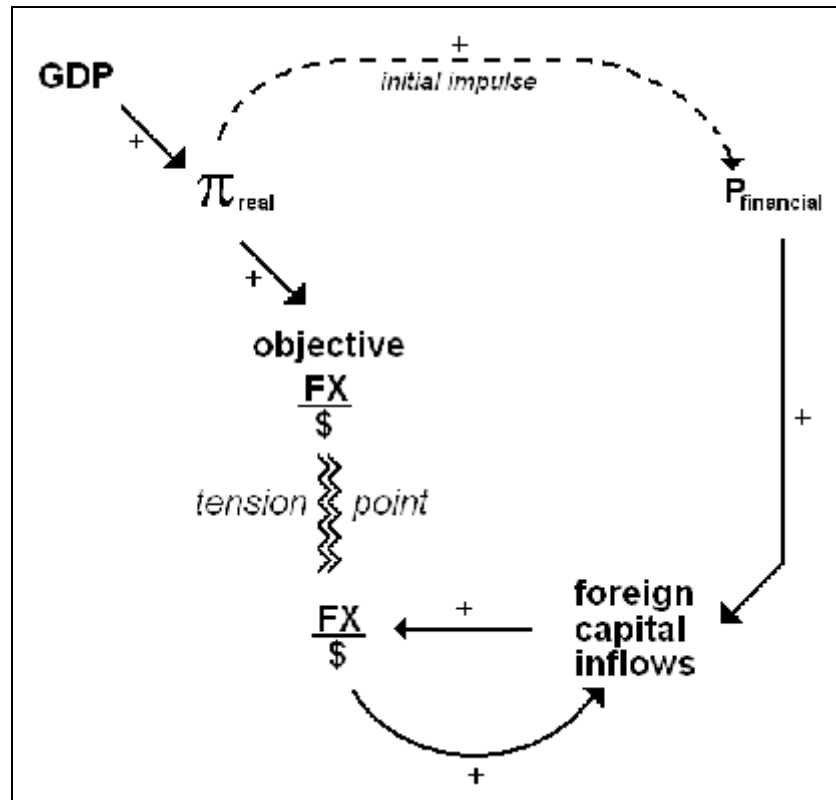


Figure 5: Flexible Exchange Rate Crisis.

underlying the rise in the currency price was the presumed profitability of the asset issuers, then that expectation will soon be disappointed. Assuming that some objective value for currency (objective FX/\$) can be derived from the performance of the non-financial sector (p_{real}), a tension point appears between the actual and objective currency prices.⁵ Once again, one side of the tension point tends to rise while the other rises at a decreasing rate, then falls. Disappointment and shock results, followed initially by capital flight and eventually by inflation, default on foreign-currency denominated loans, and a general decline in aggregate demand (see Table 1).

Perhaps more common and spectacular is the collapse of a fixed exchange rate. While Table 1 shows that it creates the very same consequences as those associated with a flexible exchange rate regime and the underlying cause would not differ, the process is unique enough to warrant developing a separate schematic. That is shown in Figure 6. Note first that from GDP through to p_{real} , $P_{\text{financial}}$, foreign capital inflows, and FX/\$, it is identical to Figure 5 (though the last variable is now called “market FX/\$”). In addition, the link from p_{real} to objective FX/\$ is the same. The major addition is “pegged FX/\$.” The introduction of a fixed currency price creates two avenues by which instability may be occur (though only one is associated with the phenomenon under study in this paper). First, there is the problem created by any gap that exists between the FX/\$ that a float would have generated (“market FX/\$”) and that set by the government (“pegged FX/\$”). The larger the difference between

⁵Creating an objective value for a currency price is obviously problematic; however, we argue that it is no more so than the myriad purchasing power parity estimates that are used so extensively (and are of very limited applicability given that currency markets are not a function of trade flows). At any rate, the determination of a specific value is less important than the conclusion that it will move in a way that creates a larger and larger gap at the tension point. Harvey (2009: 91-6) discusses this issue in more detail.

those two, the less likely the peg can be sustained. This becomes particularly problematic as foreign currency reserves (FX Reserves) dwindle, which is shown on Figure 6.

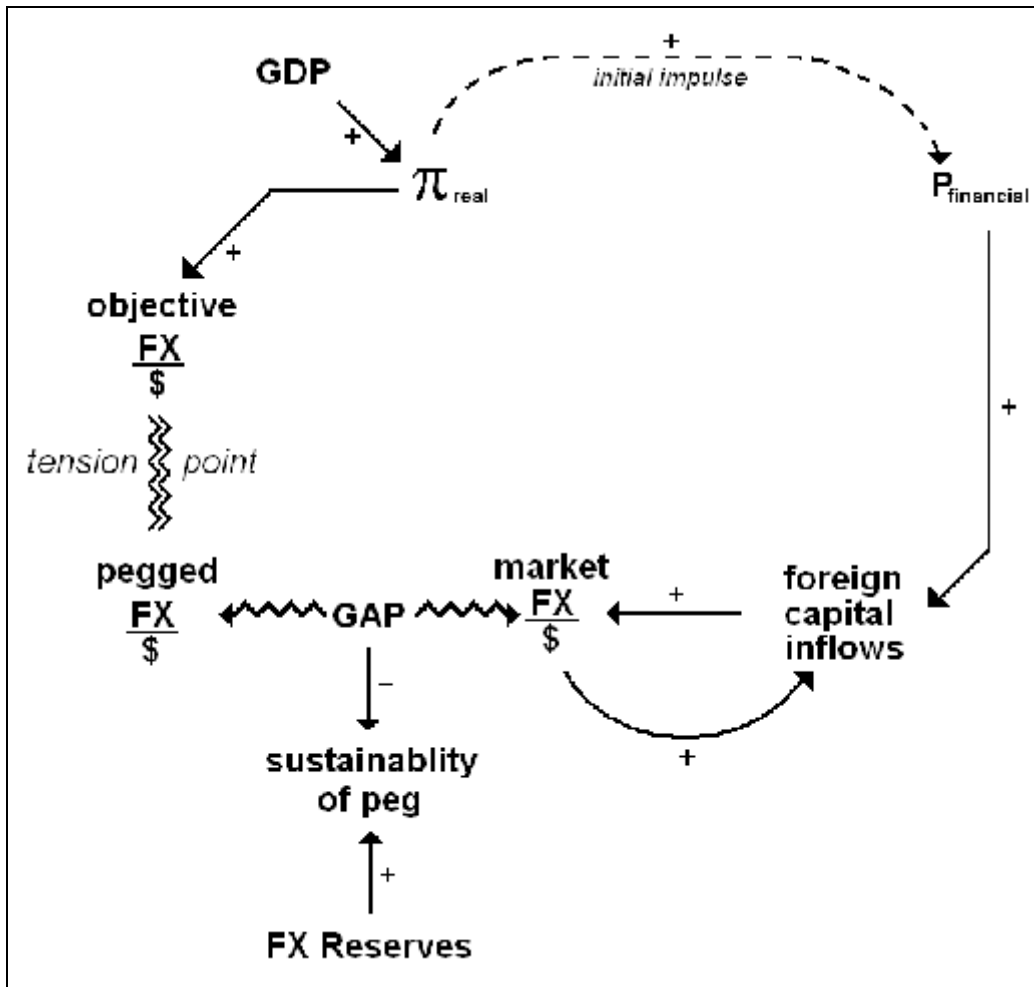


Figure 6: Fixed Exchange Rate Crisis.

Maintaining a fixed currency price when private market forces may choose to challenge the official position is certainly an issue that can create crisis and collapse and we have duly marked the relevant portion of the schematic with “GAP.” However, such difficulties are not a function of overly-

optimistic expectations versus the investment-capital cycle and so it is not the subject of this paper. More interesting in the current context is what happens when foreign capital drives up the erstwhile-invisible market FX/\$. If the government shifts the pegged rate so as to maintain a stable GAP, which they may do to satisfy foreign investors or allow domestic borrowers to gain better terms, then the overly-optimistic expectations operate just as in the flexible-exchange rate scenario. The tension point emerges between “objective FX/\$” and “pegged FX/\$,” with the former linked to a variable that will inevitably decline while the latter continues to rise. Again, at some point the fixed rate will be shown to be well out of line with that justified by a more objective evaluation. The result will be a rapid exit from the currency via a decline in “foreign capital flows” and a consequent collapse in “market FX/\$” that makes GAP too large to defend. A rapid devaluation must take place. This is followed, as noted on Table 1, by all the same contagion factors as with a flexible exchange rate collapse: capital flight, inflation, default on foreign-currency denominated loans, and a decline in aggregate demand.

A General Schematic of Financial Crises

This completes the process of developing a schematic for each of the four possible types of financial crises: Minsky, asset, flexible exchange rate, and fixed exchange rate. Though the particular manner in which they manifest themselves vary, in each case the underlying cause is overly-optimistic expectations in the financial market versus declining realized outcomes in the non-financial sector. The key factors are uncertainty, animal spirits, and the investment-capital cycle. The first creates an environment in which agents’ expectations are held with little confidence and thus prone to sudden and catastrophic revision. The second provides the courage necessary to nevertheless act under these

circumstances and, unfortunately, to spur agents on to increasingly optimistic expectations. By itself, such a process is bound to create disappointment at some point. The investment-capital cycle, with its steady undermining of the profitability of non-financial projects, ensures that point comes sooner rather than later.

Though shown on individual schematics, these processes do not occur in isolation. Indeed, when an economy is building up to a financial crisis it is very likely that a number of the tension points are coming into play simultaneously. In the end, which one becomes the tipping point is in some ways merely incidental. Expectations were going to be disappointed somewhere and events merely conspired to make it a Minsky, asset, or currency crisis. Thus, to truly understand the developments leading up to the collapse, one should really examine the economy all-at-once so that attention is not unduly focused on the sector where the crisis happened to emerge first. In addition, by doing so some new causal factors come into view. This is shown in Figure 7.

What is shown is basically a combination of the schematics for the investment-capital cycle and the Minsky, asset market, and a flexible exchange rate crises. Since each shared the variable GDP, this created a point at which they could be combined. Putting everything together also creates the opportunity to include some new factors. For example, “‘real’ p opportunities” above $(K - K_T)$ shows the relationship between the existing stock of capital (relative to the saturation point) and the opportunities for profit that exist in the nonfinancial sector. The argument here is that, first, as such opportunities diminish, so firms may shift activities more toward wealth management than the production of goods and services (this is shown on the right). As these new funds flow into asset market, they will tend, ceteris paribus, to bid prices ($P_{\text{financial}}$) up. This creates another avenue by which the feedback loop creating asset crises and, indirectly, currency crises may take be set into motion. Second, we make the assumption that as the nonfinancial sector slows, opportunities for new lending decline. This may lead banks and other financial institutions to more aggressively market debt, further contributing to the rise in debt/income hypothesized by Minsky. Also new on the diagram is the argument that rising domestic currency prices, $FX/\$$, lead agents to take on increasing levels of foreign debt, something they are simultaneously encouraged to do by their revised estimated ability to carry debt. This, too, adds to debt/income and makes the financial system more fragile.

Now imagine this system in motion. As will be discussed below, early in the process, little pressure emerges at the tension points. However, once expectations become sufficiently optimistic and the nonfinancial economy begins to slow, disappointment is inevitable.

Suppose we have an expanding economy as evidenced by a rise in GDP. This will increase the profitability of nonfinancial undertakings (p_{real}) and provide a boost to financial asset prices ($P_{\text{financial}}$).

This causes the expectations of market participants ($p_{\text{financial}}^e$) become increasingly positive, setting into motion the positive-feedback loop on the far right of the diagram. Early in this process, it is likely that the gap between p_{real} and $p_{\text{financial}}^e$ will be fairly small (particularly if the latter started fairly depressed), causing little stress to the system. Meanwhile, the rising financial asset prices will attract foreign capital, causing an appreciation of domestic currency. Again, at this point the actual price may not be too far from that justified by the rates of return on nonfinancial returns (i.e., the objective FX/\$). Moving to the Minsky side of the diagram, note first that the falling price of foreign currency will encourage agents to borrow in those monies, particularly as they decide they can carry more debt. The latter occurs as agents' rising incomes (a function of the increase in GDP) allow them to make a series of successive on-time debt repayments. All this results in higher debt-to-income ratios and a rise in overall debt burdens. Once again, however, at this stage the tension point may not be a cause of great concern as agent incomes will likely be adequate.

As these processes continue, however, problems begin to emerge. On the expectations side, the continued good times have the effect of encouraging agents to expect increasingly favorable outcomes (with perhaps even professionals announcing the birth of a "new economy"). In terms of the diagram, this is manifested in progressively more powerful cyclings of the two positive-feedback loops on the right side of the diagram (those connecting $P_{\text{financial}}$ and $p_{\text{financial}}^e$ and "foreign capital inflows" and FX/\$) and in increases in "estimated ability to service debt" that become far more optimistic than "successive debt repayments" can really justify. These factors are likely to be particularly potent when associated with a dramatic event since animal spirits will become overly excited much earlier in the sequence. Under some circumstances, this alone can be enough to create disappointment; if not, the

slowdown in the investment-capital cycle will soon make itself felt.

The feedback loop at the top of the diagram shows that as an expansionary period is driven by increases in physical investment, the latter tends to saturate the stock of physical capital and bring on recession (see Figure 2). At first, the rise in $(K - K_T)$ is insufficient to lower p_I^e to the point where it actually causes a fall in investment. Eventually, however, it will do so. This has a number of consequences. First, as $(K - K_T)$ rises, opportunities for profit in the nonfinancial sector become more scarce. This may lead businesses to shift their attention away from the production of goods and services and toward wealth management. If so, this influx of funds into the asset market will have a tendency to drive $P_{\text{financial}}$ up, meaning that at the very time when $p_{\text{financial}}^e$ should be moderated, it is actually encouraged to higher levels. Because $P_{\text{financial}}$ will encourage foreign capital inflows, the shift towards wealth management also contributes to the tension point in the currency market. Last, the fall in “real” p opportunities” forces financial institutions to find different customers. Such “debt marketing” may involve loans to agents active in the asset market boom, financial institutions caught up in the cycle of rising debt, and other high-risk opportunities. These create a number of problems, not the least of which is the higher debt/income noted on Figure 7.

The most obvious and important effect of the fall in investment is the decline in GDP. Because GDP contributes directly to one half of every tension point, as it declines, the likelihood of crisis is rapidly increased. “Debt burden,” $P_{\text{financial}}$, and $\text{FX}/\text{\$}$ will all be reaching cyclic highs just as GDP declines, pulling down with it “agent income,” $p_{\text{financial}}^e$, and “objective $\text{FX}/\text{\$}$.” Precisely which one breaks first is largely coincidental; each tension point moves inevitably towards disappointment and shock.

Figure 8 shows the same scenario but under a fixed exchange rate regime. The situations with respect to the Minsky and asset market tension points are identical. The new factor is the relationship between the pegged currency price and that which would be generated in a floating rate (“market FX/\$”) and the one implied by the rate of return on nonfinancial assets (“objective FX/\$”). The analogue of the tension point in the flexible exchange rate regime is that between “pegged FX/\$” and “objective FX/\$.” Just as before, unrealistic expectations are likely to move the fixed rate to an unsustainable level. If this, by itself, is not sufficient to create shock, then the situation will become more critical when the economy slips into recession and GDP and p_{real} begin to fall. It will become evident to market participants that “pegged FX/\$” is significantly out of line with “objective FX/\$,” and there will be a collapse in “market FX/\$” so large that the peg can no longer be sustained given the size of GAP. While how the government decides to manage GAP in general is a fascinating and important question, we do not discuss it because it is not directly related to the subject matter of this paper (i.e., the development of overly-optimistic expectations versus the saturation of the stock of capital and consequent decline of nonfinancial profits).

Lessons and Conclusions

The root cause of financial crisis is the initially gradual and eventually rapid separation of expected returns from what the real economy can actually generate. Ultimately, evidence of the relative under performance of the nonfinancial sector will become known. Shock, negative repercussions, and contagion result. Depending on the magnitude, the economic impact can be significant and even catastrophic. This phenomenon is, given the current structure of market economies throughout the world, systemic. It does not require “crony capitalism,” unique events, or government “interference” with the market mechanism—it is, in fact, the market mechanism itself that causes this outcome.

What can we do? Put succinctly, the solution is to either dampen expectations or improve economic growth. The latter cannot be accomplished without an explicit recognition of the part of policy makers that the free market is incapable of consistently generating a reasonable level of employment. It would then be necessary to implement a broad-based plan to position the state to take up any slack left by the private sector (see, for example, L. Randall Wray’s employer-of-last-resort scheme in Wray 1998). However, even assuming that this could be accomplished, it would almost certainly be insufficient. Indeed, part of our current (as of spring 2009) problem is that the economy did so well for so long. In the 1990s, the U.S. experienced the longest peacetime expansion in history, and from December 1982 through November 2007—a period of 300 months—the U.S. suffered a grand total of sixteen months of recession. This only meant that once the day of reckoning arrived, animal spirits were simply that much higher and the fall that much deeper.

Ultimately, expectations are the problem. If we lived in the rational world described by neoclassicals, then agents would either clearly recognize that forecasts must be anchored to the real

economy or, after one or two rounds of ignoring that logic and observing the consequences, they would soon learn it. However, as Keynes wrote in a similar situation, these are not the circumstances “...of the economic society in which we actually live, with the result that its teaching is misleading and disastrous if we attempt to apply it to the facts of experience” (Keynes 1964: 3). The market is not always right and people do not learn from their mistakes—they make them over and over.

Education may help to some small extent. The idea that inflation-adjusted financial returns cannot possibly be significantly out of line with real ones is not well understood even by professionals. Witnessing, as we did in the U.S. late 1990s, successive annual increases in stock prices that ranged from 4.4 to over 6 times as large as GDP growth should be a warning that leads market participants to exit or at least stabilize the market. Instead, market volume more than doubled! A few economists and officials were raising red flags, but in the euphoria that prevailed no one wanted to listen.

So, something more concrete must be done to address the possibility of asset, currency, Minsky crises. To detail possible policies is beyond the scope of the current paper. However, in short, reducing the volume of speculative transactions would help tremendously in curbing problems associated with the first two. The vigor with which the two positive feedback loops on the far right of Figures 7 and 8 operate must be limited. This can be accomplished in a number of ways. First, various “trip wires” can be set up that signal to policy makers that prices may be on an unsustainable trend (see Grabel 2003). These can be absolute (based on a number of consecutive days of continuous appreciation at some pre-set rate) or relative (a function of the ratio between target financial and nonfinancial values). When tripped, they tell government officials that intervention may be necessary. This may range from verbal warnings to closing the market for some period—something to allow cooler

heads to prevail and to create a cost to contributing to such booms. Second, taxes can be introduced to encourage agents to engage in long-term enterprise rather than short-term speculation. Something as simple as a sliding-scale fee system, wherein agents pay a tax for selling a financial asset, may be useful. As the time between purchase and sale is longer, so the tax is smaller, thus penalizing people who focus on the short term. There is no doubt that this would lower the volume of activity in asset markets, but those left would be the investors who follow fundamental factors related to the profitability of the issuing entities and not those to whom the activity is simply a form of gambling. By this method the underlying goal of linking expectations to a more realistic anchor is accomplished. Third, one may simply apply very different rules of engagement to those participating in speculative activities. This is most useful in the case of currency markets. Foreign capital may face various restrictions in terms of inflow and outflow, all generally designed to discourage hot money and encourage the funding projects that create output and employment. By each of these means, it may be possible to reduce the likelihood of asset and currency crises.

In terms of Minsky crises, we must have significant financial reform. L. Randall Wray writes, The market has decisively spoken: It is not capable of self-regulation. It cannot tell who is credit-worthy. It cannot be trusted to innovate new financial products. It cannot be relied upon to determine compensation schemes. It makes terrible credit allocation decisions. It crises out for downsizing and heavy-handed regulation (Wray 2009: 5).

Those who are borrowing do not know when to stop, and those who could refuse them do not do so. To address this, the financial system must be made more transparent, steps need to be taken to ensure that those who initiate loans actually care if they are repaid (which can be accomplished by making sure

they are the ones to carry them to maturity), and we must remind central banks that it is their duty to monitor conditions in credit markets and step in if debt levels are getting dangerously high (again, trip wires would be useful here).

Today, we stand at our own tension point. History has shown that when capitalism proves itself incapable of providing goods, services, and employment, that people will trade political freedoms for economic security. Though in most countries today, we are no doubt still some distance from such an extreme “solution,” the fact that crisis is systemic suggests that if we do not act decisively now then we may face this same problem later, and under increasingly severe circumstances.

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