IMF lending and creditor moral hazard

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Abstract

Existing empirical evidence on the effects of IMF intervention on debtor and creditor incentives – so-called moral hazard – is mixed. We develop a new test of creditor moral hazard which uses some new data and some more stringent identifying restrictions. The test examines the response of the market valuation of UK banks to IMF loan packages. It finds a significant positive response for UK banks, with abnormal returns of over 1% in a number of cases. These excess returns are greater, the larger is the IMF package and the larger is the size of the creditor banks' emerging market portfolio. This effect is significant even once we control for the potentially welfare-enhancing effect of IMF loans in offsetting overpricing problems in international capital markets. In short, we find concrete evidence of creditor-side moral hazard associated with IMF support.

Summary

There has been an active on-going debate on the appropriate role of IMF lending in resolving international financial crises. On one side are those who favour the IMF playing the role of pseudo international lender of last resort. On the other are those who would favour the debtor country and its private creditors, rather than the IMF, shouldering more of the burden when crises strike.

The balance between these arguments requires us to weigh the benefits of public policy intervention in mitigating an international capital market externality against the costs of distorting risk-taking incentives through such intervention – so-called moral hazard. But taking a quantitative view of the importance of international moral hazard is troublesome: there have been only a handful of studies and their results have been mixed. For example, a number of studies have looked at the behaviour of borrowing spreads around the time of IMF interventions as evidence of moral hazard. But the behaviour of such spreads has rarely been consistent.

This paper focuses on the incentives for creditor banks to engage in risky lending to emerging markets as a result of large-scale IMF loans. Specifically, it looks at whether the market valuations of creditor banks have been boosted excessively following a number of IMF interventions. These interventions begin with the IMF loan to Mexico in 1995 and end with the IMF loan to Brazil in 2002. If banks' valuations are indeed boosted by IMF loans, incentives to take on further risk will increase.

The following results stand out. First, returns to creditor banks are indeed (statistically significantly) greater than can be explained by general market movements around the time of IMF bail-outs. Second, these boosts to the market valuation of banks are large quantitatively – for around ten interventions, they exceed $4 billion. Third, these excess returns are greater for big-ticket IMF packages and especially when IMF loans have been subsequently augmented. Fourth, these valuation responses are larger than can be accounted for by the potentially welfare-enhancing effect of IMF loans in offsetting international capital market frictions.

Taken together, this evidence is consistent with a generic creditor moral hazard story. The response of market prices is consistent with increased incentives to take on emerging market risks, in response to large-scale IMF interventions. The costs of crisis are clear, immediate and visible while the costs of moral hazard are, by contrast, invisible and long-lasting. This paper makes clear that, though they may be out of sight, these moral hazard costs should certainly not be kept out of mind.

1. Introduction

Since the Mexican crisis in 1995, there have been at least a further dozen systemic international financial crises in emerging market economies. If anything, the incidence and virulence of these crises appears to be increasing. Against that background, there has been an active on-going debate on the appropriate role of IMF lending in resolving such crises (eg, Eichengreen (2002)). On the one side are those that favour the IMF playing the role of pseudo-international lender of last resort in those situations (eg, Fischer (2000)). On the other are those who would favour the debtor country and its private creditors, rather than the IMF, shouldering more of the burden when crises strike (eg, Meltzer (2000)).

The balance between these arguments requires us to weigh the benefits of public policy intervention in mitigating an international capital market externality, against the costs of distorting risk-taking incentives through such intervention. In an international context, the incentives in question are those of debtors when framing policy decisions (so-called debtor moral hazard) and/or private creditors when framing investment decisions (creditor moral hazard).

Taking a quantitative view of the importance of (creditor and debtor) moral hazard is, however, far from straightforward. To date, conclusions from the empirical literature have been at best mixed; they are reviewed in Section 2. Truman (2001) summarises as follows:

> 'These [moral hazard arguments] are conceptually consistent, but the advocates...have yet to demonstrate that moral hazard...has increased significantly since the Mexican rescue in 1995. In my experience, unsubstantiated theoretical propositions and anecdotes provide an insufficient intellectual foundation for dramatic changes in international financial policy.'

This paper takes up Truman's challenge. It considers some fresh evidence on the extent of the creditor moral hazard associated with recent large-scale IMF bail-outs. It builds on earlier contributions by using a different data set and stricter identifying assumptions to test a sequenced set of necessary conditions for the presence of moral hazard. In this way, it is able to reach cleaner and, we think, stronger conclusions than those unearthed in the previous literature. The empirical methodology, identifying restrictions and empirical results are discussed in Sections 3-7. Section 8 concludes with some policy implications.

2. Existing literature

The theoretical literature on moral hazard has, of course, a long intellectual history (eg, Grossmann and Hart (1983)). More recently, the issue has been explored analytically in an international context by, among others, Jeanne and Zettelmeyer (2001), Miller and Ghosal (2002), Mussa (2002) and Haldane, Irwin and Saporta (2003). All insurance contracts, IMF or otherwise, possess some degree of moral hazard. So the key issue becomes - how much is too much? To answer that question we need quantitative, empirical evidence on the importance of moral hazard.

To date, that empirical evidence has been far from conclusive and there have been only a handful of studies. Broadly, two approaches have been pursued. The first approach considers the average size of the redistribution of resources from the official sector to the debtor country and/or its private creditors through the provision of IMF loans. It has tended to find that these redistributions are sufficiently small in quantitative terms, relative to the costs incurred by debtors and creditors at crisis time, that they are unlikely to have induced significant moral hazard.

For example, Lane and Phillips (2000) consider the size of IMF loans in relation to debtor country GDP and external debt. They conclude that loans have in the past been too small to have reassured creditors that they would be repaid with certainty. Indeed, it is argued that in most crisis cases creditors have sustained non-trivial losses, while debtors have undergone severe output contractions, both of which in financial terms far exceeded the potential value of IMF loans (Mussa (2002)).

Jeanne and Zettelmeyer (2001) consider the cost, rather than size, of IMF loans. Specifically, they calculate the subsidy implicit in IMF packages – that is, whether the interest rate charged on IMF loans covers the associated credit risk. This credit risk is mitigated by the fact that the IMF is a preferred creditor and, at least historically, has almost always been repaid. For that reason, Jeanne and Zettelmeyer use US Treasury yields as a benchmark interest rate. Comparing these safe yields with IMF borrowing costs, Jeanne and Zettelmeyer argue that the extent of the financial redistribution resulting from IMF bail-outs is small and so unlikely, by itself, to have induced significant moral hazard.

These studies get at one dimension of moral hazard. But they are partial in several respects. First, calculated *average* subsidies may not be a good reflection of the *marginal* effects of IMF

intervention. For example, at the height of crisis, an average risk-free rate is unlikely to be a good proxy for the true marginal cost of capital for a country, even once allowance is made for the IMF's preferred creditor status. It is these marginal costs which affect future borrowing decisions and hence moral hazard. Second, relatedly, these studies do not assess how *forward-looking* incentives (to borrow and lend) may have been affected by IMF intervention. They measure static redistributions of wealth between parties, whereas the essence of moral hazard is a dynamic effect on future behaviour by these parties.

Third, as Jeanne and Zettelmeyer (2001) discuss, a financial redistribution from the official sector to debtors and/or private creditors is only one of the potential moral hazard channels. Even if the debtor repays its loan to the IMF, there is the potentially distorting effect of the financial redistribution from debtor country taxpayers to private creditors associated with (and facilitated by) IMF bail-outs – an indirect moral hazard channel. This indirect moral hazard is associated specifically with creditors, since it is they who benefit from this redistribution, relative to the counterfactual of no IMF intervention.

The second empirical approach to assessing moral hazard has attempted to remedy some of these shortfalls. It has looked at the behaviour of observed country borrowing costs around the time of IMF interventions. Country spreads (marginal borrowing costs) are likely to better capture the marginal effects of IMF intervention. And they are explicitly forward-looking, so better capture effects on future (borrowing and lending) incentives. Haldane (1999) considers the wedge between IMF borrowing costs and country-risk adjusted spreads at the time of eight IMF bail-outs, finding an implied IMF subsidy somewhat greater than that in Jeanne and Zettelmeyer (2001). Lane and Phillips (2000) consider the behaviour of country spreads around the time of 22 IMF interventions between 1994-99. They find that few of these IMF interventions led to a consistent and decisive lowering of spreads, which they interpret as evidence against moral hazard.

The studies by Zhang (1999), Dell'Arricia, Schnabel and Zettelmeyer (2002), McBrady and Seasholes (2000) and Kamin (2002) are all similar in spirit. They examine the behaviour of spreads either side of a single IMF-intervention event, while at the same time conditioning on other factors likely to have affected spreads such as macroeconomic fundamentals. Zhang finds no evidence of a distinct IMF moral hazard effect in emerging market spreads either side of the Mexican bail-out in 1995. Dell'Arricia *et al* and McBrady and Seasholes do find evidence in the level and dispersion of emerging market spreads consistent with moral hazard following two

official sector decisions not to bail out. In Dell'Arricia *et al*, the no bail-out event was the IMF decision not to extend loans to Russia, which preceded their crisis in 1998. McBrady and Seasholes consider the effects of the decision by the Paris Club in 1999, which required Pakistan to restructure its private sector bonds. Following both events, emerging market spreads rose and became more dispersed, consistent with a moral hazard story. Kamin, however, finds few differences between the pattern of emerging market spreads over recent years and those prior to the Mexican crisis (his 'no bail-out' counterfactual). He takes this as evidence against moral hazard having been induced by recent IMF bail-outs.

Taken together, this evidence is rather mixed. But it suggests that, at worst, moral hazard has been a transient, historical feature of the international monetary system, rather than a current and on-going concern. There are several conceptual reasons, however, for questioning that consensus.

First, using market spreads poses an identification problem. It will pick up the effects of a financial redistribution from the official sector to debtors and/or private creditors. Such a redistribution would tend to lower risks for both the debtor and its creditors and so would lower the equilibrium cost of borrowing. But it is less clear how a redistribution from the debtor to private creditors – the indirect moral hazard channel discussed by Jeanne and Zettelmeyer (2001) – would affect spreads. It might potentially result in a *rise* in spreads if the upshot is that debtor creditworthiness is put at risk. In other words, tests based on observed spreads might be poor at detecting moral hazard in general, and creditor moral hazard in particular. This might help explain the mixed messages from previous studies using spreads.

Second, as Dell'Arricia *et al* discuss, there is a further identification problem when interpreting movements in market spreads around the time of IMF bail-outs as a signal of moral hazard. A fall in spreads is consistent with moral hazard. Equally, however, it is consistent with the IMF playing a positive role in offsetting an international capital market externality, caused by private capital becoming over-priced in crisis periods (see, eg, Morris and Shin (1999)). Resolving that identification problem – do IMF interventions correct over-pricing or induce under-pricing? – calls for stricter identifying assumptions.

Third, existing studies attempt to explain whether IMF bail-outs lower borrowing costs and compress spreads looking across all emerging markets. But in practice, bail-outs might have idiosyncratic rather than generic effects – for example, because the bail-out is motivated by

'geopolitical' factors (Mussa (2002)). In these cases, the borrowing costs and incentives of the intervened country will be affected, but costs and incentives in emerging markets generally may not. That means looking at several IMF events (rather than any one) and assessing country-specific (as well as generic emerging market) movements at those times. Both generic and idiosyncratic effects are potentially incentive-distorting and hence costly in a welfare sense.

3. Method

The tests of creditor moral hazard developed below attempt to address some of these methodological problems. First, we use an event-study method, as with most of the existing literature. But we consider a wider range of IMF events than previous studies. The sample covers all of the recent large-scale capital account crises in emerging markets between 1995-2002.[1] This gives the tests extra degrees of freedom and allows us to track incentives for risk-taking over time.

Second, we focus explicitly on *creditor* moral hazard. We do this by looking at the effects of IMF interventions on the market valuation of creditors, rather than on debtors' cost of capital. Specifically, we look at the response of creditor banks' share prices following an IMF event.[2] Subject to some identifying restrictions, discussed below, this measure ought to capture the forward-looking effects of any financial redistribution either from the official sector, or from the debtor, to private creditors. In other words, it captures both of the creditor moral hazard channels identified by Jeanne and Zettelmeyer (2001). We are not aware of previous studies to have attempted to identify separately creditor moral hazard; nor studies to have used the information in creditors' market valuations to capture IMF-induced moral hazard effects.

Up front, however, it is worth emphasising two important qualifications of our analysis. These caveats apply equally to all other studies of moral hazard, but that does not detract from their importance. First, none of the tests presented here measure incentives and risk-taking behaviour directly. Rather they measure the effects of IMF loans on the net worth of banks – and hence, indirectly, on these banks' potential risk-taking behaviour. In effect, what we measure is one step removed from observable risk-taking behaviour. The tests are *necessary* conditions for the presence of moral hazard, rather than sufficient ones. Our study is one step closer to observed

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(1) Section 4 discusses these events.

(2) Brealey (1999) looks at the response of debtor country share prices to the announcement of an IMF programme and finds little significant response.

risk-taking behaviour than earlier studies. And provided risk-taking behaviour adapts in response to price signals, there ought to be a direct correspondence between effects on banks' net worth and their risk-taking behaviour. But this hypothesis is not directly tested here.

Second, we measure the change rather than the level of risk-taking over time. In judging the efficacy of IMF liquidity intervention, the degree of distortion to decision-making is likely to be at least as important as its rate of change. For that reason, our public policy conclusions must necessarily be qualified.

A simple framework can be used to illustrate the main arguments. Let V_i denote the market value of bank i. This is given by the discounted value of bank i's (current and future) assets net of its liabilities. Denote liabilities, L_i. Assets comprise a set of loans, A_i^j, to countries j=0,…m, each with probability of default, λ_i^j.[3] So:

$$V_i = \sum_{j=0}^{m} A_i^j * \left(1 - \lambda_i^j\right) - L_i \qquad \textbf{(1)}$$

We assume that asset A_i^0 denotes loans to (a block of) countries to which the IMF does not lend ('developed countries') and that the remaining m assets are loans to countries where IMF intervention is possible ('emerging markets'). Throughout, we make the assumption that the market value of loans to developed countries are invariant to IMF interventions in emerging markets.

The test of creditor moral hazard focuses on the effects of IMF interventions on default probabilities on (current and future) loans in banks' emerging market portfolio (λ_i^j) – and hence, through equation **(1)**, on the market valuation of banks themselves (V_i). Any rise in V_i associated with IMF intervention would be expected – for example, through a Q-theory of investment – to result in banks investing further in intervened country assets. In other words, a rise in V_i (and hence Q) provides a diagnostic on incentives to take additional risk – or creditor moral hazard.

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[3] Implicitly, we are assuming 100% loss in the event of default. Alternatively, we can think of λ_i^j as the product of default probability and loss given default. For simplicity, we have ignored time-discounting in the present value relationship, equation **(1)**.

Now define a sequence of IMF intervention events, ε_k^j, where j denotes the country which is the subject of the bailout and k=1,…p is the number of events. Note that a country may be subject to more than one IMF intervention and some countries may be subject to no intervention; this is the case over our sample.

Within this set-up, we consider a set of nested tests which impose (increasingly stringent) restrictions on equation **(1)**. These sequenced tests are necessary conditions for the presence of creditor moral hazard. Table A summarises the restrictions implied by these tests. Tests 1 and 2 assess whether there is a significant response of creditor banks' valuations to an IMF intervention. Test 1 is performed on *unconditional* bank equity returns (∂V_i). Test 2 looks at *conditional* bank returns (∂W_i), conditioning on movements in the overall equity market (Ω). The test is whether these returns are significantly positive following an IMF bail-out ($\partial V_i/\partial \varepsilon_k>0$, $\partial W_i/\partial \varepsilon_k>0$). This restriction is a necessary condition for the presence of creditor moral hazard – that is, IMF interventions lower default probabilities on (current and expected future) emerging market loans in such a way that they boost creditor banks' market valuations.

Tests 3 and 4 decompose the market valuation response following an IMF intervention using data on country loan exposures of banks. Specifically, using banks' country exposure data, it is possible to identify the effects of an IMF intervention on banks with large exposures to the intervened country (Test 3); and those with a large portfolio of emerging markets assets generally (Test 4). These are, in effect, direct tests of restrictions on the default probabilities, λ_i^j, for different types of banks' loans ($\partial \lambda_i^j/ \partial \varepsilon_k<0$).

Tests 5 and 6 make further conditioning assumptions to ensure that our inferences about moral hazard are robust. They take seriously the potential identification problem of IMF intervention lowering the probability of default for welfare-improving reasons, rather than because of moral hazard. To control for the welfare-enhancing effect of bail-outs on default probabilities, we use as proxies the observed change in borrowing costs for the intervened country (Test 5) or for emerging markets generally (Test 6), adjusted for the credit exposure of each individual bank to the crisis country or to emerging markets in general. So, in effect, we assume that all of the fall in observed borrowing costs is the result of welfare-improving IMF intervention, rather than moral hazard, acting on the portfolio of country assets held by the bank. We then assess whether there is any response in creditor banks' valuations following an IMF intervention *over and above* these effects – whether *conditional* default probabilities, denoted μ_i^j, are significantly affected by

the sequence of IMF interventions ($\partial \mu_i^j / \partial \varepsilon_k < 0$). This is clearly a very strict test of creditor moral hazard, which loads the dice heavily against finding such effects.

Table A: Testable restrictions of creditor moral hazard

	Theoretical	**Econometric**
Test 1	$\partial V_i / \partial \varepsilon_k > 0$	$\beta_0 > 0$
Test 2	$\partial W_i / \partial \varepsilon_k > 0$	$\beta_0 \mid \Omega > 0$
Test 3	$\partial \lambda_i^j / \partial \varepsilon_{j=k} < 0$	$\beta_1 > 0$
Test 4	$\partial \lambda_i^j / \partial \varepsilon_{j\neq k} < 0$	$\beta_2 > 0$
Test 5	$\partial \mu_i^j / \partial \varepsilon_{j=k} < 0$	$\beta_1 \mid \beta_3 > 0$
Test 6	$\partial \mu_i^j / \partial \varepsilon_{j\neq k} < 0$	$\beta_2 \mid \beta_4 > 0$

These restrictions on equation **(1)** are tested using the following econometric specification:

$$y_{ik} = \beta_0 + \beta_1 (A_{ik}^{j=k}) + \beta_2 (A_{ik}^{j\neq k}) + \beta_3 (S_k^k * A_{ik}^{j=k}) + \beta_4 (S_k^{EME} * A_{ik}^{j\neq k}) \qquad \textbf{(2)}$$

where y_{ik} is the return to bank i associated with event k; $A_{ik}^{j=k}$ are the loans by bank i at the time of event k, to the country j that is the subject of the IMF intervention, country k; $A_{ik}^{j\neq k}$ are the bank loans by bank i at the time of event k to all other emerging markets countries that are potentially subject to IMF intervention ($j \neq k$); S_k^k are borrowing spreads for country k (the object of the IMF intervention) and S_k^{EME} are borrowing spreads for emerging markets generally, both at the time of event k.

Tests 1 and 2 impose $\beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$, and test whether $\beta_0 = 0$, on a conditional and unconditional basis. Test 3 relaxes the assumption on β_1 and tests whether $\beta_1 = 0$. Test 4 does the same for β_2. Tests 5 and 6 relax, in turn, the restrictions on β_3 and β_4, so as to reassess the restrictions on β_1 and β_2 respectively, on a conditional basis. The econometric methodology involved running equation **(2)** as a pooled OLS regression, thereby exploiting both the time (IMF-event) and cross-sectional (bank-specific) dimensions of the data. In addition, we also ran some panel regressions, which allowed for event-specific fixed effects. Both are reported below.

To summarise, our methodology adds value over previous studies in five respects: first, it considers a wider set of IMF intervention events; second, it looks explicitly and directly at creditor-side responses; third, it conditions these creditor-side responses on the size of the banks'

exposures; fourth, it allows us to decouple 'systemic' from 'idiosyncratic' moral hazard events; and fifth, it conditions on factors which allow us to distinguish the welfare-enhancing effect of IMF intervention on default probabilities from their welfare-depleting moral hazard effect. Taken together, these restrictions give a cleaner – and hence hopefully more compelling – test of the importance of creditor moral hazard.

4. Data

Estimating equation **(2)** requires data on IMF-intervention events, cumulative returns to bank shares around the IMF-event window (on a conditional and unconditional basis), credit exposures of these banks to crisis countries and to emerging markets in general, and emerging market borrowing spreads around the event window. We discuss these data in turn.[4]

4.1 Identification of IMF events

The selection of IMF events is based largely on IMF press releases announcing significant country packages or policy changes. The events are typically the announcement of a bail-out rather than its approval by the IMF board, as the former is more likely to have been the market-moving event. This approach allows us to identify 26 separate intervention events, beginning with the IMF credit line to Mexico in January 1995 and ending with the IMF package for Brazil in August 2002. All but one event signalled the extension of further credit by the IMF – they are 'moral hazard' events. The exception is the announcement of Russia's default in August 1998, which signalled the IMF's unwillingness to intervene – a 'reverse moral hazard' event. Table B provides a full list of the dates, the events, the headline IMF packages as well as the IMF loan as a percentage of each country's quota.[5]

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[4] Further details on the data can be obtained from the authors on request.

[5] The source for the events and package sizes are IMF press releases, while the quota data is available from the IMF's *International Financial Statistics*.

Table B: IMF-intervention events

All amounts in US$ billions; percentages refer to the percentage of the country's IMF quota.

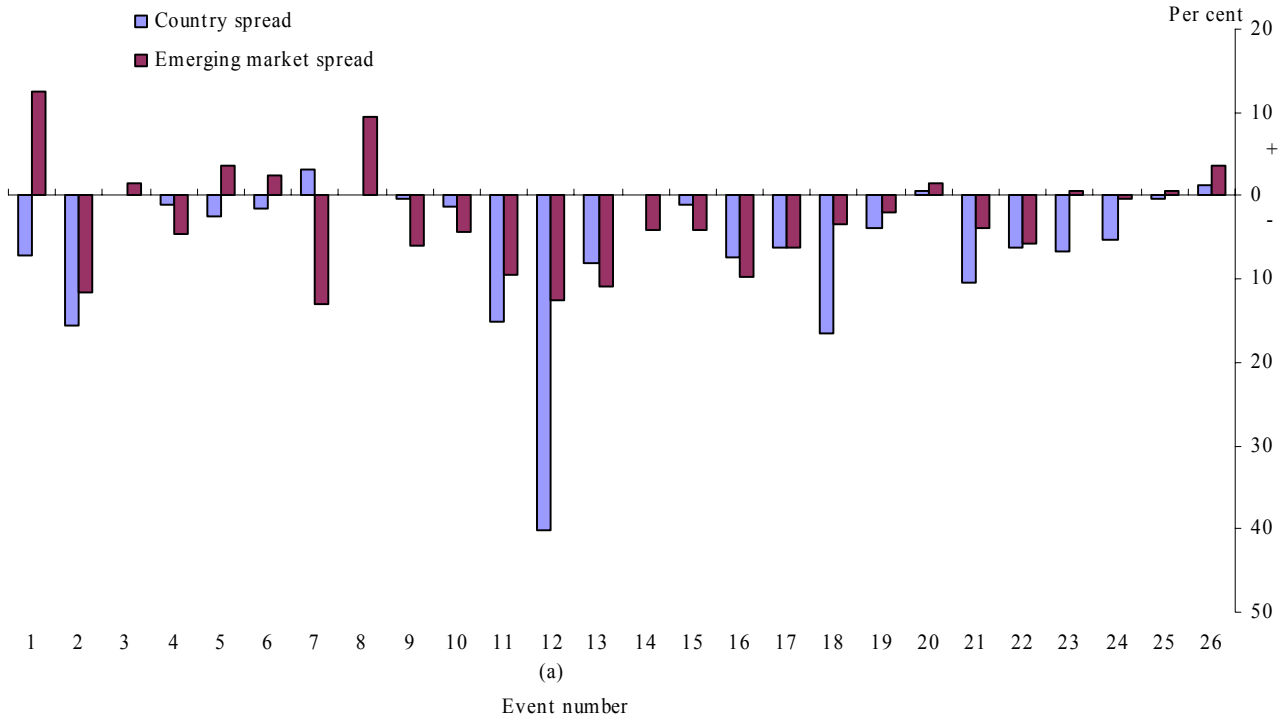
Event number	Event date	Event description
1	26 Jan 1995	Camdessus supports Mexican letter of intent requesting $7.8bn credit line (300% quota)
2	1 Feb 1995	IMF approves whole Mexican package of $17.8billion (688% quota), $7.8bn available immediately
3	26 Mar 1996	IMF approves credit line of $10.1bn (160% quota) for Russia
4	5 Aug 1997	Camdessus welcomes Thailand's policy package and suggests IMF program will soon be ready
5	20 Aug 1997	IMF approves stand-by credit of $3.9bn (505% of quota) for Thailand
6	8 Oct 1997	Camdessus announces proposed IMF support for Indonesia
7	31 Oct 1997	Camdessus recommends approval of $10bn (490% of quota) credit line to Indonesia
8	5 Nov 1997	IMF announces that financial support for Korea would be available if needed
9	21 Nov 1997	Camdessus welcomes Korean request for IMF assistance and says he has assured Korean authorities of IMF support
10	4 Dec 1997	IMF approves $21bn (1,939% of quota) credit line for Korea
11	13 Jul 1998	Camdessus announces that IMF board is to discuss strengthened reform program for Russia with increase in financing of $11.2bn (180%)
12	17 Aug 1998	Russia defaults. Camdessus comments on failure of IMF credit to avert crisis
13	23 Sep 1998	Camdessus states that the IMF will be prepared to lend to Brazil if required
14	18 Oct 1998	US congress ratifies increased US quota
15	13 Nov 1998	Announcement of successful conclusion of talks with Brazil. Camdessus says he will recommend $18bn (600% quota) stand-by credit
16	15 June 1999	Announcement of Executive Board meeting to consider Mexico's request for $4.13bn stand-by credit
17	9 Dec 1999	IMF approves letter of intent for Turkey requesting $4bn (320% quota)
18	6 Dec 2000	Köhler proposes $7.5bn (600% quota) extra funds for Turkey as part of the continuing program
19	18 Dec 2000	Köhler announces strengthened Argentine program, to bring total credit to $13.7bn (500% quota)
20	21 Dec 2000	IMF approves third and fourth reviews of Turkey's program and the $7.5bn (600% quota) extra funds Köhler proposed on 6 Dec 2000
21	27 Apr 2001	Köhler recommends an extra $10bn (800% quota) credit line for Turkey
22	3 Aug 2001	Köhler recommends approval of $15bn (400% quota) stand-by credit for Brazil
23	21 Aug 2001	Köhler announces possibility of an addition of $8bn (290% quota) to Argentina's stand-by credit
24	15 Nov 2001	Köhler announces increase of credit to Turkey to close financing gap
25	4 Feb 2002	Executive board approve an extra $12bn (960% quota) credit for Turkey
26	7 Aug 2002	IMF agrees to $30bn (800% quota) rescue package for Brazil

The events we choose differ from those in Lane and Phillips (2000). For example, Lane and Phillips use multiple event-dates associated with a single IMF intervention, whereas here we focus on the key announcement event. By way of framing, Chart 1 plots the average response of both country and emerging market spreads over the five-day period centred around each of our

IMF-intervention events.[6] In the majority of cases, the response in spreads is correctly signed – negative - and in many cases sizable. The average fall in country-specific spreads over the sample is 6.4%; and the average fall in emerging market spreads is 2.9%.

This suggests that, unlike in Lane and Phillips (2000), an alternative choice of IMF-intervention events is capable of delivering correctly-signed and economically significant spreads responses. As these responses capture the *change* in risk-taking incentives, they also suggest that moral hazard may have been accumulating during the latter part of the 1990s and into the 21st century and has been a persistent phenomenon. Both are contrary to previous evidence. Most previous studies have also stopped after looking at spreads responses. Here we choose to use further data and restrictions to refine our conclusions.

Chart 1 – Change in credit spreads around IMF events (percentage change)



(a) Event 12 is the Russian 'non-intervention' and so signs have been reversed.

Sources: JP Morgan, Chase and Co. and Bank calculations.

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[6] For emerging market spreads, we used JP Morgan's EMBI for overall emerging market exposures and the country components of the EMBI Global for the country-specific spread measures; where available, we extended the country data for Thailand and Korea forward by using the respective Chase Manhattan Bond indices.

4.2 Bank returns

In principle, it would have been desirable to look at the share price reactions of all major creditor banks with emerging market exposures, on an institution-by-institution basis. Unfortunately, bank-specific data on emerging market exposures are not publically available for a broad international cross-section of creditor banks. We do, however, have access to confidential Bank of England data on UK banks' country exposures. There are seven UK banks with significant emerging market exposures – HSBC, Standard Chartered, Barclays, Lloyds-TSB, National Westminister, the Royal Bank of Scotland (RBS) and Abbey National. Daily share prices for these banks are readily available.[7] With 26 identified events, and after accounting for the merger of RBS and National Westminster in 1999, this provides us with 173 observations for the econometric analysis.

4.3 Bank's portfolio exposures

The data on UK banks' exposures to emerging market countries come from the Bank of England. There are several potential measures of the exposure of a banking system to emerging markets. For the UK banks, we use the consolidated exposures of all UK-owned banks in all currencies to developing countries. This is probably the most comprehensive measure of banks' overseas exposure available. In addition to cross-border lending by banks' head offices, it includes lending by foreign branches and subsidiaries of UK banks, including lending in local currency.[8] In the regression analysis, we measure exposures in the quarter preceding each event to overcome any potential simultaneity problems. These exposure data need to be scaled by some measure of balance sheet size. Two obvious scalars are total bank assets and total bank capital. Both yielded very similar conclusions and in what follows we report the results for UK banks using (tier 1 plus tier 2) capital as a scalar.

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[7] We also experimented with a sample of creditor banks grouped together on a national (rather than institution-specific) basis. The 20 countries considered were Austria, Belgium, Canada, Finland, France, Germany, Hong Kong, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, Taiwan, the UK and the US. These are the countries whose banks have the largest exposures to the emerging markets according to data from the Bank for International Settlements. We do not have institution-specific exposure data for these countries, however, and for this and other data reasons, the results using aggregated national data appeared to be less robust. In what follows, we focus on the UK banks' results.

[8] Local currency lending by foreign branches and subsidiaries of developed country banks has grown in importance rapidly over recent years; for UK banks, local currency lending is currently around half of total foreign exposures.

5. Assessing bank returns

One measure we consider is cumulated unconditional returns to the creditor banks following each IMF event (Test 1 from Table A). We choose an event window of two days either side of the event data, so that the LHS variable is the cumulative five-day equity price return for each of the UK banks.[9] A second, more sophisticated measure involves controlling for the performance of the equity market as a whole, so constructing a measure of 'excess' or conditional returns (Test 2 from Table A).[10] To construct conditional returns, we experimented with several different methods for calculating the market beta for each bank. The simplest approach is simply to fix beta at unity across all banks. We also, however, considered estimating betas using the following equation on monthly data over the period January 1992 to July 2002 for each bank:[11]

$$\Delta\, bank_{it} = a_i + \beta_i \Delta\, market_t + \varepsilon_{it} \qquad \textbf{(3)}$$

where $\Delta\, bank_{it}$ is the percentage change in the equity price of UK bank i and $\Delta\, market_t$ is the percentage change in the overall UK equity market index. We estimated betas based on regressions over the entire ten-year period, as well as moving averages of 100 days prior to a given event. The estimated average betas for our sample of UK banks were very consistent, ranging between 1.2-1.6, while the betas based on moving averages had a higher variability between 0.7 and 2.5. We take as our benchmark case $\{a_i=0, \beta_i=1\}$, though the different methods yielded similar results because of the high (>0.89) correlation between the three measures of excess returns. The measure of conditional or excess returns is given by cumulating the residuals from equation **(3)**, ε_i, across each five-day event window, indexed k:

$$y_{ik} = \sum_{k=-2}^{+2} \varepsilon_{it-k} \qquad \textbf{(4)}$$

Charts 2 and 3 plot, respectively, conditional (excess) and unconditional (absolute) UK bank returns across the IMF-intervention events. For each event, we identify the mean (averaging across UK banks) and the high-low range for UK banks. For most (but not all) events, the

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[9] This event window appeared to give the most robust results. We experimented with several other (shorter and longer) event windows. Using these did not materially affect the qualitative conclusions.

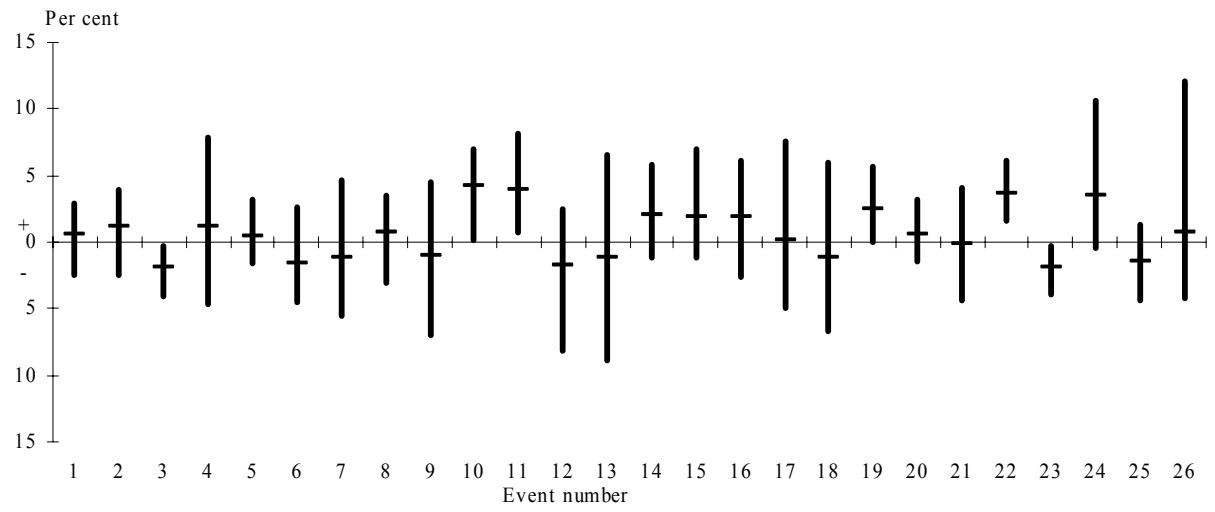
[10] From a theoretical perspective, conditional returns are probably a preferred measure. But in what follows we report both conditional and unconditional returns; they give similar results.

[11] For some of the banks we use a shorter sample period because of data availability, but the sample is never less than six years.

average response from UK banks is positive.[12] For absolute returns, the average UK bank equity price response across the 26 events is 1.12%. For excess returns, the average UK bank equity price response is 0.61%. A positive response from UK banks' market valuations is a necessary condition for these IMF interventions to have induced excessive risk-taking. So our initial results support this hypothesis, in general and across a number of separate events. They suggest that, in a number of cases, there is evidence of IMF packages having induced market responses consistent with an accumulation of moral hazard in the system.

In a number of crisis cases IMF intervention may have been anticipated more than two days prior to the main IMF announcement. If this is the case, our estimates will be a lower bound on the size of the equity market 'news' associated with IMF bail-outs. There is an obvious tension here in using a longer event window. This will capture a greater proportion of the anticipation effect. It will also, however, risk contaminating the asset price response with extraneous news, unrelated to the IMF intervention. Using a five-day window is a compromise that will tend, if anything, to bias our results away from finding significant moral hazard effects.

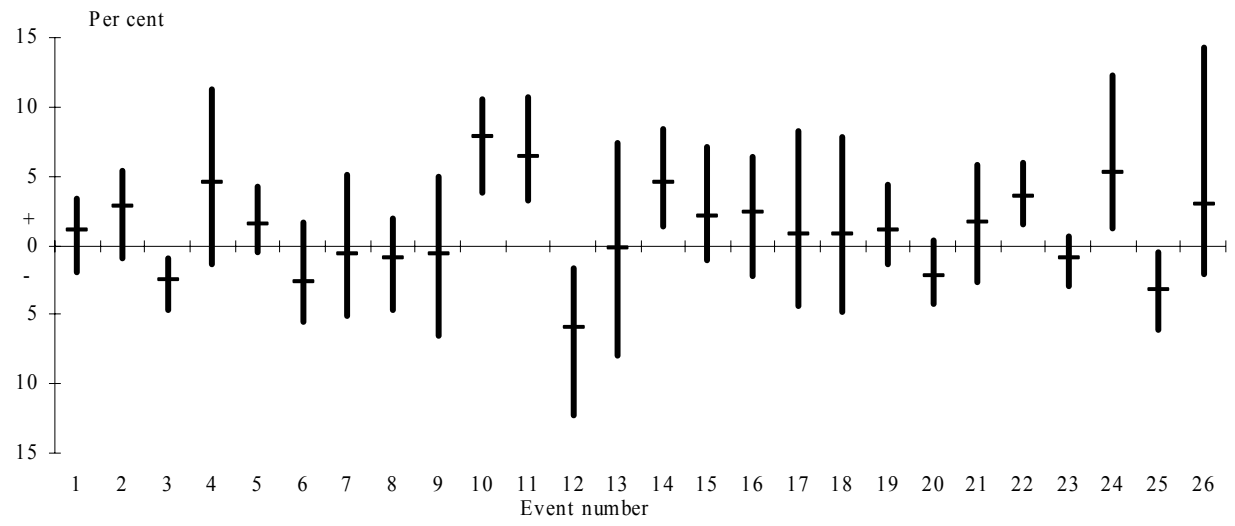
Chart 2 – UK bank excess returns (beta$_i$ = unity)



Sources: Thomson Financial Datastream and Bank calculations.

[12] The fact that all events do not exhibit positive returns is evidence that we have not 'cherry-picked' events with the largest response.

Chart 3 – UK bank absolute returns ($beta_i = 0$)



Sources: Thomson Financial Datastream and Bank calculations.

Table C gives the 'top 10' moral hazard events as defined by the largest excess response from UK banks' equity prices. Six out of the top ten events show excess returns of more than 2%. The top ten events include the extension of Argentina's IMF programme in August 2001, the augmentation of Turkey's IMF programme in November 2001, the approval of the Korea programme in December 1997, the last extension of IMF loans to Russia in July 1998 and the Mexican programme in February 1995. Also shown is the headline amount of each IMF package in $ billion, its percentage in terms of IMF quota and the statistical significance of the response.

Six generic features of these 'top ten' moral hazard events stand out. First, the returns are quite sizable for a number of events. Given a market capitalisation of UK banks of $370 billion at the end of 2001, the stock price changes represent a non-trivial jump in market valuations associated with IMF intervention. Looking across the top ten events, the average jump in the market valuation of UK banks would be well over $5 billion. Second, there is casual evidence that the larger responses were associated with larger headline IMF packages.[13] This is consistent with risk-taking incentives having been distorted most, the larger is the amount of IMF money on the table, as we might expect. Third, the majority of the top ten responses are statistically (as well as economically) significant.[14]

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[13] We test this formally below.
[14] This is only rarely the case for events outside the top ten.

Fourth, a clearer-still indication of potential moral hazard is found by looking in the last column of Table C, which compares the rise in the market valuation of UK banks to their combined credit exposure to the crisis country. A ratio in excess of unity would be clear evidence that banks were being 'overcompensated' for the country risk on their existing portfolio. In other words, it would indicate a boost to banks' valuations greater than can be explained by a fall in default probabilities from unity to zero on their country portfolio. This is the case for half of the top ten events. This evidence is broadly consistent with a generic creditor moral hazard story.

Fifth, many of the programmes in Table C were augmentations of existing programmes rather than new ones – for example, in Argentina, Turkey and Russia. This suggests that repeat-borrowers tend to induce larger valuation responses. Sixth, a number of the top ten moral hazard events are for very recent IMF programmes during 2000 or 2001. This suggests that excessive risk-taking has not subsided over time, contrary to some other evidence (Kamin (2002)) but consistent with the evidence from spreads.[15]

Table C: 'Top ten' moral hazard events for UK banks

Rank	IMF intervention	Headline Package ($billion)	Headline Package (% of quota)	Excess return (%) (a)	t-Stat	Absolute return (%)	t-Stat	Change in MktCap / Country exposure (b)
1	Korea, December 1997	21.0	1940%	4.25%	3.57**	7.89%	6.61**	>1
2	Russia, July 1998	11.2	180%	3.96%	3.32**	6.45%	5.41**	>>1
3	Brazil, August 2001	15.0	400%	3.61%	2.80**	3.51%	2.72**	<1
4	Turkey, November 2001	12.0	960%	3.55%	2.75**	5.26%	4.08**	>>1
5	Argentina, December 2000	14.0	500%	2.42%	1.88*	1.12%	0.87	<1
6	US ratify increased quota, Oct 98	--	--	2.02%	1.69*	4.50%	3.77**	--
7	Mexico, June 1999	4.1	120%	1.96%	1.65*	2.33%	1.95*	>1
8	Brazil, November 1998	18.0	600%	1.90%	1.59	2.04%	1.71*	<1
9	Mexico, February 1995	17.8	690%	1.20%	1.01	2.76%	2.31**	<1
10	Thailand, August 1997	3.9	510%	1.16%	0.97	4.46%	3.74**	>>1

(a) Excess returns are calculated with a beta set to unity. The return window is -2/+2 days.
(b) Further events with a ratio of market capitalisation to country exposure of greater than 1 include events 17, 18, and 21; all events listed have a ratio >0.
**(**) indicates significant at the 90%(95%) level, based on a regression with 26 event dummies.*

(15) No trends, whether increasing or decreasing, are found for the raw bank return or spread data. The same holds true in the later regression analysis.

6. Using exposure restrictions

We now refine our tests by using data on banks' loan exposure to the country that is the subject of the IMF intervention and to emerging market countries in general. These exposure restrictions can be tested by examining the coefficients β_1 and β_2 respectively in equation **(2)** (Tests 3 and 4 in Table A). The results for UK excess and absolute returns are shown in Tables 4 and 5 respectively. Regression 1 shows the tests of β_1; regression 2 shows the tests of β_2; while regression 3 shows the results with both country-specific and emerging market exposures included (β_1 and β_2).[16] Regressions 4, 5 and 6 introduce the exposure-weighted changes in credit spreads – our control variables for the welfare-improving effects of an IMF intervention. Regressions 7 and 8 include additionally the headline figure for the IMF loan scaled by the country's quota ($Package_k$), to test formally whether larger packages induce larger responses.[17] We estimate these regressions first using pooled OLS and then including event-specific fixed effects, which allow for idiosyncratic effects on mean returns across each event.[18] The results are generally similar for the two approaches, though the inclusion of event-specific fixed events usually resulted in greater explanatory power.

Observed R^2s are generally small: loan exposures data typically account for no more than 3%-4% of the variation in the panel. Perhaps this is not so surprising since we are modelling (notionally unpredictable) asset market 'news'. Explanatory power improves noticeably, however, if we control for changes in credit spreads and IMF loan size. Tables D and E also contain some diagnostic tests. For excess returns all of these tests are passed; for absolute returns, there are potential normality and heteroscedasticity problems in some cases.

From Tables D and E, there is only weak evidence of country-specific bank exposures being an important determinant of cross-sectional bank responses. The coefficient β_1 is rarely correctly signed and statistically significant. But second, there is much stronger evidence of emerging market exposures having an important link with bank equity market responses. The coefficient β_2 is correctly signed and statistically significant at the 95% level (for abnormal returns) and

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[16] We also tried a variable capturing a bank's exposure to other countries in the same region as the affected country, to control for fundamental spill-over linkages. The regional exposure variable was, however, never significant in the regressions.

[17] Event 12 is the only 'reverse' moral hazard event in the sample, so we have reversed the sign of the share price and credit spread changes. Also, event 12 (Russia's default in 1998) and event 14 (US ratification of the increased quota) are dummied-out of regressions which included country spread data or the *Package* variable.

[18] Lack of degrees of freedom precluded the inclusion of event-specific slope coefficients.

often significant at the 90% level for the absolute return regressions. So on average across UK banks and across IMF-intervention events, those banks with the largest emerging market exposures in relation to capital have experienced the strongest excess returns following IMF bail-outs.

On the face of it, this may pose something of a puzzle. Why should banks with the largest emerging market portfolios respond more than those with specific exposures to the intervened country? Part of the explanation may lie in the information sets of private agents. They do not have data on the country exposures of different UK banks. Those data are confidential to the Bank of England. Market participants do, however, have reasonable data on which UK banks have the largest emerging market portfolios overall. It is the latter set of banks that, on the basis of this evidence, appear to have been rewarded most when IMF interventions take place, perhaps owing to imperfect information on the part of investors on banks' country exposures.

A larger part of the explanation is, however, likely to lie in a generic creditor moral hazard story. IMF intervention in one country may be perceived as increasing the probability of future IMF intervention in other emerging markets. This would then tend to boost most the valuations of those banks with the largest (relative) emerging market portfolios overall. This is also consistent with the results from the final column of Table C, which indicates an 'overcompensation' of banks for the country-specific exposure they are assuming in a number of cases.

7. Controlling for spreads

So far, we have uncovered statistically significant evidence that IMF bail-outs boost expected excess returns to creditor banks, especially those holding large emerging market portfolios.[19] This suggests increased incentives to take on emerging market risk. An alternative interpretation is, however, that IMF interventions may be helping offset an overpricing problem in international capital markets, thereby lowering the probability of sovereign default in a welfare-enhancing

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[19] Banks with large exposures relative to capital also tend to be the biggest lenders in absolute terms.

Table D

Dependent variable: excess returns (a)

	Regression pooled OLS								Panel regression					
(b)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**	**5**	**6**
beta0	0.005 *	0.001	0.002	0.002	0.001	0.002	0.002	- 0.003	0.005 *	0.001	0.002	0.001	0.001	0.001
constant	*1.670*	*0.300*	*0.440*	*0.500*	*0.430*	*0.560*	*0.410*	*- 0.610*	*1.830*	*0.170*	*0.490*	*0.290*	*0.470*	*0.260*
beta1	0.020		- 0.036	- 0.061	- 0.034	- 0.059		- 0.061	0.015		- 0.069	- 0.095 *	- 0.067	- 0.093 *
(country exposure / capital)	*0.490*		*- 0.770*	*- 1.210*	*- 0.750*	*- 1.147*		*- 1.210*	*0.360*		*- 1.430*	*- 1.780*	*- 1.370*	*- 1.740*
beta2		0.006 **	0.007 **	0.007 **	0.006 **	0.006 **		0.006 **		0.006 **	0.009 **	0.085 **	0.007 **	0.007 **
(EM exposure / capital)		*2.320*	*2.390*	*2.460*	*2.020*	*2.010*		*2.000*		*2.780*	*3.110*	*3.110*	*2.510*	*2.500*
beta3				- 0.789		- 0.701		- 0.762				- 0.997		- 1.022
*(delta country spread * country exposure / capital)*				*- 1.080*		*- 0.960*		*- 1.050*				*- 1.150*		*- 1.180*
beta4					- 0.027	- 0.039		- 0.036					- 0.039	- 0.040
*(delta EMBI spread * EM exposure / capital)*					*- 0.900*	*- 1.260*		*- 1.170*					*- 1.080*	*- 1.110*
beta5							0.001 *	0.001 *						
(headline amount /quota)							*1.840*	*1.790*						
dummy e12				- 0.029 **		- 0.033 **	- 0.019	- 0.028 **						
				- 2.160		*- 2.370*	*- 1.440*	*- 2.000*						
dummy e14				0.012		0.011	0.019	0.016						
				0.880		*0.083*	*1.390*	*1.170*						
# of obs	173	173	173	173	173	173	173	173	173	173	173	173	173	173
R-sqr	0.001	0.031	0.034	0.068	0.038	0.077	0.045	0.094	0.001	0.050	0.063	0.072	0.071	0.080
Diagnostic Tests (c) (d)														
F-test	0.240 **	5.390	2.990 *	2.430	2.260 *	2.290	2.680	2.450	0.130 **	7.730	4.910	3.720	3.660	3.100
	0.623	*0.021*	*0.053*	*0.037*	*0.083*	*0.038*	*0.049*	*0.021*	*0.723*	*0.006*	*0.009*	*0.013*	*0.014*	*0.017*
Heteroskedasticity	1.460	0.320	1.370	0.560	0.780	0.020	1.370	0.010						
	0.226	*0.570*	*0.240*	*0.450*	*0.377*	*0.893*	*0.242*	*0.924*						
Omitted variables	0.410	1.320	1.710	0.840	0.650	0.970	2.210 *	1.150						
	0.740	*0.270*	*0.160*	*0.476*	*0.580*	*0.407*	*0.089*	*0.329*						
Normality of residuals	0.991	0.993	0.994	0.996	0.994	0.995	0.992	0.995						
	0.418	*0.640*	*0.823*	*0.928*	*0.783*	*0.798*	*0.500*	*0.806*						

(a) Event window for returns and changes in spread are -2/+2 days, using a market beta of one.
(b) *(**) denotes significance at the 90%(95%) level.
(c) The diagnostic tests are: 1) F-test: test for joint significance of regressors; 2) test for heteroscedasticity is the Breusch-Pagan test (Chi-Sqr);
3) the omitted variable test is the Ramsey RESET test (F-test); 4) the normality test is the Shapiro-Wilk test.
(d) Probability of accepting the null-hypothesis: i.e. respectively: no joint significance, homoscedasticity, no omitted variables, normal residuals.

Table E

Dependent variable: absolute returns (a)

	Regression pooled OLS								Panel regression					
(b)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**	**5**	**6**
beta0	0.010 **	0.006	0.007	0.008 *	0.007	0.008 **	0.004	-	0.011 **	0.006 *	0.007 **	0.006 *	0.007 **	0.006 *
constant	*2.580*	*1.500*	*1.530*	*1.910*	*1.520*	*2.030*	*0.960*	-	*3.610*	*1.880*	*2.160*	*1.940*	*2.140*	*1.910*
beta1	0.032	- 0.018	- 0.064	- 0.017	- 0.059		- 0.062		0.015	- 0.069	- 0.950 *	- 0.067	- 0.093 *	
(country exposure / capital)	*0.640*	- *0.320*	- *1.080*	- *0.290*	- *1.020*		- *1.100*		*0.036*	- *1.430*	- *1.780*	- *1.370*	- *1.740*	
beta2		0.006 *	0.006 *	0.007 **	0.005	0.005		0.005		0.006 **	0.009 **	0.009 **	0.007 **	0.007 **
(EM exposure / capital)		*1.840*	*1.750*	*2.030*	*1.330*	*1.350*		*1.350*		*2.780*	*3.110*	*3.110*	*2.510*	*2.500*
beta3			- 1.183		- 1.004		- 1.112					- 0.997	- 1.022	
*(delta country spread * country exposure / capital)*			- *1.390*		- *1.180*		- *1.340*					- *1.150*	- *1.180*	
beta4				- 0.044	- 0.080 **		- 0.075 **						- 0.039	- 0.040
*(delta EMBI spread * EM exposure / capital)*				- *1.160*	- *2.210*		- *2.110*						- *1.080*	- *1.110*
beta5						0.002 **	0.002 **							
(headline amount /quota)						*2.840*	*2.800*							
dummy e12			- 0.078 **		- 0.085 **	- 0.063 **	- 0.077 **							
			- *4.980*		- *5.350*	- *4.090*	- *4.820*							
dummy e14			0.031 *		0.291 *	0.041 **	0.038 **							
			1.960		*1.890*	*2.630*	*2.450*							
# of obs	173	173	173	173	173	173	173	173	173	173	173	173	173	173
R-sqr	0.002	0.020	0.020	0.168	0.028	0.192	0.176	0.228	0.001	0.050	0.063	0.072	0.071	0.008
Diagnostic Tests (c) (d)														
F-test	0.410 **	3.400 *	1.740 **	6.740	1.620 **	6.560	12.010	6.970	0.130	7.730	4.910	3.720	3.660	3.100
	0.521	*0.067*	*0.178*	-	*0.188*	-	-	-	*0.723*	*0.006*	*0.009*	*0.013*	*0.014*	*0.017*
Heteroskedasticity	1.530	2.550	4.090 **	0.670	3.750 *	-	0.040	0.060						
	0.216	*0.111*	*0.043*	*0.410*	*0.052*	*0.960*	*0.840*	*0.804*						
Omitted variables	0.400	1.000	1.030	0.650	1.780	1.180	5.470 **	0.600						
	0.756	*0.394*	*0.381*	*0.580*	*0.153*	*0.318*	*0.001*	*0.618*						
Normality of residuals	0.993	0.995	0.995	0.986 *	0.994	0.983 **	0.985 *	0.987 *						
	0.620	*0.800*	*0.826*	*0.087*	*0.720*	*0.034*	*0.062*	*0.095*						

(a) Event window for returns and changes in spread are -2/+2 days.
(b) *(**) denotes significance at the 90%(95%) level.
(c) The diagnostic tests are: 1) F-test: test for joint significance of regressors; 2) test for heteroscedasticity is the Breusch-Pagan test (Chi-Sqr);
3) the omitted variable test is the Ramsey RESET test (F-test); 4) the normality test is the Shapiro-Wilk test.
(d) Probability of accepting the null-hypothesis: i.e. respectively: no joint significance, homoscedasticity, no omitted variables, normal residuals.

way. This identification problem, discussed in Dell'Arricia *et al* (2002), can be tackled by including debtor country spreads in the regression, on a country-specific or emerging market basis. We control for the potentially welfare-enhancing nature of IMF interventions by weighting changes in country spreads (or emerging market spreads) by their share in a bank's loan portfolio.[20] This provides an upper-bound measure of the expected boost to banks' valuations that would result from a welfare-enhancing liquidity intervention.

Regressions 4, 5 and 6 in Tables D and E show the results of adding country and emerging market portfolio weighted spreads to regression 3 (Tests 5 and 6 in Table A). The coefficients on β_3 and β_4 are both correctly – negatively – signed and in some cases are significant. Controlling in this way does not, however, reduce the size and significance of the emerging market portfolio coefficient, β_2. Excess returns remain largest among UK banks with the highest emerging market exposures relative to capital. This evidence supports a creditor moral hazard story, as it attributes all of the movement in spreads to a welfare-improving risk-reduction rather than moral hazard.

Finally, regressions 7 and 8 include the headline IMF loan package as an additional explanatory factor. It appears to have considerable explanatory power over bank (especially absolute) returns, independently of other factors, consistent with the evidence from Table C. This find also supports a moral hazard story.

8. Conclusions

Existing empirical evidence on the moral hazard implications of IMF bail-outs is sparse. This paper has presented some new data and used some new restrictions to reassess this question. This new approach allows us to identify risk-taking incentives more precisely than earlier studies, while at the same time controlling for alternative potential explanations. Taken together, this makes for a cleaner test.

Using this approach, we have found some support for the moral hazard hypothesis. This evidence is weak for some IMF-intervention events. But for a significant number of these events, UK banks exhibit abnormal returns exceeding 1%. This sounds like small beer. But it is equivalent to an increase in the market valuation of UK banks of around $3.5-$4 billion. These events are often

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[20] From Chart 1, we also know that spreads do on average fall following IMF interventions, consistent with this alternative explanation.

associated with big-ticket IMF loans and are not confined to the distant past. Interventions in Argentina, Turkey and Brazil since 2000 all rank in the moral hazard top five.

These excess returns are concentrated among those banks with the largest emerging market portfolios overall, relative to their capital. IMF interventions appear to raise the expected valuation of all emerging market loans, not only those of the intervened country. This is consistent with a generic form of creditor moral hazard. This effect remains significant even once we control for the potentially welfare-enhancing effect of IMF intervention in correcting overpricing problems in capital markets.

Moral hazard problems are of course a matter of degree. Against that backdrop, these caveats are worth bearing in mind. First, our tests measure changes in moral hazard rather than the absolute level of risk-taking by creditors. Second, our tests are necessary rather than sufficient conditions for moral hazard; they measure incentives for excessive risk-taking, rather than the risk-taking itself. And third, it has proven harder to find similar-sized effects looking across banking systems in other (than UK) countries on an aggregated basis, perhaps due to data deficiencies. Future work might attempt to address these potential shortcomings. Nonetheless, the evidence presented here suggests that concerns about moral hazard should weigh more heavily than the existing literature would have us believe.

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