

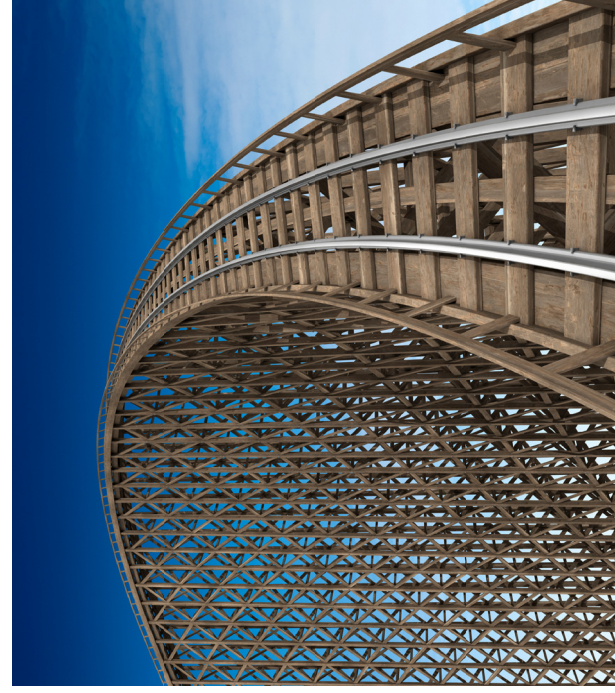
Top of Mind

June 25, 2014

Issue 24

Volatility: Lower for longer?

From the editor: The decline in economic and asset market volatility this year from already low levels in 2013 has been striking. Questions about how long this low volatility can last – and the impact it will have – are Top of Mind. We interview three experts to assess if low vol is breeding the same complacency and excessive risk-taking that led to crises past. Our own Charlie Himmelberg is relatively sanguine that the credit cycle will play out, but likely not for a long time; Markus Brunnermeier and Nicholas Bloom are somewhat more concerned, but not for the same reasons. We assert that low asset vol is consistent with the current phase of the business cycle and discuss investment implications should low vol persist (cheap options, but scarcer trading opportunities, and a need for active managers to focus more on stock-picking). We also ask what could push vol higher (interest rate and geopolitical risk – the latter (kind of) playing out in oil).

Source: www.istockphoto.com

“The whole system is more prone to a financial crisis when volatility is low, which tends to lead to a build-up of risk in the background...the ‘volatility paradox’.”

Markus Brunnermeier

“Aggressive re-regulation of markets...will likely extend the stability and sustainability of this cycle relative to past cycles.”

Charlie Himmelberg

“If I had to forecast volatility right now, my bet would be that it heads higher. Many political or other events could [cause this].”

Nicholas Bloom

Inside

Interview with Charlie Himmelberg

GS Head of Global Credit Strategy

4

Lower for longer

Dominic Wilson and Julian Richers, GS Markets

6

Equity vol and the business cycle

Krag Gregory, GS Options Research

8

Interview with Markus Brunnermeier

Professor of Economics, Princeton University

10

Active management in a low-vol world

Christian Mueller-Glissmann, GS Portfolio Strategy

12

Interview with Nicholas Bloom

Professor of Economics, Stanford University

14

“Vol seasons” to mark your calendars

Jose Ursua, GS Global Economics Research

16

Supply keeping a lid on commodity vol

Damien Courvalin, GS Commodities Research

17

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Macro news and views

We provide a brief snapshot on the most important economies for the global markets

US

Latest GS proprietary datapoints/major changes in views

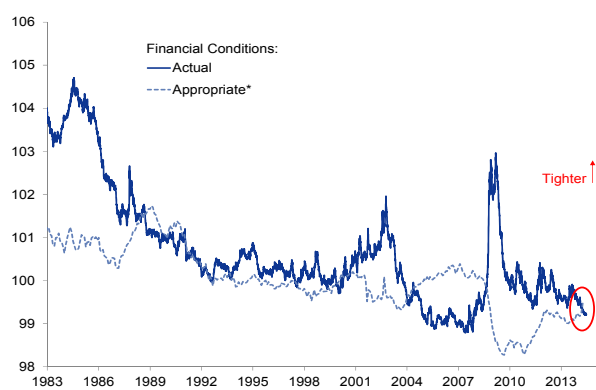
- We continue to expect the first Fed rate hike in early 2016 – about six months later than Fed and consensus projections. But risks to our forecast are now tilted toward an earlier hike given recent firmer inflation and easier financial conditions, which are now at their most accommodative level since early 2008.

Datapoints/trends we're focused on

- Ongoing improvements in our Current Activity Indicator (CAI) – now at 2.7%yoy – which point to above-trend growth in the US.
- Better housing sales – especially new home sales – in May; an improvement in housing remains key to our GDP forecasts.

Most accommodative financial conditions since 2008

Goldman Sachs Financial Conditions Index (GSFCI)



*Appropriate level of the GSFCI based on a standard interpretation of the Fed's dual mandate.

Source: Goldman Sachs Global Investment Research.

Japan

Latest GS proprietary datapoints/major changes in views

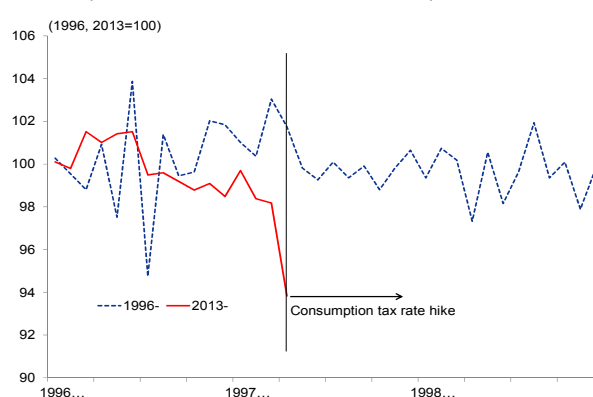
- We raised our 2014 GDP growth forecast to 1.5% on a stronger-than-expected 1Q GDP of 6.7% that was boosted by a surge in consumption ahead of the April 1 sales tax hike.

Datapoints/trends we're focused on

- A sharper-than-expected 7% yoy drop in disposable income following the sales tax hike, which was more than the decline in disposable income after the last hike in 1997. This adds downside risk to our growth forecasts.
- Basic wage growth, which will be key to raising inflation but has so far been slow.

Disposable income drops more than in 1997

Real disposable income (household survey)



Source: MIC, Goldman Sachs Global Investment Research.

Euro Area (EA)

Latest GS proprietary datapoints/major changes in views

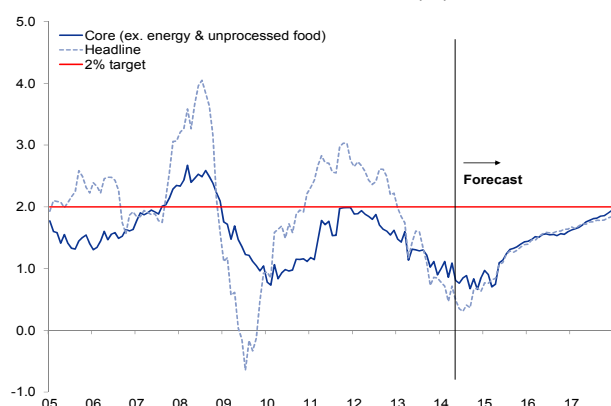
- We reduced our 2015 EA inflation forecast to 1.1% from 1.4% given few signs of stabilizing inflation so far. With inflation expected to rise more gradually, we now expect the ECB to first hike rates in early 2016 versus our previous forecast of Q3 2015.

Datapoints/trends we're focused on

- The effectiveness of targeted credit easing measures announced by the ECB, which will depend on whether the subsidy provided for credit creation will be large enough to drive new credit expansion given weak demand.

Inflation to fall short...for some years

Euro area headline and core inflation, % yoy



Source: Eurostat, Goldman Sachs Global Investment Research.

Emerging Markets (EM)

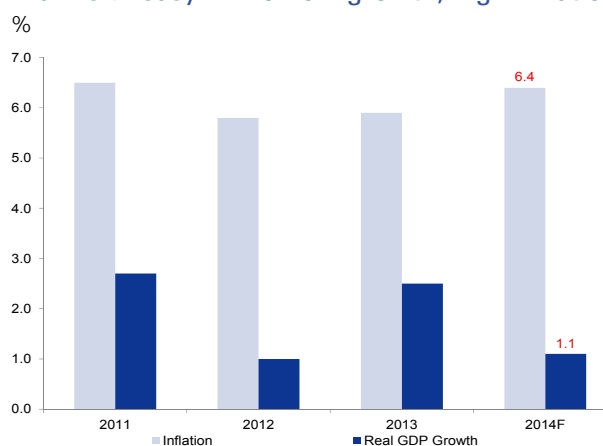
Latest GS proprietary datapoints/major changes in views

- We cut our 2014 GDP forecast for Brazil to 1.1% on weak growth and a decline in business and consumer confidence; given low growth and high inflation, stagflation risks loom.

Datapoints/trends we're focused on

- EM central banks' actions – more easing could lead to weaker FX performance, especially in places where price levels are stretched and if G3 rates rise.
- Sustainability of a recent rebound in Chinese activity owing to better external demand and looser monetary and fiscal policy.

Brazil's uneasy mix of low growth, high inflation



Source: Goldman Sachs Global Investment Research.

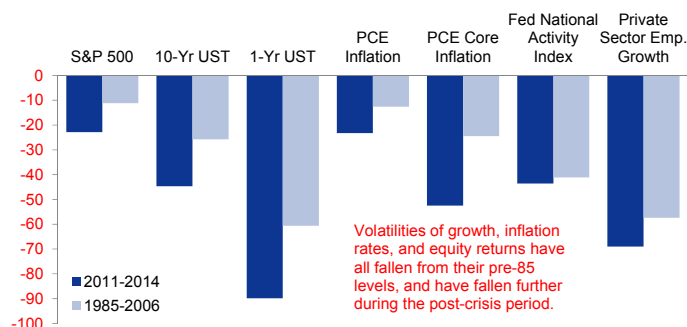
Volatility: Lower for longer?

The decline in economic and asset market volatility this year from already low levels in 2013 has been striking. Although individual assets have realized lower volatility in the past, the global nature of the decline across assets and geographies is exceptional. And now – five years on from the end of the Global Financial Crisis (GFC) – questions about how much longer the current low-vol environment can last – and if it is in itself breeding the same complacency and excessive risk-taking that have resulted in crises past – are Top of Mind. Indeed, Federal Reserve Board Chairman Janet Yellen explicitly expressed concerns in her June 18 press conference that low volatility “may induce risk-taking behavior that entails excessive buildup in leverage or maturity extension...things that can pose risks to financial stability later on.”

To address these questions, we first interview Charlie Himmelberg, head of GS Global Credit Strategy. He believes that current low economic volatility is a continuation of the “Great Moderation” in economic growth that prevailed from the mid-1980s until the GFC, largely owing to the establishment of credible monetary policy. In his view, current low asset volatility is incentivizing a buildup in leverage, but regulation post the GFC has “muzzled the financial accelerator” that amplified problems in the past, substantially slowing the process this time around. In short, the credit cycle will play out, but not any time soon.

A resumption of the “Great Moderation”

% change in volatility from 1970-1984 period



Source: Goldman Sachs Global Investment Research.

Dominic Wilson and Julian Richers of our global markets team agree that low asset volatility should persist. They assert that this low volatility is consistent with the current stage of the business cycle; so as long as a gradual economic recovery continues as we expect, so should the current low-vol environment. And Krag Gregory of our options research team drills down further into low equity volatility in particular, which he also finds is in line with current macro conditions and likely to continue.

But not all are as sanguine. We interview two external experts who are somewhat more concerned. Princeton professor Markus Brunnermeier is wary of what he calls the “paradox of volatility” – the temptation to increase risk during periods of low volatility. In his view, this dynamic is more concerning in Europe today given the increasing pressure to boost inflation in the Euro area, which will likely require more risk-taking. Although he agrees with Himmelberg that regulations since the GFC have reduced risk in the system as a whole, he notes that regulation may have pushed risk to other parts of the system, and that vulnerabilities remain. He believes the key to reducing these vulnerabilities is not adding more regulation, but incentivizing more risk-sharing.

Stanford professor Nicholas Bloom has a different – but perhaps just as concerning – take. He does not believe that current low volatility in itself is increasing the likelihood of a crisis; in his view, risk-taking for the most part is a positive development and cannot

itself be blamed for even the GFC (rather, the GFC resulted from bad management). But he does see the potential for a spike in volatility ahead, not because of current low volatility, but simply because stuff just happens every so often.

Low vol across the board

Cross-asset risk metrics

	Recent	2004-Present			%ile*	Current %-ile (10y)			
		Low	Low Date			Low			High
US IG CDX 5y	56	29	22-Feb-07		27				
US HY CDX 5y	294	208	22-Feb-07		7				
US Int Rate Vol (1y10y impl)	5	4	5-Jun-07		7				
VIX	11	10	24-Jan-07		3				
Copper (3m impl)	16	13	21-Feb-14		3				
WTI (3m impl)	15	14	9-Jun-14		1				
SPX avg stock vol (3m impl)	19	19	23-May-14		1				
FX: EM (3m impl)	6	6	27-Apr-07		0				
FX: G9 (3m impl vs USD)	6	6	19-Jun-14		0				

*% of observations since 2004 below the current level

Source: Goldman Sachs Global Investment Research.

This all leaves two key questions. First, what are the investment implications should low volatility persist? And second, what may break us out of this low-vol environment?

In terms of investment implications, the downside of low-vol environments is that trading opportunities seem scarcer. But there is also an upside: Wilson, Richers and Gregory all highlight the attractiveness of expressing views cheaply via options. In particular, Gregory emphasizes the power of the unprecedented double whammy of low vol and low rates, which has pushed call options to decade-lows across many global equity indices.

Christian Mueller-Glissmann of our European portfolio strategy team addresses the challenges that low equity volatility, which has pushed stock dispersion to very low levels, poses for active managers. But it is not all bad news: in his view, active managers can still add value in these environments by shifting away from sector and country allocation to stock-picking within sectors.

And Jose Ursua of our global economics team looks at whether there are any seasonal patterns to equity volatility that could give investors a leg up. He finds that equity vol tends to be highest in the fall, at the beginning of the week, and at the turn of the month. But these findings – while interesting – certainly should not form the basis of rules to invest by!

In terms of what may break us out of this low volatility, most of our contributors highlight two key catalysts in one way or another: (1) interest rate risk as the Fed and other major central banks continue to navigate an exit from current very accommodative policy and (2) the perennial wildcard – geopolitical events.

Perhaps no market is as vulnerable to such geopolitical risks as the commodity markets, which are differentiated by their physical nature that leaves them susceptible to sudden supply disruptions. The moderate increase in crude oil volatility in recent days on the escalation of violence in Iraq is the perfect reminder of these unique risks. But Damien Courvalin of our commodities research team asserts that the commodity supply cycle in recent years has actually reinforced the vol-dampening effects of the business cycle, and that those dynamics are set to continue...as long as geopolitical events remain in check.

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Interview with Charlie Himmelberg

Charlie Himmelberg is Goldman Sachs' head of Global Credit Strategy within Global Investment Research. Below he asserts that the "Great Moderation" – a period of low economic and asset market volatility – is set to continue, at least for now.



Allison Nathan: Is economic and market volatility really that low?

Charlie Himmelberg: It is. I prefer to use employment growth as the benchmark measure of economic volatility, and any way that you slice it, this measure is close to its post-war lows. As for financial market volatility, I think that most people have in mind equity volatility when they think about financial market volatility, and there you

are getting very close to the historical lows. So, objectively, both economic and market volatility are very low relative to history.

Allison Nathan: Why is economic volatility so low today?

Charlie Himmelberg: I believe that we are seeing a continuation of the so-called "Great Moderation" in economic growth and inflation that began in the post-1985 period. Several factors may have contributed to this Great Moderation, but in my view the most compelling is the improved conduct of monetary policy that started with Paul Volker and subsequently became institutionalized within the Federal Reserve System and, for that matter, within central banks globally. Policy economists came to understand the importance of being credible, consistent and focused on a narrow policy objective of long-run price stability, which, in the short-to-medium run, also meant growth stability. Monetary policy became very effective at achieving these goals and buffering shocks to the economy. Prior to this, policy did a poor job of buffering such shocks, and at times may have even inadvertently amplified them.

Today, I believe that monetary policy remains as competent, if not more so, than it was in the pre-crisis period. And I believe that the Great Moderation is likely to be even more moderate post the GFC – a *Greater* Moderation, if you will – because re-regulation has effectively muzzled what Ben Bernanke has referred to as the "financial accelerator." The financial accelerator is the idea that credit growth tends to amplify economic growth, and, conversely, when growth slows, tighter credit amplifies the decline. In this post-crisis period, I think it is reasonable to speculate that aggressive new restrictions on credit creation and widespread adoption of macro-prudential policies have muzzled this "accelerator", leaving the highs lower, the lows higher, and volatility in economic activity overall more moderate than what we have seen in past recoveries.

Allison Nathan: Doesn't the GFC disprove the existence of the Great Moderation and the alleged achievements of monetary policy during this period? Many have even argued that pre-crisis monetary policy was a primary cause of the GFC.

Charlie Himmelberg: There may be some truth to the narrative that the Fed's policy in the late 1990s and early 2000s may have contributed to the housing boom and thus to the subsequent economic collapse. But that narrative is overlooking the elephant in the room, which is the fact that we effectively had a bank panic. This panic had very little to do with the conduct of monetary policy and everything to do with the fact that regulators failed to recognize that they had a runnable banking system for the first time in 50 years. The roots of the crisis were grounded in the

growth of short-term wholesale funding that to investors looked virtually as safe as deposits but, unlike deposits, were not government guaranteed and therefore were subject to credit concerns and hence, bank runs, in much the same way that banks were subject to runs in the early 1800s before the formation of the Federal Reserve, its role as lender of last resort, and deposit insurance. If short-term wholesale funding had not grown as rapidly as it did during the years prior to the crisis, it is possible that there could have been less of a housing bubble in the first place, although there was obviously much more fuel to that fire than just funding. There may still have been a banking crisis and even a housing crisis that created a serious recession, but there would not have been a bank panic, which is what distinguished the GFC from previous recessions and sharply increased the damage it inflicted. If you recognize the distinct sources of the moderation – good monetary policy – and the financial crisis – a runnable banking system – and that actions by regulators since the crisis have made the financial system far less vulnerable to runs and panics, it is very difficult to argue that the GFC somehow disproves or invalidates the institutional changes that contributed to the Great Moderation, and thus makes it easier to expect that growth volatility is going to be even more moderate than it was in the pre-crisis period.

Allison Nathan: Why is financial market volatility so low?

Charlie Himmelberg: Financial market volatility, and equity volatility in particular, has a clear cyclical component to it. Risk aversion, too, tends to track business cycles, rising in recession and falling in recovery. I think this suggests that financial market volatility, especially equity market volatility, is at least partly a symptom of this risk aversion. During recessions – when risk aversion is high – investors tend to be very sensitive to news flow. The same news flow therefore has a much bigger impact on prices than it does during periods of high risk tolerance – periods like today, for example. I suspect that this explains much of the cyclical behavior of market volatility. Leverage amplifies this dynamic. For instance, late in the cycle, when investors have typically become over-levered, the prospect of a recession means that risk aversion is rising at a time when leverage is high, which can put an extra punch into volatility. The period of late 2008/early 2009 was a clear example of this dynamic; the economy was sliding into recession at a time when banks, investors and households were all highly levered – a perfect storm for volatility. And of course, that period was one of the highest periods of volatility in recent history.

Allison Nathan: Is the higher risk appetite that low volatility tends to support fully priced today?

Charlie Himmelberg: I'm inclined to think that risk appetite is stretched, despite the fact that I think risk itself is probably low. On a relative basis, I may be biased by my day job as a credit strategist, but I think credit is less over-priced than some assets. That is perhaps ironic because it seems that a lot of investors outside of the credit market look to the credit market as the canary in the coal mine – the market that is most vulnerable to overheating and mispricing of risk in general. In hindsight, that was certainly the case in the last cycle leading into the GFC. But I think the fact that credit was at the epicenter of the previous cycle will make both credit market participants and financial regulators behave much more prudently this time around.

Allison Nathan: Is there any overheating in the credit markets?

Charlie Himmelberg: Yes. But I should first point out that I am least concerned about leverage and overheating in the financial sector. Regulation is reducing banks to channel risk capital, which is a headwind for economic growth, and hence a challenge for equity investors, but is a windfall for bond holders. On the other end of the credit-rating spectrum, I think that there are clear signs of overheating in the triple-C to distressed end of the high-yield market. The lack of financial leverage is at least partly to blame for this. If you think about it from an investing perspective, you can either own investment-grade credit spreads, which are narrow, and lever them to get a return volatility comparable to equities, or you can own a high-yield credit spread that is already pretty generous, and hold it on an unlevered basis. Today, the highest Sharpe ratio between the two is overwhelmingly in the investment-grade space. So why have investors chased high-yield spreads and caused them to tighten so much on a relative basis? Because that leverage is simply not available to the same extent that it was in the past (and where it is available, investors have so far been more apprehensive about using it). So the leverage must instead be embedded in the capital structure of the companies that you are buying. The bottom of the high-yield market is where the greatest degree of embedded leverage is available to investors. But it is very aggressively priced. This likely reflects a supply and demand imbalance. In 2009/2010, there was a view that a lot of distressed assets were going to be available and a lot of credit opportunity funds were raised to direct capital into that space. And over the last three or four years, some of those credit opportunity funds have been among the best performing funds in credit, so they have attracted even more capital. But it turns out that default rates have been realizing far lower than most people – even the most bullish investors – expected. So you now have a pretty serious imbalance between the amount of capital that is looking for distressed assets and the actual supply of those assets.

Allison Nathan: So there are too few bad companies?!

Charlie Himmelberg: In a sense, yes! One of the under-told stories of the last ten years is the strength of earnings growth and profitability in the corporate sector. Ironically, non-financial corporate leverage was falling sharply throughout most of the last boom. The excess leverage was in the banking system, not the non-financial firms. There are also fewer sectors in secular decline. But, in general, the corporate sector has been well managed, highly profitable, and less levered than in the past. This, of course, is a good thing, but for corporate bond investors, it has created too little supply of distressed credits relative to demand.

Allison Nathan: Is the low level of volatility an ominous signal?

Charlie Himmelberg: It should make us worry. We have a lot of historical experience with the so-called “Minsky framework” of how credit cycles play out: a period of low volatility tends to generate complacency on the part of investors, corporations, households, and regulators as they become more and more comfortable with the notion that the volatility that they have recently experienced is a thing of the past and not likely to be repeated in the near term. As a result, they take on more leverage, which leaves them even more vulnerable when volatility inevitably rears its ugly head again and valuations decline. Recession ensues, its severity depending on the degree of imbalances. Today, the incentives for leverage are arguably as strong as they were in 2004-2006. But, in my view, the aggressive re-regulation of markets has made us less vulnerable today than in the past to these “Minsky dynamics.” The availability of leverage to investors,

banks and households is simply much lower today. This is partly because borrowers and lenders are more wary, and partly because regulators are much more macroprudentially focused and responsive to any signs of excesses. These factors will likely extend the stability and sustainability of this cycle relative to past cycles. I am not saying that the credit cycle won’t play out to some degree. I believe that it will. But I think that it will play out in slow motion relative to past credit cycles, and with lower amplitude.

Allison Nathan: How long before the credit cycle plays out?

Charlie Himmelberg: Relative to the pre-crisis period, volatility and credit spreads have already reached 2005 or 2006 and, by some metrics, even 2007 levels. So some say we are already at the peak of complacency and the next step is down. And I agree that from current levels there will unquestionably be periodic backups in volatility and spreads. But I think that those moves are likely to stay relatively range-bound for the next year or two, and possibly for as many as four or five years or more. I believe that we are still in relatively early days of this credit cycle.

Allison Nathan: What would make you more concerned?

Charlie Himmelberg: It all boils down to valuations. As I said, there is a relatively small pocket that looks stretched – the triple-Cs and bottom end of the high-yield market – but the rest of the corporate credit market looks fairly priced, including the high end of the high-yield market, which is one of the parts of the credit market that we like best right now. I would start to become more concerned if more parts of the market began looking stretched.

Allison Nathan: Is the financial system better equipped to deal with a credit crisis than before the GFC?

Charlie Himmelberg: It is certainly better equipped to deal with a crisis like the one we just had. Re-regulation post the crisis has substantially improved financial market stability, in my view. Banks are better capitalized. The asset side of bank balance sheets is materially de-risked. There is less reliance on wholesale funding. There are more regulatory tools in place both to recognize funding weaknesses and to deal with them. Regulators now have the tools to resolve financial institutions. Lehman likely wouldn’t have happened in today’s regulatory environment. It has come at a cost. I think economic growth has been a casualty, so the current generation of unemployed who are now failing to benefit from what would normally have been a surge in credit growth that would have helped drive demand and create jobs are the ones losing. Non-prime borrowers have suffered, too, by having been shut out of credit markets. You could argue this was partly unavoidable – that there’s no painless way to de-lever, and that you can’t allow too much re-leveraging in the recovery or you end up back where you started. So you’re stuck with a sluggish recovery during the transition to a safer financial system.

I also worry a lot that re-regulation put undue emphasis on regulating markets and not enough on regulating institutional incentives. The new financial system plumbing that is being built in response may end up generating instability in new ways. There is mounting evidence that some of the new regulations have made the pipes narrower – i.e. the markets are less liquid. They appear to be working fine as long as the amount of risk to be moved is low, which is the case today. But in the event of another crisis, will the plumbing of the system be capable of moving the risk necessary, or will such an event cause the pipes to burst? That, to me, is the biggest risk: that we unfortunately won’t fully be able to understand these unintended consequences until the pipes are tested in the next crisis.

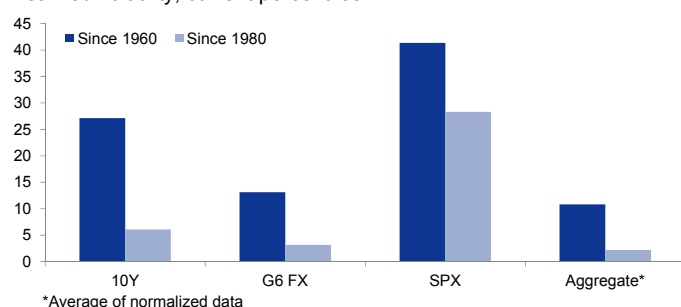
Lower for longer

Dominic Wilson and Julian Richers share why asset volatility is likely to stay lower for longer

The decline in volatility across a broad range of asset classes this year has been striking: 3-month implied volatility for US equities, 10-year yields and the major currency crosses with the USD (EUR, JPY, GBP, AUD, and CAD) are all at historically low levels. Periods of comparably low implied volatility have been seen before in each asset class: in equities, in the mid-1990s and 2006-2007; in FX in 1996 and 2006; and in rates from 2005 to 2007 and briefly in the late 1990s. But it is also striking that volatility is low across the various asset classes at the same time.

Low vol all around

Realized volatility, current percentiles



Source: Goldman Sachs Global Investment Research.

Macro drivers

Short-term movements in asset market volatility can be hard to predict and owe much to particular shocks, news or sharp market movements. However, deeper underlying trends in volatility can be linked to economic conditions and the cycle. Five areas in particular are worth thinking about in understanding low market volatility:

- **The economic cycle.** Early cycle periods – where output gaps are negative but closing, or where unemployment rates are high but falling – tend to be periods where FX and equity volatility are lower than normal.
- **Stability of the economic environment.** Periods of lower volatility in inflation and economic activity tend to be related to lower asset volatility.
- **Financial stresses.** Significant financial stress can also generate market volatility beyond their impact on the economy, such as in the global financial crisis (GFC), during the EM crisis in 1998 or most recently during the Euro area crisis.
- **Valuation.** In periods of overvaluation (high multiples in equities or low yields for bonds), smaller shifts in the available information set might be enough to force a larger market rerating, increasing market volatility.
- **ZLB and unconventional policy.** More recently, evidence has emerged that hitting the zero lower bound (ZLB) and the use of unconventional policy measures by the major central banks have played a role in depressing volatility, especially in rates markets.

Justifiably low

Considering this set of forces, it is not surprising that volatility is currently low. We are still clearly in the phase of expansion where the output gap is negative but improving. The US unemployment rate has been falling rapidly. The dispersion of US growth forecasts has narrowed significantly. Financial stresses – most strikingly in Europe – have receded substantially. Front-end rate curves remain anchored by policy. And the so-called “Great Moderation” in

economic volatility that was briefly interrupted by the GFC seems to be back.

More formally, comparing current levels of volatility to simple macro models that try to explain past movements in volatility with the above-described macro factors does not suggest that we’re far from what historical relationships would predict. Plugging GS macro forecasts into the same models suggests there is a good chance that the current low-vol regime will persist for some time.

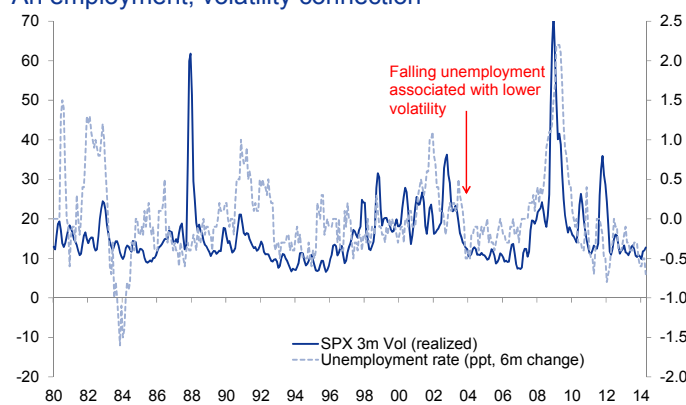
Boring not all bad

Lower volatility makes macro trading opportunities more difficult in some ways, but there is some upside to boring: Directional views can be expressed more cheaply through options. A sustained period of lower volatility is also likely to shift corporate behavior, encouraging companies to engage in M&A, to increase leverage, and to invest and hire, which will help to support the economic recovery. There are signs that this shift may have already begun.

What would shift low vol into higher vol?

Beyond renewed financial shocks, there are two main factors that could shift volatility higher from here: First, lower-than-expected slack in the economy, which would lead to sooner-than-expected overheating and related higher volatility. Second, any meaningful surprises in monetary policy as central banks navigate the exit from easy policy, which would impact rate volatility in particular. Spikes in rate volatility as a result of policy missteps could spill over into other asset classes as well, but may not. For example, equity volatility did not move much in 2013 during the rate scare, but FX volatility did. However, forward curves for volatility are quite steep so there are few signs that markets are underpricing these risks.

An employment, volatility connection



Source: Goldman Sachs Global Investment Research.

Low vol for longer

Barring these risks, the low-volatility landscape should be with us for some time. And while current volatility levels do look quite low relative to the last couple of decades, history provides some precedent for persistent low volatility regimes. This is particularly true in equities, where realized volatility for the entire 1950s and 1960s – at just over 10% – is below current levels.

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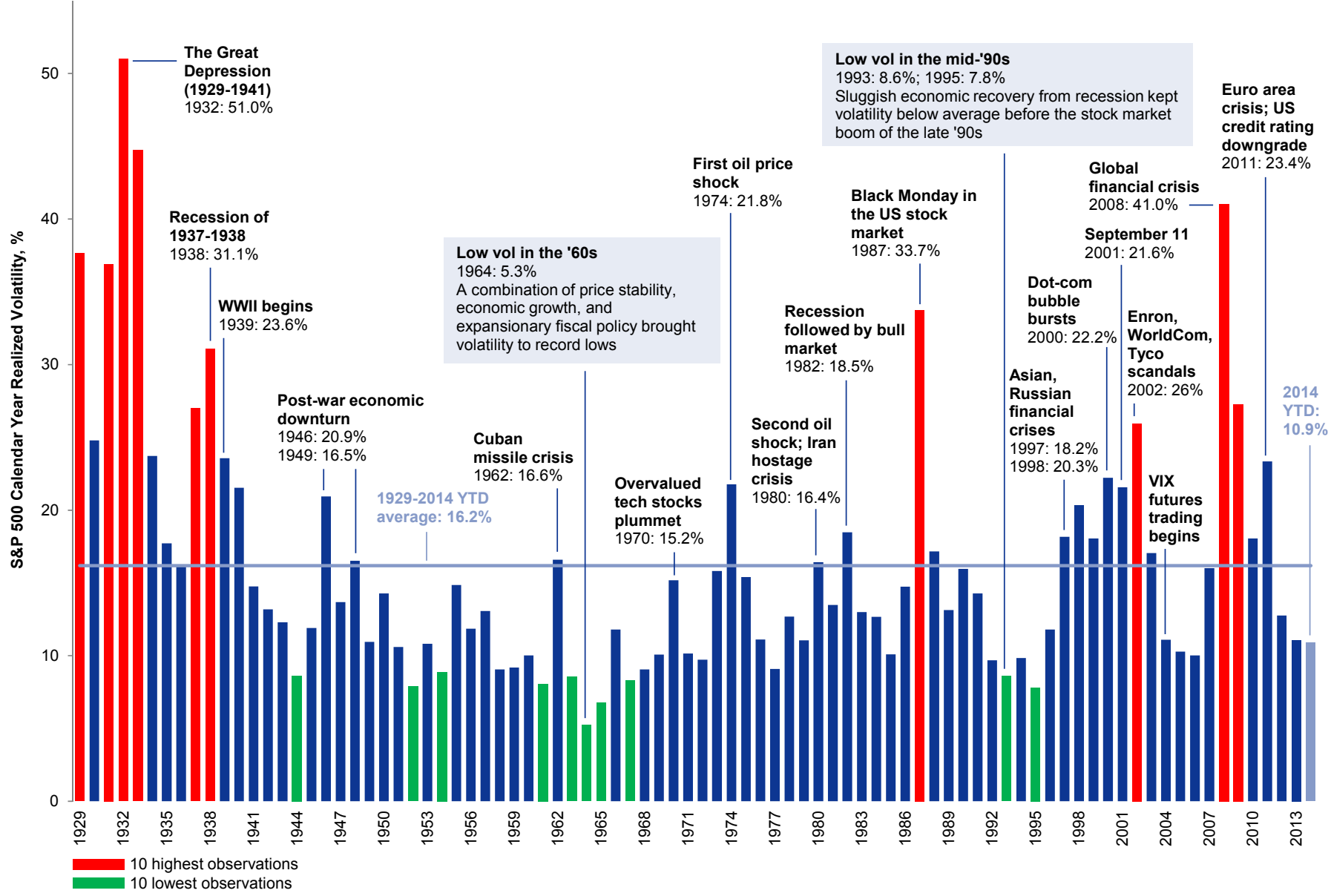
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Goldman, Sachs & Co.

A history of ups and downs



Source: Goldman Sachs Global Investment Research, various news sources.

Equity vol and the business cycle

Krag Gregory discusses the global nature of low equity vol and the unique opportunities of a low-vol, low-rate environment

Jitters across emerging markets, geopolitical tension and a pull-back in tech, small-cap and social media high-fliers are just a few of the issues that have confronted investors so far in 2014. From a risk perspective, what may seem surprising is that despite these ongoing concerns, realized volatility levels have been well contained. But this is in fact consistent with the historical interplay between volatility and the economic cycle. Realized market volatility, VIX, and single stock correlation show a strong cyclical component – increasing during periods of rising jobless claims, weaker growth and contraction in industrial activity, and falling as these factors stabilize.

Given current economic conditions, low market volatility isn't an anomaly; it is the norm at this point in the business cycle. The current outlook for unemployment, ISM new orders, and consumer spending is consistent with 1m S&P 500 realized volatility levels of 10-13% and a 1y forecast of 11%. With realized volatility running at 10.9% year to date, we have not even reached our target for the calendar year. If US growth continues to improve, investors should continue to expect low levels of equity volatility, at least in the near-to-medium term (barring any external shocks).

Low but not unprecedented

If S&P 500 realized volatility stays on its current course, it would place in the 35th percentile for calendar year realized volatility dating back to 1929. This implies that over one-third of the volatility observations over the last 85 years were lower than current levels. During the last low-volatility regime in the mid-2000s, realized volatility was 11 in 2004 and 10 in 2005-2006. Moreover, if history is any guide, we could be in an extended period of low realized volatility. One-year realized volatility was below current levels across six years in the 1950s, eight out of ten years in the 1960s, and for four straight years in the 1990s (1992-1995). So not only is there historical precedent for low volatility – it can be persistently low for long periods of time.

What gets the VIX back to 25?

While economic conditions suggest volatility should remain low, geopolitical risks remain. So far the markets have remained relatively immune to such risks, including heightened tensions in Ukraine and Iraq, but this may not necessarily remain the case. The exit from unconventional policy and the “zero lower bound” may also lead to a sharper rise in uncertainty about the future level for US rates, which could increase rate volatility and have knock-on effects across asset markets. Eventually, it is also natural to expect more pressure for volatility to rise as the business cycle matures. However, VIX levels of 20-25% would be consistent with ISM levels of 50 and an unemployment rate of 7-7.5%, or a full point higher than current levels.

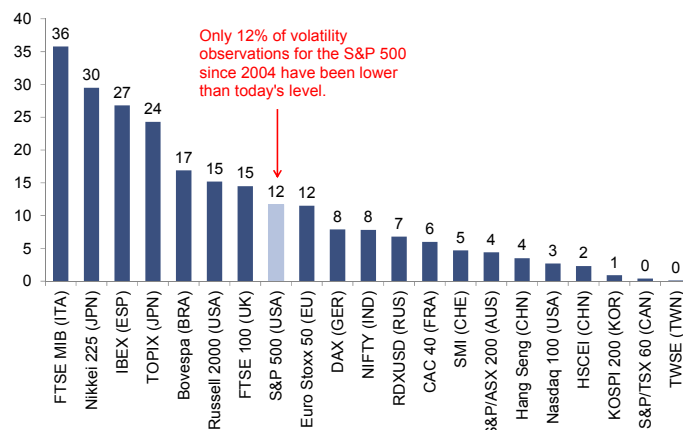
Not just a US story

Low equity volatility is not just a US phenomenon. Option implied volatility levels are currently near decade lows across many equity indices globally. Implied volatility levels across 21 indices with liquid options markets are, on average, within two points of their decade low reached in 2005. With a common set of core macro drivers centered around the developed world and its very accommodative monetary policy, this is perhaps no surprise. But

there is some cross-country differentiation: options in Japan and the European periphery (Italy and Spain) remain the exceptions – well off their 2005-2007 lows – given uncertainty around Abenomics and the recent imposition of the consumption tax in Japan, as well as still-large economic and institutional uncertainties in the Euro area periphery.

A global phenomenon

3m implied volatility across indices, 10y %-ile



Source: Global Sachs Global Investment Research.

Double whammy: Low rates and low volatility

While low-vol environments have occurred in the past, the current combination of low volatility and low interest rates is unprecedented. This is directly impacting options investors: all else being equal, low rates make call options cheaper, especially longer-dated options. As a result, call prices have fallen to decade lows across many global indices.

Call option prices at decade lows

3y SPX and Euro Stoxx atm call prices



Source: Global Sachs Global Investment Research.

Many investors have taken advantage of lower priced 1y+ options and used long calls to establish long equity exposure (rather than outright longs) or to increase exposure to regional underweights. This long call strategy takes advantage of two expected outcomes of the global economic recovery – higher equity prices and rising yields as rates normalize. As equities move higher and yields rise, calls will increase in value.

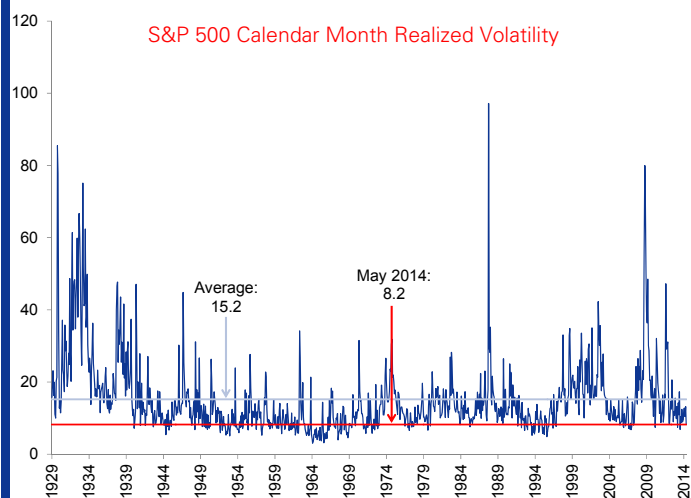
Krag Gregory, Senior Options Strategist

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Goldman, Sachs & Co.

Equity vol in six snapshots

S&P 500 Calendar Month Realized Volatility



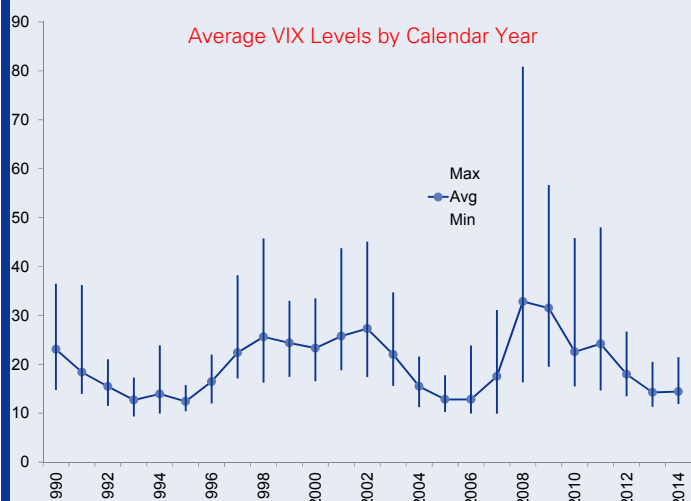
Source: Goldman Sachs Global Investment Research.

S&P 500 Calendar Realized Volatility Stats

1929-Present	Calendar Month	Calendar Quarter	Calendar Year
Recent	8.2	12.0	10.9
Min	3.1	3.7	5.2
25th %-ile	9.0	10.0	10.1
Median	12.2	12.9	13.5
Average	15.2	15.6	16.2
75th %-ile	17.3	17.7	18.2
Max	97.1	69.0	51.0

Source: Chicago Board Options Exchange, GS Global Investment Research.

Average VIX Levels by Calendar Year



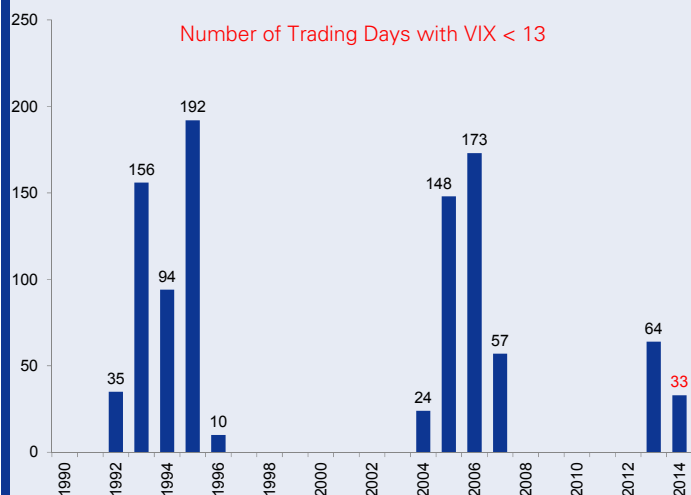
Source: Goldman Sachs Global Investment Research.

S&P 500 Realized Volatility Stats by Period

Period	Calendar Month			Calendar Year		
	Min	Avg	Max	Min	Avg	Max
1929	10.0	29.6	85.5	37.6	37.6	37.6
1930s	10.7	28.1	75.1	16.2	29.7	51.0
1940s	5.4	13.5	47.1	8.6	14.4	21.5
1950s	5.1	10.5	27.6	7.9	11.0	14.9
1960s	3.1	8.7	34.1	5.2	9.5	16.6
1970s	5.8	12.6	31.8	9.1	13.2	21.8
1980s	7.6	14.9	97.1	10.1	16.3	33.7
1990s	4.9	13.0	34.8	7.8	13.5	20.3
2000s	6.8	17.8	79.9	10.0	19.1	41.0
Overall	3.1	15.2	97.1	5.2	16.2	51.0

Source: Goldman Sachs Global Investment Research.

Number of Trading Days with VIX < 13



Source: Goldman Sachs Global Investment Research.

Ten Lowest VIX Levels

Rank	Date	VIX Level
1	22-Dec-93	9.31
2	23-Dec-93	9.48
3	27-Dec-93	9.70
4	28-Dec-93	9.82
5	24-Jan-07	9.89
6	21-Nov-06	9.90
7	28-Jan-94	9.94
8	20-Nov-06	9.97
9	14-Dec-06	9.97
10	16-Feb-07	10.02

Source: Chicago Board Options Exchange, GS Global Investment Research.

Interview with Markus Brunnermeier

Markus Brunnermeier is a professor of economics at Princeton University and will be the newly appointed director of Princeton's Bendheim Center for Finance. Brunnermeier is a member of advisory groups to the New York Fed, IMF, Bundesbank, and the European Systemic Risk Board. Below, he expresses some concern about what he calls the "paradox of volatility" – the tendency for a build-up of risk during periods of low volatility.

The views stated herein are those of the interviewee and do not necessarily reflect those of Goldman Sachs.



Allison Nathan: Does low market volatility breed complacency and excessive risk taking?

Markus Brunnermeier: Yes. I have coined this dynamic the "volatility paradox." When measured market volatility is low, people feel empowered to take on more leverage and more liquidity mismatch, which leaves the whole system more prone to sharp movements. This dynamic occurred

during the "Great Moderation." During that period, fundamental and asset volatility was generally low and market participants took on much more leverage.

Allison Nathan: How concerned are you that the current low economic and asset market volatility is leading to a build-up of risk that could result in another financial crisis?

Markus Brunnermeier: Low risk premia in certain credit markets can be helpful in overcoming current macro-economic challenges, but from a risk perspective they are also concerning should they suddenly return to higher levels. For example, low inflation and weak growth in Europe have increased the pressure on Central Banks to become more accommodative, thereby potentially compromising financial stability. This is because one way to attempt to boost inflation is to ask financial institutions to extend more credit, especially to small and medium-sized enterprises (SMEs), which naturally requires these institutions to take on more risk. On the one hand, these actions should push inflation closer to target, but, on the other hand, they also risk more financial instability. So there is a tradeoff between price stability and financial stability. This tradeoff was not recognized previously. Before the crisis, financial stability and price stability were typically regarded as two separate concepts, overseen by two different agencies. For example, a financial regulator such as the FSA or the SEC was in charge of financial stability and the central bank was separately in charge of price stability. The crisis made it obvious that both stability concepts are tightly interlinked.

“The whole system is more prone to a financial crisis when measured volatility is low, which tends to lead to a build-up of risk in the background – the so-called 'volatility paradox'.”

Allison Nathan: So do the recent ECB actions that encourage more credit extension to SMEs pose a potential risk to financial stability?

Markus Brunnermeier: Not necessarily; it depends on what other measures take place alongside them. If the banks are forced to recapitalize themselves sufficiently as determined by rigorous stress tests and the Asset Quality Review (AQR) then this should be less of a concern. If this is not the case, then of course this type of credit extension would provide more cause for concern. Over one hundred banks will soon be under the supervision of the ECB, so the ECB should have good information about whether or not such credit extension would be suitable at least for these banks. But overall, if growth does not improve, then stability concerns will gain more weight.

“Smart regulation can reduce total risk in the economy, but there is always the danger that risk has shifted to other parts of the system that are less regulated.”

Allison Nathan: What else did we learn from the global financial crisis?

Markus Brunnermeier: We learned that financial crises do not only occur in emerging market economies, which became the primary mentality in the 1990s. We also learned that the free market economy is not necessarily self-stabilizing. If the system is sufficiently highly levered, then the economy needs some help to regain its footing after an adverse shock. Similarly, we learned that economies do not necessarily bounce back to pre-recessionary trends post a downturn. In particular, to the extent that a recession is associated with a financial crisis, the prior trend may not be attainable. Finally, as I alluded to earlier, we learned that the whole system is more prone to a financial crisis when measured volatility is low, which tends to lead to a build-up of risk in the background – again, the so-called "volatility paradox." A fundamental shock or trigger can bring this risk to the foreground, enormously amplifying the initial shock and the subsequent damage. This dynamic underscores the need for macro-prudential regulation, which addresses risk in the system as a whole, not just at individual institutions, and takes on a countercyclical perspective.

Allison Nathan: To what extent does systemic risk to the financial system remain post the surge in regulation since the GFC?

Markus Brunnermeier: Let me first define what I mean by systemic risk. I define systemic risk as risk that is generated by the system itself. And I believe that there are two elements of systematic risk: a time dimension – the build-up of risk in the background during quiet times, which then materializes when the

crisis erupts – and the spillover dimension – the extent to which the bankruptcy of one institution impacts the rest of the system. I believe that regulations since the crisis have materially addressed systemic risk on both of these dimensions – there is now much greater use of regulation and macro-prudential regulation in particular to dampen the risk build-up over time and to contain the spillovers that one bank's demise may cause for the rest of the system. And so the total amount of risk in the system has been reduced. But systemic risk has of course not been eliminated. Smart regulation can reduce total risk in the economy, but there is always the danger that risk has shifted to other parts of the system that are less regulated. So we remain in a vulnerable environment as we speak.

Allison Nathan: Is there a cost to these regulations?

Markus Brunnermeier: There is an argument that greater regulation that aims to shore up financial stability comes at the expense of economic growth. But one could also make the case that a sound financial system provides the foundation for sustainable growth. In addition, new banking arrangements and alternative forms of credit growth have emerged that put in doubt how much overall credit growth has really been impaired. In Europe, alternative forms of credit, especially to SMEs, are less well developed. Overall, the economic costs of regulation will depend on how the regulation is implemented. For example, forcing banks to stabilize themselves by issuing new additional equity would likely not hurt economic growth much. On the other hand, demanding higher capital requirements that do not lead to new equity issuance but induce banks to shrink their balance sheets, and, in turn, reduce credit growth, would inflict more damage on the real economy.

“Issuing more equity rather than debt would be a stabilizing force...Equity issuance tends to be more widely held, spreading the risk across a bigger population.”

Allison Nathan: What else should be done to boost financial stability?

Markus Brunnermeier: There are two ways to go. One is to make the regulatory framework more and more complicated in an attempt to plug all of the different holes that might appear in the future. The other is to provide better incentives for the financial system to hold more equity on its own. In general, issuing more equity rather than debt would be a stabilizing force and a simpler way of managing the financial system. Debt concentrates risk in the hands of a few. Conversely, equity issuance tends to be more widely held, spreading the risk across a bigger population. Several measures could be implemented to increase the attractiveness of issuing equity rather than debt. For example, many measures in

the tax code that currently favor issuing debt over equity could be amended or removed.

“In general, extremely low risk premiums right now are somewhat concerning...If there is a smooth adjustment towards more normal levels of risk premium, I believe the financial system can handle it. But if risk premiums suddenly move back to high levels...the question is how the financial system will react.”

Risk is not only concentrated in the financial sector. The household and corporate sectors are also vulnerable to a buildup of imbalances and bubbles, especially during periods of low volatility. This risk is most concerning when it is exposed to a liquidity mismatch. For example, if you look at the United States in the 2000s the mismatch built up in the financial sector and in the household sector, so households became heavily indebted. In contrast, if you look at Japan in the late 1980s, the mismatch built up not in the household sector, but in the corporate sector, as well as in the financial sector. It is therefore important for regulators to look for liquidity mismatches across the whole economy to identify where the next big problems may crop up and to be flexible in the policy approach they take to address these problems, which may appear in different sectors.

Allison Nathan: What liquidity mismatches seem most likely to become problematic today?

Markus Brunnermeier: An institution is exposed to a high degree of liquidity mismatch if the market liquidity of its assets is very low – i.e. they can only be sold at a high price discount in times of crisis – and at the same time its liability structure is very short term or assets are financed on margins that can change quickly. Pension funds and insurance companies have long-dated liabilities – i.e. their payout obligations to pensioners and insurance subscribers are far in the future. To reduce their mismatch they would like to hold long-dated fixed income instruments that will cover the cost of these payouts. These institutions seem to be willing to take on more credit risk in order to match their duration risk. This leaves them vulnerable to a deterioration of the economy.

In general, extremely low risk premiums right now are somewhat concerning. If there is a smooth adjustment towards more normal levels of risk premium, I believe the financial system can handle it. But if risk premiums suddenly move back to high levels – for example, long-dated interest rates move sharply higher – the question is how the financial system will react. Given some of the liquidity mismatches I identified, that is a key area of concern.

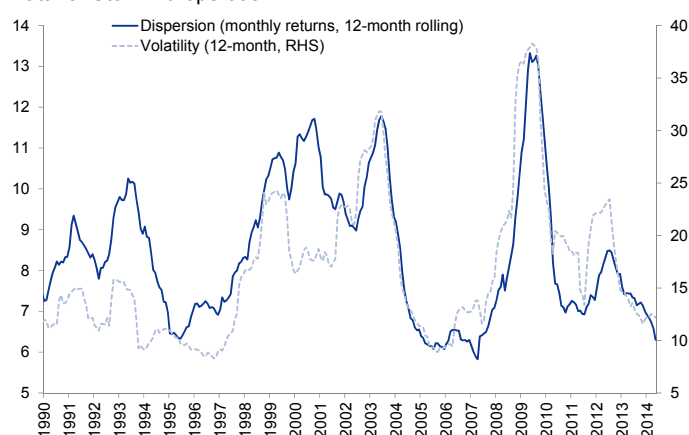
Active management in a low-vol world

Christian Mueller-Glissmann explains why active equity management requires a different approach in periods of low volatility

Active equity managers have struggled with the shift towards a low volatility world. Low volatility has reduced the dispersion of equity returns – the difference in returns yielded by individual stocks – and the correlation of equities – the degree to which individual stocks move together. This changes both the size and the source of the value add or “alpha” from active equity management over passive management. As a result, in both Europe and the US, few active funds have managed to outperform their benchmark YTD. Equity hedge fund performance has also been generally weak – yielding only a 1.6% return through May according to Hedge Fund Research (HFR). And recently inflows into passive funds have picked up at the expense of active funds, indicating investor concerns over the ability of active managers to add value.

Volatility is a key driver of dispersion

Data for Stoxx Europe 600



Source: Datastream, Global Sachs Global Investment Research.

Correlation ≠ dispersion

Dispersion is often confused with correlation, but they are quite different. Correlation measures directional coherence (i.e. if stocks are going up and down together consistently), while dispersion incorporates the magnitude of moves. Stocks can therefore be highly correlated but still diverge over time if they have different volatility. Similarly, dispersion of returns can be low despite low correlations if volatility is very low. Lower correlations can increase the dispersion of returns but the more important driver tends to be volatility. For example, during the tech bubble in 1999/2000 very low correlations actually kept dispersion elevated although volatility was muted.

Low dispersion = less alpha

Dispersion has declined to very low levels alongside volatility, both in Europe and the US. As dispersion measures the difference in returns between stocks, it indicates the alpha opportunity from picking the right stocks in the market (or avoiding the wrong ones). During the GFC, both equity volatility and dispersion in Europe reached high levels generating large return differences across sectors and countries; by correctly over- or underweighting the banks sector alone, active managers in Europe would have been able to add significant alpha relative to their benchmark. But since mid-2012 dispersion has declined close to previous cycle lows, which has reduced alpha opportunities for active managers.

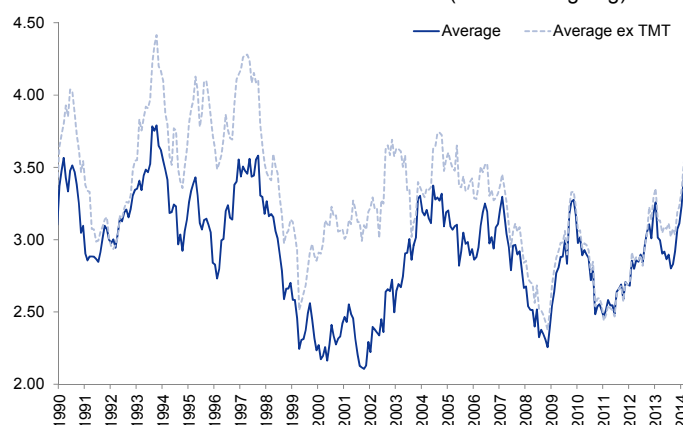
Looking underneath the surface shows that dispersion of both sector and country returns has declined materially from the peaks of 2009. The spread of sector returns is at the lowest levels since the 1990s – seldom have the returns of different sectors been so similar. Country-level dispersion in Europe has held up since mid-2012 as the Euro area crisis pushed country risk back to the fore. In 2014, improved sentiment around the Euro area has led to a strong rebound of periphery equity indices. The result: dispersion in country returns has exceeded that of sector returns for the first time since the introduction of the EMU. However, this outperformance of the periphery may run out of steam given that credit spreads have less potential to narrow further.

Low correlation = shift from macro to micro

Correlations between equities declined alongside volatility and dispersion. Similar to volatility, correlations are counter-cyclical – they tend to increase when markets weaken and investors are less discerning over the fundamentals of stocks. More importantly, the level of correlation hints at where to find dispersion – dispersion in the market can be caused by macro drivers, e.g. sectors, countries and styles, or by micro factors, e.g. company-specific factors. If equity correlations are high, it signals a macro-driven market where dispersion across sectors or countries matters more. If equity correlations are lower, it indicates a more micro-driven market. Following several years of a macro-driven market, micro dispersion is once again becoming a more important source of alpha. Since mid-2012, the dispersion of stocks within sectors has increased relative to the dispersion across sectors.

Dispersion higher within sectors than across sectors

Ratio intra- vs. inter-sector max vs. min return (12-mo rolling avg)



Source: Datastream, Global Sachs Global Investment Research.

Good news for “traditional” stock-pickers

This increase in the dispersion of stocks within sectors indicates that stock-picking within sectors is again becoming more important compared with sector allocation. This has been good news for traditional stock-pickers. For example, the performance of equity long/short funds that often focus on pair trading and equity relative value within sectors and countries has been better in periods with low correlations. And indeed, performance of equity long/short funds has improved since 2012. The key message: despite the low dispersion of returns, active managers should still be able to add value in equities. But their focus needs to shift away from sector and country allocation to stock-picking within sectors.

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Goldman Sachs International

Snapshot of our views

Implications of low volatility

FX Robin Brooks Fiona Lake (DM) Kamakshya Trivedi Themos Fiotakis (EM)	<ul style="list-style-type: none"> The decline in FX volatility is a good development for most countries as long as exchange rates are freely determined and are not sustained at misaligned levels, as it helps reduce uncertainties around monetary policy and hedging costs for market participants. Low volatility does not preclude large exchange rate moves. We expect the largest moves to occur in G10 currencies, such as the EUR and JPY. As low volatility reduces the costs of option-based strategies, we would suggest such strategies to position for these moves. Low volatility has encouraged carry-seeking behavior targeted at higher-yielding EM currencies, many of which come from countries with large and unsustainable current account deficits. For these countries, FX depreciation will be a necessary part of the rebalancing/adjustment to equilibrium. In that sense, carry-seeking behavior not only postpones/derails the adjustment process, but it also directs capital to currencies likely to depreciate in value going forward such as the ZAR and the TRY. We tend to favor short positions in these currencies.
Rates Francesco Garzarelli Silvia Ardagna (DM) Kamakshya Trivedi Themos Fiotakis (EM) Fiona Lake (Asia)	<ul style="list-style-type: none"> Interest rate volatility (both realized and implied) is close to historical lows, particularly at the long end of the US term structure. At the front end, volatility of US rates has picked up slightly from very low levels in anticipation of the end of the asset purchase program and the possibility of a hike in mid-2015. As central banks prepare markets for the exit strategy from ultra-accommodative monetary policy, we expect volatility to increase further. In the UK, the debate has already begun and the forwards are discounting the first hike to take place towards the end of this year. In the US, in her last press conference, Fed Chair Yellen underlined the “data dependency” of the FOMC’s decisions regarding the “lift-off” date for policy rates, the pace of subsequent hikes and the level of the neutral rate. She also emphasized that there is a high degree of uncertainty around the evolution of the economic outlook, which poses risks around the FOMC’s economic forecasts and the appropriate path for interest rates. Our research also suggests that US interest rates have become much more sensitive to data, which suggests a pick-up in volatility. By contrast, in the Euro area, we expect volatility to remain low given the ECB policy measures announced in May imply that the central bank will remain on hold for a longer period of time. The main risk to our view is a weaker-than-expected economic outlook and persistently low inflation, which would lead central banks to push forward any communication about the exit strategy.
Credit Charlie Himmelberg Lotfi Karoui (DM) Kenneth Ho (Asia)	<ul style="list-style-type: none"> In contrast to past credit cycles, we believe that the current tight-spread and low-volatility phase of the cycle may persist for several more years. Although the temptation to increase leverage is just as strong – if not stronger – than it was before the GFC, the re-regulation of the financial sector will act as a muzzle on the financial accelerator that in the past has led to an unsustainable build-up in leverage; the credit cycle will ultimately play out, but at a much slower pace this time. The “Great Moderation” in business cycle activity may therefore return as a <i>Greater</i> Moderation. Investors tend to see the credit market as the most vulnerable to overheating and mispricing of risk. Currently, there are clear signs of overheating in the triple-Cs to the distressed end of the high-yield market. However, the rest of the corporate credit market looks fairly priced, including the high end of the high-yield market, which is the part of the credit market that we believe holds the most value today.
Equity David Kostin (US) Kathy Matsui (Japan) Tim Moe (Asia ex-Japan) Peter Oppenheimer (Europe) Caesar Maasry Kamakshya Trivedi Themos Fiotakis (EM)	<ul style="list-style-type: none"> Equity index implied and realized volatility levels are currently near decade lows across many global indices (Japan and the European periphery, i.e. Italy and Spain, are the exceptions.). However, vol cycles can be long, and this one has not yet matched prior cycles in terms of average levels, lows, or the duration of low volatility. This low volatility is consistent with current economic conditions; we are in a stage of the business cycle in which S&P realized volatility and VIX levels tend to be persistently low. Our models indicate that 1m realized volatility levels of 10-13 are consistent with our current outlook for ISM, employment and consumer spending. We therefore expect equity vol to remain low in the near-to-medium term. The current low-vol, low-rate environment is unprecedented and has pushed option prices to decade lows in the US and Europe. We recommend taking advantage of this pricing by using calls or risk reversals for beta replacement or to increase exposure to regional underweights. Stock dispersion and correlation have declined alongside volatility, which has lowered the overall alpha opportunity and increased the importance of stock-picking for active managers. Geopolitical risks and potential unexpected shifts in the global rate cycle remain upside risks to our low-vol view.
Commodity Jeff Currie Damien Courvalin Samantha Dart Max Layton Christian Lelong Anamaria Pieschacon Roger Yuan	<ul style="list-style-type: none"> Commodity price volatility is at the low end of historical ranges for both cyclical and structural reasons. In terms of the former, we are in the recovery phase of the business cycle, when volatility is lowest. Structurally, we are in the early stages of the “exploitation phase” of the commodity supply cycle, when the availability of spare production capacity helps mute price volatility. Low commodity volatility is therefore set to continue. Easy monetary policy is another driver of the low-vol environment for commodities. Very accommodative policy across much of the world has helped stabilize economic growth, commodity demand, and, in turn, commodity prices. Further, as these easy policies begin to unwind, EM economies that are no longer benefitting as much from “search for yield” inflows have cut domestic fuel subsidies, thereby becoming more elastic consumers. As a result, DM countries are now driving global commodity growth, but at a much slower – and less volatile – pace. The main risk to low commodity price volatility is geopolitical turmoil, as evidenced by the recent violence in Iraq.

Interview with Nicholas Bloom

Nicholas Bloom is Professor of Economics at Stanford University. He is also the Co-Director of the Productivity, Innovation and Entrepreneurship program at the National Bureau of Economic Research (NBER), and a fellow of the Center for Economic Performance and the Stanford Institute for Economic Policy Research. His research focuses on the intersection of uncertainty, economic performance, and business management. Below he shares his view that a rise in volatility may lay ahead, but not as a consequence of the low volatility today.

The views stated herein are those of the interviewee and do not necessarily reflect those of Goldman Sachs.



Allison Nathan: Does stock market volatility tell us anything about the real economy?

Nicholas Bloom: Stock market volatility is, in my view, the single best proxy of broad economic uncertainty. It's not a perfect measure by any means, and there are other measures including GDP volatility, exchange rate volatility, forecaster disagreement, and even the frequency of the word "uncertainty" in newspaper articles. All of these

measures move together, which suggests that they have real economic content, but they are not the same. I prefer to look at stock market volatility given the generally ample liquidity in the stock market, which makes it less susceptible to idiosyncratic drivers, although it is certainly not immune to them. The 1987 stock market crash was one example of a huge spike in stock market volatility that I do not believe reflected a large spike in real uncertainty.

Allison Nathan: Does uncertainty as measured by stock market volatility impact the real economy?

Nicholas Bloom: Uncertainty is a major driver of the economy. In fact in 1983, former US Federal Reserve Board Governor Ben Bernanke published a paper about the idea that increases in uncertainty lead to recessions. I think this is as true now as it was back then. Uncertainty affects the economy because it makes firms more cautious, which slows investment and hiring. If factory managers are thinking about buying new equipment or hiring more labor but are uncertain about the future, the easiest, most sensible thing to do is to wait since it is typically relatively cheap to wait whereas it can be very expensive to invest and discover that you have made a mistake. This mindset also naturally leaves firms less responsive to monetary and fiscal stimulus, posing a challenge for policymakers. Of course, when uncertainty declines again, all of that pent-up demand for investment and hiring should resurface and firms should become more responsive to policy stimulus again. But if all firms in the economy delay investing and hiring, that causes a recession.

“When the VIX spikes up, growth tends to stall. When the VIX drops back down, growth tends to speed up again.”

Allison Nathan: Is there a “chicken and egg” problem here? You suggest that there is a causal connection from market volatility into real economic activity, but could causation also work the other way around?

Nicholas Bloom: Yes, indeed you can get powerful feedback mechanisms. One of these is through policy. For example, after the economic crash of 2008, governments in the US and Europe started aggressively cutting interest rates and pumping money through fiscal policy. This policy hyperactivity led to a surge in economic uncertainty, which was ultimately fuelled by the recession. So a vicious cycle can build up whereby the economy slows, uncertainty increases, slowing the economy further, etc.

“History just has too few incidents of low volatility to conclude that low volatility generates crises.”

Allison Nathan: How low is uncertainty today?

Nicholas Bloom: That depends on which measure we look at. Uncertainty as measured by the VIX is very low right now – its average since 1990 is about 20 and it is currently around 11, which is in the bottom 10% of the values. But implied volatility farther out on the vol curve – i.e. ten years out – is nowhere near as low and much closer to average levels. And if you look at our daily economic policy uncertainty index, which is based on counts of the word “uncertainty” in newspapers, this is hovering around its long-run average of 100. This measure of policy uncertainty was highly correlated with the VIX until about 2010, and then recently the VIX has declined while our policy uncertainty measure has not. This is due to events such as the US fiscal cliff, the debt-ceiling debate and the US government shutdown late last year.

Allison Nathan: Why is there a discrepancy between uncertainty reflected in the stock market (VIX) and uncertainty reflected in the newspapers?

Nicholas Bloom: I think one reason revolves around time horizon. The VIX is a one-month index of implied volatility on the S&P 500, so it is short-run focused. The policy uncertainty index appears to be more medium-term focused, looking at policies that are occurring over the next few months and years. For example, the policy uncertainty index has been driven a lot by concerns about the roll-out of the Affordable Care Act (ACA), which is a multi-year process. Policy uncertainty will likely remain elevated for some time due to a range of issues that will need to be resolved in the future but are not necessarily pressing today, such as tax, social security and pension reform, the US debt overhang, etc.

Another reason for the discrepancy in the measures of uncertainty is a difference in focus. The VIX measure is based on the S&P 500 index so it is an average across all sectors and is therefore only responsive to macro shocks. The policy uncertainty index can also

be impacted by micro shocks like the roll-out of the ACA or the implementation of Dodd-Frank.

Finally, there is also a Wall Street vs. Main Street divergence between the VIX and our policy uncertainty index. Wall Street and the VIX tend to be heavily influenced by monetary policy uncertainty, around events like QE1, operation twist and tapering. Newspapers tend not to focus on monetary policy uncertainty because for most firms this is now very low given stable interest rates and inflation. Instead, newspapers focus on uncertainty around policies like the ACA, personal and business tax changes, and government spending on health and defense.

Allison Nathan: To what extent has high policy uncertainty contributed to the exceptionally slow economic recovery in recent years?

Nick Bloom: I estimate that uncertainty overall has caused about one-third of the 10% drop between trend and current output that has occurred since 2007. So uncertainty played a major role in the drop in output, but it was not the only factor. I also think that the fact that uncertainty has not declined to the same extent that it usually does after recessions has slowed the recovery. However, putting a number on this is hard. I would venture that the still elevated policy uncertainty has cut the recovery by roughly 10% to 30%.

Allison Nathan: Do current low levels of the VIX and more average levels of policy uncertainty bode well for the US economy?

Nicholas Bloom: Yes, the VIX in particular is very negatively correlated with economic growth and is a great forecaster for economic growth. When the VIX spikes up, growth tends to stall. When the VIX drops back down again, growth tends to speed up again.

“The fact that volatility is well below its long-run average right now suggests that there is not much downside risk and a lot of upside risk for volatility.”

Allison Nathan: Given that low VIX volatility has persisted for some time, why haven't we seen stronger improvement in investment?

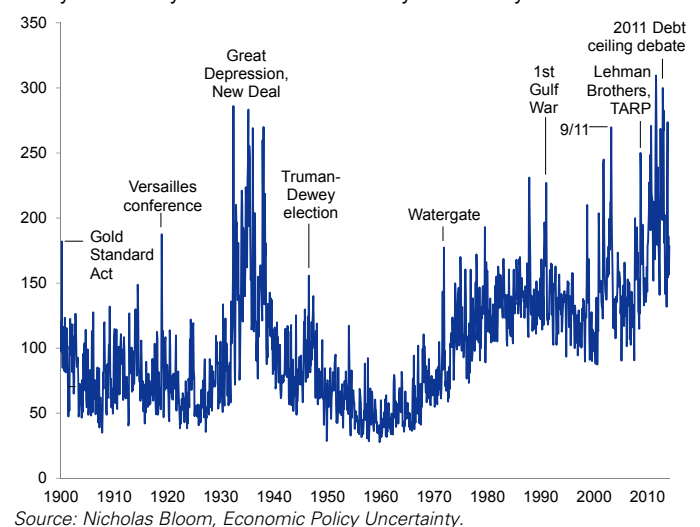
Nicholas Bloom: Indeed, conditions for investment are currently very good with low interest rates, falling uncertainty and stable growth, but we are not seeing any investment rebound. One explanation might be that investment is going to bounce back and we just need to wait a bit longer. Another explanation might be that investment is picking up, but offshore. And another – and, in my view, most likely – explanation is that the nature of investment has changed and is no longer being well captured by traditional measures of physical investment in plants, vehicles and buildings, which are dwindling in importance. Instead, the key types of investment today are in software, knowledge, organizational capital and human capital, which are probably rebounding but are more intangible and hard to measure. So the lack of observed investment rebound probably more reflects that we are looking at the wrong thing, not that the investment isn't happening.

Allison Nathan: There is a concern that low uncertainty as reflected in low volatility breeds complacency and excessive risk-taking. Is that concern warranted?

Nicholas Bloom: Possibly, although there is no strong evidence for this. It is one of many possible ex-post rationalizations for the great recession. But there are a lot of other explanations for the recent recession and financial crisis, like poor governance, bad policy and excessive leverage. History just has too few incidents of low volatility to conclude that low volatility generates crises. In fact, low volatility is actually a good predictor of future low volatility, so it is really not obvious that low volatility predicts anything more than more low volatility.

Economic policy uncertainty rising since the 1960s

Policy uncertainty index based on monthly news analysis



Allison Nathan: But couldn't one argue that high uncertainty is beneficial in that it engenders caution and reduces the risk of excessive risk-taking?

Nicholas Bloom: Living in Silicon Valley, I am used to people seeing risk-taking as a driver of growth. Technology, pharmaceuticals, biotech, oil exploration – all very successful industries – are based on risk-taking. This type of risk-taking is probably aided by periods of macro stability, but we do not think of it as excessive. Unfortunately, a lot of poor risks were taken in the financial sector in the 2000s. But I do not see that so much as an outcome of lower uncertainty leading to complacency, but simply bad management that allowed banks to make inappropriate loans that generated a housing boom and bust.

Allison Nathan: Do you think that the current low-vol environment can persist?

Nicholas Bloom: The fact that volatility is well below its long-run average right now suggests that there is not much downside risk and a lot of upside risk for volatility. So if I had to forecast volatility right now, my bet would be that it heads higher. Many political or other events could send volatility higher – another US political crisis, war in Ukraine or the Middle East, instability in South America or East Asia, or a major natural disaster, to name a few. Looking at history we see these types of events as more or less random occurrences that hit the world's markets and economies every five years or so. But right now it seems like the markets are not pricing in much likelihood of this.

"Vol seasons" to mark your calendars

Jose Ursua assesses puzzling seasonal patterns of volatility by month, day, and type of data period

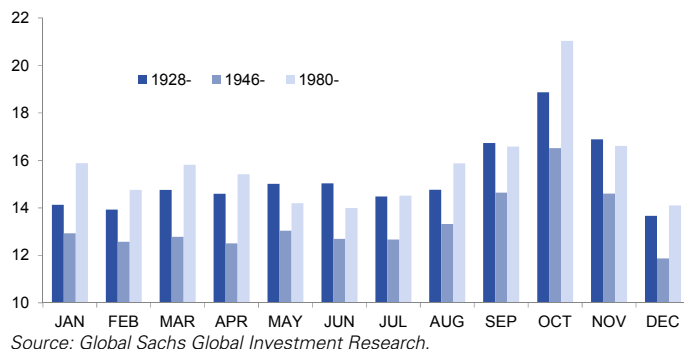
There are a few "market anomalies" affecting the seasonality of stock returns that have captured some investor attention, like the day-of-the-week effect or the January effect, for example. They are called anomalies because – according to financial theory – the market should arbitrage away the regularity of such patterns. But in reality, it does not. We ask whether similar patterns exist with respect to market volatility. And the answer is yes: they exist and are equally puzzling.

Monthly patterns: Fall is the season of vol

We start by looking at average volatility (of S&P 500 daily returns) over the course of the year, split by month. If the arbitraging away argument were right, we would not expect to see major differences across months. Yet we find the opposite – volatility tends to be steady in the spring and summer, considerably higher in the fall, and relatively lower in the winter. Indeed, the averages for those periods since 1928 are as follows: March through August (14.8%), September through November (17.5%), and December through February (13.9%). For the whole year, average volatility stands at 15.2%, so in effect there are substantial intra-year "Vol Seasons," which do not change much depending on which historical period we take.

Volatility spikes in the fall, freezes in winter...

Average annualized volatility per day by historical sample, %



The famous adage, "Sell in May and go away; don't come back till St Leger Day," is based precisely on the notion that investors would go away for the summer, volumes would come down, and volatility would rise to uncomfortable levels. The St. Leger Stakes (an English horseracing classic) usually takes place in mid-September, so the pattern would be somewhat off when it comes to volatility – at least with respect to US markets. Our results show that a more proper recipe for volatility traders would be to "Buy in Independence Day and go away; don't come back till Halloween" – or something like that.

Daily patterns: Not so smooth coming back from the weekend

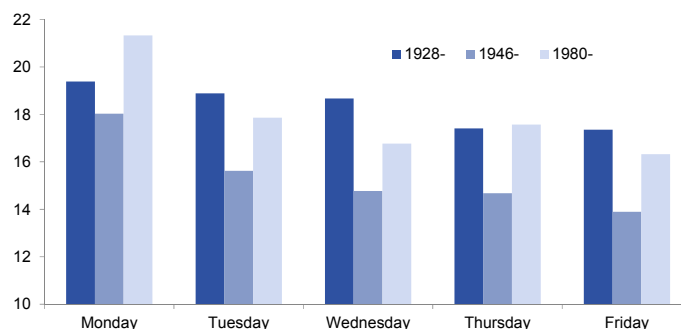
We then look at average annualized volatility by day of the week. We find that volatility is highest at the beginning of the week, and then declines towards Friday. For the three historical periods, Monday through Friday volatility goes from: 19.4% to 17.4% (since 1928), 18.0% to 13.9% (since 1946), and 21.3% to 16.3% (since 1980). One could argue that some historical events that occurred at the beginning of the week are to blame for these patterns – like Tuesday 9/11 2001, Black Monday of October 1987, and Black

Tuesday of October 1929. But excluding them does not materially alter the patterns.

We also find that volatility is highest at the turn of the month, with two intra-month spikes: one around the 11th and another one around the 22nd-23rd. The bottom line appears to be that markets get relatively more nervous at the turn of the week and at the turn of the month. At least partially, these patterns could reflect some Monday blues on the one hand and portfolio-rebalancing sprees on the other.

...and tends to be relatively higher earlier in the week

Average annualized volatility per day by historical sample, %

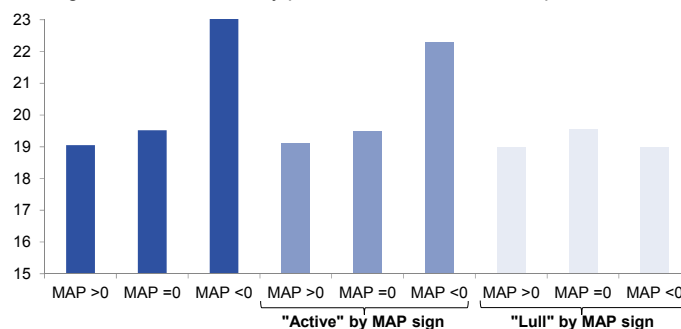


Data patterns: Bad news makes markets nervous

Finally, we look at how volatility behaves around data surprises. We find that volatility is substantially higher around data misses (when our MAP indicator – which is higher, equal, or lower than zero when prints exceed, match, or undershoot consensus, respectively – is negative). Moreover, that spike happens almost exclusively in the midst of what we have called "Active" data periods of the month (running from Philly Fed to Non-farm Payrolls, the most intense period in terms of data releases). In contrast, "Lull" periods (when there are fewer data releases) show more boring patterns, regardless of the sign of MAP.

Bad news moves markets, especially in "Active" periods

Average annualized volatility per month for different samples, %



Keep "Vol Seasons" in mind, but trust fundamentals

For an infinitely-lived investor, exploiting market anomalies can be profitable. But for regular investors with shorter horizons, the strategy is somewhat riskier – since patterns *tend* to materialize, but *do not always*. In the end, "Vol Seasons" are something to keep in mind, but fundamental analysis should stay in the driver's seat.

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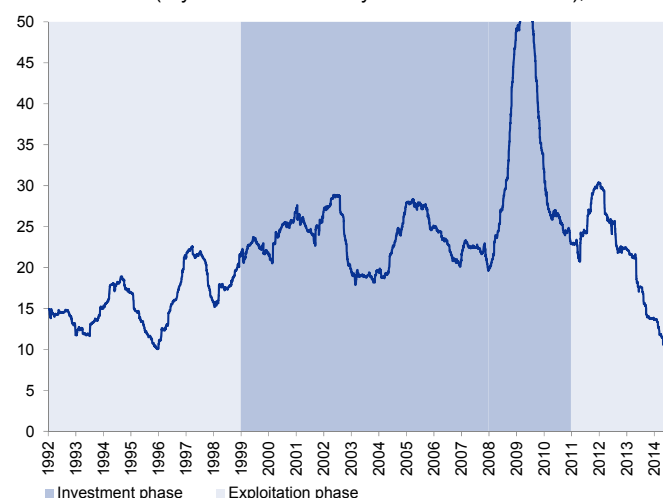
Supply keeping a lid on commodity vol

Damien Courvalin discusses how the intersection of the business cycle and the commodity supply cycle are set to keep commodity vol low – but the physical nature of commodities poses real risks to this view

Escalating violence in Iraq has pushed crude oil volatility higher in recent days. But even despite these concerning events, crude oil volatility remains at the very low end of historical ranges as the current intersection of the recovery phase of the business cycle and the “exploitation phase” of the commodity supply cycle – characterized by spare production capacity – has pushed commodity price volatility sharply lower in recent years. Unprecedented central bank monetary policies and the unwinding of such policies, combined with the scalability and flexibility of shale extraction, have exacerbated the volatility-dampening features of these business and commodity supply cycles. As a result, volatility of commodities like oil and copper reached record-low levels in 2014. These factors suggest that volatility will remain low over the next few years assuming that geopolitical dynamics like the current situation in Iraq do not overwhelm these ongoing cyclical and structural forces.

Volatility rises during investment, falls during exploitation

Annualized vol (1-yr realized vol of 1-yr forward WTI futures), %



Source: Global Sachs Global Investment Research.

The background: what drives commodity price volatility?

There are two sources of commodity price volatility: Cyclical and structural volatility, which dominate on different horizons:

Cyclical commodity volatility – reflected in movements in near-term commodity prices – is driven by current fundamentals such as the balance between supply and demand today as well as the level of inventories. Cyclical volatility tends to be highest when inventories are at extremes – either at historically low or historically high levels. Not surprisingly, cyclical volatility also exhibits a clear pattern over the phases of the business cycle. It is highest when economic activity is either at its peak and/or just beginning to slow – i.e. at the end of the business cycle when the economy is overheating and commodity shortages tend to be more prevalent – or when economic activity is contracting and demand is collapsing faster than supply, leaving the commodity markets oversupplied. Conversely, cyclical volatility is lowest during the recovery phase of

the business cycle following a recession, when demand is rising but ample supplies that were built up during the downturn are available to meet this demand. We are currently in the midst of such a less-volatile recovery phase in the business cycle.

Structural commodity volatility – reflected in movements in long-term commodity prices (prices of deferred commodity contracts) – is driven by the level of uncertainty about future commodity supply. It is highest when spare production capacity has been exhausted and the economics of future extraction are most uncertain – the “investment phase” of the commodity cycle. Conversely, once new production techniques become viable and scalable, new spare production capacity re-emerges, leading to the “exploitation phase” of the supply cycle typically characterized by stable long-term commodity prices. Meaningful investment in shale and deep water energy production capacity during an investment phase that lasted from 1999 to 2011 – on top of a substantial build-out in production capacity for several metals and other commodities – has now generally left us in the early stages of this less volatile exploitation phase of the commodity supply cycle.

Perfect storm for low volatility

Specific – and in some cases, unprecedented – aspects of the current phases of the business and commodity supply cycles are likely to amplify the volatility-dampening features of these phases. In terms of the business cycle, the extraordinary policies that monetary authorities have implemented throughout this recovery phase to stabilize growth have exacerbated the lack of economic and commodity demand volatility and, in turn, commodity price volatility. Notably, the unwinding of these extraordinary policies as Developed Market (DM) growth improves could reinforce these dynamics. Pressure on Emerging Market (EM) assets and economies (particularly those that have built up large deficits off the back of a surge in yield-searching flows in recent years) has already led countries like Brazil, India and Indonesia to cut subsidies on domestic fuel prices, which triggered a sharp decline in fuel demand. These moves have effectively turned the EM countries, which have dominated global commodity demand growth for more than a decade, into marginal – and much more elastic – consumers. In turn, DM countries are now driving global commodity growth, but at a much slower – and less volatile – pace.

In terms of the supply cycle, shale technology provides unprecedented elasticity in adjusting supply to meet demand fluctuations. Unlike other oil extraction techniques, shale is similar to a manufacturing process, with a short turn-around time and an infrastructure that can be recycled quickly. As a result, it is likely the most important driver behind the collapse in structural oil price volatility in recent years.

The geopolitical wildcard

Of course, geopolitical developments in key commodity producers will continue to exert a significant influence on commodity price volatility, irrespective of the phase of the business and supply cycles. After all, it is the physical nature of commodity markets that differentiates them from all of the rest. Indonesia’s recent ban on nickel exports, which sent nickel prices and volatility soaring, and the recent rise in oil price volatility following the escalating violence in Iraq are timely reminders of this differentiation.

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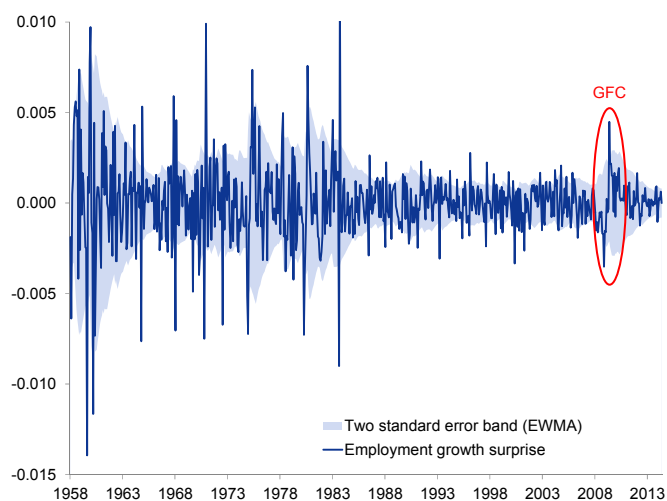
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Low volatility in pics

A special thanks to the Global Economics team and Krag Gregory for these pics.

2008-2009 only a brief interruption to the Great Moderation

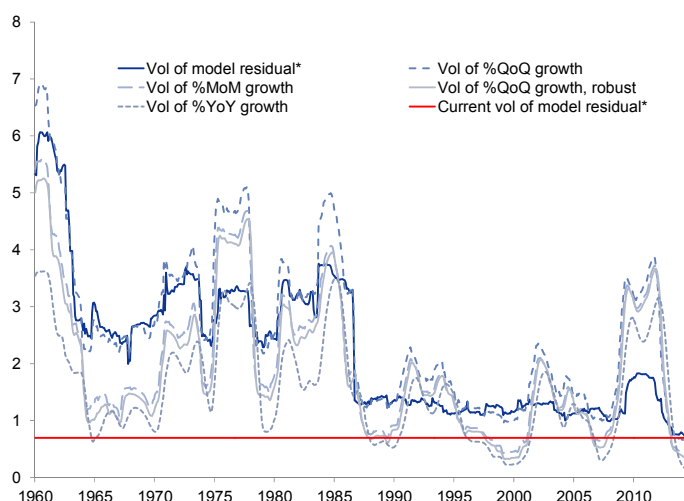
Log deviation from model-implied monthly growth



Source: Goldman Sachs Global Investment Research.

Volatility of US employment growth at 50-year lows

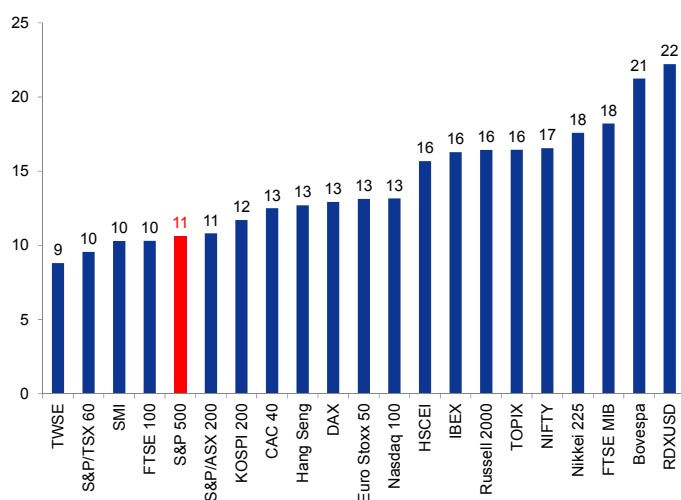
Standard deviation of annualized growth



*Our preferred measure, which is an "unobserved components model" that removes a flexible trend and autoregressive components.
Source: Goldman Sachs Global Investment Research.

Most of the world's equity indices experiencing low vol

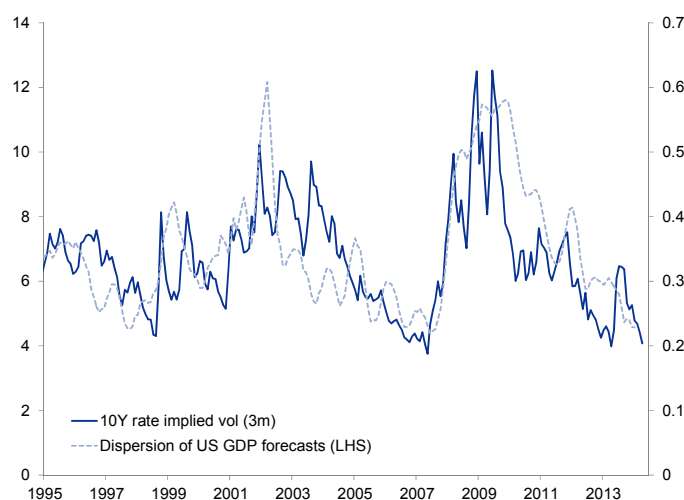
3m implied volatility, %



Source: Goldman Sachs Global Investment Research.

More GDP forecast dispersion = more rate vol

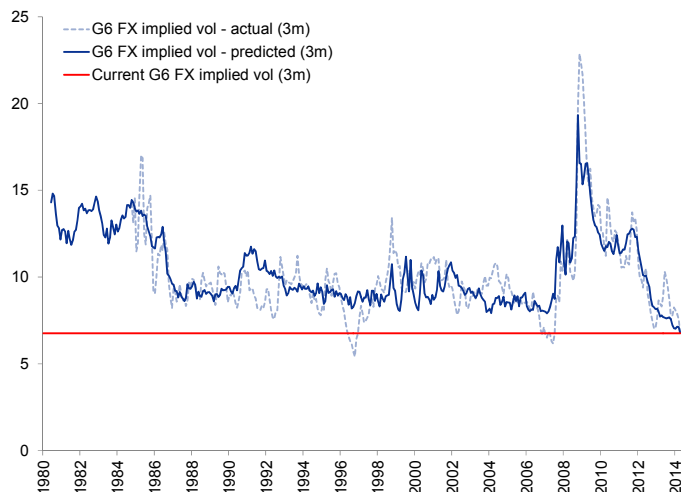
%



Source: Goldman Sachs Global Investment Research.

Current low vol comparable to pre-crisis lows in FX

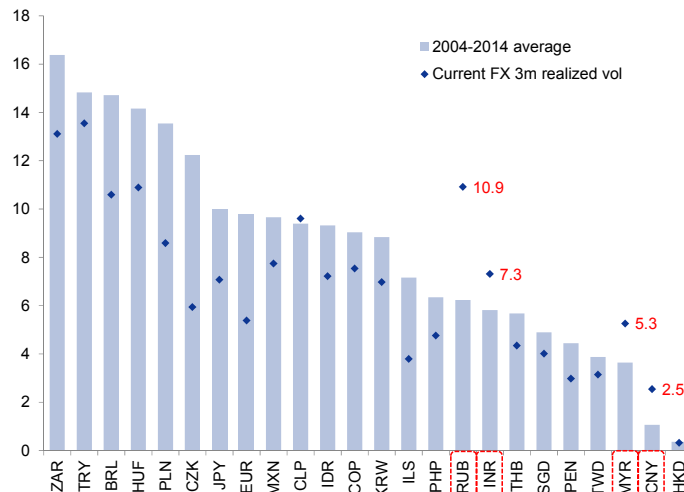
%



Source: Goldman Sachs Global Investment Research.

Subdued vol in EM currencies, with some exceptions

%



Source: Goldman Sachs Global Investment Research.

Snapshot of our key forecasts

	GDP Growth (% yoy)						FX						Equity						Rates (% eop)						Revision Notes
	2014			2015			3-mth			12-mth			3-mth			12-mth			Policy			10-yr			
	GS	Cons		GS	Cons		GS	Cons		GS	Cons		GS	Cons		GS	Cons		2014	2015	2014	2015			
Global	3.2	3.2		3.8	3.7		-	-		-	-		-	-		-	-		-	-	-	-	We slightly reduced our global GDP growth forecasts owing to weak 1Q GDP data from some major economies, particularly the US.		
US	EUR/\$						SP500						SP500						0.13						We decreased US GDP growth forecasts after 1Q GDP was revised lower than expected to -1.0%, mainly due to weaker inventory investment. But broader indicators of economic activity show US GDP growing above trend in the recent period.
	2.1	2.2		3.1	3.1		1.38	1.35		1.30	1.29		1925	-		2000	-		0.13	0.13	3.25	3.75			
EURO AREA	EUR/\$						Eurostoxx 50						Eurostoxx 50						0.15						
	1.0	1.1		1.5	1.5		1.38	1.35		1.30	1.29		3450	-		3700	-		0.15	0.15	-	-			
GERMANY	EUR/\$						DAX						DAX						-						3.00
	2.3	2.0		2.1	2.0		1.38	1.35		1.30	1.29		-	-		-	-		-	-	2.25				
CHINA	\$ /CNY*						HSCEI						HSCEI						4.25						
	7.3	7.3		7.6	7.1		6.16	6.19		6.15	6.08		-	-		12000	-		4.25	4.50	-	-			
BRAZIL	\$ /BRL						BOVESPA						BOVESPA						11.00						We lowered our 2014 GDP growth forecasts to 1.3% from 1.8% on May 30 and again to 1.1% on June 13 on large declines in consumer and business confidence, high inflation, and data signaling weak 2Q activity in industry, retail, and services.
	1.1	1.7		2.0	2.0		2.30	2.33		2.55	2.45		-	-		-	-		11.00	12.50	-	-			
JAPAN	\$ /JPY						TOPIX						TOPIX						0.10						We raised our 2014 GDP growth forecast to 1.5% from 1.3% after a surprisingly strong upward revision to 1Q GDP to 6.7% from 5.9% (which led to a slight downward revision to our 2015 forecast due to base effects). But a drop in disposable income since the tax hike in April may hamper growth going forward.
	1.5	1.5		1.2	1.2		103	104		110	109		1250	-		1450	-		0.10	0.10	1.00	1.25			
Commodities	Brent crude oil (\$/bbl)						Copper (\$/mt)						Gold (\$/toz)						Com (\$/bu)						Revision Notes
	3-mth			12-mth			3-mth			12-mth			3-mth			12-mth			3-mth			12-mth			
	GS	Cons		GS	Cons		GS	Cons		GS	Cons		GS	Cons		GS	Cons		GS	Cons	GS	Cons			
	105	106		100	103		6600	-		6600	-		1195	-		1050	-		4.50	-	4.00	-			

Note: Recent revisions marked in red. GDP consensus is Consensus Economics, all other consensus is Reuters, commodity 12-mo consensus is Reuters for 2015 average.

* CNY daily fix

Source: Goldman Sachs Global Investment Research.

Glossary of GS proprietary indices

Current Activity Indicator (CAI)

Measures the growth signal in the major high-frequency activity indicators for the economy. Gross Domestic Product (GDP) is a useful but imperfect guide to current activity. In most countries, GDP is only available quarterly, is released with a substantial delay, and initial estimates are often heavily revised. GDP also ignores important measures of real activity, such as employment and the purchasing managers' indexes (PMIs). All of these problems reduce the effectiveness of GDP for investment and policy decisions. Our CAIs are alternative summary measures of economic activity that attempt to overcome some of these drawbacks. We currently calculate CAIs for the following countries: USA, Euro area, UK, Norway, Sweden, China, Japan, Hong Kong, India, Indonesia, Malaysia, Philippines, Singapore, South Korea, Taiwan, Thailand, Australia and New Zealand.

Financial Conditions Index (FCI)

Financial conditions are important because shifts in monetary policy do not tell the whole story. Our FCIs attempt to measure the direct and indirect effects of monetary policy on economic activity. We feel they provide a better gauge of the overall financial climate because they include variables that directly affect spending on domestically produced goods and services. The index includes four variables: real 3-month interest rates, real long-term interest rates, real trade-weighted value of the exchange rate and equity market capitalization to GDP.

Global Leading Indicator (GLI)

Our GLIs provide a more timely reading on the state of the global industrial cycle than the existing alternatives, and in a way that is largely independent of market variables. Global cyclical swings are important to a huge range of asset classes; as a result, we have come to rely on this consistent leading measure of the global cycle. Over the past few years, our GLI has provided early signals on turning points in the global cycle on a number of occasions and has helped confirm or deny the direction in which markets were heading. Our GLI currently includes the following components: Consumer Confidence aggregate, Japan IP inventory/sales ratio, Korea exports, S&P GS Industrial Metals Index, US Initial jobless claims, Belgian and Netherlands manufacturing surveys, Global PMI, GS Australian and Canadian dollar trade weighted index aggregate, Global new orders less inventories, Baltic Dry Index.

Goldman Sachs Analyst Index (GSAI)

Our US GSAI is based on a monthly survey of Goldman Sachs equity analysts to obtain their assessments of business conditions in the industries they follow. The results provide timely "bottom-up" information about US economic activity to supplement and cross-check our analysis of "top-down" data. Based on their responses, we create a diffusion index for economic activity comparable to the ISM's indexes for activity in the manufacturing and nonmanufacturing sectors.

Growth Environment Score (GES)

The Growth Environment Scores (GES) are our measure of growth conditions covering more than 180 countries, starting in 1997. They are designed to capture important features of the economic, political and institutional environment that affects productivity performance and growth.

Macro-data Assessment Platform (MAP)

Our MAP scores facilitate rapid interpretation of new data releases. In essence, MAP combines into one simple measure the importance of a specific data release (i.e., its historical correlation with GDP) and the degree of surprise relative to the consensus forecast. We put a sign on the degree of surprise, so that an underperformance will be characterized with a negative number and an outperformance with a positive number. We rank each of these two components on a scale from 0 to 5, and the MAP score will be the product of the two, i.e., from -25 to +25. The idea is that when data are released, the assessment we make will include a MAP score of, for example, +20 (5;+4)—which would indicate that the data has a very high correlation to GDP (the '5') and that it came out well above consensus expectations (the '+4')—for a total MAP value of '+20.' We currently employ MAP for US, EMEA and Asia data releases.

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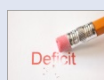
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Source of photos: www.istockphoto.com, NOAA-NASA GOES Project.

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Reg AC

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