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Measures of Investor and Consumer Confidence and Policy Actions in the Current Crisis

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Abstract

The current financial crisis has highlighted the danger that declines in confidence can have a self-fulfilling effect on economic activity. In this paper, the authors consider ways of measuring investor and consumer confidence, and try to explain the evolution of confidence using measures of financial volatility, investment performance, macroeconomic outcomes, and policy actions. They identify a link between investor and consumer

confidence. Finally, they show that liquidity provision and easing of interest rates had only a limited effect on financial market spreads during the crisis, arguing for additional measures to address the loss of confidence. The paper focuses on the need for financial regulatory reform, and shows how the incentives to cooperate in this area are stimulated by a common shock to confidence.

This paper—a product of the International Finance Unit, Development Prospects Group—is part of a larger effort in the department to analyze the role of confidence in the propagation of global financial cycles. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The author may be contacted at Mdailami@worldbank.org.

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Measures of Investor and Consumer Confidence and Policy Actions in the Current Crisis

by

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I. Introduction

Among government officials, policy makers, and key market observers, calls to restore confidence in the global financial system have become international mantra. In a March 2009 interview, for example, U.S. Federal Reserve Chairman Ben Bernanke stated, “[C]onfidence is key. People don’t know what’s happening. And they’re afraid. And they’re not sure . . . and I think the way to get confidence is to show progress.” Zhou Xiaochuan, governor of the People’s Bank of China, indicated the danger of not repairing confidence in a press briefing the same month, declaring, “If we act slowly and less decisively, we’re likely to see what happened in other countries: a slide in confidence.” U.K. Prime Minister Gordon Brown and Italian Prime Minister Silvio Berlusconi, meanwhile, asserted in a joint statement that world leaders must “take whatever action is necessary to restore confidence, stabilize financial markets, and enable families and companies to get through the global recession.” Similar sentiment was expressed in the G-20 Leaders’ Statement issued in conjunction with the group’s London meetings in early April.

Restoring confidence is a crucial step in repairing financial markets and lifting the global economy out of recession. How to measure confidence, however, and in a larger sense how to go about restoring it, are more complex. In the former regard, there exists a variety of market and survey based indicators of consumer confidence, investment sentiment, and business confidence used to express the views and outlook of the investor, household or business community on the future course of markets or the economy at large. In the latter regard, much hope is being pinned on the ability of countries to undertake coordinated stimulus efforts. Initial policy responses by central banks addressed the lack of liquidity in financial markets, but were unable to stem the loss of confidence. Thus, broader measures were put in place to recapitalize banks, provide fiscal stimulus, and reform financial regulation. The G-20 meetings, in particular, were viewed as a chief forum for negotiating and planning the way forward. While the meetings begat promises for actions intended to improve confidence in both developed and developing countries, details of policy intentions and evidence of implementation remain to be seen.

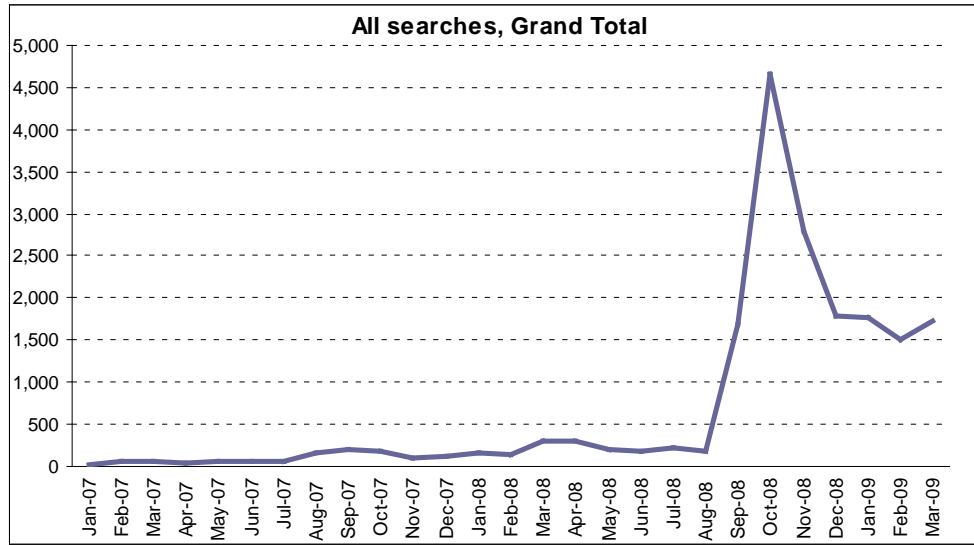
This paper develops a framework for gauging changes in investor confidence that have potentially important financial and economic consequences. We start with the view that investors’ beliefs are embodied in market prices, and reflect expectations of economic fundamentals (including the paths of employment, trade, housing prices, and industrial production). Those expectations, in turn, are affected by recent investment performance and by government policy measures. Furthermore, investor confidence is likely to be linked to consumer confidence. Using this framework, we provide a gauge of the extent to which various measures of confidence deteriorated since the start of the crisis and link changes in confidence to various economic variables and events. We report on individual indicators as well as calculating common factors that express the extent of co-movement of different indicators. These indicators show the dramatic deterioration of confidence that occurred as the crisis unfolded, and the inadequacy of policy measures taken so far to reverse fully the deterioration of confidence.

II. Motivation

Probably the most dramatic aspect of the crisis has been the degree to which the public at large has lost confidence in the stability of financial system and in future economic security. Drawing on major press coverage of the financial crisis, we can assess the degree to which the sentiment of the public at large has been affected. The rationale here is that the media help shape the views of their readers, while at the same time reflecting the overall climate of confidence or insecurity. We conducted a Web search of media references to the crisis, capturing the number of times that terms such as “financial crisis,” “financial meltdown,” “financial turbulence,” “financial turmoil” appeared in major financial media: Bloomberg (headlines from terminal), Financial Express (India), Financial Times, New York Times, The Economic Times (India), The Economist, The Guardian, and the Wall Street Journal. Interestingly, this indicator does not show a dramatic deterioration until October 2008, that is, until shortly after the Lehman failure, when the stock market and other prices plummeted. Its movements suggest that the financial crisis moved to a new phase at that time, becoming much more widespread and generalized (see Figure 1).

Confidence has been shaken by the severity of the crisis and by its unique features—including heightened volatility in all financial markets; plunging equity prices that have erased trillions of dollars of households’ wealth; and deteriorating macroeconomic conditions that have led to successive announcements of bleaker forecasts and desperate policy measures. These and other factors have inflated the public’s foreboding about the economic future, a feeling reinforced by major securities scandals and the failure of prestigious global financial firms. Drawing parallels with the Great Depression, reputable commentators have sharpened the public’s consciousness of the severity of the crisis, as memories of that era conjure up images of severe economic hardship, political instability, and self-defeating protectionism. Confidence has been especially shaken by the fact that the crisis originated in the United States, the heart of the global financial system, the country reputed to have the most advanced financial system and effective financial regulation and supervision.

Figure 1. Media coverage of the crisis to gauge public sentiment



The high correlations of coverage across major media outlets, as reported in the table below, are an indication of the global nature of the crisis.

Table 1. Correlation matrix for all searches

Source	Bloomberg Headlines	Financial Express (India)	FT	NYT	The Economic Times (India)	The Economist	The Guardian	WSJ
Bloomberg Headlines	1.00	0.66	0.96	0.97	0.99	0.94	0.96	0.97
Financial Express (India)		1.00	0.65	0.78	0.70	0.74	0.76	0.70
FT			1.00	0.95	0.97	0.94	0.98	0.98
NYT				1.00	0.98	0.95	0.98	0.98
The Economic Times (India)					1.00	0.94	0.97	0.97
The Economist						1.00	0.97	0.95
The Guardian							1.00	0.99
WSJ								1.00

Source: World Bank staff estimates

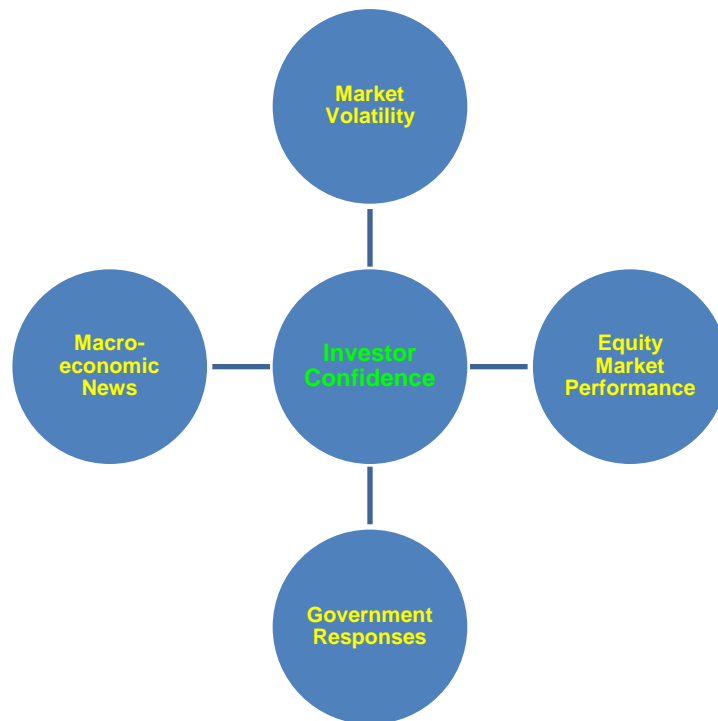
III. A Framework for Measuring Investor Confidence

Measuring changes in investor confidence is not an easy task, since it must be grounded in the psychology of investor behavior and attitudes. There are two main approaches: using surveys of investors or constructing indices based on market information. The first approach uses surveys of investors' opinions on particular issues at particular times and often focuses on a specific segment of the investor community—for example institutional investors in the United States (Shiller, 2000) or private equity investors in the United Kingdom (Deloitte, 2009).

The other approach uses market information. An example is the index of investor confidence provided by State Street Global Markets, which is based on institutional investors' holdings of risky assets, particularly equities (Ken Froot, www.statestreet.com/investmentconfidenceindex). The more investors are willing to allocate assets to equities, the theory goes, the greater their risk appetite and confidence.

What, exactly, needs to be measured? Drawing on insights from three strands of finance literature—behavioral finance (Thaler, 1985, 1987; Loewenstein and Elster, 1992; Nisbett and Ross, 1980), investor sentiment (Barberis, Shleifer, and Vishny, 1997; Froot, O'Connell, and Seasholes, 2001; Froot and Ramadorai, 2008), and market reaction to macroeconomic news (Balduzzi, 2001; Brandt and Kavajecz, 2004; Goldberg and Leonard 2003)—we postulate four dimensions of investor confidence: *market volatility*, *market performance*, *macroeconomic news*, and *government responses* (see Diagram 1).

Diagram 1. Four dimensions of investor confidence



- First, investor psychology is strongly influenced by the scale of abnormal *volatility* in the marketplace, particularly when that volatility spans several asset classes, signaling an overall climate of uncertainty and risk aversion. In recent months, global equity markets have shown record volatility.
- Second, investor confidence is related to the *performance* of their investments, as measured by wealth creation or destruction. The scale of the contraction in financial wealth that has occurred during the current crisis has been unprecedented since the Great Depression.
- Third, investors and traders typically look at a broad array of *macroeconomic data* releases that provide insights into economic fundamentals and shape perceptions of the future state of the economy. Relevant series include monthly payrolls, industrial production, sales and trade data, personal income, and housing starts. These data typically lag behind the financial data, but during the course of 2008 and into 2009 the one-sided stream of negative economic news has had a dramatic impact on confidence.
- Fourth, market participants and traders pay close attention to the stance of *government policy makers* and continually assess the credibility of their responses. Governments can influence investors' confidence in many ways: through macroeconomic policy (for example, by easing monetary policy or providing fiscal stimulus), through regulatory policy, and through other legislative actions that can strengthen transparency and enhance corporate financial disclosure and integrity (for example, actions taken by the U.S. government in the aftermath of the Enron scandal). While the measures announced or taken to date have no doubt helped somewhat to stem the deterioration in confidence, they have not been able to offset the negative effects of grim financial and macroeconomic developments.

We use publicly available data to proxy the first three dimensions of investor confidence, while providing a more selective discussion of the various policy responses, in particular the expansion of central bank liquidity, before turning to what remains to be done. The above framework for measuring investor confidence enables us to gauge the extent to which confidence has deteriorated and to link changes in confidence to various economic events. What is striking is the extent to which the various indicators move together, though each has a somewhat different story to tell and provides different insights. We report on individual indicators as well as calculating common factors that express the extent of co-movement of different indicators.

IV. Interpretation

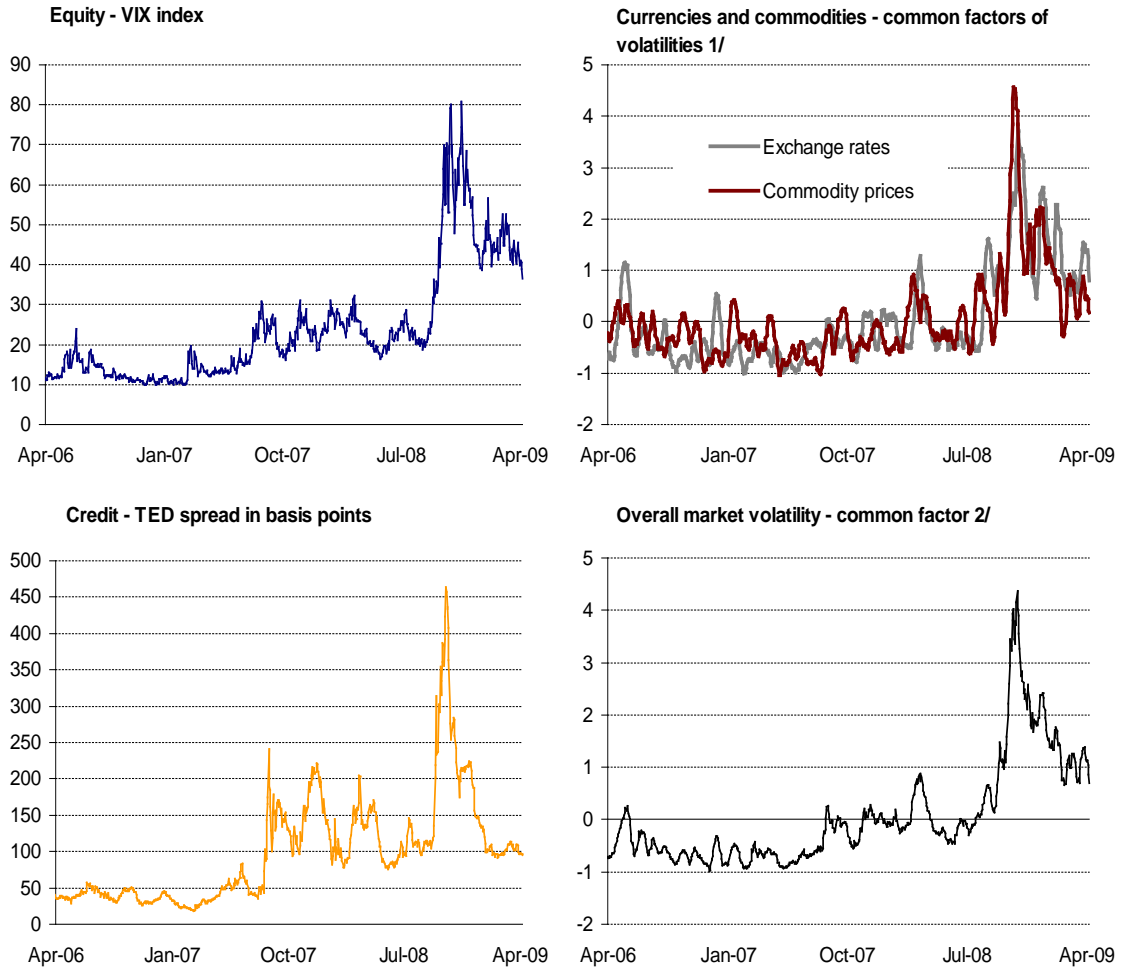
Turning first to the measures of market volatility and investor anxiety, they show a sharp deterioration in credit markets in August/September 2007 (as measured by the TED spread, the spread between interest rates paid by the US Treasury and those prevailing in the interbank market) followed by movements in a fairly narrow range until September/October 2008, when confidence suffered a massive deterioration following the failure of Lehman Brothers (Figure 2). Since that time, there has been a substantial narrowing of the TED spread, as liquidity in credit markets has improved. Other indicators of market volatility (the VIX and measured volatility in commodity and foreign exchange markets) were slower to increase but have since risen to high levels and have not seen much improvement as the crisis has spread and become more severe. The measure of overall market volatility thus has remained at a very high level, though somewhat below its peak in October 2008.

A second influence on investor psychology is the market performance of investments. Dramatic declines in wealth have occurred in all of the world's equity markets—in the United States, other industrial countries, and emerging markets (Figure 3). In February 2009, equity markets stood at their lowest point in more than a decade, a fact that has exerted a continuing depressive effect on consumer confidence, though a sharp rebound in stock markets beginning in March suggests that a durable improvement may be underway.

The overall performance of the economy is an important factor in investor confidence because it affects prospects for employment income as well as the values of nonfinancial and financial assets. Until the end of 2007, macroeconomic indicators in major industrial countries had not shown much deterioration (Figure 4). By the end of 2008, however, these series had declined to levels that signaled that the current global recession was the most severe in the postwar period.

A fourth important factor influencing investor confidence is the stance of government policy. Rather than attempting to construct a composite indicator that reflects the many facets of government actions in the economy, we describe the initial policy responses to the crisis in the next section and consider what remains to be done. So far, policy measures have not re-established confidence, and so more decisive measures, including regulatory reform, are necessary.

Figure 2. Indicators of market volatility and anxiety



Source: Bloomberg

Note: 1/ Exchange rate common factor from a factor analysis of the annualized coefficient of variation of daily exchange rates (EUR, JPY and GBP); for commodity prices a factor analysis of the annualized coefficient of variation of daily prices (agriculture, energy and metals)

2/ Overall market volatility common factor from a factor analysis of VIX, daily exchange rates (EUR, JPY and GBP), commodity prices (agriculture, energy and metals) and the TED spread.

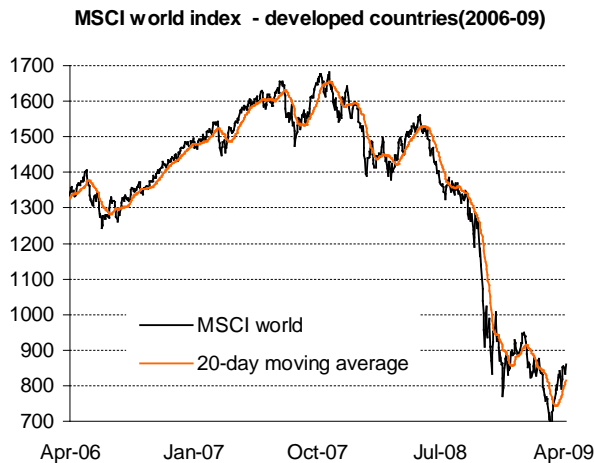
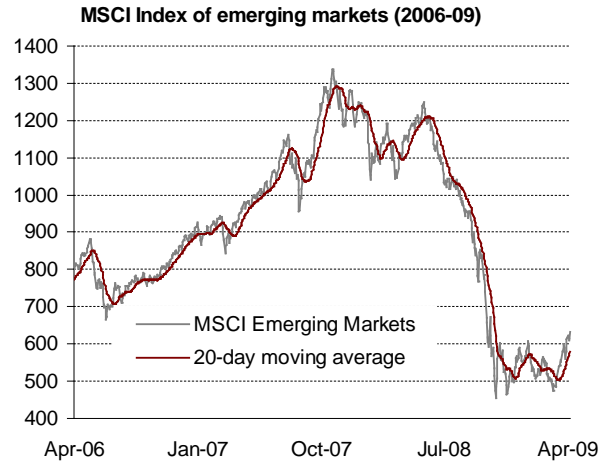
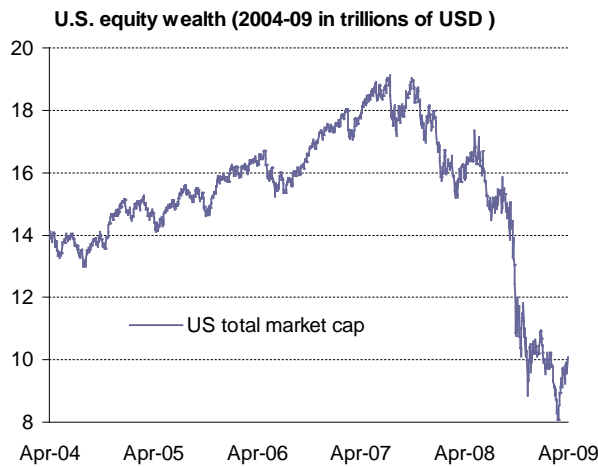
Table 2. Correlation matrix of volatility indicators

	Equity	Credit	Currency	Commodities
Equity	1			
Credit	0.74	1		
Currency	0.80	0.60	1	
Commodities	0.77	0.65	0.76	1

Source: Bloomberg

The overall market volatility index is derived as the common factor in a factor analysis of eight variables spanning equity (VIX); currency (rolling standard deviations of daily changes in USD/Euro, USD/Yen, USD/Sterling; commodities (rolling standard deviations of three broad sets of commodity prices: agriculture, energy, and industrial metals prices); and credit (TED).

Figure 3. Indicators of wealth decline

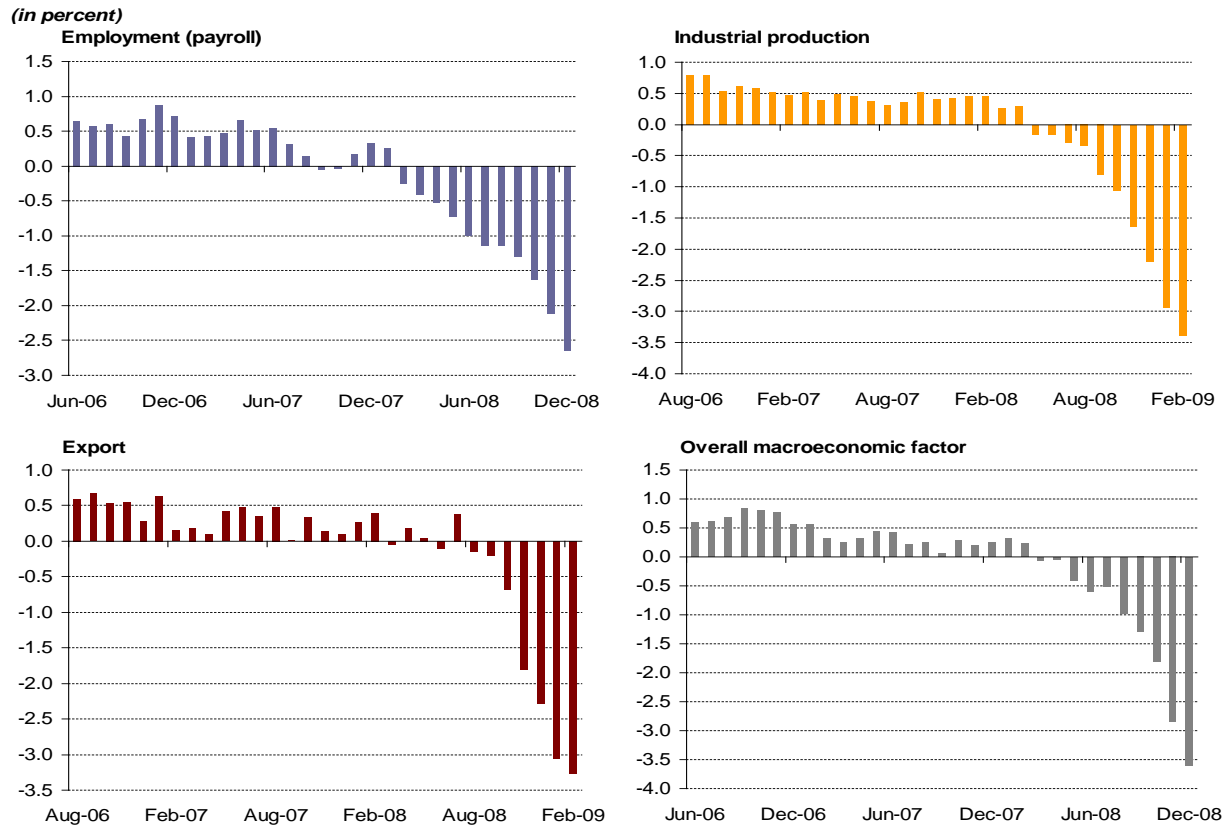


Source: Bloomberg

Note: The MSCI EM index includes Argentina, Brazil, Chile, China, Colombia, Czech Republic, Egypt, Hungary, India, Indonesia, Israel, South Korea, Malaysia, Mexico, Morocco, Peru, Philippines, Poland, Russia, South Africa, Taiwan, Thailand and Turkey.

The MSCI WORLD index includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, HK, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, United Kingdom and USA.

Figure 4. Macroeconomic indicators



Source: Bloomberg, Datastream, ILO, UK Statistical Office
 Note: The overall macroeconomic index is derived as the predicted common factor in a factor analysis of twelve variables (transformed into Y-o-Y growth in all cases): US index of industrial production, Germany index of industrial production (incl. construction), UK index of production (all industries), Japan index of production (all industries), US total exports, Germany exports f.o.b., UK exports, Japan exports, US nonfarm total employed, Germany persons engaged in economic activity, UK all persons in employment, Japan employed persons.

Table 3. Correlation matrix of macroeconomic indicators

	Employment Growth	Industrial Growth	Export Growth
Employment Growth	1		
Industrial Growth	0.91	1	
Export Growth	0.86	0.92	1

Source: Bloomberg, Datastream, ILO, UK Statistical Office

The overall macroeconomic index is derived as the predicted common factor in a factor analysis of 12 variables (transformed into year-on-year growth in all cases): the U.S. index of industrial production, the German index of industrial production (including construction), the U.K. index of production (all industries), the Japanese index of production (all industries), U.S. total exports, German exports f.o.b., U.K. exports, Japanese exports, U.S. nonfarm employment, Germans engaged in economic activity, U.K. employment, and Japanese employment. One factor explains 64 percent of the common variance.

V. Using the State Street Measure of Investor Confidence

As a check to see whether our indicators capture investor sentiment, it is useful to try to relate them to a variable that purports to capture institutional investors' risk appetite. In particular, we regress the State Street Advisors measure of their holdings of risky versus other assets—on the various confidence measures we have just described, namely market volatility, industrial production, and stock market performance. As shown in the table below, regressions show a consistently significant and negative effect of market volatility on the State Street Measure of Investor Confidence. The same is true (with a positive sign) of industrial production, and stock market performance.

Table 4. Risk appetite and selected indicators of confidence

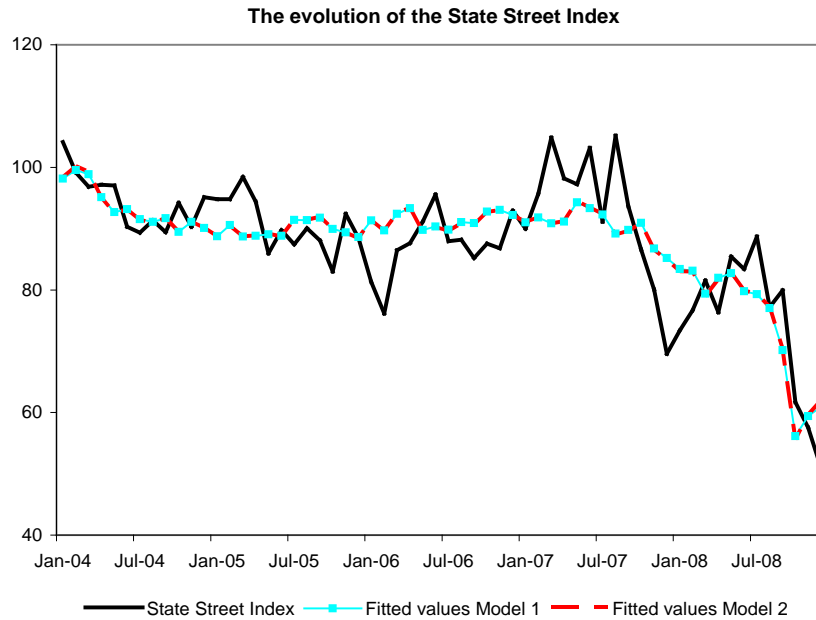
Dependent variable: Risk Appetite		
	(Model 1)	(Model 2)
Volatility Factor	-2.003 (1.245)	-2.156** (0.968)
Industrial Growth Factor	0.545 (2.341)	
MSCI Developed World	0.325*** (0.077)	0.339*** (0.077)
Constant	85.332*** (1.292)	85.339*** (1.276)
Observations	60	60
R-squared	0.620	0.626

$$R = \alpha + \beta_1 \times Volatility + \beta_2 \times Macro + \beta_3 \times Equities$$

In this regression, the dependent variable is represented by 'Risk Appetite' (proxied by the State Street Investor Confidence Index). Volatility is the monthly average of the predicted daily common factor across eight variables: VIX, usd/euro volatility, usd/yen volatility, usd/sterling volatility, agriculture commodities price index volatility, energy price index volatility, industrial metals price index volatility, and the TED spread. Industrial growth is the predicted common factor across industrial production growth rates(y-o-y) in the USA, UK, Germany and Japan. Equity market growth is represented by the change (y-o-y) in the MSCI for developed economies. Table 4 shows that risk appetite seems to be most closely related to developed world market performance and to market volatility, while industrial growth is positive, but not significant. Figure 5 shows that the regression captures a substantial part of the variation of risk appetite, including the large fall during the crisis.

Figure 5. Risk Appetite

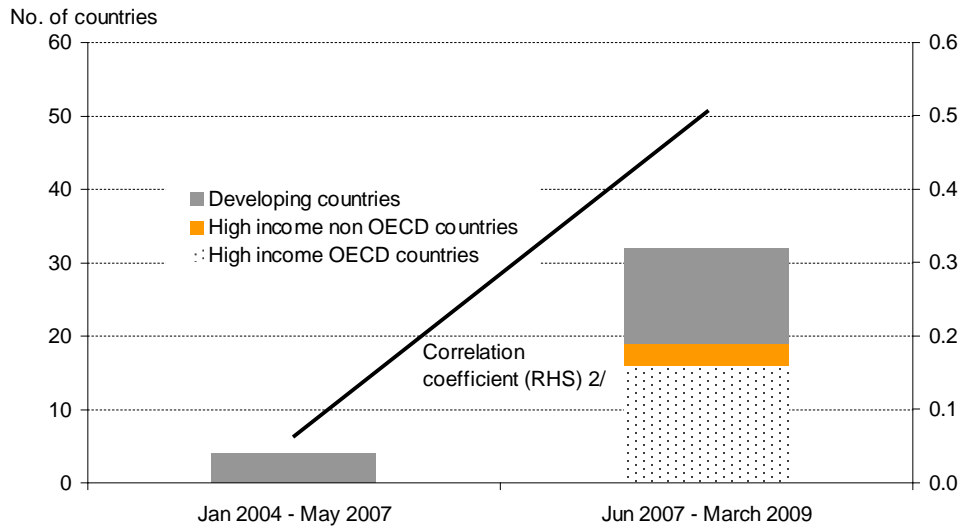
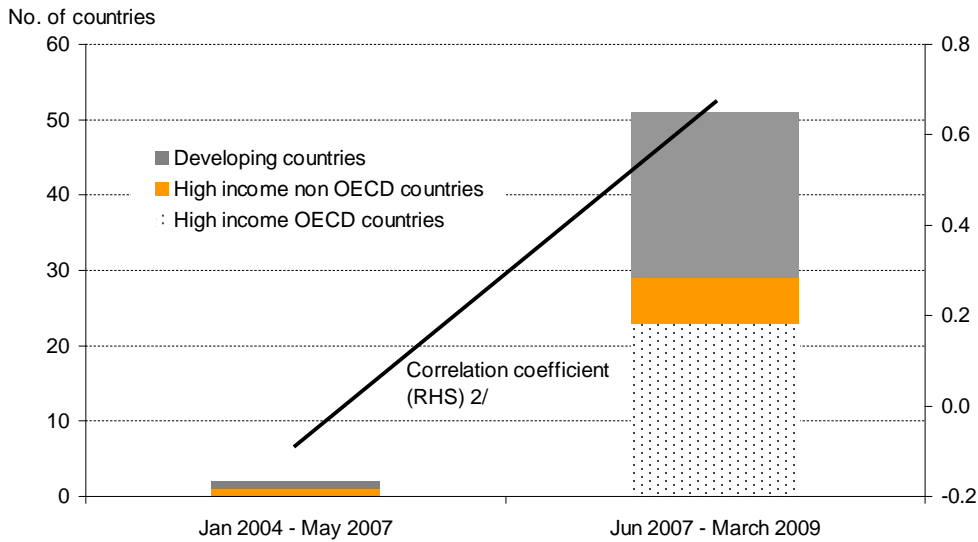
The estimation sample covers January 2004 - December 2008.



This measure of investor confidence appears to have some predictive power in explaining the behavior of stock markets, in both developed and developing countries.

In order to gauge the relationship between investor confidence and local capital markets, we calculated simple correlations between the confidence variable (the State Street Investor Confidence Index) and the country level US\$ MSCI across a sample of countries with available data. An interesting result is that during the downturn period from June 2007 to March 2009, the proportion of countries whose capital markets are positively and highly correlated with the confidence indicator is much higher than in the boom period from Jan 2004 to May 2007 (Figure 6). In particular, less than 5 % of the 77 countries with available data have a positive correlation with the confidence index greater than 0.5 during the boom period versus 65% during the bust (or 40% if calculations are performed on annual growth rates which posit a relationship between changes in investor confidence and the market rate of return).

Figure 6. Investor confidence and local capital market valuation 1/



1/ No. of countries with correlation between the y/y changes of the State Street investor confidence index and country US\$ MSCI greater than 0.5 (out of 77 countries with available data)

2/ Correlation coefficient between the y/y changes of the State Street investor confidence index and world US\$ MSCI

VI. The Relationship between Investor and Consumer Confidence

Our indicators of market volatility, macro environment and equity market performance are also significantly related to an indicator of consumer confidence—the common factor across consumer confidence indices in the United States, United Kingdom, Canada, Germany and Japan (Table 5). An alternate indicator measuring investor risk appetite, namely the State Street Advisors’ measure of institutional investor holdings of risky versus other assets, is also correlated with the consumer confidence factor (more so during bad times) but does not perform as well in regressions. Risk appetite declined

markedly late in 2008, but has not shown the continued decline in 2009 exhibited by consumer confidence.

Table 5. Regression of consumer confidence on investor confidence components

Dependent variable: Consumer Confidence Factor		
	(Model 1)	(Model 2)
Volatility factor	-0.273*** (0.056)	-0.301*** (0.059)
Macro environment factor	0.233*** (0.056)	
Macro environment factor (t-1)		0.237*** (0.051)
MSCI Developed World	0.012*** (0.003)	0.013*** (0.003)
Constant	-0.050 (0.042)	-0.069* (0.040)
Observations	97	97
R-squared	0.72	0.75

$$CC = \alpha + \beta_1 \times Volatility + \beta_2 \times Macro + \beta_3 \times Equities$$

The dependent variable is the common factor of consumer confidence indices from United States, United Kingdom, Canada, Germany and Japan. Volatility is the monthly average of the predicted daily common factor across eight variables: VIX, US\$/euro volatility, US\$/yen volatility, US\$/sterling volatility, agriculture commodities price index volatility, energy price index volatility, industrial metals price index volatility, and the TED spread. The macro environment factor is the predicted common factor across industrial production, employment and export growth rates (year-on-year) in the United States, United Kingdom, Germany, and Japan. Equity market growth is represented by the change (year-on-year) in the MSCI for developed economies. The estimation sample covers the period from January 2001 to Jan 2009.

VII. What Can Policy Do to Improve Confidence?

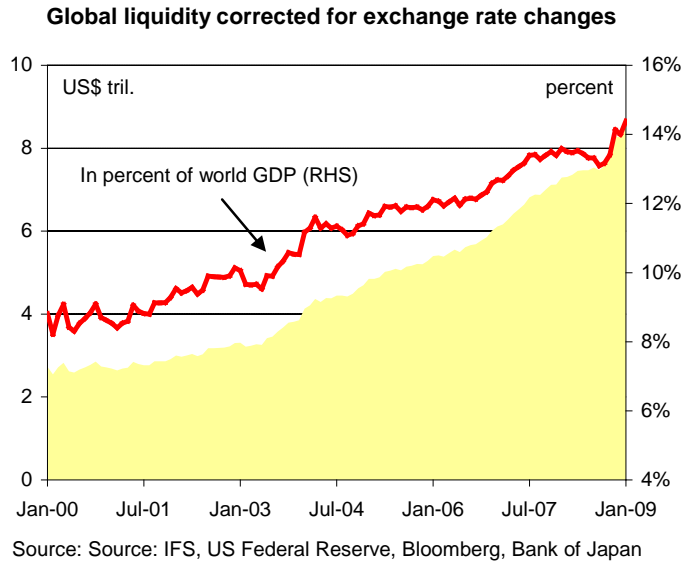
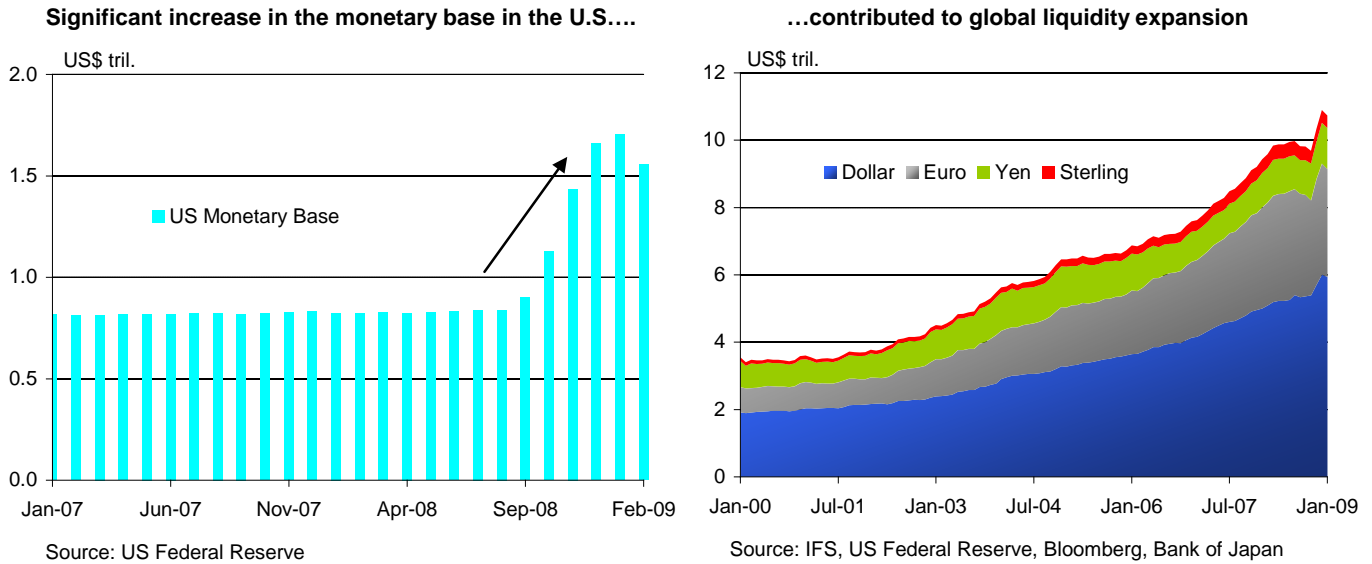
Liquidity expansion and easing interest rates

Initial policy responses to the unfolding crisis centered on the provision of liquidity, since the initial symptoms involved the effective shutdown of interbank markets and markets for securitizations. In August 2007, central banks in the industrialized countries began to provide unprecedented amounts of funding to their banking systems, creating new facilities that extended the range of securities they would accept, the institutions to which they would lend, and the terms of their lending.

In January 2008, the U.S. Federal Reserve announced that it would make dollars available to the European Central Bank (ECB) and the Swiss National Bank so that they could on-lend funds to their banks with international operations. The Fed also introduced at that time three new facilities. The term auction facility grants liquidity for up to 84 days. The primary dealer credit facility extended the right to access Fed credit beyond the commercial banks to investment banks—in fact, to all primary dealers with which the Fed performs open-market operations. The term securities lending facility allows investment banks to borrow Treasury securities using mortgage-backed securities as collateral. In addition, the Fed extended the term of its existing facilities, granting discount-window lending to banks for terms up to 90 days, allowing repurchase agreements extending over 28 days, and accepting mortgage-backed securities rather than the usual Treasury securities. Other central banks also expanded their liquidity provisions and coordinated their announcements of the extended facilities. Starting in January 2008, the U.S. Federal Reserve created swap facilities for other central banks whose commercial banks needed access to dollar liquidity.

In this section we attempt to quantify the provision of liquidity by the major central banks, and gauge its effect on confidence. Our measure of global liquidity is the monetary base of the four component currencies of the SDR, namely the US dollar, euro, Japanese yen, and pound sterling, plus the holdings of foreign exchange reserves in these currencies by the world's central banks. In the period leading up to the crisis, to a large extent foreign exchange reserve accumulation by other central banks was the main engine of global liquidity. With the onset of the crisis, the engine for liquidity expansion became the rapid growth of base money in the United States, the euro area, Japan and the United Kingdom. While some reserve accumulation continued, it slowed as a result of the decline of commodity prices and the dampening of global activity and exports (Figure 7).

Figure 7. Growth of Global Liquidity



Two phases need to be distinguished. In the period from 2002 to mid-2007, major central banks followed monetary policies that were initially expansionary but gradually tightened, while other central banks, especially in Asia and in the oil exporting countries, accumulated large quantities of reserves as a result of substantial balance of payments surpluses. During this period, China's central bank, for instance, increased its foreign exchange reserves from \$200 billion to \$1.5 trillion. These reserves were mainly held in dollars. After the onset of the crisis, the motor for liquidity expansion was the rapid growth of

base money in the United States, the euro area, Japan and the United Kingdom. While some reserve accumulation continued, it slowed as a result of the decline of commodity prices and the dampening of global activity and exports. During the first phase, strong growth in liquidity helped to keep interest rates low and inflate the prices of a wide range of financial assets. The bursting of the housing bubble and resulting crisis of confidence in assets backed by sub-prime mortgages brought an end to this phase. In the second phase, monetary authorities reacted to the problems in interbank and credit markets by expanding their balance sheets to an unprecedented extent in an effort to revive them.

As the crisis threatened to spread to the real economy, central banks and treasuries adopted additional measures. They eased monetary policy, eventually lowering their target rates to historically low levels. By April 2009 the Federal Reserve's interest rate target had been lowered to a range of 0–0.25 percent, the Bank of Canada's and the Bank of England's to 0.5 percent, and the ECB's to 1.25 percent. Because the zero bound on interest rates would soon limit further use of that instrument, central banks turned to "quantitative easing," that is, expanding the money supply directly through purchases of various securities, in order to provide further monetary stimulus.

The term liquidity, however, has two principal meanings, and the global liquidity measure captures just one of them, namely the volume of funds available for investment. Another meaning is the ease and quickness with which assets can be converted to cash, and this depends in turn on the volume of transactions for that particular asset and the spreads over comparable assets. A striking feature of the crisis is the extent to which the quantity of official liquidity available has become disconnected from the ease of realizing assets issued by banks or backed by private securities. In contrast to the above measure, liquidity in this second sense has decreased dramatically for all except government securities. A proxy for the deterioration of the liquidity in markets for claims on banks and for other non-government securities is the TED spread, which widened dramatically in September, 2008, and has not yet narrowed back to pre-crisis levels. Monetary authorities banked on their ability to resolve the problems in private credit markets by an expansion of official liquidity, but this did not prove successful, at least initially.

**Figure 8. TED spread, liquidity, the Fed’s target rate, and risk appetite
monthly, pre- and post-crisis**

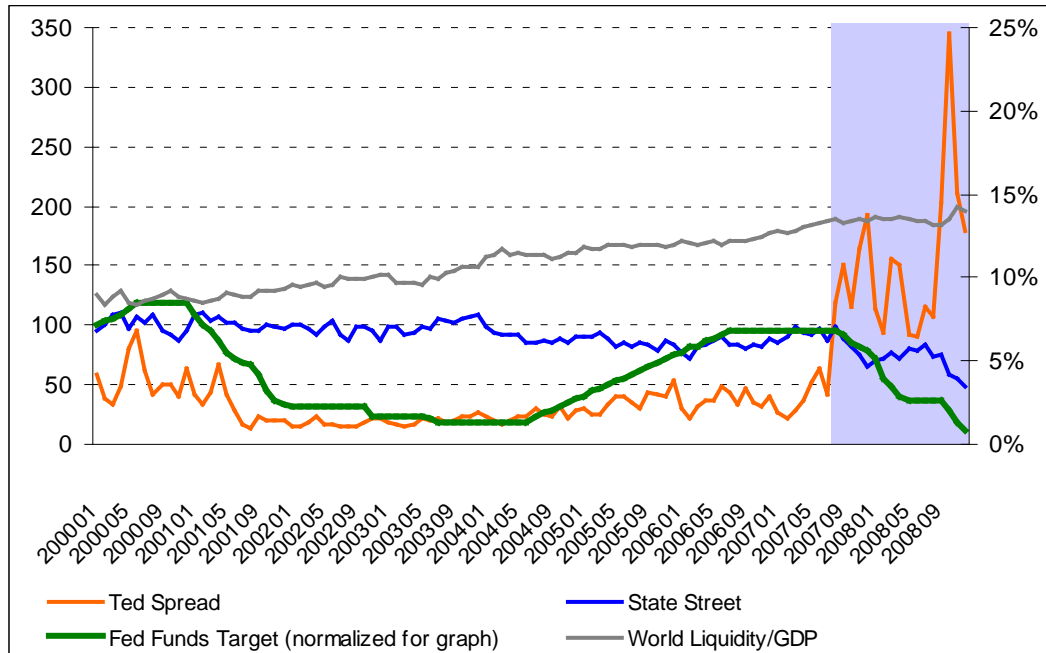


Figure 8 plots the measure of global liquidity, the TED spread, and the State Street Advisors’ measure of risk appetite (or investor confidence), as well as the Federal Reserve’ target for the fed funds rate. The period from January 2000 until August 2007 saw a steady rise in liquidity as well as a decline in spreads, with little relationship with movements in risk appetite. Broad movements in the TED spread seem to mimic movements in the stance of monetary policy, as captured by the Fed’s operating target. As interest rates rise, so does the spread between commercial bank’s borrowing costs and the rate paid by the US treasury on its borrowing. The shaded crisis period however shows quite different behavior: a dramatic increase in spreads and a large decline in risk appetite, despite a further rise in global liquidity and a large fall in the Fed’s interest rate target. It is true that since October 2008 the rise in liquidity and easing of US monetary policy has been accompanied by a large fall in spreads, but spreads are still nowhere near their level in the 2003-04 period, when interest rates were also very low.

Table 6 confirms these impressions. A regression run for the period before the crisis indicates a negative effect of liquidity on spreads, albeit an insignificant one, and a large and significant effect of the Fed’s monetary policy target. In the crisis period, the State Street risk appetite measure has a significant negative effect on spreads, while global liquidity again has an insignificant effect (though with the right sign, and larger in magnitude). The number of crisis observations is small, making it difficult to identify the determinants of the TED spread; only the risk appetite variable seems to have a significant influence on the spread. The crisis period illustrates the relative ineffectiveness of monetary policy alone to counteract a major shock to confidence.

Table 6. TED spread, risk appetite, and global liquidity

	Pre-Crisis	Crisis
	TED spread	TED spread
State Street risk appetite	0.167 (0.96)	-4.141 (2.29)*
World Liquidity / World GDP	0.429 (0.41)	-62.33 (0.88)
Fed Funds Target	6.045 (10.56)**	7.042 (0.56)
Constant	-8.446 (0.33)	1,281.496 (1.24)
Observations	91	17
R-squared	0.56	0.35

Absolute value of t statistics in parentheses

- significant at 5%; ** significant at 1%

Policy measures in many advanced countries have also included substantial state intervention in virtually all aspects of the banking industry, including funding, loan portfolio, compensation, and dividend policy. Governments have moved beyond their traditional role of lender of last resort to a new status as “guardian of last resort “ in extending sovereign guarantees to banks’ new debt issuance and risky assets, as well as investing directly in banks’ debt and equity instruments. As of early March 2009, the total amount of cash invested in the banking industry by governments in the US and Europe had reached \$538.6 billion, with the US spending \$250 billion under the TARP’s Capital Purchase Program, and the UK spending \$172.5 billion. Capital infusions had already led governments to acquire large stakes in banks in the United States, Britain, and continental Europe, but even more government financing seemed likely.

Other policy measures

In the last quarter of 2008, attention turned to broader policy measures to provide stimulus to the economy, in particular the use of fiscal policy.² Around the world, countries announced their plans. China unveiled a package of new and existing measures totaling some \$600 billion, while the U.S. Congress approved, in February 2009, a fiscal stimulus program amounting to \$787 billion and involving both tax cuts and increased spending on infrastructure and education, among other items. The fiscal stimulus measures will take time to take effect, especially infrastructure spending, which typically involves long lead times. It is too early to tell whether these measures will have a significant impact on confidence. It is

² The US administration had already implemented fiscal stimulus in the second quarter, 2008, through tax rebates. While they temporarily boosted economic activity, they did not lead to a revival of confidence and the US experienced a sharp fall in GDP in the second half of the year.

also too early to predict whether they may have significant costs, both to the taxpayer and to private borrowers, if government borrowing crowds out other borrowers' access to capital markets.

At the global level, a two-pronged approach involving greater pooling of resources and addressing stronger cooperation across countries merits attention.

Pooling of resources is important to resist a downward spiral in economic activity and in preventing the world recession from having a catastrophic impact on developing countries, in particular. Experience from the Latin American and Asian crises of the 1990s showed that to be effective, official financing must be substantial.

Governments' willingness to coordinate their policies can help reestablish confidence by ruling out beggar-thy-neighbor responses to the crisis. The danger of special interests using trade policy to protect particular industries is especially severe in a downturn. A joint international commitment to maintaining open markets for goods and services must be a central feature of governments' policy responses. As for financial policies, there have been clear instances in which the absence of coordination has led to problems, as when Ireland initially guaranteed the deposits of domestic banks only, leading to runs on branches of foreign banks operating in the country. Ireland later extended the guarantee to all banks operating in Ireland, and other European countries also widened the scope of their deposit insurance.

While the case for *fiscal policy coordination* is weak in normal times—because countries normally face very different challenges and priorities—it is called for today, as all countries are facing the same prospect of inadequate global demand. Stimulating aggregate demand through fiscal expansion is in everyone's interest at the moment, but each country will be reluctant to undertake it on the necessary scale because some of the expansionary effects will spill over to other countries, and because a country acting alone—even the United States—may reasonably fear that increases in government debt will cause investors to lose confidence in its fiscal sustainability and so withdraw financing. Both of these constraints will be lessened by a commitment to coordinate a fiscal expansion globally.

VIII. How Could Regulatory Reform Help Restore Confidence?

The financial crisis has increased the prominence of central banks in regulation and supervision, as increases in the scope of their liquidity provision has generated proposals to extend central bank supervision to all institutions that benefit from the central bank's liquidity facilities. Moreover, regulation has significant cross-country aspects, since banking is increasingly global and is dominated by several multinational institutions. At present, inadequate regulation in one country can have major repercussions in others. The willingness to harmonize regulatory reform is likely to be influenced by the stage of the financial crisis. While the international spillover effects in the financial arena provide a continuing incentive for harmonization, regulatory cooperation has been resisted in normal times because of concern to maintain or further competitive advantage for each country's financial firms. However, the incentive for cooperation among national regulators changes with shifts in the tradeoff that regulators face between safeguarding national competitiveness and promoting financial stability. A downward shock to

confidence in financial stability makes increased regulation desirable and provides an incentive for regulators to harmonize, because only by doing so can they avoid jeopardizing the international competitiveness of their financial sectors.

In this section we develop a formal model of regulatory coordination, in which policy is chosen optimally by each country to maximize an objective function that includes both maintaining competitiveness and promoting financial stability. The model suggests that the gains from coordination may be largest when there is a large common shock to confidence.

If governments could agree to set aside the issue of competitiveness, where the effects of policy are zero sum, in favor of coordinated policies capable of improving the welfare of all, then they would increase the amount of regulation. However, finding the right mechanisms to enforce agreements to coordinate is difficult. The Nash equilibrium results from the best response by each country to the other's policies: if country i knew that country j would carry out the coordinated policy, then its best policy response would be to cheat and revert to its uncoordinated reaction function. However, the Nash equilibrium is clearly inferior to a coordinated solution without cheating.

The presence of common shocks to confidence may heighten countries' awareness of the gains of coordination. Under Nash, if shocks to two countries' financial stability are different, their optimal responses are different, and coordination may not be welfare-improving. In contrast, a common shock to confidence always produces gains from coordination. In the current crisis, the fact that confidence problems are global may be a powerful incentive to coordinate and harmonize regulation.

The state of financial integration also matters for gains to coordination. If countries are perfectly integrated, then it does not matter who carries out the regulation, as all countries gain equally. Thus, countries may try to maintain competitive advantage by lowering their own regulatory burden, hoping that others will do the job for them. A system in which everyone is a free rider becomes increasingly unregulated. Only by putting in place some form of global regulation can the goal of financial stability be achieved in these circumstances.

Technically, let us consider a formal model patterned after the informal discussion of these issues by Singer (2001), in which the objective function of national regulators depends on improving the competitiveness of the country's financial firms as well as promoting financial stability (which Singer calls "confidence"). We will assume that the stringency of regulation, R , affects both variables: in a two-country world, competitiveness C is proportional to the difference in regulation, while stability S in both countries depends directly on the country's own regulation but also on the other country's (but with a weight less than one). Formally, for countries $i = 1, 2$, (and $j = 2, 1$, the foreign country):

$$C_i = \alpha (R_j - R_i) \tag{1}$$

$$S_i = R_i + \gamma R_j - u_i \tag{2}$$

$$U_i = C_i - \beta (S_i - S^*)^2 \quad (3)$$

where S^* is some target level of financial stability that is subject to a (negative) confidence shock. The regulator's utility function, (3), is linear in competitiveness, but quadratic in financial stability because the regulator internalizes the inefficiencies that result from overregulation: there is an optimal amount of stability. The justification for the coefficient γ in (2), with $0 < \gamma < 1$, is that a country's regulation has a comparative advantage in furthering its own country financial stability, presumably because some financial services are not traded. A perfectly globalized world for finance, which we consider later below, would set $\gamma = 1$.

Let us consider the optimal amount of regulation for each economy, first when each economy chooses it independently (that is, under a Nash equilibrium) and second when all economies cooperate in choosing a common level of regulation to maximize joint utility.

The Nash equilibrium: independent regulation

Here, each country maximizes (3) subject to (1) and (2). The first-order conditions yield

$$R_i = -\gamma R_j + u_i + S^* - \frac{\alpha}{\beta} \quad (4)$$

Solving the two countries' reaction functions together gives

$$R_i = \frac{1}{1 + \gamma} \left(S^* - \frac{\alpha}{\beta} \right) + \frac{1}{1 - \gamma^2} (u_i - \gamma u_j) \quad (5)$$

Note that if the two countries' confidence shocks are equal, $u_i = u_j = u$, then (5) simplifies to

$$R_i = \frac{1}{1 + \gamma} \left(S^* - \frac{\alpha}{\beta} + u \right) \quad (6)$$

It can be seen that regulation is lower by an amount that depends on the negative effect of regulation on competitiveness (α) and inversely on the weight of stability in the objective function (β), while also being affected by the impact of foreign regulation on stability (γ).

The cooperative equilibrium: joint decision making

Suppose instead that the two countries collaborate and jointly choose regulation to maximize an equally weighted average of their two utility functions. In this case, they maximize utility U with respect to both countries' regulation $R=R_1=R_2$ where utility is given by

$$U=U_1+U_2=C_1+C_2-\beta(S_1-S^*)^2-\beta(S_2-S^*)^2 \tag{7}$$

The first-order condition in this case is simply the result of minimizing the last two terms, since the first two cancel out:

$$-2\beta(1+\gamma)((1+\gamma)R-u_1-S^*)-2\beta(1+\gamma)((1+\gamma)R-u_2-S^*)=0$$

Solving for R gives an expression for optimal regulation:

$$R = \frac{1}{1+\gamma} S^* + \frac{1}{1+\gamma} \frac{u_1 + u_2}{2} \tag{8}$$

Note that equation (8) is very similar to (5), but it is not reduced by the objective of gaining a competitive advantage over the other country and it depends on the average shock to confidence. The cooperative equilibrium leads to *greater* regulation on average, as each country knows that it need not worry about the other country's attempt to become more competitive.

Let us consider in some detail the case of identical shocks. If the two countries' confidence shocks are the same, then (8) simplifies to

$$R = \frac{1}{1+\gamma} (S^* + u) \tag{9}$$

which again is similar to (6) but with the omission of a negative term that reduces the amount of regulation in both countries. Thus, a Nash equilibrium results in a suboptimal amount of regulation. The cooperative equilibrium produces higher welfare in both countries by providing greater regulation—if the two countries can agree to cooperate and not to try to gain a competitive advantage over the other. Doing so is self-defeating, because, in the Nash equilibrium, both countries adopt the same policies, with the result that neither succeeds in becoming more competitive relative to the other. The gain in utility from cooperation can be written as $\Delta U_i = U_i^C - U_i^N$, where U_i^C and U_i^N are the utilities of country i evaluated at Nash and cooperative equilibria. When $u_i = u_j$

$$\Delta U_i = \frac{\alpha^2}{4\beta} \quad (10)$$

Thus, when the shocks to confidence are identical, then the gains from coordination are always positive and are independent of the shock itself. The shock is completely offset by the coordinated policies, which achieve the goal S^* for financial stability as well as maintaining equal competitive positions.

The general case when $u_i \neq u_j$ is ambiguous. Here, the optimal Nash and coordinated policies are given by (5) and (8), respectively, and the gains or losses from coordination for country i are given by

$$\Delta U_i = -\frac{\beta}{4}(u_j - u_i)^2 - \frac{\alpha}{1-\gamma}(u_j - u_i) + \frac{\alpha^2}{4\beta} \quad (11)$$

The condition for $\Delta U_1 > 0$ and $\Delta U_2 > 0$ is

$$|u_1 - u_2| < \frac{\alpha}{\beta} \quad (12)$$

This condition indicates that the two shocks, if both positive, cannot be very different in magnitude if there are to be gains from coordination (the same applies for the other country j). If the shocks are very different, for instance if country i 's shock u_i is large and j 's is close to zero, then there may not be gains from coordination for country i (though there could be for country j). The possibility of gains also depends on the extent of globalization. If the spillovers on financial stability are large, that is, if γ goes to one, then the middle term of (11) goes to infinity, magnifying the effects of asymmetric shocks to confidence on competitiveness.

Globalization

The case of increased globalization can be studied by letting $\gamma \rightarrow 1$. In the limiting case, with a common shock u to confidence, the first-order conditions become indeterminate. In the case of independent (Nash) policies, the first-order conditions are given by

$$R_1 = -R_2 + u + S^* - \frac{\alpha}{\beta} \quad (13)$$

and

$$R_2 = -R_1 + u + S^* - \left(\frac{\alpha}{\beta} \right) \tag{14}$$

These two equations cannot be solved for individual values of R_1 , R_2 , only for their sum. Doing so implies that the total of regulation $R_1 + R_2$ is set optimally at a point that trades off financial stability for competitiveness. But this can be done through any arbitrary sharing of the regulatory burden. Given this indeterminacy, countries would no doubt prefer that the other country did the regulating. In these circumstances, harmonization would be necessary to rule out a downward spiral of deregulation.

IX. Concluding Remarks

The indicators that we have developed in this paper should prove useful to track changes in confidence as we go forward. Already, there has been a small upturn, as credit spreads have narrowed and stock markets have experienced a substantial rebound. Time will tell whether these improvements prove to be durable. It may be the case that a lasting revival of confidence requires more far-reaching changes to the regulatory environment than have already occurred. So far, reforms have been modest, and the hoped-for agreement on regulatory issues has not yet materialized.

We have argued that the existence of a common shock to confidence can be a powerful motivating force for governments to agree on harmonized regulatory reforms. However, getting there faces a number of difficult hurdles. Most important is the reluctance of countries with major financial centers to weaken their competitive advantage. In the absence of a supra-national regulatory authority, any agreement would have to be on a voluntary basis, and countries face somewhat different regulatory challenges and institutional environments. National regulatory authorities retain responsibility for their financial sectors and will guard their freedom of maneuver. Finally, as confidence improves, even if only partially, the pressure on politicians to undertake a significant remake of the global financial regulatory system and/or make progress on national regulatory reform may wane.

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