“Banks’ great bailout of 2008-2009”

AUTHORS	Michele Fratianni Francesco Marchionne

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Michele Fratianni (Italy), Francesco Marchionne (Italy)

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Abstract

This paper examines government policies aimed at rescuing banks from the effects of the financial crisis of 2007-2009. To delimit the scope of the analysis, we concentrate on the fiscal side of interventions and ignore, by design, the monetary policy reaction to the crisis. The policy response to the subprime crisis started in earnest after Lehman's failure in mid September 2008, accelerated after February 2009, and has become very large by September 2009. Governments have relied on a portfolio of intervention tools, but the biggest commitments and outlays have been in the form of debt and asset guarantees, while purchases of bad assets have been very limited. We employ event study methodology to estimate the effects of government interventions on banks and their shareholders.

Announcements directed at the banking system as a whole (general) and at specific banks (specific) were priced by the markets as cumulative abnormal rates of return over the selected window periods. General announcements tend to be associated with positive cumulative abnormal returns and specific announcements with negative ones. Our results are also sensitive to the information environment. Specific announcements tend to exert a positive impact on rates of return in the pre-crisis sub-period, when announcements are few and markets have relative confidence in the "normal" information flow. The opposite takes place in the turbulent crisis sub-period when announcements are frequent and markets mistrust the "normal" information flow. These results appear consistent with the observed reluctance of individual institutions to come forth with requests for public assistance.

Keywords: announcements, financial crisis, rescue plans, undercapitalization.
JEL Classification: G01, G21, N20.

Introduction

This paper examines government policies aimed at rescuing banks from the effects of the great financial crisis of 2007-2009. To delimit the scope of the analysis, we will concentrate on the fiscal side of interventions and will ignore, by design, the monetary policy reaction to the crisis (in essence, we will ignore inflation as a possible crisis exit). The paper is organized in three parts. The first one (Sections 1 and 2) gives a description of the subprime crisis that fits many aspects of a credit-boom-and-bust-cycle (CBB, for short) hypothesis. Crises, on the other hand, have idiosyncratic features. The distinctive characteristic of this crisis has been the creation of complex and opaque assets and the transfer of these assets from the balance sheet of banks to the markets. The subprime crisis has been big in terms of geographical coverage, number of failed and rescued banks, and real sector spillovers. Over a 19-month period starting at the end of July 2007, a representative sample of 120 large banks from the United States, Western Europe and the Pacific region lost $3.23 trillion of market capitalization. The depth of the crisis cannot be explained only by deteriorating fundamentals; as predicted by the CBB hypothesis, the bust that followed the boom led to a sharply rising risk aversion of the investing public.

The second part (Sections 3 and 4) reviews the long list of government announcements to rescue the banking system after the failure of Lehman Brothers in the mid September 2008. We provide quantitative summaries of both commitments and actual disbursements using alternative sources. The data available suggest that governments have employed a mixture of bank assets and debt guarantees, equity funding and purchases of poor-quality assets. Opaque but politically attractive guarantees have the dominant weight in this portfolio. The third part (Section 5) employs event study methodology to estimate the effects of government interventions on banks and their shareholders. The hypothesis is that the announcement of a rescue plan is credible if it affects rates of return of the targeted banks. We test for these effects by computing cumulative abnormal returns of the participating banks around a window that includes announcement dates. Our findings suggest that announcements have exerted a statistically significant and economically relevant impact on banks' equity valuation over the announcement window. We draw conclusions about our study in the final section.

1. The subprime crisis as a credit boom and bust cycle

There is a long tradition in economics of associating financial crises with credit booms and busts that give rise to booms and busts in banking and securities markets; see, among others, Mitchell (1913), Fisher (1933), Minsky (1977), and Kindleberger (1978). A crisis starts with a macro shock that alters the profit outlook in the economy. Then, an expansion of bank credit feeds the economic boom. Optimism about the future drives the process of capital and debt accumulation. Monetary expansion promotes the expansion of bank credit. Prices of specific assets increase, leading to a state of euphoria and herding behavior. Then, an event (e.g., real estate price implosion or a large bank failure) occurs that triggers

a reversal in expectations and wakes up investors that assets are badly overpriced. The disturbance must be such as to alter fundamentally future anticipated profits. Asset prices implode as speculators unload risky assets. The interaction between profits and speculation sets up a vicious circle that drives up interest rates and leads to a rush for liquidity. In the panic phase of debt liquidation, inflation falls below expectations. Disinflation forces a rise in the real value of debt and debtors suffer a decline in net worth. Business contraction occurs through debt deflation. Even in the absence of disinflation, the same mechanism is operative through a decline in asset prices that reduces the value of collateral and forces borrowers to put up more security for a given nominal value of debt. The end result is that banks become fragile and governments respond by providing public assistance (Fratianni, 2008). While policy makers tend to argue that government intervention is superior to the alternative of letting banks fail, the injection of public funds in banking involves not only large current costs but also large future ones by inducing more opportunistic behavior on the part of banks (for example, the too-big-to-fail policy).

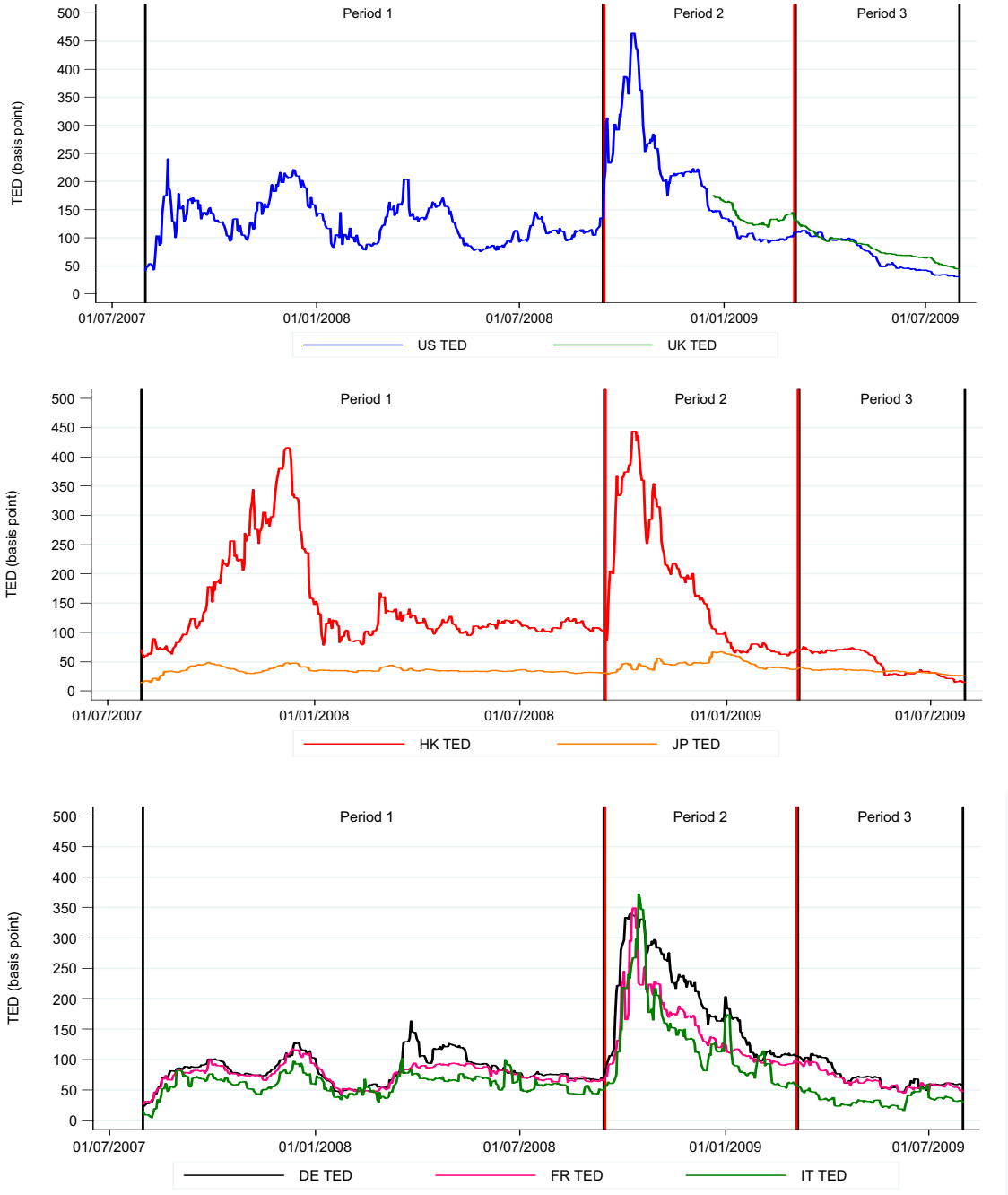
1.1. Unique features of the subprime crisis. The subprime crisis has many features of the timeline implied by the CBB hypothesis. Yet, some characteristics are unique to this crisis, such as the transfer of assets from the balance sheets of banks to the markets, the creation of complex and opaque assets, the failure of rating agencies to properly assess the risk of such assets, and the application of fair value accounting. Subprime mortgages were the innovation of the 1990s. In 1994, subprime loans were five percent of total mortgage origination; by 2005, they had risen to 20 percent. Over the period of 1994-2005, this market grew at an average annual growth rate of 26 percent and expanded home ownership by estimated 12 million units. A great deal of subprime origination was made by independent, federally unregulated lenders who applied adjustable interest rates and often so-called teaser rates. Practices, such as excluding taxes and interest rates from escrow accounts and prepayment penalties, were widespread. All of this was driven by the property boom. The credit boom and the politics of lending led to a progressive deterioration of credit standards from 2001 to 2007 (Demyanyk and van Hembert, forthcoming). Declining lending standards were correlated with rapid home price appreciation, evidence that is consistent with the hypothesis that the housing boom was driving both the expansion of credit and declining lending standards. An expansive monetary policy was providing added impetus to a loosening of the standards (Dell'Ariccia et al., 2008). The link between CBB and monetary policy is hardly surprising (Berger and Udell, 2004).

Actual and projected write-downs on low-quality mortgages represent approximately 25 percent of estimated losses on prime, commercial real estate, and consumer and corporate loans; and 9 percent of the estimated mark-to-market losses on asset-backed securities (ABS), collateralized debt obligations (CDO), prime mortgage-backed securities (MBS), collateralized MBS (CMBS), collateralized loan obligations (CLO), and corporate debt (IMF, 2008a, Table 1.1)[1]. Large default rates on subprime mortgages cannot explain the depth of this crisis. Subprime mortgages were the accelerant to the fire after the real estate bust short circuited in the financial house. A sudden rush for liquidity and fast deleveraging exacerbated by the practice of fair value accounting kept the fire running.

The innovation that best characterizes this crisis is the "originate and distribute" bank model, in which banks originate loans or purchase them from specialized brokers to either sell them in the financial markets or transfer them to sponsored structured investment vehicles (SIV). Two serious problems arise with the practice of structured finance. The first one relates to the incentive of the originator to screen debtors when the loans are destined to be placed off balance sheet. Reputational considerations would suggest that the originator would not want to compromise his standards. However, the fact that regulators and accounting standards required little disclosure about unconsolidated off-balance sheet entities made these entities opaque to investors and lowered the cost of reputational loss to the sponsoring institution. To complicate matters, the rating agencies were not up to the task of properly evaluating the new complex products. The second problem concerns the contingency that the off-balance sheet entities may be reabsorbed by the sponsoring institution. Balance-sheet absorption can occur either because the sponsoring institution covers more than half of the trading losses of the sponsored SIV or because the sponsoring institution wants to prevent a downgrade of the SIV's credit risk (IMF 2008a, Box 2.6). At that point, there is a reversal of the intended benefits of "originate and distribute"; namely, risk returns home and regulatory capital rises. The investor, having finally gained transparency in the transaction, may judge correctly that the sponsoring bank is overleveraged and demands for it a higher required return on capital; this translates into a spot drop of the share price of the consolidated bank.

[1] The estimate of total losses, as of October 2008, is placed at $1,405 billion.

1.2. Liquidity rush and risk repricing. The liquidity crisis exploded in the interbank market in August of 2007. The so-called US TED – the difference between the three-month Libor interest rate and the three-month U.S. Treasury bill – under ordinary times is contained within 20 to 30 basis points. At the peak of the Mexican crisis of 1994-95 and the South-East Asian financial crisis of 1997, it rose to approximately 60 basis points. In the Gulf War and the crisis of Long-Term Capital Management, it peaked at approximately 120 basis points. During the entire subprime crisis, TED has moved to uncharted territory. Figure 1 plots TED values for three areas of the world: the United States, Europe and the Pacific region. The US TED, from September 15 (the day when Lehman declared bankruptcy) to October 14, 2008, averaged over 300 basis points and reached an all-time peak of 464 basis points on October 10, 2008, the Friday that ended a historic week of panic selling in the equity markets. A similar story holds for the TED of the large European countries and Hong Kong. Japan, on the other hand, stands as a country of moderate risk.



Notes: TED for USA (US); TED equivalent spreads for United Kingdom (UK), Honk-Kong (HK), Japan (JP), DE (Germany), France (FR) and Italy (IT). There are no TED equivalent spreads for other countries. United Kingdom has 3-month government bonds since December 22, 2008. See text for periods.
Source: Bloomberg.

Fig. 1. TED (or equivalent spread) by countries

The markets were gripped by fears of credit and liquidity risks, two risks distinguishable in theory but not in practice (IMF 2008b, pp. 78-81). The fact that the massive injections of monetary base by central banks were ineffective in containing the spreads in the interbank market is consistent with the view that market participants were worried of large credit risks and adverse selection and that they could not separate liquidity from credit concerns. Spreads relative to yields on government bonds shot up across all maturities, short and long (IMF, 2008b, Figures 4 and 5, pp. 172-3)[1]. The switch in the public's degree of risk aversion was justified by the mounting difficulty of gathering reliable information on opaque clients in times of distress. Confronted with more uncertainty in assessing the true credit status of relatively opaque borrowers, creditors had no better method than applying higher interest rates to entire classes of borrowers. The fog shrouding banks' balance sheets and the financial markets was reinforced by opaque accounting practices. To illustrate, according to reported accounting data, the US banking system did not yet appear severely undercapitalized: at the end of 2008, the ratio of Tier 1 or core capital to risk-weighted assets was 17.4 percent for small banks, 12.3 percent for intermediate banks, and 9.4 percent for large banks (Fratianni and Marchionne, 2009). These ratios are way above the benchmark of 4 percent. Yet, it was widely acknowledged that banks were severely undercapitalized. Undercapitalization has been the biggest stumbling block to the resolution of the financial crisis.

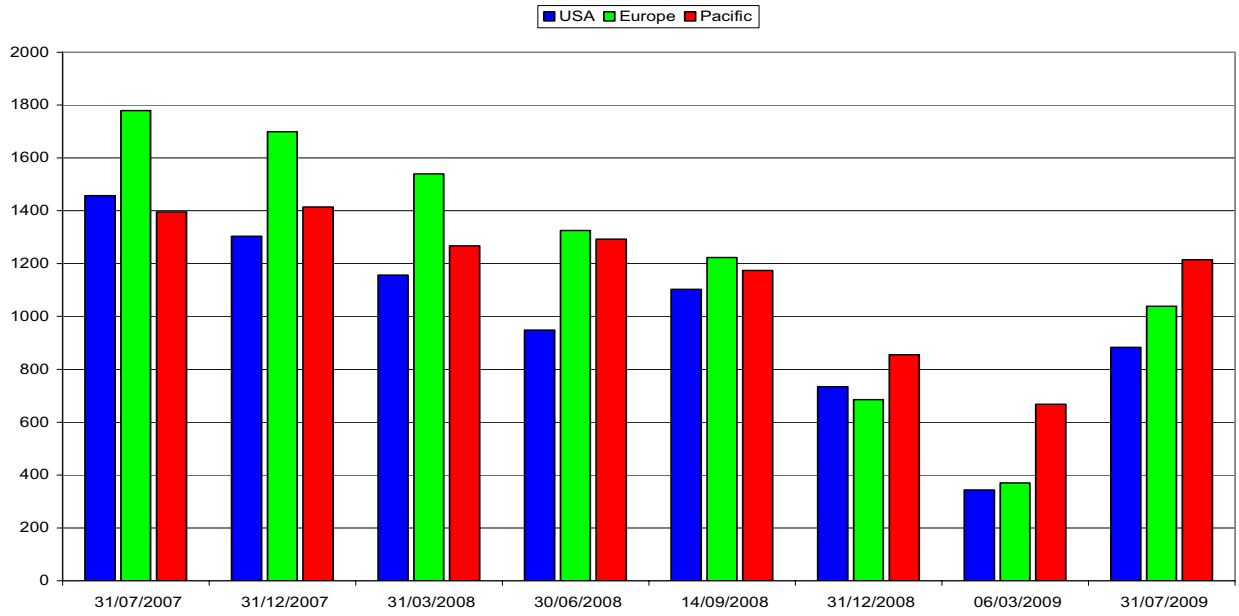
The biggest impact of the subprime has occurred through the re-pricing of risk across a variety of assets and the shrinking of balance sheets. Spillovers across markets and the subsequent process of deleveraging are the standard prediction of the CBB hypothesis. Deleveraging can be done either by selling assets or by recapitalizing. Recapitalization was aggressively pursued from the second half of 2007 through September 2008, when global banks raised $430 billion of fresh capital (IMF 2008b, p. 22). Then, recapitalization became increasingly difficult, and leverage had to be lowered by selling assets in illiquid markets. Thus, in the absence of fresh capital and without significant profits to retire debt in the short run, the deleveraging process necessarily implies distress sales and falling asset values (Adrian and Shin, 2008, Figure 2.5). The shorter the horizon over which deleveraging occurs, the more dramatic is the implosion of asset prices. The rapidly rising risk aversion of the public, fed by bad news and the thick fog of asymmetric information, was pushing financial institutions to compress leverage quickly. Fair value accounting aggravated the problem through its pro-cyclical bias. Lower accounting asset prices have a negative impact on regulatory capital and may have pushed bankers to engage in liquidation sales that further depressed asset prices.

2. Markets' reaction

To have an appreciation of the financial maelstrom extent, we need to turn to market data. For this purpose, we collected equity prices for a sample of banks from three areas of the world: the United States, Western Europe, and the Pacific region. The actual list, shown in the Appendix, includes 45 US banks, 49 banks from 14 different Western European countries, and 26 banks from three different Pacific region countries[2]. The listed banks tend to be large and, thus, capable of engaging in complex structured finance. We provide three sets of descriptive statistics. The first one, displayed in Figure 2, is market capitalization values for the three bank-area aggregates. The second set, displayed in Figure 3, is holding-period dollar rates of return, again for the three bank-area aggregates. The third set, shown in Table 1, provides rates of return, both in local currency and in dollars, for banks aggregated at the country level. The sample period goes from July 31, 2007, our benchmark of pre-crisis date, to July 31, 2009, our last observation. To simplify the presentation, we have taken a few benchmark dates in computing market capitalization and rates of return: the end of 2007; the end of the first and second quarter of 2008; September 14, 2008; the end of 2008; March 6, 2009; and the final observation of July 31, 2009. Some dates, such as quarter ends, are arbitrary but serve the purpose of underscoring the time evolution of the crisis. The September 14, 2008 is significant because it is the day before Lehman Brothers filed for Chapter 11 bankruptcy protection, an event widely believed to have represented a watershed in the crisis. The March 6, 2009 was selected because it is the bottom of bank stock declines. To save space, Table 1 considers only three periods: the first phase of the crisis from July 31, 2007 to pre-Lehman's failure, the expanded phase of the crisis until March 6, 2009, and a further expanded phase including a modest recovery that goes up to our last observation of July 31, 2009.

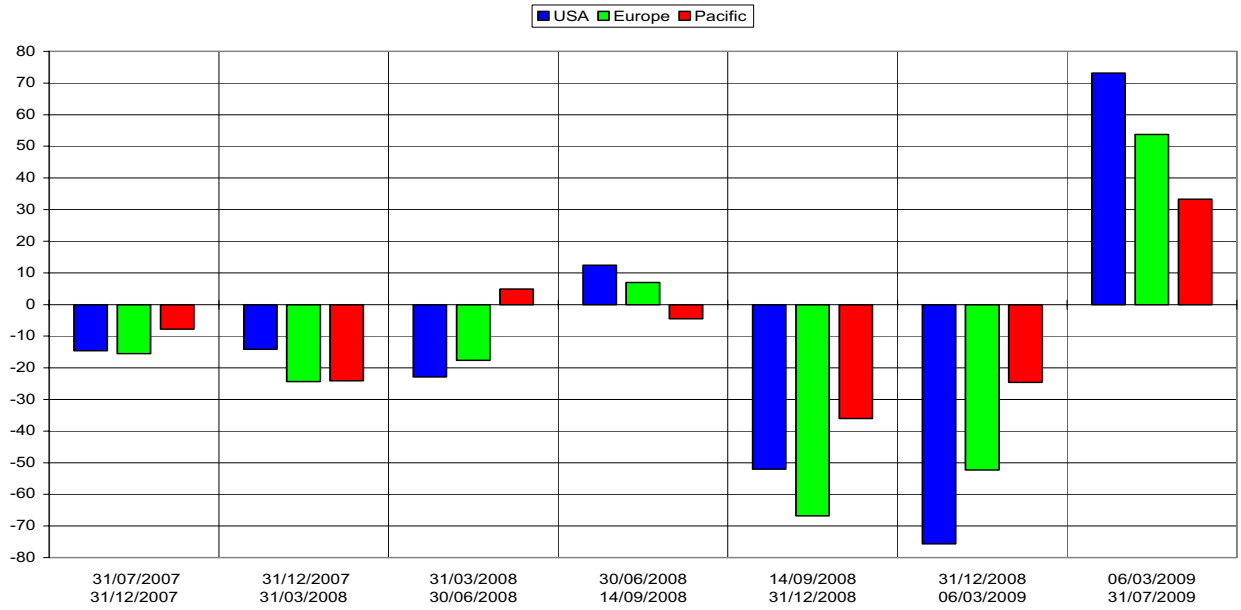
[1] See Mishkin (1991) for historical evidence from the 19th and 20th century US panics.

[2] Only the largest listed banks are included. For Ireland, Norway, and Switzerland, we have only one bank each (see Appendix).



Notes: CME Group Inc., Discover Financial Services, Fukuoka Financial Group, and Invesco Ltd. were excluded from the sample of 120 banks because they did not make the list at the end of July 2007.
Source: Bloomberg (August 7, 2009).

Fig. 2. Market capitalization of a sample of US, European, and Pacific region banks from the end of July, 2007 to July 31, 2009, in US$ billion



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Source: Bloomberg (August 7, 2009).

Fig. 3. Holding-period dollar rates of return on a sample of US, European, and Pacific region banks from the end of July, 2007 to July 31, 2009

Table 1. Rates of returns in local currency and in dollars on selected US, European and Pacific region banks, in percent, from July 31, 2007 to July 31, 2009

Area	Country	31/07/2007 14/09/2008			31/07/2007 06/03/2009			31/07/2007 31/07/2009		
		LCU	EXC	USD	LCU	EXC	USD	LCU	EXC	USD
Europe	AT	-42.29	3.31	-40.38	-199.61	-7.86	-191.78	-104.68	4.06	-104.87
	BE	-54.67	3.31	-53.17	-287.72	-7.86	-272.96	-160.25	4.06	-162.69
	DE	-62.64	3.31	-61.40	-297.29	-7.86	-281.78	-207.92	4.06	-212.30
	EI	-88.06	3.31	-87.66	-403.63	-7.86	-379.75	-239.22	4.06	-244.87
	ES	-43.14	3.31	-41.26	-101.61	-7.86	-101.48	-45.16	4.06	-42.93
	FR	-64.80	3.31	-63.64	-178.66	-7.86	-172.47	-104.34	4.06	-104.52
	GR	-42.61	3.31	-40.71	-161.66	-7.86	-156.81	-85.64	4.06	-85.06
	IT	-42.65	3.31	-40.75	-134.29	-7.86	-131.59	-79.21	4.06	-78.37
	PT	-92.74	3.31	-92.50	-153.90	-7.86	-149.66	-121.45	4.06	-122.32
	CH	13.52	5.88	20.19	14.64	4.21	19.47	15.44	11.94	29.22
	DK	-49.98	3.10	-48.43	-169.91	-8.01	-164.30	-77.06	3.97	-76.15
	NO	-30.46	1.44	-29.45	-126.41	-19.53	-121.25	-37.62	-5.14	-40.82
	SE	-45.72	-0.02	-45.73	-155.59	-31.50	-138.08	-72.10	-7.22	-74.11
	UK	-54.12	-12.92	-60.05	-233.67	-36.69	-184.63	-116.96	-19.76	-113.61
Europe total		-50.92	1.05	-50.32	-175.20	-13.32	-163.14	-96.96	0.19	-96.53
Pacific	HK	-12.04	0.39	-11.70	-77.53	0.92	-77.33	-12.71	0.98	-11.86
	JP	-43.66	10.26	-37.87	-109.63	19.65	-111.53	-78.37	23.12	-73.36
	AU	-30.34	-5.06	-33.87	-81.02	-29.35	-86.59	-40.53	-3.01	-42.32
Pacific total		-30.34	3.42	-28.54	-92.49	1.89	-94.60	-48.28	9.76	-46.23
USA	US	-39.27	0.00	-39.27	-166.92	0.00	-166.92	-93.74	0.00	-93.74
USA total		-39.27	0.00	-39.27	-166.92	0.00	-166.92	-93.74	0.00	-93.74

Notes: LCU = rate of return in local-currency units; EXC = depreciation/appreciation of the US dollar relative to the local currency; USD = rate of return in dollars; AT = Austria; BE = Belgium; CH = Switzerland; DE = Germany; DK = Denmark; EI = Eire; ES = Spain; FR = France; GR = Greece; IT = Italy; NO = Norway; PT = Portugal; SE = Sweden; UK = United Kingdom; AU = Australia; HK = Hong-Kong; JP = Japan; US = United States. CME Group Inc., Discover Financial Services, Fukuoka Financial Group, and Invesco Ltd. were excluded from the sample of 120 banks because they did not make the list at the end of July 2007.
Source: Bloomberg (August 7, 2009).

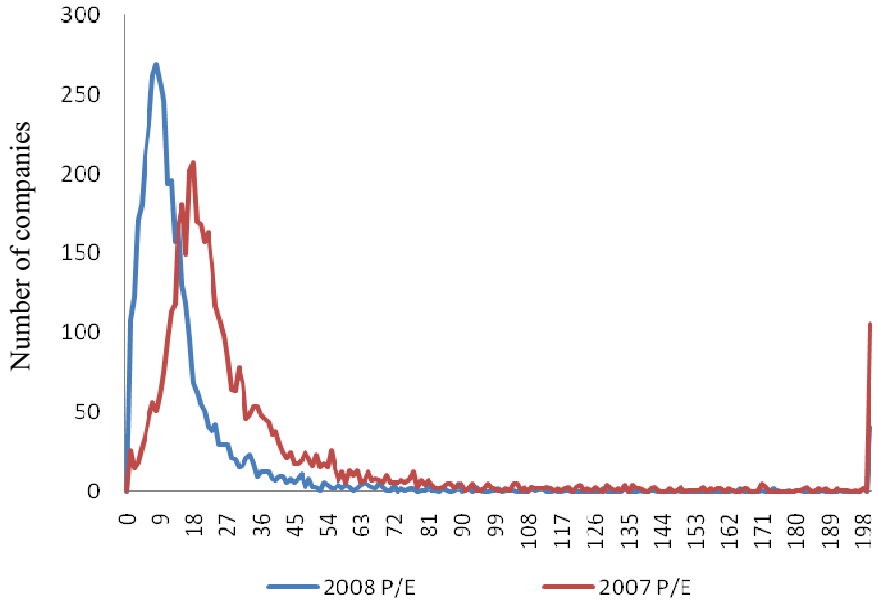
Over the period from July 31, 2007 to March 6, 2009, the crisis has destroyed $3.23 trillion of market values in our sample of banks. European banks were hit the hardest with a 75 percent decline, the Pacific banks were hit the mildest with a 48 percent decline, and US banks fared in the middle with a 68 percent decline (see Figure 1). The decline, furthermore, was at least twice as large after September 14, 2009 than in the previous sub-period. This is quite apparent from the holding-period rates of return shown in Figure 2, and corroborates the view that the Lehman failure was perceived by the market as a critical event.

Table 1 compares rates of return at the national level, using both local-currency and dollar returns. Dollar returns are the sum of local-currency returns, the rate of dollar depreciation (or appreciation if negative) and the interaction between these two terms. The dollar depreciated relative to most currencies in the pre-Lehman period, appreciated in the first part of the post-Lehman period and then depreciated again in May of 2009. Take bank stocks of the euro area. In the pre-Lehman period, rates of return averaged -59 percent, over a range comprised between -42 percent for Austria and -92 percent for Portugal. Banks from France, Germany, Ireland and Portugal did worse than those from Austria, Greece, Italy, and Spain. From July 31, 2007 to March 6, 2009, the euro-area average rate of return is an astounding -213 percent, over a range comprised between -102 percent for Spain and -404 percent for Ireland. Austrian, Belgian, German and Irish banks did much worse than French and Southern European banks. As we have already remarked in connection with dollar valuation, European bank stocks suffered the most, Pacific region bank stocks the least, and US bank stocks were in the middle. For most countries, but not for the United Kingdom, Norway and Sweden, the differences between local-currency returns and dollar returns were of a small order of magnitude.

This massive destruction of market value can be attributed only in part to deteriorating fundamentals. As predicted by the CBB hypothesis, the crisis made investors much more risk averse. To illustrate the extent of this shift in risk aversion, Figure 4 plots the distribution of price-to-earnings ratios computed over 4,000 US equities for the years 2007 and 2008 (Trzcinka, 2009)[1]. The 2008 distribution shifts sharply to the left of the 2007 distribution: the mean tumbles from 40.8 to 18.9, the 10th percentile from 10.4 to 3,

[1] There are 4,363 firms in the 2007 sample and 4,010 in the 2008 sample.

the 90th percentile from 62 to 29.5. Across a very broad range of US equities, investors were valuing a unit of 2008 earnings with a price multiple that was less than one half the price multiple according to 2007 earnings. In sum, rising risk aversion magnified the effect of deteriorating fundamentals on bank stocks.



Source: F529 class notes by Professor Charles Trzcinka, Indiana University, Department of Finance.
Notes: 2007 P/E and 2008 P/E observations refer to the end of January 2008 and 2009, respectively.

Fig. 4. Shift in the price-earnings ratio of US stocks, 2007-2008

3. Timeline of government rescue plans

The rescue of several large financial institutions in the United States and in Europe was sparked by the migration of liquidity risk from banks to finance and followed the rapidly expanding role of government as a market maker of last resort to support not only big banking but also big finance. The list of large failed institutions is long. After the merger of Bear Stearns with JP Morgan Chase & Co., financed with a $29 billion loan by the Fed of New York, the US government gave an explicit and massive guarantee to the liabilities of Fannie Mae and Freddie Mac that held or guaranteed at that time approximately $5,200 billion of mortgages. An Asset Guarantee Program was launched in the last few days of the Bush Administration. The original October 2008 bailout proposal of Treasury Secretary Paulson, discussed below, excluded a guarantee program, but Congress pushed for its inclusion because it was concerned with the expenditure implications. Debt and asset guarantees are politically attractive because governments do not have to argue the case and request funds from Congress or Parliament. They also entail smaller current costs than the expected present-value contingent cost, suggesting that government gambles for a possible resurrection of the banking system. This strategy was a defining characteristic of both the US S&L crisis of the Eighties and the long Japanese crisis of the Nineties; and it was responsible for transforming "a relatively small cost into a staggeringly large one" (Glauber, 2000, p. 102).

The failure of Lehman Brothers on September 15 was the high point of the financial crisis: credit default swap premia on a sample of North American and European commercial and investment banks, in fact, peaked on that day (BIS 2009, Annual Report, Graph III.1, p. 38). The following day AIG, the enormous international insurance company, was bailed out by the US Treasury[1]. On September 19, the US Treasury announced a temporary guaranty program of up to $50 billion for money market mutual funds. On September 26, the FDIC closed the activities of Washington Mutual, making it the largest bank failure to date. On September 29, the UK government nationalized Bradford and Bingley, a large UK mortgage lender. On September 30, Fortis received emergency funding from the governments of Belgium, the Netherlands and Luxembourg. On October 5, the German government extended guarantees to Hypo Real Estate Bank as part of a private takeover.

In October, government interventions became less ad-hoc and more directed at addressing systemic problems. On October 3, the United States established the Troubled Asset Relief Program (TARP), authorizing the US government to purchase sub-standard illiquid assets up to an amount of $700 billion spread over three tranches. No sooner the law was approved than it became apparent that valuing sub-standard assets

[1] The Federal Reserve of New York was authorized to lend to AIG up to $85 billion. An additional authorization of $37.8 billion was approved on October 8.

would be a serious problem: without a market, the government was likely to either overvalue "toxic" assets, thus penalizing taxpayers, or undervaluing them, thus penalizing potential sellers. Fortunately, there was language in the bill for the Treasury to use the alternative of recapitalizing banks[1]. On October 8, the UK government revealed a £500 billion financial support program centered on the recapitalization of the banking system. Eight banks were identified for immediate recapitalization: Abbey, Barclays, HBOS, HSBC, Lloyds, Nationwide, Royal Bank of Scotland, and Standard Chartered[2]. The program was seen as a nationalization scheme. Nationalization is the fastest in stopping a crisis but is invasive and has adverse long-term consequences on the future efficiency of the banking system. Thus, it has a relatively small cost to the taxpayer in the short run but has a potentially big upside in the long run. This is the solution that Italy adopted in the Thirties (Fratianni and Spinelli, 2001, pp. 316-321). It took fifty years before the bulk of the Italian banking system was again privatized. Equity funding is a partial nationalization. It is less credible than full nationalization as a commitment mechanism to restore banks to long-term viability; it is more expensive than nationalization in the short run, but makes it easier and less costly for government to disengage from banking once the crisis is over.

On October 14, Treasury Secretary Paulson adopted the UK model, although it fell short of complete nationalization[3]. The new program was relabeled TARP Capital Purchase Program and permitted eligible institutions to apply for preferred stocks owned by the US Treasury up to an aggregate of $250 billion[4]. On October 16, UBS received a capital injection from the Swiss government. On October 19, there was news of a capital injection in ING by the Dutch government. On the same day, the South Korean government announced a $130 billion financial rescue plan. On October 20, it was Sweden's turn to announce its own rescue package worth $205 billion. On October 28, Belgian KBC and Dutch Aegon were targeted for capital injections by their respective governments. On November 28, the Italian government unveiled a plan of issuing government subordinated bonds to fund targeted banks. Under this scheme, the Italian Treasury would borrow from the markets and lend to the banks at a much higher interest rate[5].

Additional measures were taken in 2009, this time with more attention being paid to relieving banks of bad assets. The creation of a bad-asset bank worked well for the Nordic countries, especially for Sweden, in resolving their financial crisis of the early Nineties. Governments intervened early and decisively, and not only bought toxic assets but managed them. In Sweden, the crisis erupted in the early part of 1992; shortly after that the government purchased two large failing banks (Nordbanken and Gotabanken) and created two asset-management institutions (Securum and Retriva) to acquire and manage bad loans (Drees and Pazarbasioglu, 1998). Altogether, the government committed less than $10 billion to rescue the banking system[6]. The crisis was relatively short-lived. However, this episode suggests that certain conditions were critical in making the bad-asset bank model successful: a transparent political system, a well delineated plan, uncorrupt bank practices, a broad consensus in the population to support banks, and a competent management to run the new institutions (Ingves and Lind, 1996). These conditions were not present during the deep and long Japanese financial crisis of the Nineties and the bank-asset model failed despite repeated attempts[7].

The purchase of banks' low-quality assets was announced in a new US plan by Treasury Secretary Timothy Geithner on February 10, with details unveiled on March 23. In addition to government buying convertible preferred stock in qualified banks, the plan added a Public-Private Investment Program (PPIP) aimed at relieving banks of legacy assets[8]. PPIP would be funded by government and private financial institutions with each putting up equity of $75 to

[1] Interestingly enough, the recapitalization strategy was employed by the Reconstruction Finance Corporation (1932-1953), a fact that seemed to have been completely ignored by the first version of TARP.

[2] These institutions committed to increase capital by £25 billion. Government would inject £50 billion in the form of preference shares and with conditions such as limits on executive compensation, dividend policies and commitment to support lending to small business and home buyers. Furthermore, £250 billion would be made available to eligible institutions to guarantee new short and medium-term debt issuance. To obtain these guarantees the eligible institutions had to raise Tier 1 capital to the level deemed appropriate by government.

[3] The official announcement that Treasury would no longer purchase illiquid mortgage-related assets was made on November 12.

[4] The preferred shares would pay a cumulative dividend rate of 5 percent for the first five years and 9 percent subsequently. Furthermore, Treasury would receive warrants to purchase common stocks for an aggregate market price of 15 percent of the senior preferred shares; the exercise price of the warrants would be the market price of the common stock at the time of issuance calculated on a 20-trading day trailing average. The program had restrictions on dividend payment and executive salary. Nine large financial institutions declared their intentions to subscribe to this facility for an amount of $125 billion; the announcement is dated October 28, 2008.

[5] To further limit risk for Treasury, the requesting banks would be subject to a stress test performed by the Banca d'Italia.

[6] The cost of the rescue plans, net of liquidation of assets and including appreciation in the value of government shares, was close to zero for Sweden and Norway and 5.3 percent of GDP for Finland (Anderson, 2009).

[7] Four attempts were made in setting up bad-asset banks: the first in 1992, the second in 1995, the third in 1995 and the last (the Industrial Revitalization Corporation of Japan) in 2003. It should be noted that there are differences between the Nordic and Japanese crises, such as: the economic size of the Nordic countries was and is significantly smaller than Japan's; Nordic countries were foreign net debtors, whereas Japan was a foreign net creditor; and liberalization occurred way before the crisis in Sweden and Finland, helping these countries to clean up bad loans from their balance sheets through a more efficient financial market, whereas financial deregulation was a reaction to the crisis in Japan.

[8] The Geithner Plan also added a compulsory stress test for the 19 largest US bank holding companies. The results of this test were unveiled in early May and found that 9 of the 19 banks had adequate capital, while the remaining 10 had to add $75 billion of fresh capital.

$100 billion. The equity would be leveraged with interest-free non-recourse loans (i.e., pledged by collateral, but without any personal liability for the borrower) by the FDIC and the Fed up to a ratio of 6 to 1. PPIP became quickly controversial. Paul Krugman (March 23, 2009), from the pages of the New York Times, was quick in declaring, politely, that the Administration was lying on the claim that PPIP involved no taxpayer's subsidy. Jeffrey Sachs (March 25, 2009) titled his article in VoxEU "Will Geithner and Summers succeed in raiding the FDIC and Fed?". Joseph Stiglitz (March 31, 2009), in the New York Times, labeled the PPIP "Obama's Ersatz capitalism", the privatizing of gains and socializing of losses. Peyton Young (April 1, 2009), in the Financial Times, thought the PPIP would be the taxpayer's curse, the parallel to the winner's curse in auctions. The common element underlying these reactions was that the Plan would entail a massive and unnecessary wealth transfer from taxpayers to the financial markets. It was deemed unnecessary because a direct government transfer to the banks would be cheaper in rescuing the banks. This is because private investors would make extraordinary returns financed by government. Bids would rise through competition until returns would become "normal" or even zero. But as the price of assets rises, the transfer from taxpayers to banks would also rise. In essence, taxpayers would do worse than with a direct government transfer to banks. Yet, the Plan had to be seen from a political economy angle. Its "clever, complex and nontransparent" features – using Stiglitz' words – packed great political value. Like guarantees, it obscured the true cost of government intervention and raised the probability of its acceptance among the public.

This potted history of government interventions in the financial markets is bound to be unfinished. At the time of writing, other governments, such as those of Germany and Spain, are either in the process or in the planning stage of launching new rescue facilities.

4. Estimates of government commitments and outlays

We present three sets of aggregate data on government rescue plans. The first estimate is due to Mediobanca and was posted on its Website at the end of February 2009 (see Table 2). It refers to actual interventions by the United States and 10 European governments to support their banking systems[1]. The second estimate comes from a study by the staff of the Bank of International Settlements and the Banca d'Italia (BIS-BdI, for short) with a cut-out date for the data of June 10, 2009 (Panetta et al., 2009, Table 1.2 p. 9) (see Table 3). It differs from Mediobanca's estimate in that it distinguishes between commitments and actual outlays, adds (relative to Table 2) three non-European countries but includes a smaller set of European countries[2]. The third estimate, shown in Table 4, is from BNP Paribas (2009) and is dated June 1, 2009: it has the broadest country coverage but is limited only to commitments.

According to Mediobanca's estimates, as of February 2009 the sampled 11 governments had spent $633 billion in supporting their banking systems, of which 62 percent was in the form of equity funding, 23 percent in debt guarantee, 7 percent in the purchase of bad assets, 5 percent in nationalization, and 3 percent in convertible bonds. The largest interventions were effected by the United States, Germany, the Netherlands and the United Kingdom. According to the BIS-BdI study, as of June 10, 2009, the (differently) sampled 11 governments had made commitments for approximately €5,000 billion and actual outlays for €2,000 billion. The value of total guarantees appears to be greatly understated. Just the guarantee commitment of the US government to Fannie Mae and Freddie Mac, as we have seen, exceeds $5,000 billion[3]. Six of the 11 countries are covered by the two estimates. As one would expect, the passage of time has meant more governments' interventions in the banking system. The biggest change refers to the United States, which has moved from $278 billion in February to €825 billion in June, and the United Kingdom which has moved from $63 billion to €690 billion. The increases are more contained for France, the Netherlands and Switzerland. The BIS-BdI study underscores the prevalence of guarantees (83 percent of total commitments and 78 percent of outlays) over capital injections (14 and 19 percent, respectively) and asset purchases (3 percent for both commitments and outlays). The BNP Paribas estimate covers 14 EMU countries, five non-EMU European countries, Australia, Canada, Japan, Qatar, Saudi Arabia, South Korea, UAE and the United States. Total commitments amount to €5,700 billion, of which 34 percent in the United States, 34 percent in the EMU countries, and 19 percent in the United Kingdom.

In sum, the policy response to the subprime crisis started in earnest after Lehman's failure in mid September 2008, accelerated after February 2009, and has become very large at the time of writing (September 2009). The narrative and the data have underscored that governments have relied on a portfolio of intervention tools, but the biggest commitments and outlays have been in the form of debt and asset guarantees, while purchases of bad

[1] The 10 European countries are Austria, Belgium, France, Germany, Ireland, Iceland, Luxembourg, the Netherlands, Switzerland and the United Kingdom. Italy is excluded because it committed an unspecified amount of funds without incurring any expenditure.

[2] The added non-European countries are Australia, Canada and Japan. As to the European countries, Italy, Spain, Austria, Belgium, Ireland, Iceland, and Luxembourg were dropped.

[3] At an exchange rate of $1.3 = €1, it would amount to €3,846.

assets have been very limited. In what follows, we evaluate the rescue plans from the viewpoint of financial markets, that is how bank stock prices have reacted to the commitment news of supporting banks.

Table 2. Government interventions to support banks, by country and types through February 2009 (in million USD)

	Type of intervention					Total
	Bad banks	Convertible bonds	Debt guarantee	Equity funding	Nationalization	
AT					0,00[(a)]	0,000
BE				10,504	6,759	17,263
CH		6,799				6,799
DE		10,430	144,856	16,101		171,387
EI			1,923	5,550	0,000	7,473
FR				18,204		18,204
IS					0,829	0,829
LU		4,050				4,050
NL	42,543				23,211	65,753
UK				63,037	0,00[(a)]	63,037
US				278,804		278,804
Total	42,543	21,278	146,779	392,200	30,799	633,599

Notes: AT = Austria; BE = Belgium; CH = Switzerland; DE = Germany; EI = Eire; FR = France; IS = Iceland; LU = Luxembourg; UK = United Kingdom; US = United States. (a) Government bought distressed banks for 2 Euro in Austria and for free in UK.
Source: Mediobanca (February 10, 2009).

Table 3. Overview of commitments and outlays as of June 10, 2009*

Euro billions and percentage points		Capital injections			Debt guarantees			Asset purchase			Asset guarantees (1)			Total		
			% of GDP (2008)	% of banking sector assets (end-2008)		% of GDP (2008)	% of banking sector assets (end-2008)		% of GDP (2008)	% of banking sector assets (end-2008)		% of GDP (2008)	% of banking sector assets (end-2008)	Euro billions	% of GDP (2008)	% of banking sector assets (end-2008)
Australia	Commitments	–	–	–	UNS	UNS	UNS	–	–	–	–	–	–	UNS	UNS	UNS
	Outlays	–	–	–	62	10.4	4.6	–	–	–	–	–	–	62	10.4	4.6
Canada	Commitments	–	–	–	UNS	UNS	UNS	–	–	–	–	–	–	UNS	UNS	UNS
	Outlays	–	–	–	0	0	0	–	–	–	–	–	–	–	–	–
France	Commitments	43	2.2	0.6	320	16.4	4.2	–	–	–	5	0.2	0.1	368	18.9	4.8
	Outlays	28	1.4	0.4	72	3.7	0.9	–	–	–	5	0.2	0.1	104	5.3	1.4
Germany	Commitments	80	3.2	1	420	16.9	5.3	UNS	UNS	UNS	200	8	2.5	700	28.1	8.9
	Outlays	22	0.9	0.3	129	5.2	1.6	0	0	0	0	0	0	151	6.1	1.9
Italy	Commitments	20	1.3	0.5	UNS	UNS	UNS	–	–	–	–	–	–	UNS	UNS	UNS
	Outlays	10	0.6	0.3	0	0	0	–	–	–	–	–	–	10	0.6	0.3
Japan	Commitments	105	2.5	0.9	–	–	–	8	0.2	0.1	–	–	–	113	2.7	0.9
	Outlays	3	0.1	0	–	–	–	0	0	0	–	–	–	3	0.1	0
Netherlands	Commitments	37	6.2	1.7	200	33.6	9.0	–	–	–	28	4.7	1.3	265	44.6	11.9
	Outlays	31	5.1	1.4	40	6.8	1.8	–	–	–	28	4.7	1.3	99	16.6	4.4
Spain	Commitments	UNS	UNS	UNS	100	9.1	3	–	–	–	–	–	–	UNS	UNS	UNS
	Outlays	0	0	0	31	2.8	0.9	–	–	–	–	–	–	31	2.8	0.9
Switzerland	Commitments	4	1.1	0.2	UNS	UNS	UNS	27	7.6	1.3	–	–	–	UNS	UNS	UNS
	Outlays	4	1.1	0.2	0	0	0	27	7.6	1.3	–	–	–	31	8.7	1.5
United Kingdom	Commitments	54	3.4	0.7	269	17.2	3.4	–	–	–	523	33.4	6.7	845	54	10.8
	Outlays	54	3.4	0.7	113	7.2	1.4	–	–	–	523	33.4	6.7	690	44.1	8.8
United States	Commitments	335	3	3.4	1,760	15.7	18	115	1	1.2	281	2.5	2.9	2,491	22.3	25.5
	Outlays	237	2.1	2.4	271	2.4	2.8	36	0.3	0.4	281	2.5	2.9	825	7.4	8.4
Total commitments		677	2.6	1.1	3,131	11.8	5.2	150	0.6	0.3	1,036	3.9	1.7	4,994	18.8	8.3
Total outlays		387	1.5	0.6	719	2.7	1.2	64	0.2	0.1	836	3.2	1.4	2,006	7.6	3.3

Notes: * As of June 10, 2009 unless otherwise specified. UNS = unspecified amount; "–" = no program/action. Banking sector assets are consolidated data for Australia, banks, credit unions, building societies and corporations; for Canada, chartered banks; for Japan, depository corporations (banks and collectively managed trusts); for Switzerland, all domestic banks; for the five euro area countries and the United Kingdom, monetary financial institutions; and for the United States, commercial banks.
Source: Panetta et al. (2009, Table 1.2).

Table 4. Overview of policy measures from September 15, 2008 to June 1, 2009

	Amounts pledged (bn)*			Total*			Note
Country	Capital injections	New debt issuance guarantees	Others	Local currency (bn)	EURbn	% of GDP	
Austria	15	85		100	100	37.0	Includes Dexia, Ethias, Fortis and KBC
Belgium	19.6			19.6	19.6	5.9	
Cyprus	2			2	2	12.8	
Finland	4	50		54	54	30.1	
France	24	320		344	344	18.2	Includes Dexia
Germany	80	400		480	480	19.8	
Greece	5	15	8	28	28	12.3	
Ireland	7	400		407	407	213.5	
Italy	12		40	52	52	3.4	
Luxembourg	2.9			2.9	2.9	0.8	Includes Fortis, but not ING
Netherlands	36.8	200		236.8	236.8	41.6	Illiquid Assets Facility
Portugal	4	20		24	24	14.7	
Slovenia		12	1	13	13	39.0	
Spain		209	50	259	259	24.6	Includes guarantee on loan to Caja Castilla La Mancha
Eurozone	197.8	1,711	99	2,028	1,955	21.0	
Australia			8	8	4	0.7	
Canada		218	125	343	259	22.3	
Denmark	100			100	13.4	5.9	Plus losses over DKK35bn on bank liabilities
Hungary	1.5**	1.5**		3.1**	2.3	2.2	
Japan	13000		7691	20691	161.2	4.0	
Norway	100		350	450	51.1	19.8	
Qatar	6**			6**	4.7	8.8	
Saudi Arabia	3**			3**	2.4	0.8	
South Korea	14.2**	100**	40.8**	155*	114.9	16.3	
Sweden	65	1,500		1,565	145.8	51.0	
Switzerland	6			6	4	1.0	Capitalization of UBS excludes Special Liquidity
UK	678.1	250	635	963.1	1,059	68.7	Scheme (GBP200bn) but includes Asset Protection Scheme
UAE	19**			19**	14.7	9.6	
US	350	1,400***	750****	2,500	1,925	18.1	Does not include Fed's facilities, such as the MMIFF but does include TALF

Notes: * Includes capital injections, asset buying and guarantees on debt issuance. Excludes deposit guarantees. ** In USD. *** FDIC estimate of total size of unsecured debt falling under its guarantee. **** Includes USD 500 bn for PPIF, USD 200 bn for TALF, USD 50 bn for foreclosure prevention.
Source: BNP Paribus.

5. The effects of government rescue plans

In this section, we employ event study methodology (event parameter) to estimate markets' reaction to the announcements of government interventions. The underlying hypothesis is that the announcement of a rescue plan is credible if it raises the survivability and rates of return of participating banks. Therefore, we can test the effects of rescue plans by computing cumulative abnormal returns (CAR) of participating banks around a window that includes announcement dates. For the actual test, we will use the same sample of banks in Table 1 (Appendix). Estimates of alpha, the risk free rate, and beta, the market risk parameter, from the capital asset price model will be based on daily market return observations of three sample periods: the first from July 31, 2007 to September 14, 2008 (the day before Lehman Brothers' failure), the second from September 15, 2008 to March 6, 2009 (the bottom of the market) and the third from March 7, 2009 to our last available observation of July 31, 2009.

The events are of two types. The first one is an announcement that the government will intervene to protect the banking system (for brevity, general announcement). Our main data sources are Mediobanca, BIS-BdI, and BNP Paribus, but we have also used information from DLA Piper, the International Capital Market Association and websites of Ministries of Finance or Treasury. For the 18 countries represented in our data set, there are 37 general announcements, of which the greatest number pertains to capital injections. The second type is an announcement that a specific bank will receive government support (for brevity, specific announcement). We have 63 specific announcements affecting 43 of 120 banks in our sample, 4 of which pertain to asset purchase and

guarantees, 8 to debt guarantees, and 51 to capital injection. A few banks, such as Bank of America and Hypo Real Estate, have multiple announcements. 43 banks with specific announcements represent half of the countries in our sample[1]. 77 banks from the other half of the countries have no announcement, in particular those from the Pacific area.

We regress daily rates of returns on bank stock *i* of country *j* at time *t*, R_{ijt}, on an intercept capturing the risk-free rate of return and on the market rate of return, R^{M}_{jt}, and two dummy event variables. The first dummy variable, G_{jt}, is equal to one during the event time window, *T*, around a general announcement, otherwise it is zero; the second dummy variable, S_{it}, is equal to one in the time window *T* around a specific announcement. We also break down *G* and *S* by the different intervention types discussed above, such as asset purchases, capital injections, and debt guarantees. We assume that a general announcement is more complex than a specific announcement and requires longer time for the market to process it; in addition, it is easier for the markets to get wind of a general announcement than of a specific one. For this reason, we apply different windows to the two types of announcements: *G*'s window is seven days and is comprised between three working days before and after the announcement, whereas *S*'s window is five days. The test is formalized in equation (1):

$$R_{ijt} = \alpha + \beta \cdot R^{M}_{jt} + \gamma \cdot G_{jt} + \delta \cdot S_{it} + u_{ijt}, \quad (1)$$

where *u* denotes a well-behaved error term and *G* and *S* become dummy vector when we disaggregate by intervention type[2]. Markets' reaction to announcements is captured by γ and δ: within the time window *T*, CAR is predicted to be higher than returns in other periods. Since the error of the regression must be zero on average, the null hypothesis is that CAR within *T* must also be zero. A rejection of the null hypothesis corroborates the presence of abnormal rates of return. In our one-step formulation of the event study regression (1) (i.e. event parameter), the positive impact of news of a government intervention on rates of return is captured by CAR, which is equal to the sum of the estimates of parameters γ and δ multiplied by *T* (Meulbroek, 1992).

Table 5 shows estimates of equation (1) for the period spanning from July 31, 2007 to July 31, 2009 and three sub-periods we have already used for Table 1. We have 34,354 observations in the first period, 14,697 in the second and 12,416 in the third one. We test equation (1) by first aggregating all types of general and specific announcements and then using three specific categories of asset purchase, capital injections, and debt guarantees (see equation (1b); e.g., G_1 = general announcement of asset purchase, S_2 = specific announcement of capital injection). We recall that *G* has a seven-day window and *S* a five-day window. We did experiment with different window lengths: results tend to weaken as the window is enlarged, in particular, for specific announcements. The bulk of the announcements occurs in the second period. The panel is estimated with fixed country effects, a specification that is not rejected by the Hausman Test (1978)[3]. In addition to the variables indicated on the right-hand side of equation (1), we have added the logarithmic value of bank capitalization expressed in dollars. In fact, bank size turns out to have positive and statistically significant effects in the first and second periods.

The key finding of Table 5 is that announcements, both general and specific, have a statistically significant and economically relevant impact on banks' rates of return. Over the entire two-year period, CAR were almost 5 percentage points higher than normal returns for general announcements and 6 percentage points lower than normal returns for specific announcements. The signs of the coefficients reflect differences in the way markets evaluate the two types of announcements. General announcements are taken as signals that governments want to protect the banking systems. The banking industry, as a whole, receives support and rates of return to shareholders rise "abnormally" over the announcement window. Specific announcements are more problematic for the markets. During times of relative transparency, when markets face stable information flows and price with relative efficiency banks' future net cash flows, *S* is evaluated as a boost to shareholders' return. On the other hand, in the fog of a financial crisis, when markets are extremely uncertain about the quality of the assets they have to evaluate, *S* is taken as a revelation of partially unknown troubles; CAR may turn to be negative. On this point, it is worth mentioning that particularly

[1] The nine countries are Austria, Belgium, France, Germany, Ireland, Italy, Netherlands, UK, and US.

[2] In this case, the extended formulation is:

$$R_{ijt} = \alpha + \beta \cdot R^{M}_{jt} + \sum_{k=1}^{3} \left(\gamma_k \cdot G_{kjt} + \delta_k \cdot S_{kit} \right) + u_{ijt}, \quad (1b)$$

where k = 1 indicates asset guarantees and purchase, k = 2 capital injection, and k = 3 debt guarantees.

[3] The Hausman (1978) specification test uses the statistic $H = N(\beta_{FE} - \beta_{RE})' Var(\beta_{FE} - \beta_{RE})^{-1} (\beta_{FE} - \beta_{RE})$ to compare fixed effects with random effects, where N = number of observations, β_{FE} and β_{RE} are the vector of coefficients in the FE and RE model respectively, and Var(.) indicates the variance-covariance operator; *H* has a chi-squared distribution. In Table 7, except for the last column, the null hypothesis that the estimated coefficients from the fixed-effect model are not systematically different from the coefficients of the random-variable model is rejected. In this case, that is under the alternative hypothesis, the random-effect model is inconsistent, where the fixed-effect model is. In the last column, the Hausman test fails to meet asymptotic assumptions.

hectic activities took place in the first half of October 2008, when governments intervened on a big scale to stabilize their banking systems. Over a two-week period, policy makers first tried to purchase or guarantee assets, then moved to inject capital into banks, and finally decided to guarantee bank debts. The fact that three different strategies were adopted in such a brief time span underscores the state of confusion, if not outright panic, enshrouding government decisions. Capital markets were extremely opaque in the immediate wake of Lehman's failure.

Differences in the information environment appear to be corroborated by the CAR pattern in three sub-periods: *S* has a positive impact on *R* in the pre-crisis sub-period, when announcements are few and markets have relative confidence in the "normal" information flow; but the opposite takes place in the turbulent crisis sub-period when announcements are the order of the day and markets mistrust the "normal" information flow. These results appear consistent with the observed reluctance of individual institutions to come forth with requests for public assistance. Fear of being identified as a "bad apple" was also the reason why some banks were reticent, during 2008, to apply central banks for emergency lending.

The key finding of the second group of estimates of Table 7 is that the markets do not distinguish between the relative efficacy of different types of announcements. In fact, we cannot reject the null hypothesis that G_1, G_2, G_3, and similarly for *S*, exert equivalent impacts on *R*[1]. These results suggest two policy implications. The first is that, during a big financial crisis, markets value timely and big actions without little regard to refinements on the type of actions undertaken. The different long-run consequences of different interventions are ignored. The similitude with a war is compelling. Like in a war, participants in a financial crisis want to survive: planning horizons are shortened and considerations that are taken seriously under normal circumstances are instead relegated to minor roles in a crisis. This pattern is consistent with the lessons from Nordic and Japanese banking crises: timely and big public interventions solved successfully the crisis in Sweden, whereas untimely and small government measures led to the lost Japanese decade. The second is that, given that different announcements produce equivalent effects, governments have incentives to gamble for opaque and "low-cost" guarantees of bank assets and debts rather than undertake more transparent and costly alternatives.

Table 5. Effects of general and specific announcements on banks' rates of return; fixed effects

Coefficient	All announcements				Announcements by type			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All periods	Subperiod 1	Subperiod 2	Subperiod 3	All periods	Subperiod 1	Subperiod 2	Subperiod 3
R_m	1.405***	1.355***	1.331***	1.731***	1.405***	1.355***	1.332***	1.732***
SIZE	0.00215***	0.00324***	0.0198***	0.00217	0.00211***	0.00324***	0.0198***	0.00251
G	0.00666***	-0.00183	0.00465***	0.00290*				
G_{AP}					0.00345**	0	0.00455**	-0.0128
G_{CI}					0.00481***	-0.00183	0.00216	0.00429**
G_{DG}					0.00614***	0	0.00443	-0.00916
S	-0.0119***	0.0179*	-0.0136***	0.00355				
S_{AP}					-0.0109	0	-0.0243	0.00607
S_{CI}					-0.0137***	0	-0.0156***	0.00308
S_{DG}					-0.00103	0.0179*	0.00637	0
Constant	-0.0202***	-0.0315***	-0.180***	-0.0187	-0.0198***	-0.0315***	-0.180***	-0.0217
Observations	61,467	34,354	14,697	12,416	61,467	34,354	14,697	12,416
Number of banks	120	120	120	120	120	120	120	120
Adjusted R^2	0.392	0.428	0.320	0.328	0.392	0.428	0.321	0.328
F-test	9,984	6,814	2,544	1,547	4,993	6,814	1,273	885.3
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Hausman test	36.00	23.61	208.8	47.71	36.81	23.61	284.6	-99.81[(a)]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(1.000)
WALD $GS_x=0$	52.06	1.618	12.72	1.562	18.20	1.618	5.560	1.907
	(0.000)	(0.198)	(0.000)	(0.210)	(0.000)	(0.198)	(0.000)	(0.0896)
F-test $G_{AP}=G_{CI}$					0.512	-	0.457	2.719
					(0.474)		(0.499)	(0.0991)

[1] The Wald test shows that the announcements, taken as a whole, have a non-zero impact on rates of return for the entire period and the crisis sub-period. The F-test on *G* and *S* pairs shows that effect similarity cannot be rejected. For the pre-crisis period, the F-test cannot be done because of the scarcity of announcements.

Table 5 (cont.). Effects of general and specific announcements on banks' rates of return; fixed effects

Coefficient	All announcements				Announcements by type			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All periods	Subperiod 1	Subperiod 2	Subperiod 3	All periods	Subperiod 1	Subperiod 2	Subperiod 3
F-test G_{AP}=G_{DG}					1.677	-	0.00150	0.0927
					(0.195)		(0.969)	(0.761)
F-test G_{CI}=G_{DG}					0.382	-	0.301	4.237
					(0.537)		(0.583)	(0.0395)
F-test G_{AP}=G_{CI}					0.0959	-	0.222	0.0329
					(0.757)		(0.638)	(0.856)
F-test G_{AP}=G_{DG}					0.856	-	2.134	0.172
					(0.355)		(0.144)	(0.678)
F-test G_{CI}=G_{DG}					3.584	-	3.747	0.163
					(0.0583)		(0.0529)	(0.687)
CAR=G*7	4.66%	-	3.26%	2.03%				
CAR=G_{AP}*7					2.42%	-	3.19%	-
CAR=G_{CI} *7					3.37%	-	-	3.00%
CAR=G_{DG}*7					4.30%	-	-	-
CAR=S*5	-5.95%	8.95%	-6.80%	-				
CAR=S_{AP}*5					-	-	-	-
CAR=S_{CI}*5					-6.85%	-	-7.80%	-
CAR=S_{DG}*5					-	8.95%	-	-

Notes: All estimations with fixed effects. See text for sub-period. R_m = rate of market return; *SIZE* = ln (market capitalization in million USD); G = general announcement; S = specific announcement; *AP* = asset guarantees and purchase; *CI* = capital injection; *DG* = debt guarantees; Hausman test vs. random effect model; GS_x = all general and specific announcements; CAR = cumulative abnormal return. (a) fails to meet asymptotic assumption. *** p < 0.01, ** p < 0.05, * p < 0.1. P-values of tests are in parentheses.

Summary and conclusions

The great financial crisis of 2007-2009 had its roots in a credit boom that manifested itself in an extremely indebted US economy and in a high appetite for risk by investors. The collapse of the real estate market in 2006 and the high failure rates of subprime mortgages were the first symptom of a credit boom tuned to bust. Several factors are unique to this crisis: the transfer of assets from the balance sheets of banks to the markets, the creation of complex and opaque assets, the failure of rating agencies to properly assess the risk of such assets, and the application of fair value accounting.

Banks' undercapitalization has been the biggest stumbling block to the resolution of the financial crisis. From the end of July 2007 to March 6, 2009, our sample of 120 large US, Western European, and Pacific region banks lost $3,232 billion of capitalization. This massive destruction of market value can be attributed only in part to deteriorating fundamentals. The financial crisis, not surprisingly, made investors much more risk averse. Banks' undercapitalization is the reason why governments continue to inject vast sums of public funds into banks. The first rescue plans started after Lehman's failure in mid September 2008 and were ad-hoc responses to specific negative events. In October of the same year, governments began to focus on systemic problems. Governments have committed aggregate sums in excess of €5 trillion to support their fragile banking systems and actually disbursed two-fifths of the committed funds. The biggest commitments and outlays have been in the form of debt and asset guarantees, while purchases of bad assets have been limited. Political-economy considerations explain the high weight assigned to opaque and complex guarantees.

We found that general and specific announcements were priced by the markets as cumulative abnormal rates of return over the window periods. General announcements tend to be associated with positive abnormal returns and specific announcements with negative abnormal returns. Our results were also sensitive to the information environment. Specific announcements tend to exert a positive impact on rates of return in the pre-crisis sub-period, when announcements are few and markets have relative confidence in the "normal" information flow. The opposite takes place in the turbulent crisis sub-period when announcements are the order of the day and markets mistrust the "normal" information flow. These results appear consistent with the observed reluctance of individual institutions to come forth with requests for public assistance.

Banks will not resume lending until undercapitalization is overcome. Banking systems remain fragile and additional government funds may be required to stabilize banks. Given that governments will have diminished resources, the greatest challenge may

well be for politicians to convince an enraged public of the necessity of either injecting additional funds into the banking systems or undertaking outright nationalizations.

We end with a cautionary note on the relationship between risk taking and moral hazard. Government rescue plans tend to consolidate the banking system in fewer and bigger players. This, in turn, raises the probability of invoking the too-big-to-fail policy. Given the strain on public finances created by the current crisis, it is now time to ask the question of when too-big-to-fail institutions become too big to be saved.

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Appendix. List of banks included in market capitalization

Area	Country	Bank Nr.	Bank name
Europe	AT	2	ERSTE GROUP BANK AG, RAIFFEISEN INTL BANK HOLDING
	BE	2	DEXIA SA, KBC GROEP NV
	CH	1	VALIANT HOLDING AG-REG
	DE	3	COMMERZBANK AG, DEUTSCHE POSTBANK AG, HYPO REAL ESTATE HOLDING
	DK	3	DANSKE BANK A/S, JYSKE BANK-REG, SYDBANK A/S
	ES	6	BANCO BILBAO VIZCAYA ARGENTA, BANCO DE VALENCIA SA, BANCO POPULAR ESPANOL, BANCO SANTANDER SA, BANKINTER SA
	FR	4	BNP PARIBAS, CREDIT AGRICOLE SA, NATIXIS, SOCIETE GENERALE
	GR	5	ALPHA BANK A.E., BANK OF GREECE, EFG EUROBANK ERGASIAS, NATIONAL BANK OF GREECE, PIRAEUS BANK S.A.
	IE	1	ALLIED IRISH BANKS PLC
	IT	8	BANCA CARIGE SPA, BANCA MONTE DEI PASCHI SIENA, BANCA POPOLARE DI MILANO, BANCO POPOLARE SCARL, INTESA SANPAOLO, PICCOLO CREDITO VALTELLINESE, UBI BANCA SCPA, UNICREDIT SPA
	NO	1	DNB NOR ASA
	PT	3	BANCO BPI SA, BANCO COMERCIAL PORTUGUES, BANCO ESPIRITO SANTO
	SE	4	NORDEA BANK AB, SKANDINAVISKA ENSKILDA, SVENSKA HANDELSBANKEN SHS, SWEDBANK AB
	UK	6	BANK OF IRELAND, BARCLAYS PLC, HSBC HOLDINGS PLC, LLOYDS BANKING GROUP PLC, ROYAL BANK OF SCOTLAND, STANDARD CHARTERED PLC
Pacific	AU	6	AUST AND NZ BANKING GROUP, BANK OF QUEENSLAND LTD, BENDIGO AND ADELAIDE BANK, COMMONWEALTH BANK OF AUSTRALIA, NATIONAL AUSTRALIA BANK LTD, WESTPAC BANKING CORP
	HK	8	BANK OF CHINA LTD, BANK OF COMMUNICATIONS CO, BANK OF EAST ASIA, BOC HONG KONG HOLDINGS LTD, CHINA CONSTRUCTION BANK, HANG SENG BANK LTD, HSBC HOLDINGS PLC, IND & COMM BANK OF CHINA
	JP	12	BANK OF YOKOHAMA LTD, CHIBA BANK LTD, CHUO MITSUI TRUST HOLDINGS, FUKUOKA FINANCIAL GROUP INC., MITSUBISHI UFJ FINANCIAL GROUP, MIZUHO FINANCIAL GROUP INC, MIZUHO TRUST & BANKING CO, RESONA HOLDINGS INC, SHINSEI BANK LTD, SHIZUOKA BANK LTD, SUMITOMO MITSUI FINANCIAL GROUP, SUMITOMO TRUST & BANKING CO
USA	US	45	AMERICAN CAPITAL LTD, AMERICAN EXPRESS CO, AMERIPRISE FINANCIAL INC, BANK OF AMERICA CORP, BANK OF NEW YORK MELLON CORP, BB&T CORP, CAPITAL ONE FINANCIAL CORP, CIT GROUP INC, CITIGROUP INC, CMA GROUP INC, COMERICA INC, DISCOVERY FINANCIAL SERVICES, E*TRADE FINANCIAL CORP, FEDERATED INVESTORS INC, FIFTH THIRD BANCORP, FIRST HORIZON NATIONAL CORP, FRANKLIN RESOURCES INC, GOLDMAN SACHS GROUP INC, HUDSON CITY BANCORP INC, HUNTINGTON BANCSHARES INC, INTERCONTINENTALEXCHANGE INC, INVESCO LTD, JANUS CAPITAL GROUP INC, JPMORGAN CHASE & CO, KEYCORP, LEGG MASON INC, LEUCADIA NATIONAL CORP, M & T BANK CORP, MARSHALL & ILSLEY CORP, MOODY'S CORP, MORGAN STANLEY, NASDAQ OMX GROUP, NORTHERN TRUST CORP, NYSE EURONEXT, PEOPLE'S UNITED FINANCIAL, PNC FINANCIAL SERVICES GROUP, REGIONS FINANCIAL CORP, SCHWAB (CHARLES) CORP, SLM CORP, STATE STREET CORP, SUNTRUST BANKS INC, T ROWE PRICE GROUP INC, US BANCORP, WELLS FARGO & CO, ZIONS BANCORPORATION

Notes: AT = Austria, BE = Belgium; CH = Switzerland; DE = Germany; DK = Denmark; ES = Spain; FR = France; GR = Greece; IE = Eire; IT = Italy; NO = Norway; PT = Portugal; SE = Sweden; UK = United Kingdom; AU = Australia; HK = Hong-Kong; JP = Japan; US = United States.
Source: Bloomberg.