MULTIPLE EQUILIBRIA, CONTAGION, AND THE EMERGING MARKET CRISES: COMMENT*

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This is the last but certainly not the least in a series of contributions on currency crises and contagion by Paul Masson. Making order --- at least, *some* order --- in what is currently the most chaotic and Byzantine niche of international macroeconomic literature is a burdensome but priceless task. In this and other recent papers, Masson contributes coherently and intelligently to an overdue process of intellectual housecleaning within the field, presenting reasonable taxonomies and shedding light on the implications of a vast array of models and theories for policy analysis. Specifically, this paper provides a neat, extensive overview of "multiple-equilibria" models of speculative attacks and currency crises. It is an easy guess that this survey will frequently appear on the reading lists of courses in international capital markets, and I am confident it will have long shelf life among researchers and policy analysts.

Masson is an earnest advocate of the relevance of multiple equilibria as a modelling device to understand complex issues such as the determinants and implications of the international currency and financial crises of the 1990s. But proselytizing need not mean being blind or unfair. While the strengths of the multiple-equilibria approach are emphasized, as we expect, its weaknesses are not hidden or dismissed. Rather, they are generally treated as open issues left to future investigations and analyses.

In my comments, I will try to emulate the standards of impartiality and objectivity of the paper, although with a twist. In my view, what needs to be emphasized are not the strengths of the multiple-equilibria approach, but rather its weaknesses. This is not to deny or overlook its accomplishments. Simply, I think the time has now come to build on these past accomplishments

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and move over to a new paradigm for the analysis and assessment of international crises. Masson's paper --- and I quote directly --- "rather than attempting to provide new theories or econometric evidence, discusses in an informal way the *plausibility* of multiple equilibria models and their *usefulness* as a modeling technique" (my italics). It is on these two italicized words that most of my comments will be focused.

Is "plausibility" a well-defined concept in the context of the multiple-equilibria literature? I am not sure. Sudden shifts in private agents expectations are consistent, almost by definition, with any episode of speculative attack and crisis. From this vantage point, to "explain" a crisis in terms of an arbitrary selection of a particular equilibrium is not much different from stating that a crisis occurs when a crisis occurs. Truisms are not falsifiable, and multiple-equilibria models are not testable. In both cases one may be excused for regarding their empirical content --- and their contribution to positive and normative analyses --- with some degree of skepticism. Certainly it is not correct from an epistemological viewpoint to use the shortcomings and empirical failures of models based on fundamental explanations as evidence in favor of multiple equilibria models. And I haven't seen any convincing way of testing directly one approach against another, since the so-called first- and second-generation models are in practice observationally equivalent.

To give an example, consider the textbook first-generation model of balance of payments crises á-la-Krugman. A common misconception is the idea that what determines a crisis in this setting is the observed acceleration in domestic credit leading to a fall in the stock of reserves. Actually, the key factor triggering a crisis in this model is the deterioration in fundamentals --- such as domestic credit expansion --- that is expected to occur in the future, not the one that has occurred in the past. So, even if the record shows no deficit monetization in the past, even if the record shows an increasing stock of international reserves, a Krugman-style speculative attack can still occur in anticipation of future problems. In the end, both a model of this kind and a model based on jumps between multiple equilibria suggest that, on the basis of *observed* fundamentals, a crisis is unpredictable. Which model is more "plausible"? The answer is in the eye of the beholder, a matter of tastes more than econometrics.

In general, the rule is that for any "plausible" multiple equilibria-based story one can tell there is an alternative interpretation which is just as plausible --- that is to say, the debate between "fundamentalists" and "non-fundamentalists" is bound to be finely balanced for a long,

long time. For instance, Masson argues that a multiple equilibria approach is plausible when applied to the analysis of speculative crises in France in 1993. He observes that in the late spring of 1993 French short-term rates were below German rates, and still there were attacks on the franc triggered not by deteriorating fundamentals but by "relatively minor events". He may be right. But there is at least one other plausible story. In retrospect, many have interpreted the behavior of French interest rates in 1993 as the result of a rather deliberate effort to promote the franc as a co-anchor of a new European Monetary System, an effort perceived at the time as unsustainable. The attacks against the franc were perhaps nothing but a way to test such effort --- and, somebody would add, to call the bluff. Speculative tensions in Europe stopped only when the basis for political cooperation regarding the Maastricht project were reestablished, basically in the summer of 1993. In general, once we take into account political developments in Europe during 1992 and 1993 --- and their implications for the credibility of the Exchange Rate Mechanism --- we have absolutely no need to invoke jumps among multiple equilibria to make sense of the speculative attacks against the European Monetary System.[1]

I wholeheartedly agree with Masson as regards the "usefulness" of multiple equilibria as a modelling device. There is no doubt that this approach has had a huge impact on the academic literature. Some of the most innovative and thought-provoking currency crisis models of the last fifteen years have built upon the notion of multiple equilibria. To mention but one example, Maury Obstfeld's analysis of the destabilizing effects of escape clauses[2] has supplied an important general argument against a less than fully credible commitment to the defense of an exchange rate parity. This argument has greatly reduced the appeal of disinflation strategies based on exchange rate targeting, and is still used in favor of extreme forms of exchange rate regimes (such as free floats or currency boards) over intermediate forms such as adjustable pegs.

I would only like to point out that multiple equilibria models are, by the standards of year 2000, so much part of the typical conceptual apparatus of any self-respected international economist that any further advocacy on their behalf sounds, so to speak, *passé*, like preaching to the converted. The key question nowadays is: what next? In the past few years, and especially since the Asian crisis, my feeling is that both the academic and the policy environments have felt an urgent need to go beyond the traditional interpretive frameworks.

[1] An interpretation along these lines appears in Buiter, Corsetti and Pesenti (1998).
[2] Obstfeld (1997).

One of the outcomes of this quest for non-traditional crisis theories has been the development of a new approach in modelling confidence crises.[3] This approach promises to take care of one of the most obvious problems with the multiple-equilibria models, namely their oft-mentioned agnosticism on what causes the expectation shifts underlying currency and financial crises. Masson's paper is perhaps a bit dismissive as regards these recent developments, and the reason --- one suspects --- is that the new research agenda threatens to curtail the relevance and generality of the concept of multiple equilibria. In what follows, I will attempt to provide a non-technical comparison between the different approaches with the help of the model introduced in Corsetti (2000).

Let me start by considering a simple case of multiple equilibria at work. Here is the setup. A country pursues a unilateral peg. Its monetary authorities can only commit a given amount of resources (say, official reserves) to the defense of such peg. There are two agents in this economy who can attack the peg by selling domestic currency to the central bank in exchange for foreign currency. No agent is large enough to deplete the entire stock of official international reserves and force the abandonment of the peg. If both agents attack simultaneously, however, their combined attack forces the central bank to capitulate.

Each agent can attack (strategy A) or not (strategy N), and chooses to do so on the basis of the expected payoff. No coordination between agents is feasible. A speculative attack --- no matter whether successful or not --- involves a cost, here normalized to 1. So, if the attack is unsuccessful, the agent loses 1. If no attack occurs, the agent gets nothing and loses nothing. If a joint --- and successful --- run materializes, each agent's gains depend on the size of the post-attack exchange rate devaluation. Realistically, the size of such devaluation is a function of underlying fundamental weaknesses in the economy. We will denote the exchange rate gains by X. The higher is X, the weaker the fundamentals at the time of the attack. Table 1 shows the matrix of the net payoffs described above.

We immediately observe that if agent I does not attack, agent II has no incentive to attack, and if agent II does not attack, agent I chooses not to attack either. So there is an equilibrium in which no attack occurs. Now suppose that X is a random variable whose realization is known to both agents. In other words, both agents face no uncertainty regarding the

[3] See for instance Morris and Shin (1998).

state of the economy. Clearly, if $X<1$ no agent attacks (the payoff from an attack is negative, and each player can guarantee a zero payoff to herself by not attacking). If $X\geq 1$, there are multiple equilibria: one in which no one attacks, as seen above, and one in which both agents attack. If one agent chooses a specific strategy, A or N, the other agent is better off by following suit.

Figure 1

		Agent	II
		A	N
Agent	A	X-1, X-1	-1,0
I	N	0,-1	0,0

The model is highly stylized, yet it includes many key features of more sophisticated multiple-equilibria settings. Three considerations stand out. First, if fundamentals are sound enough, no speculative attacks occur. Second, when fundamentals are sufficiently weak, there are multiple equilibria. Third, provided we are in the weak-fundamentals region, a speculative crisis occurs when the agents shift from the no-attack equilibrium to the attack equilibrium. Why this happens, when does this happen we don't know. The theory is silent on what determines such deterioration in confidence.

Now assume that X is a random variable whose realization is unknown to the agents. Rather than observing X directly, each agent receives some private information about the state of fundamentals in the form of a signal Z, which is distributed uniformly and symmetrically around the true value of X. In other words, from the vantage point of each agent, the true value of X lies somewhere between $Z-\varepsilon$ and $Z+\varepsilon$ --- where is ε is some positive, arbitrarily small number --- with equal probability. So, Z is the best estimate of X.

Both the distributions of X and Z are common knowledge. Each agent's expected payoff if she attacks is given by $Z-1$ when the other agent attacks as well, or –1 if the other agent does not attack. Thus, each agent's expected payoff if she attacks is:

$$Prob\{other\ agent\ attacks\}*(Z-1)+(1-Prob\{other\ agent\ attacks\})*(-1) =$$

$$= Prob\{other\ agent\ \ attacks\}*Z - 1.$$

For this expected payoff to be positive, we need two elements. First, the signal Z received by the agent must be sufficiently high: if $Z<1$, the expected payoff is negative regardless of what the other agent does. Second, the probability that the other agent attacks must be sufficiently high. If one agent receives a signal Z equal to, say, $1+\eta$, with η very small, she will attack only if she believes that the other agent will attack with probability close to 100 percent.

The problem is that if agent I receives a signal $1+\eta$, she cannot consider it highly likely that agent II will attack. The reasoning is as follows. Agent I's estimate of X is $1+\eta$, so she must think that her opponent will receive a signal below $1+\eta$ with probability 50 percent. This implies that agent I thinks that agent II is receiving a signal below 1 with probability close to 50 percent, and we have established above that no agent with a signal below 1 will ever attack the currency. So when $Z=1+\eta$, agent I's expected payoff cannot be positive, and she will decide not to attack.

We can iterate this argument: a slightly larger signal, say $1+2\eta$, will not be enough to generate a positive expected return from attacking as there is a probability close to 50 percent that her opponent will get a signal below $1+\eta$, and so on. At some point we will find a cutoff point, say $Z=Z'$, at which agent I will rationally switch from a "no attack" to an "attack" strategy since her signal is now high enough to make her sufficiently confident that the other agent will also attack. In equilibrium agents will find it optimal to follow a simple rule based on this cutoff point: attack if and only if $Z>Z'$, do not attack otherwise. It can be shown that, in our case, such cutoff point is $Z'=2$ for both agents. Since agents can estimate the state of fundamentals with arbitrarily high precision, relatively weak fundamentals ($X>2$) will be associated with currency collapses, relatively strong fundamentals ($X\leq 2$) with the absence of speculative attacks.

The message of the model above is rather explicit. First, the realistic introduction of some uncertainty (incomplete information) on the state of fundamentals rules out multiple equilibria: an attack occurs if fundamentals are sufficiently weak, no attack occurs when fundamentals are strong. Second, to "kill" the multiplicity of equilibria we only need an arbitrarily small degree of uncertainty. Third, there are no longer self-fulfilling crises triggered by arbitrary shifts in expectations. Fundamentals --- and fundamentals only --- determine whether a currency crisis occurs or not. Fourth, multiple equilibria occur only in a very special case of the model in which there is no uncertainty whatsoever on the state of fundamentals (or, alternatively, in which all signals are common knowledge).

At this stage, it is still much too early to predict whether and when the new approach will produce a body of crisis literature able to supplant the traditional apparatus. But we cannot afford to overlook that models of speculation with incomplete information represent today the building blocks of a promising new and far-reaching theory of the determinants of market confidence and its swings. If this theory delivers on its promises, I look forward to reading a survey of its development as lucid and informative as the one Paul Masson has written for the multiple-equilibria literature.

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