



***Second conference of the  
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*Financial stability  
and globalisation*

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***How to escape contagion in the interest rate trap***

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## 1 How to escape contagion in the interest rate trap

*"The presence of crossover investors poses potential risks to the emerging markets asset class as their investments are often tactical in nature and as such they could shift holdings quickly in response to event risk, better opportunities elsewhere, or a growing perception that upside surprises are much less likely than downside ones given the sharp rise in valuations of emerging market assets over the past year and a half." Institute of International Finance, 15 April 2004*

During the last couple of years, "deflation trap" has been the catch word for many central bankers. In the aftermath of the bursting of the bubble of asset prices starting in April 2000, serious concern about the risk of worldwide stagnation (the fear of a Japanese scenario) motivated an unusually aggressive policy of exceptionally low short-term interest rates. This policy has been extended for a "considerable" period. Abundant liquidity was a key factor for resurgent economic growth and for a rebound of global asset prices.

Recently, however, there is increasing concern that the aggressive policy of low interest rates has encouraged excessive risk-taking – thus building up serious imbalances, resulting in high vulnerability of the world economy: low short-term interest rates and a steep yield curve provide powerful incentives for a strategy of borrowing short and lending long. Feedback trading may have pushed asset valuations beyond levels justified by improvements in fundamentals. The policy of easy money encourages the boosting of leverage. It makes it attractive to undertake carry trades in order to finance excessive investment in risky markets (let it be shares, housing or emerging markets).

### 1.1 The 1994 scare

In that view, the Fed, having just escaped the "deflation trap", is now caught in an "interest rate trap". Strong economic growth could have the effect that inflation might rise significantly and so may call for a rapid tightening so as not to be left "behind the curve". But an unanticipated spike in yields in the US treasury market might trigger the unwinding of carry trades and leveraged positions and so lead to an abrupt widening of credit spreads both in mature and emerging markets. Some fear that such a scenario of rapidly rising interest rates may lead to a financial meltdown. Such fears are driven by the experience of 1994. In that year (the last time the Fed ended a long period of low interest rates), long-term interest rates spiked up dramatically after an unexpected tightening in February, from 5.7% in February to more than 8% by November. At the same time, a sell-off in global bond markets doubled yield spreads on emerging bond markets from 405 basis points at the end of 1993 to 800 basis points in December 1994. The tightening of monetary policy sparked both the Orange County and the Tequila crisis.

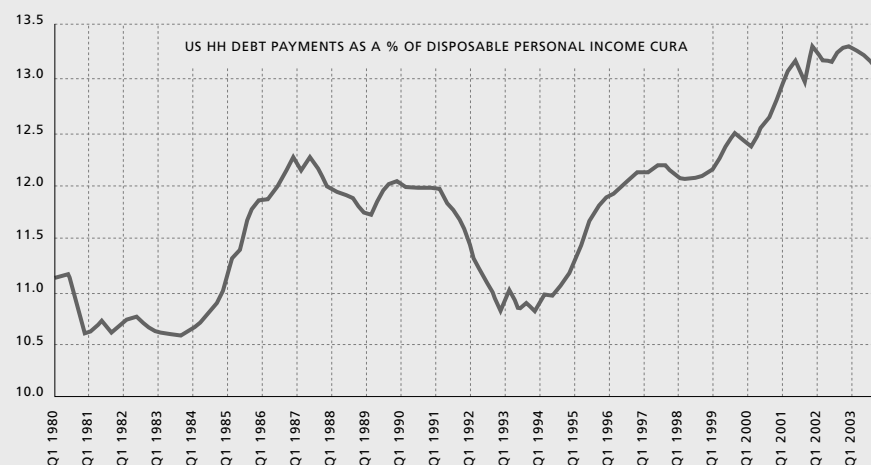
After years of intensive research focussed on ways how to get around the deflation trap, caused by the "zero-interest rate bound", it seems that we now have to turn to a novel twist: the "interest rate trap", postulating a conflict between two key central bank objectives: price stability and financial stability. Is there a fool-proof way to escape the unpleasant consequences of this trap? If indeed there is a conflict between price stability and financial stability, the challenge is how to organise an orderly reduction of imbalances without either triggering financial collapse or feeding excessive inflation.

Let me first try to identify what kind of imbalances should be addressed. Stimulated by the assurance of a long-term perspective of a period of low interest rates, positive-feedback trading may have pushed asset prices above fundamentals. Large unsustainable increases in asset prices pose a problem both on the domestic and on the global level. In the USA, there are indications that low interest rates

also encouraged overinvestment in emerging markets. *Carry traders*, seeking higher yields by going out along the credit risk spectrum, use credit in short-term US debt to invest in risky emerging market bonds. Recovering from the shock of Argentina's default, there has been a surge in portfolio flows to emerging markets at the end of 2003 and the beginning of 2004 (see IMF 2004 and Figure 2).

Figure 1. Debt payments of US households as a % of disposable personal income

Source: Datastream.



encouraged households and businesses to build up debt and to artificially inflate the prices of houses, stocks, bonds and other assets. Household financial liabilities (as per cent of disposable personal income) increased in the USA from 87% in 1990 to more than 104% in 2000 and up to 117% at the end of 2003. Debt payments of US households went up from 11% of disposable personal income in 1994 to more than 13% in 2002 and stabilised at that level as a result of the huge drop in interest rates (see Figure 1).

At the same time, search for attractive yields

What are the risks involved? If asset valuations become based on excess liquidity rather than fundamentals, the withdrawal of monetary stimulus could trigger a widespread reassessment of asset valuations. A drastic rise in interest rates might trigger fire sales on risk markets. In the attempt to unwind carry trades and leveraged positions, a dramatic jump in prices may result in the following types of risk:

1 *Financial intermediation risk*: the most imminent risk is that highly leveraged investors will become bankrupt (let it be leveraged institutions on the housing market in the

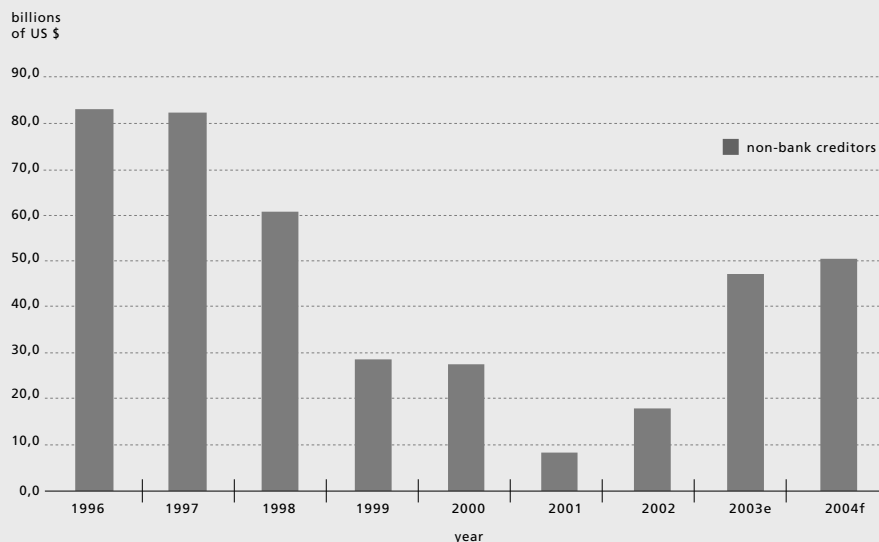


Figure 2. Net capital flows to emerging market economies; non-bank creditors

Source: IIF 2004.

USA<sup>1</sup> or the carry traders on emerging markets). The main concern here is that once one key player gets into trouble, it may trigger a chain reaction threatening a worldwide financial meltdown just as during the LTCM crisis in 1998.

**2 Debtor risk:** rapidly increasing spreads may cause financial distress to debtors relying on a constant flow of funds. In the USA, holders of adjustable-rate mortgages may get in trouble as a result of an excessive spike in long-term interest rates. Drying up of funds (sudden stops) to emerging markets may substantially worsen the fundamentals in some regions relying on outside funds to promote internal growth.

In an interest rate trap, central banks are faced with the following dilemma. Any wrong move (either a too tight or a too lax policy) might be the trigger on the road to disaster:

a) Raising interest rates too much runs the risk of a credit crunch on domestic markets. At the same time, contagion effects may spread across emerging markets (inducing large-scale capital flight from the periphery to the core – as in the East Asian financial crises of 1997).

b) Leaving interest rates too low runs the risk of further fuelling existing imbalances. This may not only fuel a long- (or better medium-) run risk for price stability, but in addition poses the threat of simply postponing and at the same time aggravating the day of reckoning.

The present paper focuses on financial intermediation risk – the question how to contain contagion. Following work by Morris and Shin (1999, 2004) based on the theory of global

games, the present paper argues that when traders are highly leveraged, unexpected news are likely to cause dramatic informational spillover effects resulting in significant overshooting of price effects. Under such conditions, public information may create serious multiplier effects. So during periods of distress, financial markets are characterised by substantial destabilising properties.

Traders tend to build up similar positions. Such herding need not be the result of bounded rationality. It can be driven by perfectly rational incentives on an individual base – possibly as the result of the payments structure of fund managers: if payments are linked to relative performance, it pays to go with the markets. But it will definitely be encouraged even further when there is a public commitment to an extended period of calm policy. Once this commitment will be withdrawn, the incentive to rush to the exit in the attempt to unwind the own positions may then cause excessive price movements. For each single trader, it is individually rational to ignore the externalities involved in such moves.

The task for policymakers to prevent contagion under such conditions involves an extremely precarious intertemporal balance: a clear public signal of an imminent rise of interest rates would immediately spark the very contagion effects we want to avoid. Instead, the challenge is to introduce sufficient noise in central banks statements indicating the risk of rising interest rates without being precise about the exact timing. A policy of gradualism is called for: the implementation of interest rate steps should wait until the most precarious leveraged positions have been unwounded.

Unfortunately, it will be extremely difficult to

get the dynamics right: the task is to make leveraged investors aware of the risks involved in playing along the yield curve, without triggering a sell-off. Under what conditions might such a strategy work out? Private information needs to be sufficiently dispersed, but it should be in such a way that the most leveraged investors have the more precise information. This will be the case if institutional investors have better strategies to identify noisy statements with implicit messages.

The most recent Fed policy seems to be fairly in line with what our theory suggests, after some period of mistaken communication policy. No doubt, the statement “*policy accommodation can be maintained for a considerable period*” made by the Federal Open Market Committee on 9 December 2003 contributed to the increase in underlying risk, thus aggravating vulnerabilities. It certainly did not ease the task to initiate a turnaround in interest rates. Recently, however, speeches and statements seem to follow the script just outlined.<sup>2</sup> Gradualism may contribute to unwind financial imbalances. Otherwise, there has to be an excessively long period of too low interest rates!

In principle, according to the theory of global games, the best strategy to prevent a sell-off would be to give very precise private signals to the most leveraged traders, whereas the public statements remain rather vague (the overshooting effect arises from the fear of traders that others react faster to public information). The problem with such a strategy is that the unwinding of positions is bound to have redistributive effects: those selling first gain at the expense of those coming late and in particular of those who are buying. Of course, stability of the financial system would be res-

<sup>1</sup> On the surface, it may seem that highly leveraged institutions like Fannie Mae and Freddy Mac are safely cushioned against such risks by engaging in sophisticated hedging strategies – making sure that by active derivative trading they are sufficiently diversified to survive stressful developments. But such complacency ignores two critical points. (1) Investors who hold mortgage-related securities usually use dynamic hedging strategies. These strategies rely heavily on markets being very liquid and may run into trouble exactly when liquid markets dry out. (2) It neglects the counterparty risk and may be unpleasantly disturbed by wake-up calls as soon as the trading partners of these hedging activities are caught in the interest rate trap!

<sup>2</sup> See in particular Alan Greenspan’s remark before the Joint Economic Committee, US Senate on 21 April 2004: “Rates must rise at some point to prevent pressures on price inflation from eventually emerging”, at the same time signalling that no increase is imminent, and the statement of the Federal Open Market Committee on 4 May 2004: “The Committee believes that policy accommodation can be removed at a pace that is likely to be measured.”

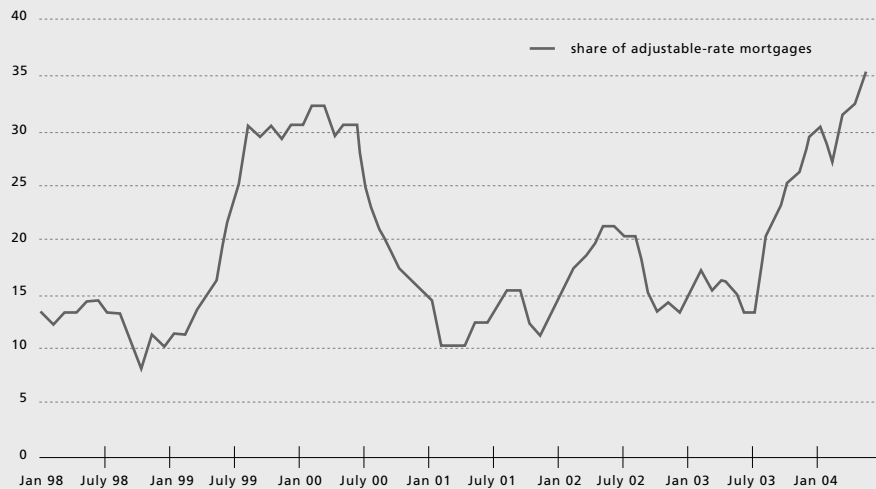


Figure 3. Share of adjustable-rate mortgages in the USA

Source: Datastream and Mortgage Bankers Association.

cued (at least for the moment), if the key players are given sufficient time to sell the bonds to small private investors. If there are enough naïve (low-leveraged) investors around to chew up the hot potatoes, there would be no need for a sell-off. The same principle applies also to a transfer of the interest rate risk inherent in mortgages from highly leveraged GSE to families happily engaging in adjustable-rate mortgages. It may be no coincidence that adjustable-rate mortgages (ARMs) propelled from a low of 12% in 2001 to 35.2% of all mortgage applications in May 2004 (see Figure 3), while at the same time, the NCUA (National Credit Union Association) Board cautioned that credit unions must manage today's risk of holding too many fixed-rate mortgages in their portfolios as interest rates rise.<sup>3</sup>

In general, most economists do not care much about redistributive effects. But what we should care about are long-run moral hazard effects: bailing out leveraged investors by a

policy of excessive gradualism may encourage excessive risk-taking in the future. So the real issue is: how to give ex ante incentives not to engage in carry trades? May this justify to teach highly leveraged investors a lesson ("Do never rely on being bailed out!") by giving them a haircut? Trying to bail in the key leveraged players would be a highly risky game, putting at stake the stability of the global financial system. The potential costs would be much higher than in the case of Argentine bondholders: the real costs would not be limited to the population of one country (like Argentine) picked out as guinea pig. As argued below, instead the problem should be tackled by imposing stronger procyclical liquidity regulations.

## 2 Contagion in emerging markets

Until January 2004, there has been an unusual strong compression of EMBI spreads. Declining volatility increased the risk appetite of investors as a rational response to improved market conditions.

<sup>3</sup> According to Reuters, Frank Nothaft, Freddie Mac's chief economist, commented on 11 March 2004: "Families looking to lower their monthly payments even further might consider adjustable-rate mortgages (ARMs). We predict ARMs will make up a much larger share of originations this year, perhaps the highest since about 1995."

But expectations of an extended period of low interest rates made such an exposure even more attractive, resulting in an artificial compression of risk aversion and further encouraging incentives to take leveraged positions: "carry trades" based on expectations of a sustained period of low interest rates raised increasing concern about the risk of a sudden withdrawal of funds triggering widespread contagion (see IMF 2004 and IIF 2004). Are these concerns justified? How does contagion work? Here, we are interested in contagion defined as excessive comovements of seemingly unrelated assets with the risk of a systemic financial collapse.

Comovements of emerging market bonds are not necessarily due to contagion effects in the sense of the definition given above. In the terminology of Masson (1999), we have to differentiate between contagion effects and other causes, namely

- 1 monsoonal effects (movements due to a common cause such as policies undertaken in industrial countries that affect different emerging market countries in a similar way) and
- 2 spillovers (a change in macroeconomic fundamentals affecting fundamentals of other countries, for instance via trade links).

Instead, our focus here is on financial links, more precisely on contagion caused by the overshooting of asset prices. When the same investors are active in otherwise unrelated markets, their liquidity shocks will pass through to these markets.

At first sight, it seems to be difficult to disentangle monsoonal effects from contagion via asset prices: how should we differentiate? If interest rates not only in the USA but worldwide are low, there is good reason to believe that this will also improve fundamentals in emerging markets. This effect can be explained through various channels: the reduced debt burden due to low interest rates reduces the probability of sovereign debt default; high export demand to industrial countries provides a strong demand stimulus, the procyclical risk appetite of investors drives substitution into riskier assets, and so on. After the Tequila crisis, many studies have analysed the link between US interest rates and EMBI spreads. The econometric evidence has been somewhat mixed; but there are strong indications that this link became more important recently. A study by McGuire and Schrijvers (2003), using high-frequency data, shows that secondary-market spreads on emerging market sovereign bonds tend to be highly correlated across countries. They show that one third of the total variation in spreads (correlation between daily spread changes for a sample of 15 countries) is driven by common forces. As illustrated in Figure 4, the common factor is correlated with US interest rates (negatively) and in particular positively with measures of risk tolerance. There is a high correlation with the VIX index<sup>4</sup> (see Figure 5).

So it seems quite natural that news of a rise in the US rates may drive emerging market countries into difficulties and so give an incentive to withdraw.<sup>5</sup> But what we are interested here is in

<sup>4</sup> VIX: the Chicago Board Options Exchange Volatility Index is a market estimate of future volatility. It is based on a weighted average of the implied volatilities of eight OEX calls and puts.

<sup>5</sup> We are not concerned with such procyclical fluctuations of funds per se. They may be seen as an efficient response to changes in market conditions. Instead, the focus here is on sudden excess fluctuations as a result of a sell-off. Of course, as Eichengreen/Mody (1998) argue, procyclical fluctuations can cause problems in itself for emerging markets: "If price and availability of funds depends heavily on external financial conditions, then emerging markets may find themselves alternatively swamped by and starved of foreign capital. They may be vulnerable to inflow-induced consumption booms, asset-price bubbles, and real overvaluation when industrial-country interest rates are low and to sudden reversals in the direction of flows sufficient to precipitate a crisis when industrial-country interest rates rise."

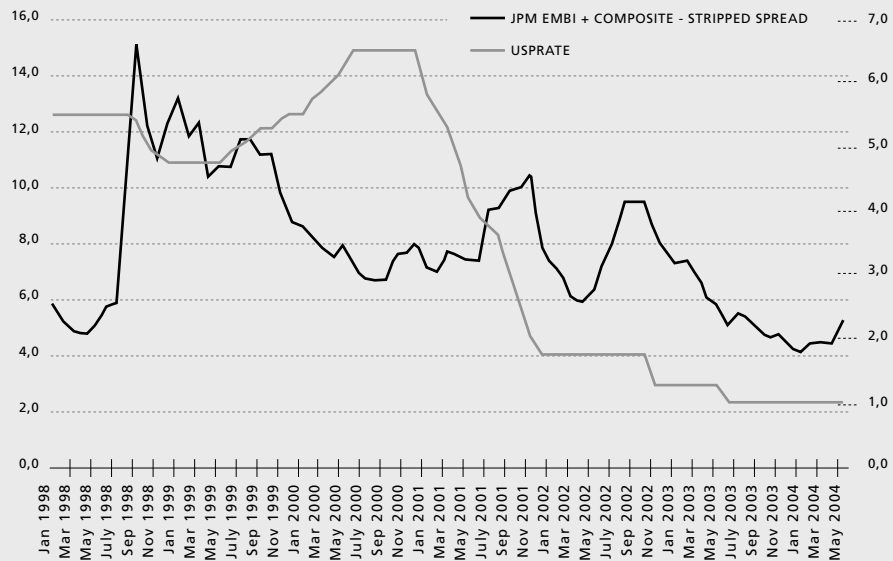


Figure 4. US Federal Funds Rate and JPM EMBI + COMPOSITE - STRIPPED SPREAD

Source: Datastream.

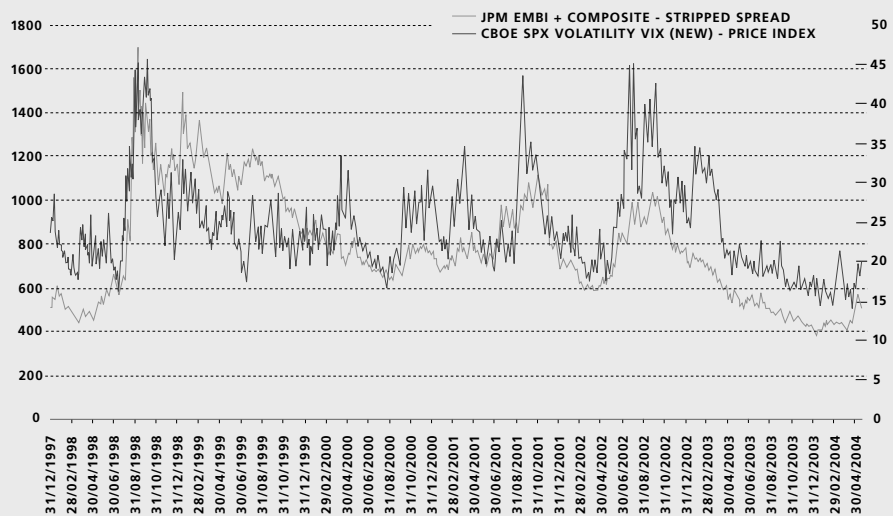


Figure 5. JPM EMBI + COMPOSITE - STRIPPED SPREAD and VIX VOLATILITY index

Source: Datastream.

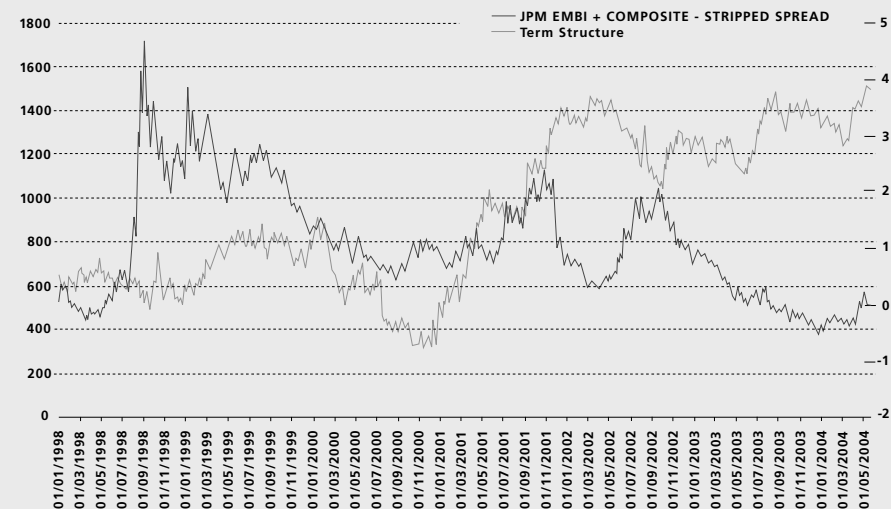


Figure 6. JPM EMBI + COMPOSITE - STRIPPED SPREAD and Term Structure (10 YR US BOND YIELD GOV - 3 MONTH US TREASURY BILL)

Source: Datastream.

contagion, in the sense of rapid and (excessive) unexpected movements characterised by overshooting – possibly resulting in sudden stops. Leveraged investors play a key role here. Remarkably, Ferrucci (2003) finds that long-term US treasury rates are negatively correlated with spreads. A steeper US yield curve is associated with lower emerging market spreads (see Figure 6). He attributes that effect to the presence of leveraged investors, who borrow at short-term rates to lend at longer-term rates. In an interesting paper, Kaminsky, Reinhart and Vegh (2003) identified three key factors triggering contagion defined in the following way. A chain reaction in other countries has been triggered by the “unholy trinity”:

- they follow a large surge in capital flows,
- they come as a surprise, and
- they involve a leveraged common creditor.

In contrast, when similar events have elicited little international reaction, they were widely

anticipated and took place at a time when capital flows had already subsided.

Unfortunately, Kaminsky, Reinhart and Vegh (2003) do not pose (let alone answer) the most pressing question from a policy point of view: Why have some events been widely anticipated, whereas others came as a drastic shock? In the case of those that have been anticipated, why did contagion not set in before – at the time they became anticipated? As examples for anticipated shocks with limited external consequences they cite the default in Argentina, December 2001, and the devaluations in Brazil 1999 and in Turkey 2001. These examples illustrate an important point: public policy plays a crucial role. Take the example of Argentina: IMF interventions before the default have been crucial to contain contagion by giving time to unwind excessively leveraged positions. If you are stuck in an interest rate trap, the same recipe will

help. Of course, at that time the IMF was heavily accused of bailing out investors – exactly the same issue plays a role here.

What can be done to contain contagion? In traditional models of contagion, fund managers may follow fads driven by the relative performance payment structure or as a result of bounded rationality (as motivated in theories of behavioural finance). The fragility of mass behaviour is captured by models of herding as a result of informational cascades. A characteristic of these models is that arbitrary changes in expectations, not related to fundamentals, lead to self-fulfilling jumps between multiple equilibria. These models yield important insights; but they introduce too much indeterminacy – the actions may be purely driven by sunspots unrelated to fundamental policy variables. Furthermore, in models with informational cascades the results are extremely sensitive to the sequential structure of the game.

The following section instead uses a model of simultaneous actions of many (possibly small) traders. Private information, as modelled in the theory of global games, leads to a unique, predictable outcome in settings where multiple equilibria would prevail with common knowledge. This approach turns out to be extremely useful for helping to understand the key mechanism at work with contagion via changes in asset prices. Informational externalities cause multiplier effects of individual reactions. This set-up can be used to identify crucial market failures involved in contagion and to draw important policy implications.

### 3 Contagion – a perspective from the theory of global games

A typical characteristic of financial markets is that frequently, the own actions depend strongly on my beliefs about what others are do-



ing. This strategic complementarity introduces feedback mechanisms, possibly generating multiple equilibria due to self-fulfilling beliefs. Let me illustrate this feature using a specific example. Let us have a look at highly leveraged investors, heavily exposed to emerging markets. If interest rates are expected to stay as low as they are at the time of writing the paper, these investors are on the safe side. They have no reason to get out of emerging markets. If, however, interest rates are expected to go up dramatically, investors will be forced to liquidate their assets at any cost. But there may well be an intermediate range of interest rate paths, let me call it a range of fuzziness, for which there are multiple equilibria. In that case, the outcome strongly depends on each investor's expectations about what others are doing on the bond market.

If you expect no sell-off (fairly stable spreads), you may be happy to keep your assets even in case interest rates go up. But if you expect others to sell, with the consequence of falling bond prices, you prefer to be the first to sell. This first-come-first-served mechanism drives the asset prices down instantaneously. Leverage plays a key role in this line of reasoning: the more leveraged you are as investor, the strong-

er you would be forced to liquidate once bond prices have been falling, and thus the stronger is the incentive for you to forestall such an unpleasant event. Obviously, traders with high short-term exposure have to be particularly concerned about the risk of others selling their assets. They will try to unwind their positions before prices are falling too much. This pressure to rush to the exit may trigger a run on the market, exacerbating the price movement.

Such a scenario is a typical example of a coordination game with multiple equilibria: for an intermediate range of fundamentals (here we are interested in the federal funds rate as the key fundamental variable), the outcome depends strongly on the beliefs of all traders. This indeterminacy is satisfactory neither from the point of view of theory nor of policymakers: if all depends on expectations, it is neither clear what will nor what should be done. Fortunately, however, recent advances in game theory show that we can get much more precise answers by using intuitively plausible selection criteria. The idea, initially developed by Hans Carlsson and Eric Van Damme in the theory of global game, is straightforward. It has been adapted and extensively refined to financial markets by Morris and Shin.<sup>6</sup>

If agents do not have common knowledge about fundamentals, there is (under fairly general conditions) a unique equilibrium even for the intermediate range of fuzziness. All agents get some private signal about the true state of fundamentals, but they do not know the signal of other agents. It turns out that a simple trigger strategy is optimal in that case. If my signal indicates that interest rates are likely to rise above some critical value, then I should sell my bonds. Otherwise, I should stay in the market.

To assume that all agents have private signals

(the lack of common knowledge) seems to be a most natural assumption. Sure enough, everybody should be able to figure out the current federal funds rate – just look it up in any newspaper. So there should be common knowledge about that rate among all investors. But the key variable relevant here is the future path of the funds rate. Usually, nobody has perfect knowledge about that path (with the exception of some odd period when a central bank commits to hold the rate constant for a considerable period). Market participants have access to a large set of information variables; but usually they have slightly different perceptions (the private information set is dispersed). These small differences in information generate uncertainty about others' beliefs. As Morris and Shin have shown, in the absence of common knowledge, there exists a unique equilibrium under plausible conditions, with each investor using the simple trigger strategy characterised above.

Some investors get bad signals and sell; others – those receiving better signals – stay in the market. An interesting feature of this game is that if a critical mass of investors is getting bad signals and sell, there will be a dramatic fall in the bond price. At some critical stage, there is an abrupt switch from the good to the bad outcome.

But is the assumption of heterogenous private information really realistic in our context? Surely, any announcement by central bank officials should be common knowledge – it has to be public information. But even if the whole future path of short-term rates would be publicly announced, there is no common knowledge among investors about how the changes in interest rates will affect fundamentals on specific markets. So in reality, there is a mix of both public and private information. This, however, can have fascinating, and, possibly embarrassing, impacts on public information.

<sup>6</sup> See Morris/Shin (1999, 2004) and also Heinemann/Illing (2002).



### 3.1 Multiplier effects of signals

New public signals will lead you to reassess the probabilities of fundamentals. But beyond the simple updating of your own a priori probability, public information, if it is sufficiently precise, has an additional effect: it also conveys some information about how others will react. This strategic aspect multiplies the initial impact. It will result in a more than proportional adjustment of your own assessment and so lead to stronger reactions. Even seemingly small changes in the public signal may thus result in strong movements of market positions, possibly triggering large crises. To the outside observer, the aggregate effect seems to be an overreaction of the market to new information. Intuitively, if we are already close to the critical stage where the abrupt switch from the good to the bad outcome is happening, some small news indicating a slight deterioration in fundamentals may result in an update of enough investors to trigger that switch. There will be a drastic change in mood, even though fundamentals did not deteriorate much.

This change in mood will be the more dramatic, the higher the leverage and the faster the speed of information transmission. Active traders on financial markets are familiar with this phenomenon from own experience, but the theory of global games allows for a precise modelling of the strategic effect: if market participants are concerned about the actions of other investors, they take into account how others might react to public news (you form beliefs about how the news might affect the beliefs and thus the actions of other traders). Public signals play the role of coordinating expectations. Again, the intuition is straightforward: if I am concerned that my competitors react to the news by selling, I have an incentive to act even faster to be the first. Because of this strategic incentive to move

first, traders put a stronger weight on public information than rational signal procession without the interdependency of creditor behaviour would suggest. It aggravates price movements and may result in runs on markets.

This coordination aspect is of utmost importance when prices are sensitive to the flow volume of trade: potential losses arising from sudden changes in asset prices induce traders to react strongly to the risk of selling pressure by others. For leveraged investors, a fall in asset value increases the pressure to sell, reinforcing the initial impact. During these events, the liquidity of the market dries up. When prices are falling rapidly, traders will be forced to sell even assets of different, not closely related risk classes. Obviously, the multiplier is stronger the higher the leverage.

### 3.2 Lessons for central bank policy

When private information is very precise relative to public information, the multiplier effect is small. So when the noise in the public signals of market participants is large, the breaks are less pronounced. The noise generates a greater dispersion of estimates of the underlying fundamentals, and hence there is less unanimity in judgements as to whether the critical threshold of the switching strategy has been breached. In contrast, when the noise is small, the market outcome suffers a much sharper break, since the distribution of estimates conditional on the true realisation of fundamentals is that much more concentrated around the mean. This gives rise to much more precipitous breaks in the market outcome.

Experimental evidence, however, shows that common (public) information does not necessarily lead to common beliefs (common knowledge) as is presupposed by the theory of global games (see Heinemann, Nagel, Ockenfels [2003]).

Subjects do not distinguish between public and private information (with high precision). Transparency, however, has a crucial impact. It can be understood as an increase in the precision of information (private or public) and results in more precise private beliefs (as in Heinemann/Illing [2002]), resulting in the multiplier effects discussed above. So in order to contain the overshooting effect and to prevent rush to the exit, central banks should introduce sufficient noise in their signals before interest rates are raised. Ideally, if feasible, pivotal private investors should be given highly precise signals as private (inside) information in order to give them time to unwind their positions without triggering the strategic multiplier effects putting financial stability at risk. Such a policy may, however, have damaging long-run moral hazard effects. But a similar mechanism works if the most heavily leveraged players are in a better position to infer the relevant information from noisy public signals than others. Usually, experienced financial market participants have complementary information which puts them in a position to interpret central bank statements more precisely than less well-trained traders. So announcements may be framed in such a way as to guide them to have enough time to clean their leveraged positions before contagion sets in. Of course, that requires an extremely precarious intertemporal communication strategy. If it does not yield the desired outcome, there is no escape from the interest rate trap. In that case, a slower adjustment of interest rates (a policy of gradualism) is needed to guarantee financial stability even if persisting signs would indicate a high risk for price stability. Contrary to Bernanke (2004), you cannot have the cake and eat it at the same time.

Our analysis provides an additional lesson for the role of communication to central banks. Whenever there is a need for coordination

among expectations of private investors, public information plays a crucial coordinating role. This holds not only for interest rate changes, but also issues such as how the role of new technologies may affect price stability and the natural rate of output. In the presence of uncertainty, central bankers should not talk too much about new paradigms, picking out structural breaks as a central theme – it will serve as focal point for financial markets as a justification for excessive asset prices – they soak up the slightest hint like a sponge.

### 3.3 Externalities involved

Why do traders, being aware of the risk of markets becoming illiquid, not try to insure against this risk by holding more liquid assets? Should not market discipline force them to reduce leverage and instead hold more liquid assets? The problem is that the amount of insurance chosen by each individual agent will be insufficient. The selling pressure imposes externalities on the other traders. The individual trader has no incentive to internalise these externalities, resulting in a suboptimal level of liquidity. As argued by Cifuentes, Ferrucci and Shin (2004), regulation in the form of minimum capital requirement ratios or other solvency constraints may, at times of market turbulence, exacerbate the contagion effects, becoming itself an important source of systemic risk. A decline in asset prices may wipe out the capital meant to serve as a buffer. In that case, insisting on the fulfilment of capital requirement will aggravate the selling pressure. Instead, procyclical liquidity requirements might mitigate spillovers and so help to correct these externalities.

### 3.4 Conclusions

Central banks play an important role as coordination mechanism in the presence of informa-

tional externalities. They should not prevent an orderly unwinding of imbalances – in contrast, they should contribute to make the unwinding orderly. But this strategy poses a serious risk: a policy limited trying to soften ex post the impact of negative systemic shocks may contribute itself to building up new structural imbalances. If that is the case, the solution of the underlying problems would simply be postponed in the future. Even worse: it may encourage building up even more serious imbalances, thus aggravating the underlying risks. So the challenge for policy and for future research is to try to identify instruments for economic policy which help to prevent the building up of imbalances right from the beginning.

A key issue in this context is to identify financial imbalances in time. In order to cope with the information externalities described above, stricter regulation is needed. More stringent capital requirements, however, may be counterproductive if the risk of declining asset prices is at the core of the problem. A promising way to go could be to impose procyclical liquidity requirements. In contrast, monetary policy using just one instrument (interest rates) would be overburdened trying to address both financial and price stability. Even though it may be well suited to prevent financial meltdowns, extensive use of this instrument is likely to encourage risk taking ex ante, thus encouraging bubbles and excessive valuations on other asset markets (see Illing [2004]). So monetary policy will be seriously handicapped if it is not supported by adequate regulation.

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#### **Dinner speech**

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