Goldman Sachs | Global Macro Reseach

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TOP of MIND

GEOPOLITICAL RISKS

Escalating geopolitical tensions (think North Korea, cyber-attacks, instability in the Middle East) are Top of Mind, yet markets have barely flinched. We ask US Ambassador Christopher Hill if geopolitical concerns are overblown (no, and certainly not when it comes to nuclear weapons). Both Hill and Chinese foreign policy scholar Ren Xiao share their views on how to rein in one of the most pressing threats today: North Korea's nuclear ambitions. We then explore the disconnect between high geopolitical/other risks and low market volatility (seen even in highly exposed South Korean assets). Sandy Rattray, Man Group CIO and co-inventor of the VIX, comments on the market psychology behind this, as well as on the risks that current trading trends (passive investing, vol selling) pose to investors and markets should a tail event materialize. Finally, we explore implications for the assets seemingly most exposed to geopolitics: Defense and Cyber stocks, as well as gold.

"Experience with other countries such as Pakistan suggests that when countries are sanctioned, they speed up rather than slow down their nuclear programs.

- Christopher Hill, former Assistant US Secretary of State for East Asian and Pacific Affairs

The very low-volatility environment today will end at some point, although it is very hard to forecast why and when that will happen."

- Sandy Rattray, CIO, Man Group

WHATS INSIDE

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Macro news and views

US

Latest GS proprietary datapoints/major changes in views

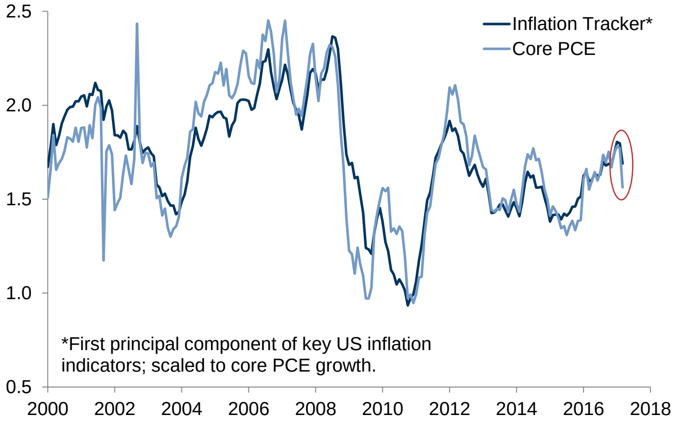
- Following weaker core inflation in March/April, we lowered our subjective odds of a June rate hike to 80% from 90%. Given the coinciding upside surprise in labor market strength, we continue to expect two hikes this year and an announcement of balance-sheet runoff in December.

Datapoints/trends we're focused on

- Rising recession risk over the medium term, given that the current expansion is already the third-longest on record.
- Momentum on healthcare reform, which reduces the odds that Congress will enact a tax cut before year-end.

Inflation inflection?

GS US inflation tracker, % change, year ago



Source: Goldman Sachs Global Investment Research.

Japan

Latest GS proprietary datapoints/major changes in views

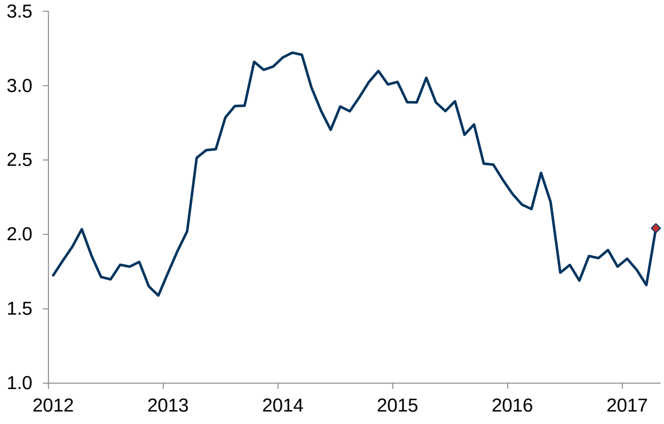
- No major changes in views.

Datapoints/trends we're focused on

- Upward revisions to exports and personal spending, pushing up our Q1 GDP tracking estimate to 1.7% qoq ann.; positive growth in Q1 would mark the first time in 11 years that Japan sees five consecutive quarters of sequential growth.
- A recent surge in household inflation expectations, likely reflecting various price hikes implemented this fiscal year.
- Government efforts to reshape Japan's trade strategy.

Onward and upward

Japan household expectations for inflation one year ahead, %



Source: Cabinet Office of Japan.

Europe

Latest GS proprietary datapoints/major changes in views

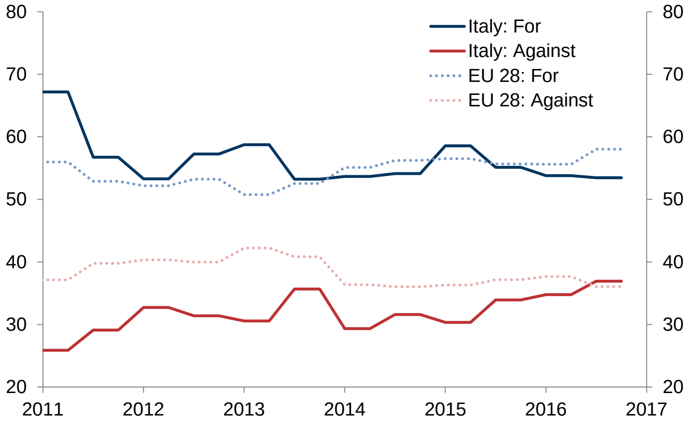
- No major changes in views.

Datapoints/trends we're focused on

- Upcoming elections in the UK, which could have implications for the Brexit process, and in France, where the president's party will need a parliamentary majority to enact reforms.
- Tensions resulting from negative interest rates such as solvency challenges for insurers and higher house prices.
- Vulnerabilities in Italy, where sovereign debt levels remain high and Euroskeptic populism threatens political stability.

Italy's worrying trend

Support for the euro, % responding "for" or "against"



Source: Eurobarometer, Goldman Sachs Global Investment Research.

Emerging Markets (EM)

Latest GS proprietary datapoints/major changes in views

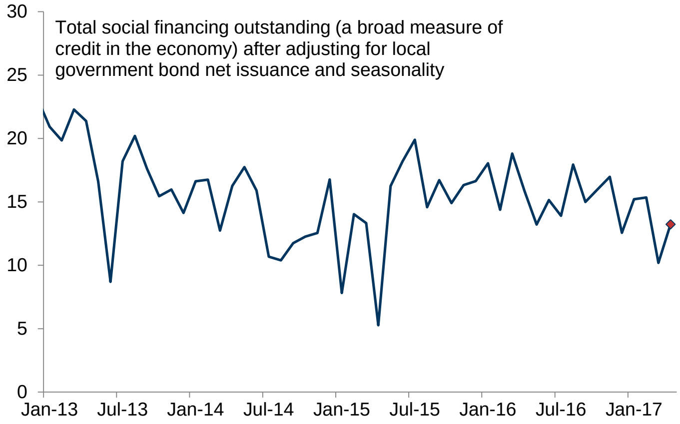
- No major changes in views.

Datapoints/trends we're focused on

- Downside surprises to key indicators of China activity in April; meanwhile, a rebound in credit growth suggests policymakers may be moderating their hawkish stance.
- A broad-based recovery in global trade—an important theme for small, open EM economies in particular.
- Lower inflation in key Latin American economies, opening up space for monetary easing, particularly in Brazil/Colombia.

Signs of a slight policy shift

China's total social financing outstanding, % change annualized



Source: PBOC, WIND, Goldman Sachs Global Investment Research.

Geopolitical risks

Escalating tensions around North Korea's nuclear ambitions, increasingly prolific and sophisticated cyber-attacks, and souring US-Russia relations—not to mention ongoing instability in the Middle East—have made geopolitical risk Top of Mind. In fact, a recent Goldman Sachs survey showed that one-fifth of investors saw North Korea developments as the US political issue that would have the most impact on markets in May, second only to tax reform.[1] Yet risky assets have generally performed well amid these geopolitical concerns (even the KOSPI is up about 13% YTD). So are concerns about geopolitical issues—and North Korea in particular—overblown? Or is it simply that the markets don't care?

We ask the first question to US Ambassador Christopher Hill, whose past diplomatic postings include South Korea and Iraq. In his view, geopolitical risk *is* elevated right now, creating a number of strategic challenges that the Trump administration is not fully equipped to handle. Looking across the many threats to international security today, from terrorism to armed conflict, Hill argues that weak or uncertain command and control over nuclear weapons is the most worrisome. And nuclear advances in North Korea under a leader who "has little interest" in US or Chinese opinions mean this threat has grown considerably.

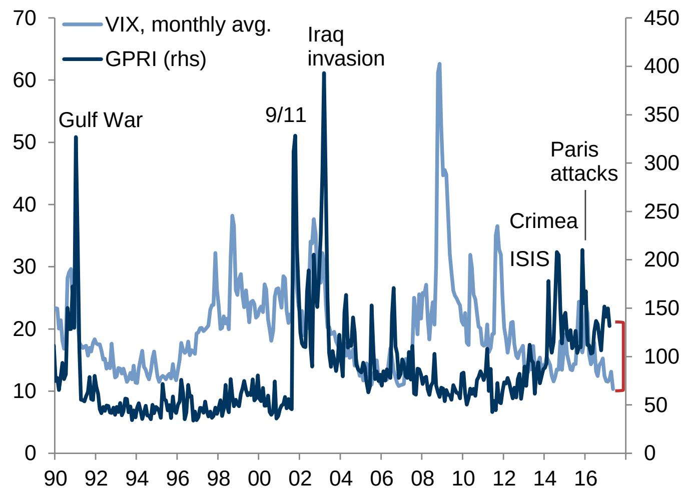
Having led the US delegation in six-party talks with North Korea in the mid-2000s, Hill commends the Trump administration's focus on the issue but acknowledges that the potential for retaliation limits prospects for US action against Pyongyang. He argues that China must do more to rein in North Korean nuclear ambitions, but that sanctions alone may not work; in fact, they may accelerate nuclear weapons development. Rather, multi-tiered pressure from China together with the United States would provide the best chance of a denuclearized North Korea.

Given the pressure on China to take a major role in reining in North Korea, we also interview Ren Xiao, Director of the Center for the Study of Chinese Foreign Policy at Fudan University, for Beijing's perspective. He believes many in China's foreign-policy community see North Korea as a *genuine* security risk and only a *nominal* ally. But he asserts that China alone should not be expected to solve the North Korean issue. And Beijing's willingness to do so in cooperation with Washington has arguably waned given the decision to deploy the Terminal High Altitude Area Defense (THAAD) system in South Korea. In his view, the *United States* and North Korea must do the hard work of negotiating a diplomatic solution.

So with all this tension around North Korea, assets in the region must be selling off, right? Not so much. In fact, the KOSPI reached an all-time high last week, and the trade-weighted KRW shows little sign of recent tensions. What gives? GS Co-Chief Markets Economist Charlie Himmelberg and Senior Asia Economist Goohoon Kwon believe that markets have become accustomed to geopolitical tensions waxing and waning, with rewards (usually) going to those investors who buy the dips. This mentality seems to be prevailing today, as even the most convincing evidence of markets pricing North Korea risk—elevated KRW/USD skew—looks somewhat modest.

Mixed signals

VIX vs. Geopolitical Risk Index (rhs)



Source: Bloomberg; Dario Caldara and Matteo Iacoviello, Federal Reserve Board. See also https://www2.bc.edu/matteo-iacoviello/gpr.htm.

We sat down with Sandy Rattray, co-developer of the VIX and now the CIO of Man Group, to dig further into the seeming disconnect between high geopolitical and other risks and exceptionally low volatility, as well as the potential for popular trading strategies (think passive investing or volatility selling) to exacerbate market reactions to a tail-risk episode. In short, he believes volatility has remained low because some of the most-watched "tail events" have so far turned out better for markets and economies than many observers expected (think Brexit). While he does not see shifts in trading strategies creating distortions in the market, he cautions that short-vol strategies pose significant risks if not managed appropriately. He strongly believes that the current low-vol environment is not a "new normal," meaning that investors who aren't prepared for its eventual end—whether through their asset allocation mix or more direct hedging strategies—are very likely to fare poorly.

We also look into an obvious set of assets tied to geopolitical risk: Defense and Cybersecurity stocks, and gold. GS Aerospace and Defense Analyst Noah Poponak observes a clear relationship between geopolitical escalations and defense spending, but reminds us that the defense budget was already inflecting from its recent trough, a key driver behind his Attractive view on the Defense sector. Security Software Analyst Gabriela Borges highlights two stocks exposed to cyber: FEYE and VRNT. And Jeff Currie and Mikhail Sprogis of GS Commodities Research ask whether gold is truly a good geopolitical hedge. Their answer: It can be if the event involves currency debasement, but implementation is important.

To end on a positive note, Chief Japan Equity Strategist Kathy Matsui revisits one source of geopolitical tension that has potential to be resolved—a territorial dispute between Japan and Russia—and the investment opportunities that may follow.

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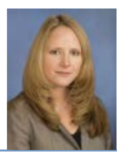

[1] Goldman Sachs Securities Division Marquee QuickPoll conducted May 3-4 2017, reflecting the views of 1,088 clients.

Interview with Christopher Hill

Ambassador Christopher Hill served as Assistant Secretary of State for East Asian and Pacific Affairs from 2005 until 2009, during which time he was the head of the US delegation to the Six Party Talks on the North Korean nuclear issue. He also served as US Ambassador to Iraq (2009-2010), the Republic of Korea (2004-2005), Poland (2000-2004), and the Republic of Macedonia (1996-1999), and as Special Envoy to Kosovo (1998-1999). In addition, he was Special Assistant to the President and Senior Director on the staff of the National Security Council (1999-2000). He is currently the Dean of the Josef Korbel School of International Studies at the University of Denver. Below, he argues that nuclear weapons in uncertain states poses a greater threat than terrorism, and emphasizes that the US and China must work together to rein in the North Korean threat.

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

Allison Nathan: There is a sense that geopolitical risk is elevated today. Do you agree?

Christopher Hill: I do think geopolitical risk has risen. Obviously, there are a number of hotspots around the world. In particular, the lack of consensus within the Sunni world about what the relationship should be between Arab nation-states and a more radicalized version of Sunni Islam has generated considerable instability in parts of the Middle East. But I believe that the threat posed by nuclear weapons in the hands of states such as Pakistan, Iran—where nuclear development has been checked but not permanently—and North Korea is a bigger problem than the threat posed by Sunni Arab terrorism. Even in the worst days of the Cold War, both the United States and Russia had very strong command and control over their nuclear weapons capabilities. I am not sure that is the case in these other countries today.

Allison Nathan: How do you rate the threat North Korea poses now relative to the past?

Christopher Hill: The threat has grown considerably. Although the North Koreans have, to our knowledge, never married a nuclear device with a missile, they conducted two nuclear tests in 2016 alone—and they seem ready to conduct another this year. In 2016 they also began testing a new generation of solid-fuel missiles, including the Musudan rocket, which can be stood up and fired much more quickly than the liquid-fuel rockets they have had for some time. This makes it much more challenging to address any missile threat before launch. So if the North Koreans succeed in miniaturizing their nuclear devices and using them as warheads on solid-fuel missiles, we would have to be on a hair trigger to respond.

In addition, the North Koreans have made some progress on developing multi-stage missiles, which could enable them to launch nuclear warheads that could reach the continental United States. That is not a reality today but it's pretty clear that they are trying to make it a reality in the coming years. This dimension would put additional pressure on US leadership. For example, if the United States joined its South Korean ally in responding to a North Korean attack on South Korea, the US administration would have to consider the risk of a retaliatory attack on US soil. Lastly, all of these developments are occurring under Kim Jong-un, who has little interest in what the United States and China think, unlike his father who seemed to be much more solicitous of Chinese concerns in particular. That in and of itself increases the North Korean threat.

Allison Nathan: Does President Trump's more aggressive rhetoric on North Korea advance US interests?

Christopher Hill: The Trump administration is rightly concerned about North Korea. And it understandably wants to address the issue now rather than risk having to acknowledge to the American people in 2020 that under Trump's stewardship North Korea was able to mount a nuclear threat to the United States. But politics aside, trying to convince North Korea that it could be subjected to an attack if it doesn't desist can be helpful. If you suggest that you're not prepared to use any kind of force against an emerging threat, then you encourage that threat. On the other hand, this is a dangerous strategy. Should North Korea call the United States' bluff, it could retaliate with attacks on population centers in South Korea and/or US interests. In that scenario, I think the United States would regret having attacked North Korea in the first place. So to some extent, I think the Trump administration is using an old formula of strategic ambiguity, making it difficult to discern what it would do or would not do.

So far, North Korea seems to have pulled back from testing another nuclear weapon. But despite assurances from US Secretary of State Rex Tillerson that the United States is only interested in an end to North Korea's nuclear program—not regime change—there is no indication that Pyongyang is planning to withdraw from the development of nuclear weapons. So the situation remains a tinderbox.

Allison Nathan: To what extent does reining in North Korea depend on China's actions? How much influence does China really have over North Korea?

Christopher Hill: At first, the Trump administration suggested it would completely outsource this issue to China. But it's pretty clear that China cannot address this by itself; the United States and China must cooperate to resolve the problem, which I think the Trump administration now understands.

I think China does have influence; in recent years, more and more of North Korea's trade has been concentrated with China. So should China decide, for example, to cut off all shipments of refined fuel to North Korea or to extend its ban on purchases of

North Korean coal—which would curtail North Korea's ability to buy other vital imports—that would hurt North Korea considerably. But the key question is whether using this type of leverage will induce North Korea to pull back its nuclear development. Experience with other countries such as Pakistan suggests that when countries are sanctioned, they speed up rather than slow down their nuclear programs. So it's not at all clear that sanctions enforcement from China would be sufficient or would even lead North Korea in the right direction.

Allison Nathan: Should China be doing more?

Christopher Hill: Yes. China needs to do more than simply follow the UN sanction regimes. It needs to pursue a broader strategy that clearly communicates that Beijing will not tolerate North Korea's development of nuclear weapons; it needs to activate its networks within North Korea and engage in a way that will impair North Korea's capacity to produce these weapons of mass destruction. In effect, China needs to keep North Korea guessing as to whether it would intervene in a more direct way or work with the United States more directly, perhaps via cyber assets or other means. A comprehensive, multi-tiered approach would begin to get North Korea's attention and help make headway towards a nuclear pull back.

Allison Nathan: Given the need for Chinese cooperation, do you agree with the US decision to deploy the THAAD system on South Korean soil over China's objections?

Christopher Hill: The decision to deploy THAAD was the right one. I cannot imagine a scenario in which the United States would refuse to provide our South Korean ally with our best defensive weaponry against the looming North Korean threat. And I think it is up to the United States to make clear to the Chinese that their efforts to pressure the South Koreans to say no to THAAD are not in concert with the overall US policy of trying to work with China to alleviate the North Korean threat.

Allison Nathan: Could new South Korean President Moon Jae-in's more conciliatory stance on North Korea derail US efforts to rein in North Korea's nuclear ambitions?

Christopher Hill: The United States has considerable experience working with Moon Jae-In during his time as Chief of Staff to President Roh Moo-hyun. It is true that Moon wants to test the waters on whether there can be any improvement in the inter-Korean dialogue. Roh had some of the same instincts. Going forward, it will be important for the United States and South Korea to be in close communication and avoid surprises. Moon certainly has the experience to deal with this issue and not in any way damage efforts to denuclearize North Korea.

Allison Nathan: What actions should the United States be taking today to resolve the situation with North Korea?

Christopher Hill: First, we need to engage with the Chinese to make clear that we are not seeking to diminish or harm China's strategic interests and that we need to work cooperatively, whether via embargoes, cyber intervention, or other direct methods. Second, we need to ensure that the new leadership in South Korea is satisfied that the US-South Korean alliance is alive and well. We also need to stay close to the Japanese. So it's going to require a lot of diplomacy, which the Trump administration has shown a willingness to pursue. Key US officials have visited the region, generally offering assurances to our allies. But I think these US leaders need to make clear to President Trump that saying things like the South Koreans need to pay for THAAD or that we need to tear up the US-South Korean Free Trade Agreements is not helpful.

Allison Nathan: Trump has also taken more aggressive actions in Afghanistan and Syria. Is this more aggressive shift appropriate, particularly in Syria?

Christopher Hill: I'd consider the recent attack on the Syrian airbase an effort to punish the Syrian government for its actions and an attempt to reestablish deterrents on the issue of chemical weapons. It was not an effort to further a political agenda in the country or in the region. But having a political policy for Syria is in fact the big challenge for the Trump administration, as it was for the Obama administration.

It is important to understand that there are two ongoing wars in Syria. The first is driven by ISIS and is a war of annihilation; there's no negotiating with ISIS. But the second is a war of succession within Syria that I believe calls for much more cooperation. In my view, just getting rid of Syrian President Bashar al-Assad does not amount to a policy, given that other major actors in the region like Russia and Iran don't subscribe to it—so it's not going to happen—and it wouldn't solve anything anyway. Instead, the United States needs to engage with other interested parties to define what the outcome should be: Should it be a unified Syria within its internationally recognized borders? Should it be a considerably decentralized Syria, or a Syria with a rotating leadership in Damascus? These issues need to be discussed. Encouragingly, Secretary Tillerson seems to want to get more involved on this issue, but I don't see any kind of strategy from the overall Trump administration.

In that context, President Trump's visit to Saudi Arabia on his first trip overseas will be critical. The Saudis have been extremely concerned about US behavior in the Middle East in recent years, namely the flipping of Iraq to a Shia-led country, as well as the US effort to spearhead a nuclear deal with Iran, both of which they viewed as a threat. To have a better sense of what the future in the Middle East—let alone in Syria—will hold, we have to come to some understanding with the Saudis.

Allison Nathan: How does Russia factor into all of this? Are you concerned about the state of US-Russia relations?

Christopher Hill: Certainly with Syria, it is not in our interest to outsource the problem to the Russians or to suggest that we don't have an interest and they do. That would amount to a symbolic US withdrawal from a serious Middle East policy. We need to be a player there and work together with Russia. Secondly, as long as Russia is seen as dominating its "near-abroad"—continuing to pressure Ukraine, for example—I think the concern is not so much Russia but a potential recreation of the Soviet Union. And there too, the United States needs to be very engaged, especially with the eastern flank of NATO. We need to make sure that countries like Ukraine survive because otherwise we will be faced with a whole other unwelcome geopolitical reality. I don't think the Trump administration is particularly well-equipped to deal with these foreign-policy challenges in such strategic terms, but it will inevitably need to.

Lots of tension, little sign of it

Charlie Himmelberg and Goohoon Kwon find that South Korean assets are showing little sign of concern about North Korea's nuclear program, as stronger global growth and low volatility take precedence over geopolitics

Following a series of ballistic missile launches by North Korea earlier this year, the Trump administration's national security team completed a broad review of options on North Korea, concluding that it was time to end the policy of "strategic patience."[2] Soon after, a senior US official was quoted as saying that the "clock has now run out" on Pyongyang.[3] After a failed missile test on April 5, Secretary of State Rex Tillerson issued a terse, 23-word statement that concluded, "The United States has spoken enough about North Korea. We have no further comment." And ahead of his Florida summit with China's President Xi Jingping, President Trump himself warned that "if China is not going to solve North Korea, we will."

Do the tensions *ever* price?

Despite this backdrop of rising geopolitical tension between North Korea and the United States, the KOSPI stock index in South Korea closed at an all-time high last week of 2,296. Looking at the South Korean stock market over the past several months—or the trade-weighted exchange rate, for that matter—it is difficult to see much evidence of the mounting geopolitical tensions.

Do geopolitical tensions on the Korean peninsula *ever* price? The answer: occasionally, but not persistently and not by much. Tensions in the region have waxed and waned for decades. And over most of that history, it has usually rewarded market participants to *fade* negative price moves. Consequently, most investors have come to recognize that until and unless the day comes when war actually breaks out, geopolitical tensions invariably blow over, the market rallies back, and the right trade was to buy the dip. The result is a market psychology that is relatively resistant to the pricing of such geopolitical risk.

Global growth trumps geopolitical concerns

While political commentators warn that this time may in fact be different, markets so far seem to disagree. Korean asset prices reveal little obvious evidence of outsized concern over the recent rise in tensions. The KOSPI is up 13% this year in local-currency terms, and the Korean won is roughly 4% stronger on a trade-weighted basis. Far from struggling, risk sentiment toward South Korean markets appears to be thriving.

A big part of the explanation is likely the fact that a robust repricing of global growth data (to which South Korea has a large exposure) has been large enough to drown out the rise in geopolitical concerns. South Korean exports are booming this year, having risen almost 15% yoy in March following a two-year decline. While higher commodity prices and robust demand for Korean semiconductors account for most of the gains, the evidence still suggests a better global demand environment for exporters. Global growth, together with reduced political uncertainty following the recent South Korean presidential election, has buoyed bourses on the peninsula.

Only small hints of worry

A more nuanced part of the explanation is that the geopolitical risks facing the South Korean economy are less garden-variety moves than extreme tail risks. As such, the price impact of geopolitical concerns should be more visible in derivative markets. There is some evidence that this is indeed the case, but perhaps not as much as first appears.

In the case of the KOSPI, for example, the 25-delta one-month implied volatility rose visibly in April, around the time that geopolitical tensions appeared to be escalating. And the implied KOSPI "skew" (measured as the difference between the implied vols on 25-delta puts and calls) suggested that there was more concern about downside risk to puts than about upside risk to calls. However, European and US equity markets also displayed this same vol pattern. Closer inspection reveals that the more likely driver of these vol moves was concern over the first round of the French elections. Assigning responsibility for market moves is never straightforward.

That said, at a time when global equity volatility is hitting cycle lows, Korean equities show some slight signs of lingering anxiety. While KOSPI implied vol remains low by any historical standard, it nonetheless looks elevated compared to its usual relationship to the level of global volatility. This seems more easily traced to geopolitical concerns, although again, current market pricing is not flashing any obvious warning signs.

The most convincing evidence of geopolitical risk pricing is in the South Korean currency market. Like the equity market, implied volatility on USD/KRW jumped sharply in April. And like equities, this move was also visible in other major FX crosses, like EUR/USD and JPY/USD. But in contrast to the equity markets, our measure of implied KRW/USD skew remains near three-year highs. Moreover, Korean FX skew looks increasingly correlated with our measure of geopolitical risks (the number of articles found on the Bloomberg terminal with words of "North Korea" and "US"). Currency markets, in other words, are now more worried about a sharp devaluation of the won than they have been in years. That said, the magnitude of this concern seems exceedingly modest. If investors are worried about the recent rise in geopolitical risks to the South Korean economy, such concerns are currently swamped by recent improvements in the global growth outlook and record-low levels of global volatility.

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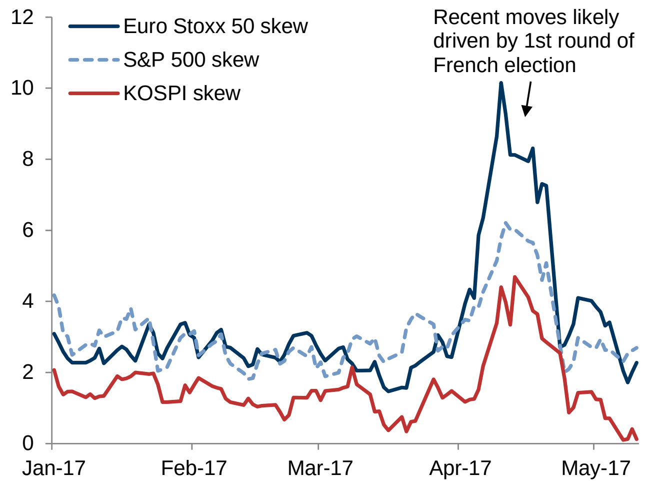
[2] "Trump national security aides complete North Korea policy review: official," Reuters, April 2, 2017.
[3] "North Korea fires missile as US official says 'clock has now run out' on Pyongyang," FoxNews.com, April 4, 2017.

Equity skew: think Paris, not Pyongyang

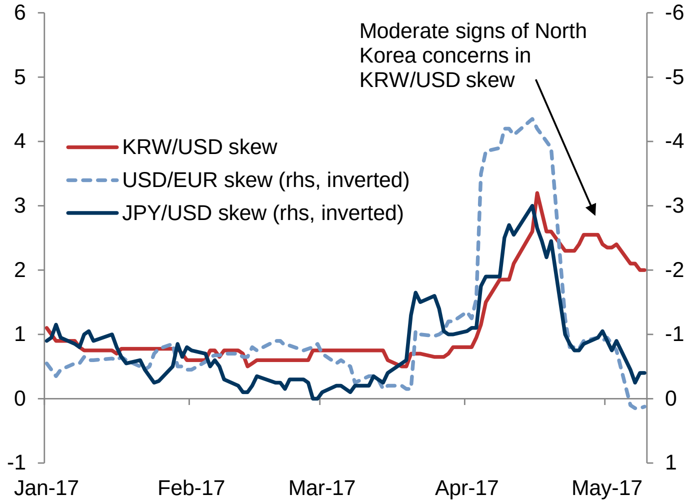
Euro Stoxx 50, S&P 500, and KOSPI skew (one-month 25-delta puts minus one-month 25-delta calls)



Source: Bloomberg, Goldman Sachs Global Investment Research.

Currency skew: more signs of concern

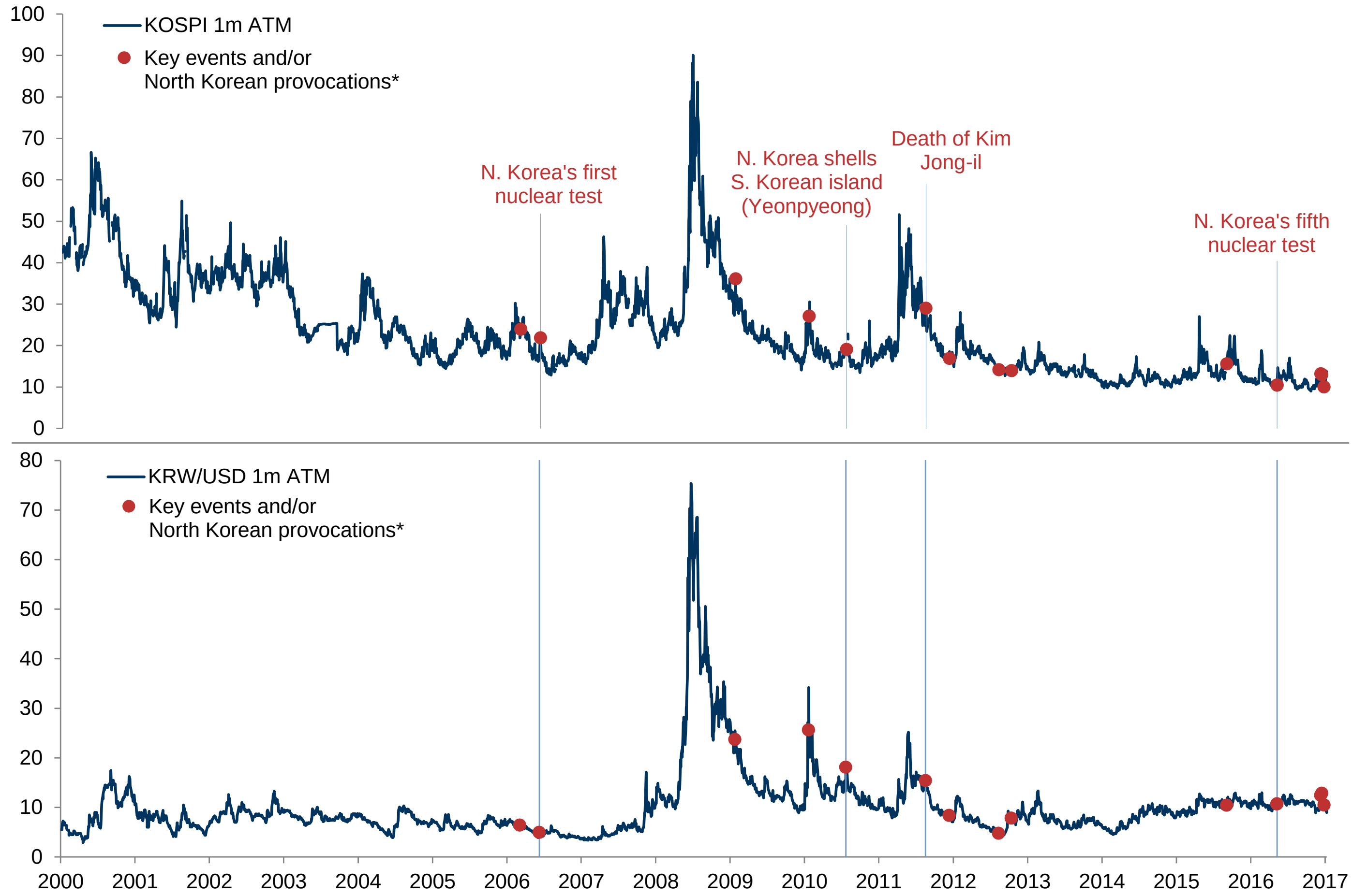
KRW/USD, USD/EUR, and JPY/USD skew (one-month 25-delta calls minus one-month 25-delta puts)



Source: Bloomberg, Goldman Sachs Global Investment Research.

Resistant to pricing (geopolitical) risk

KOSPI and KRW/USD one-month ATM implied volatility



**Provocations based on data compiled by CSIS at http://beyondparallel.csis.org/database-rok-elections-and-dprk-provocations/.*

Source: Bloomberg, CSIS; compiled by Goldman Sachs Global Investment Research.

Interview with Ren Xiao

Ren Xiao is a professor of international politics at the Institute of International Studies at Fudan University and Director of the Center for the Study of Chinese Foreign Policy. Previously, he was Senior Fellow and Director of the Asia Pacific Studies Department at the Shanghai Institute for International Studies. From 2010 to 2012, he served as First Secretary at the Chinese embassy in Tokyo. He is the author/editor of several books including *New Frontiers in China's Foreign Relations* (2011). He is also a member of the China National Committee of Council for Security Cooperation in the Asia Pacific. Below, he discusses why it is wrong to assume that it is up China to rein in North Korea's nuclear ambitions, despite Beijing's tougher stance toward its neighbor.

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

Allison Nathan: What is the state of North Korea's nuclear/missile capabilities today?

Ren Xiao: Of course, it's very hard to make an accurate assessment; no one knows for sure. But we have a rough sense based on what we can observe, largely from North Korea's tests and other information. The North Koreans have clearly made progress on producing more nuclear materials, militarizing them, and delivering them via missiles. They have short-and medium term missile capabilities that, for example, could easily reach Seoul. But I don't think they have sufficient intercontinental ballistic missile (ICBM) capabilities today to strike the US mainland with nuclear weapons. This assessment is widely shared by the research community.

Allison Nathan: What does China see as the bigger threat today: North Korea's nuclear program or a united Korea?

Ren Xiao: There are few policy issues as controversial in China as its policy toward North Korea; opinions vary widely on how China should think about its neighbor. On the one hand, China feels that North Korea and its nuclear weapons program are increasingly undermining China's national security interests and becoming a serious problem for China, for the region, and for the international community.

On the other hand, there is still the view that North Korea provides a valuable buffer to South Korea and its US ally. But whether that is actually the case is increasingly an open question; if North Korea was once a strategic military buffer, it is not so today. Of course, it is a buffer in the geographic sense—but this type of buffer is no longer meaningful given advances in military technology and weapons systems. So if North Korea is a buffer, it is primarily in the political sense.

But the perception of whether North Korea serves as a buffer at all depends in part on US-China relations. If relations are strained, more people in China see value in North Korea as a buffer; if the relationship is going well, fewer people do. That said, departure from the status quo could also result in a failed North Korean state rather than a united Korea, which could lead to another major concern: a potential flood of North Koreans over the border and a refugee crisis in China's northeastern region. This is clearly something China wants to avoid.

If your question is really how China perceives North Korea—as a true ally or just a nominal ally—I think the answer is the latter. Even with the 1961 treaty between the two countries, China does not believe it is necessarily obligated to assist North Korea in the event of a conflict. North Korea recognizes this, and therefore probably believes that having nuclear weapons would strengthen its own security.

Allison Nathan: How has China's position vis-à-vis Pyongyang changed in recent years, and why?

Ren Xiao: China's dealings with North Korea have never been easy, even during the Korean War when the two fought side by side. But more recently, China has gotten tougher on North Korea. For years, Pyongyang has generally resisted China's efforts to persuade it to reform and open up to the outside world, as well as to halt its nuclear ambitions. China had apparently made some progress in this regard with the late Kim Jong-il, who made five trips to China in his final years. But the relationship between the two countries turned lukewarm after his son, Kim Jong-un, assumed power in North Korea in December 2011; over four years since Xi Jinping's rise to power in China, no Xi-Kim meeting has yet taken place.

> "…if North Korea was once a strategic military buffer, it is not so today. Of course, it is a buffer in the geographic sense—but this type of buffer is no longer meaningful given advances in military technology and weapons systems. So if North Korea is a buffer, it is primarily in the political sense."

In particular, China has become increasingly frustrated and disappointed with North Korea's failure to de-nuclearize and with its repeated nuclear tests. During Kim Jong-il's seventeen years in power, only two nuclear tests were conducted, compared to Kim Jong-un's three tests in less than five years. These recent tests seem to demonstrate Pyongyang's commitment to its present course, and they have seriously changed the dynamic of China's relationship with North Korea.

In response, China joined other members in the UN Security Council to pass new resolutions imposing tougher sanctions on North Korea, specifically resolution 2270 after the fourth test in January 2016 and 2321 after the fifth test later that year. The last resolution implemented a ceiling on North Korea's coal exports, one of their few exports and sources of foreign exchange. And on February 18 of this year, China made the important decision to go beyond what the resolution required and halt all coal imports from North Korea for the rest of the year. That should make developing nuclear missile capabilities even more difficult, hopefully pressuring North Korea to re-think its behavior and return to the negotiating table.

Allison Nathan: How much has the US position on North Korea influenced China's own policy stance?

Ren Xiao: The Trump administration's shift from a policy of "strategic patience" to one of "maximum pressure and engagement" to force Pyongyang to de-nuclearize is the new reality that China has had to face. Every time there has been bilateral communication between the US and China—whether it be phone conversations or the meeting between the two presidents in Florida or Secretary of State Rex Tillerson's recent trip to China—North Korea has been very high on the agenda. So the Trump administration's focus on the issue has probably prompted China to take the issue more seriously, and to re-think its approach. That said, other factors including North Korea's own behavior have influenced China's position. The assassination of Kim Jong-nam in Malaysia earlier this year infuriated China, for example.

Allison Nathan: Donald Trump seems to believe that China has the power to rein in North Korea's nuclear ambitions and could be the key to resolving the situation. Do you agree? How much influence does China really have over North Korea?

Ren Xiao: I do think China has influence over North Korea. But it would be unrealistic to expect to achieve de-nuclearization simply by China alone taking more action, because the two most important parties here are the US and North Korea. So even though China has room to take more measures or use more leverage, it is still key to bring the US and North Korea together to talk seriously and reach a compromise. From China's perspective, that is the way to find a peaceful solution. It's not all about China doing something and resolving the problem; that's not the right way to think about the issue.

> "…it would be unrealistic to expect to achieve de-nuclearization simply by China alone taking more action, because the two most important parties here are the US and North Korea."

Allison Nathan: Does the US have enough leverage over China to convince it to apply more pressure on North Korea?

Ren Xiao: That depends on the overall US-China relationship. If the Trump administration takes action that China views as unfriendly such as imposing a high tariff on Chinese products, it would of course be very difficult for the US and China to work together on the North Korean nuclear problem. If the overall relationship is constructive and positive, there is more possibility for the two countries to cooperate on finding a solution. After a somewhat rocky start during Trump's initial transition, it seems that right now the two countries are working together on the issue. But again, China is reluctant to be told what measures it should take against North Korea; the US must recognize its own role in resolving the problem.

Allison Nathan: Will China take further steps to rein in North Korea? What does China do next?

Ren Xiao: It depends. There is a moral issue here that is very tricky. It's not as simple as just cutting off all trade with North Korea—which the Security Council is not asking China to do—because the people of North Korea would likely suffer tremendously from starvation and other serious consequences.

> "It's not as simple as just cutting off all trade with North Korea… because the people of North Korea would likely suffer tremendously from starvation and other serious consequences."

And other factors are also at work. For example, the decision taken by the US and South Korea to deploy the Terminal High Altitude Area Defense (THAAD) system on South Korean soil certainly has not helped the situation. The perception here in China is that THAAD will undermine China's national security. China is therefore strongly opposed to its deployment. So that has become a major issue and perhaps has somewhat weakened China's determination to take further measures to rein in Pyongyang. Although not conclusive, a 2016 study conducted by the Sejong Institute, a South Korean think tank, found that the volume of trade between China and North Korea was rising since the US and South Korea announced their plans to deploy THAAD in July 2016. But that may have changed more recently.

For now, I think China will see what happens over the next few months in response to existing measures before deciding to take further action on North Korea.

Allison Nathan: What might China's response be if the US decided to take unilateral military action against North Korea? Is it conceivable that China would join the US in a military action?

Ren Xiao: Well, that's hypothetical. What I can say is that the decision to take unilateral military action would be a very difficult one because it is so risky. North Korea has the capability to retaliate by bombing Seoul, for example, which is just 35 miles from the demilitarized zone between the two countries, or by attacking US bases in South Korea. It would likely be catastrophic. That is why China continues to insist on a peaceful resolution. I think that's also why the Trump administration has come up with its new approach of maximum pressure and engagement, because the administration realizes the dangers of military action. For these reasons, it is also hard to envisage joint military action.

Timeline of North Korean developments

Backstory

Post-WWII: Following the end of Japanese occupation, Korea splits into communist north allied with the USSR and capitalist south backed by the US.
1950-1953: Korean War with Chinese and UN involvement; no treaty is ever signed.
1985: North Korea signs the NPT, committing not to acquire or develop nuclear weapons.
1986: Nuclear reactor at North Korea's main nuclear site becomes operational.

Glossary

IAEA: International Atomic Energy Agency.
NPT: Nuclear Non-Proliferation Treaty.
THAAD: Terminal High Altitude Area Defense anti-ballistic missile system.
UNSC: UN Security Council.
(#kt) : Nuclear test and estimated explosive yield in kilotons.*

1993: IAEA demands access to North Korean nuclear facilities that it believes are in violation of the NPT.

1994: North Korea agrees to dismantle its nuclear weapons program in exchange for energy aid.

Mid-1990s (dates uncertain): Pakistani scientist A.Q. Khan transfers nuclear equipment/know-how to North Korea.

1998: North Korea fires its first long-range missile (over Japan).

1999: North Korea agrees to end long-range missile tests.

2002: North Korea expels IAEA inspectors and restarts its nuclear weapons program.

2003: North Korea withdraws from the NPT. Six-party talks aimed at ending North Korea's nuclear program begin, with China, the US, South Korea, Japan, and Russia involved.

Mid-2000s-Present: US and South Korea conduct regular joint military exercises.

2005: North Korea announces definitively that it possesses nuclear weapons.

2006: (<1kt). UNSC imposes sanctions on North Korea and demands that Pyongyang abandon its nuclear weapons program.

2007: North Korea agrees to start disabling its nuclear weapons facilities but misses a key deadline for compliance at year-end.

2008: Under Lee Myung-bak, South Korea ends its decade-long peaceful "sunshine policy" toward North Korea. Six-party talks break down, with North Korea refusing inspectors full access to its facilities.

2009: North Korea withdraws from six-party talks. (2-6kt). UNSC expands sanctions.

2010: North Korea torpedoes and sinks a South Korean warship. Later in the year, it shells the South Korean island of Yeonpyeong. Pyongyang reveals a new uranium enrichment facility to a team of visiting experts.

2012: North Korea launches a satellite using missile technology.

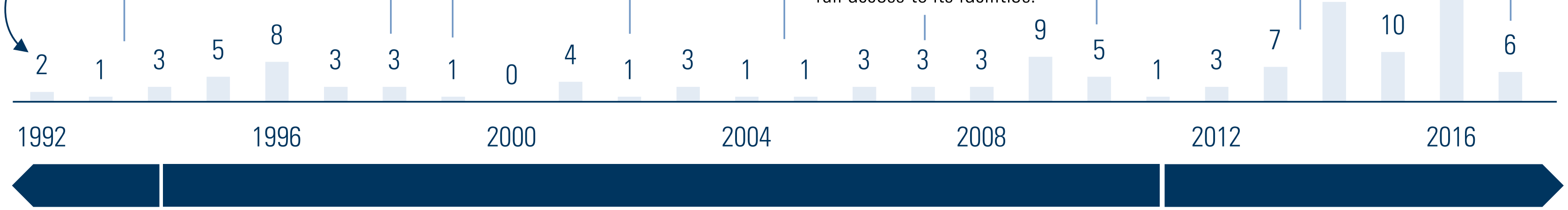
2013: (6-9kt). UNSC expands sanctions. North Korea declares 1953 armistice invalid and temporarily shuts Kaesong industrial complex operated jointly with South Korea.

2014: North Korea conducts its first medium-range missile tests in five years. North Korea and South Korea exchange artillery fire.

2016: (6-9kt, claimed to be a hydrogen bomb). South Korea suspends operations at Kaesong. South Korea and the US announce plans for THAAD; China expresses "serious concerns." (10kt). UNSC expands sanctions in response to both nuclear tests.

2017: Series of missile launches. US ends policy of strategic patience. Moon Jae-in, a strong advocate of sunshine policy, is elected President of South Korea.

*Number of North Korean provocations (e.g., missile tests)***



1948-1994
Kim Il-sung

1994-2011
Kim Jong-il

2011-Present
Kim Jong-un

**Explosive yield estimates based on South Korean sources compiled by CSIS at http://beyondparallel.csis.org/decade-north-korean-nuclear-tests.*
***Provocations based on data compiled by CSIS at http://beyondparallel.csis.org/database-rok-elections-and-dprk-provocations/.*
Source: Various news sources, Arms Control Association, CSIS; iStockPhoto; compiled by Goldman Sachs Global Investment Research.

The geopolitical hedge of last resort

Jeff Currie and Mikhail Sprogis find that gold can only be an effective hedge against geopolitical events when they are extreme enough to cause currency debasement

Like most other financial assets, gold price volatility has ground to near-record lows. In fact, implied gold volatility is at the lowest levels since the 1990s when gold was considered an unwanted asset even by central banks. This makes the recent focus on gold and heightened geopolitical risks feel like a paradox, particularly with gold prices at roughly $1,235/toz vs. a three-year average of $1,220/toz. However, this pattern is not entirely inconsistent with the history of gold prices. While gold has acted as a call option on extreme geopolitical events such as the Gulf Wars and other tail risks in the past, on average it doesn't respond to geopolitical risk after controlling for other macro variables, such as real interest rates and the US dollar. Further, we find that oil is a better hedge historically given that oil producers such as Iraq, Iran, and Russia have been at the center of most geopolitical risks since the early 1970s.

The currency of last resort

So what kind of risk does gold hedge? The short answer is currency debasement typically resulting from a central bank printing money. This dynamic is captured by a negative correlation between gold prices and real interest rates. As the central bank prints more currency, the price of the currency as measured by the real interest rate declines. The lower real interest rate, in turn, reduces the opportunity cost of holding a real asset like gold, leading the market to bid up gold prices. So at the core, gold is a hedge against debasement, which is why we have termed it the "currency of last resort." This also explains why gold can be a good inflation hedge but is not always one. If debasement leads to inflation, then gold will serve as an inflation hedge. But as we saw over the past decade, debasement doesn't always lead to inflation, and is not the only source of it, either.

Gold: the "currency of last resort"

Gold price, $/toz. vs. five-year real rates, % (inverted, rhs)

Source: Bloomberg.

Can gold hedge geopolitical risk?

Given the above, we find that gold can effectively hedge against geopolitical risk if the geopolitical event is extreme enough that it leads to some sort of currency debasement, and especially if the gold price move is much sharper than the move in real rates or the dollar. For these events, gold essentially serves as a call option and can therefore be thought of as a "geopolitical hedge of last resort." For example, gold served as an effective hedge after the events of September 11th of 2001 when the US Federal Reserve substantially increased dollar liquidity, debasing the US dollar. Gold also proved an effective hedge during the Gulf Wars as governments printed money. That said, it is interesting to note that the oil supply disruptions created by Gulf War I led oil to act as a better hedge than gold, which has been the case during several geopolitical events centered around oil-producing nations. However, during Gulf War II, when supply disruptions were minimized, gold acted as the better hedge.

Risk and response

Commodity price response to geopolitical risk, measured as changes in standard deviation conditioned on macro variables

Geopolitical Event (mm/yy)	Oil Price Change*	Gold Price Change*
Apartheid Sanctions (9/86)	0.24	2.52
Kuwait Invasion/Gulf War I (8/90)	3.19	1.75
9/11 Attacks (9/01)	0.22	2.39
Gulf War II (1/03)	1.18	2.04
Madrid bombings (3/04)	0.56	-0.22
London bombings (7/05)	0.44	-0.24
Lebanon War (7/06)	0.65	1.15
Lehman bankruptcy (9/08)	-1.22	0.97
Crimea annexation (3/14)	-1.18	0.63
Paris attacks (11/15)	-0.23	-1.68

**Price changes are controlled for real rate and dollar changes.*
Source: Bloomberg, Goldman Sachs Global Investment Research.

Liquidity matters

This analysis, however, doesn't take into consideration gold-market liquidity itself, which can be crucial when deciding to hedge via physical gold in a vault versus COMEX gold futures. Using a gold futures contract as the basis of the hedge makes the implicit assumption that market liquidity will not be a problem in the realization of a geopolitical event. The importance of liquidity was tested during the collapse of Lehman Brothers in September 2008. Gold prices declined sharply as both traded volumes and open interest on the exchange plummeted. After this liquidity event, investors became more conscious of the physical vs. futures market distinction and began to demand more physical gold or physically-backed ETFs as a hedge against black-swan events. The lesson learned was that if gold liquidity dries up along with the broader market's, so does your hedge—unless it is physical gold in a vault, the true "hedge of last resort."

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Interview with Sandy Rattray

Sandy Rattray is CIO of Man Group, CEO of Man AHL, and a member of the Man Executive Committee. He joined Man via Man GLG in 2007 after 15 years at Goldman Sachs, where he co-invented the VIX index. Below, he argues that low volatility in the face of geopolitical and other risks may owe to recent tail events proving less disruptive than expected. However, he believes it is extremely unlikely that today's low realized volatility represents a "new normal."

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

Allison Nathan: Geopolitical and/or political risk seems to be high on many investors' list of concerns, but volatility is extraordinarily low and risky assets like equities have performed very well. What do you make of this?

Sandy Rattray: Implied volatility on the S&P 500 as reflected in the VIX is very low, but futures on the VIX are not as low. For example, a VIX future maturing in December 2017 is pricing at about 16.4 now, which is a bit below the long-term average but less so than the VIX itself. This suggests that the markets are relaxed about the near term but not quite as relaxed about the future, which is normal given greater uncertainty about the future.

That said, how do we square this relatively low volatility with the numerous so-called tail-risk events that materialized over the past year, including the unexpected outcomes of the Brexit referendum, the Italian referendum, and the US election? In my view, the recent geopolitical or political events that we use as our point of reference simply had less impact than the press, economists, or smart commentators predicted. There was a lot of fear going into them but ultimately much less volatility than people expected. And the aftermath turned out to be both unpredictable and generally less severe than feared. Take Brexit, for example. If you had asked nearly anybody in the spring of 2016 what would happen if the UK voted to exit the EU, they would have said the economic and market consequences would be extremely negative. But the vast majority of those negative consequences have not occurred. So, with the benefit of hindsight, it's not clear that the vote in favor of Brexit was a tail event at all. I think the discovery that even these "bad" events have not been so bad for markets is one reason why realized volatility has been so low.

Historically, true tail events are those that cannot be anticipated and seemingly come out of nowhere after a period of calm. It's worth remembering that the VIX in August 2008—the month before Lehman Brothers went bankrupt—averaged around 20; it didn't pick up until the disaster was actually underway. Unfortunately, we have very limited ability to forecast which of the many risks we can identify will be the one that matters; in fact, it quite likely may be none of the ones on our list.

Allison Nathan: Is the market underpricing tail risk today?

Sandy Rattray: It's impossible to answer questions like this because, again, it is extremely difficult to identify the source of the next event, let alone the timing of it. It's therefore quite possible that the current very low level of realized and implied volatility could persist for some months or even years. But if you forced me to give a yes or no answer, I would say yes: The market is underpricing tail risk today.

Allison Nathan: You were a co-inventor of the VIX and have observed how investors respond to volatility and tail risk throughout your career. Are investors thinking about tail risks differently today than they have in the past?

Sandy Rattray: First, the idea that something is new or different is vastly overemployed in finance; the phrase "this time it's different" should strike fear in any investor. People have worried about tail risk for a very long time, and the broad issues that they've worried about have generally been similar. That said, I have observed an increased investor understanding of the difficulty of forecasting tail events and their implications, and therefore a greater interest in strategies that are potentially more sustainable over a longer period and don't require getting the timing right. In other words, I perceive that there is generally less preference for hedging strategies that have defined costs and maturities—such as buying a put on the S&P 500 for a specific month.

Allison Nathan: Can you elaborate on how tail-risk strategies have changed as a result?

Sandy Rattray: There has been a proliferation of alternative hedging strategies such as ETF products on the VIX, univariate momentum or trend-following strategies—what some fund managers call "crisis alpha strategies"—and defensive equity strategies that take long positions in higher-quality stocks and short positions in lower-quality stocks. These alternatives can range in effectiveness. But they can offer lower carrying costs during the good times and are generally not tied to specific time horizons. This broader range of available strategies has probably increased the number of investors hedging tail risk. And the relatively strong rise in liquidity in the VIX or other protection strategies—not only in equities but also in credit—must mean that more investors are active in those types of hedging strategies than in the past.

It is also worth noting that an increased awareness of the liability profile of many investors, especially pension plans, has led them to re-think their overall investing strategy and make changes to their asset allocation—something they may have been more reluctant to do in the past. In some cases, this has taken the place of trying to run a hedging strategy as an overlay to a fixed asset allocation. So asset re-allocation has essentially displaced hedging strategies for some investors.

Allison Nathan: Can machine learning and/or other innovations play a role in mitigating tail risk at this point?

Sandy Rattray: We have invested heavily in machine learning strategies over the last few years and run a reasonable amount of money using machine-learning techniques. In general, those techniques are extraordinarily data-hungry, requiring an extremely large number of events to fit the algorithm. But one of the challenges with tail events is that they are rare. So in principle, machine learning strategies are not helpful in mitigating tail risk because they tend to be better suited to shorter-term and very high-data-volume studies, which do not fit the characteristics of tail events.

That said, we have observed some features of machine-learning strategies that suggest they could potentially be more helpful in tail-risk scenarios than they initially seem. First, machine-learning strategies are non-linear, in contrast to most other investing strategies that are basically linear. Tail events often involve a non-linear acceleration downwards, so in theory it may be possible that machine-learning strategies would do well in that type of non-linear event. Second, we have found that machine-learning strategies can be useful in determining when markets are undergoing regime changes. At the most basic level, this could mean identifying a shift from a momentum type of market, in which prices tend to move in the same direction, to a reversion type of environment, or vice versa. That can also potentially be quite helpful during a tail-risk episode. But, again, tail-risk hedging is not the core use of machine learning.

Allison Nathan: Has the rise of passive investing increased the risk of drawdowns should a tail-risk event occur?

Sandy Rattray: I don't think the rise of passive investing has particularly exacerbated the risk of drawdowns. When passive investors held 10% of the US equity market twenty years ago, there were lots of people talking about how passive investing was distorting and endangering the market. But even at about 40% passive today, we've failed to see too many implications for the market. People argue that leveraged ETFs raise the risk of a tail event, and I agree that tail events and leverage are two concepts that freely associate with each other. The possibility that investors aren't able to withstand the leverage on the downside as much as they were excited about it on the upside could accelerate a drawdown. But I would say it is a *possible*, not a *probable*, source of a market correction.

That said, the rise of passive investing has certainly had other consequences. I do think the shift has made life more difficult for active managers because it's generally hard to outperform when either you or your competitors are facing redemptions in the same positions you own. I think we may be seeing this in some market segments, such as US small cap equities.

Allison Nathan: What do you make of the increased popularity of volatility selling? To what extent could this strategy be distorting volatility in a way that could prove disruptive to the markets should a tail-risk event occur?

Sandy Rattray: Across many previous cycles, volatility selling tends to be quite popular after long periods of relatively low volatility and unpopular just after volatility has spiked—the reverse of what would seem to be rational.

So the fact that there's lots of volatility selling at the moment isn't particularly surprising in my view. Historically there seems to be a new group of people each time that underappreciates the very significant risks of being short volatility and wants to learn this expensive lesson. In my view, shorting volatility should only comprise a relatively small part of a portfolio, and should have a clear risk-management process around it. If you don't follow those two rules, then you could potentially end up in significant trouble. There is no question that these short-vol strategies can pose significant risk to individual investors pursuing them if they are not managed appropriately.

That said, I'm not sure these volatility sellers are impacting the market any more than usual. The reality is the low levels of the VIX are fairly consistent with low levels of realized volatility; S&P 500 30-day realized volatility is about 6.6 now, and the VIX is about 10.6, versus a long-term spread between implied and realized volatility of about three to four points. So I don't think we can blame much on volatility sellers themselves. I see them as playing their traditional role of keeping supply and demand for implied volatility in equilibrium.

Allison Nathan: In the context of this low-vol environment and the tail-risk strategies we've discussed, what advice would you give investors today?

Sandy Rattray: People often ask whether we have a new, lower normal in realized volatility. I believe with some conviction that we don't. The very low-volatility environment today will end at some point, although it is very hard to forecast why and when that will happen. But we've had a fairly strong and continuous rally in equity markets around the world since 2009, and equities in a number of countries, particularly the US, don't look terribly cheap today in my view. That does not mean that equities are going to correct in the near term. But it is unimaginable that equities don't correct at some point.

One concern is that many people choose to scale their positions by the level of realized volatility, which means there could be very large positions out there today with potentially significant leverage that might be vulnerable should volatility rise whether due to a tail risk event or other developments in the market. So it is important that investors have a plan for when the market environment changes. That plan could potentially involve a hedging strategy, a fund-management strategy, or it could come down to asset allocation or rebalancing—though rebalancing, of course, may exacerbate drawdowns. One size does not fit all here, so there is no one clear strategy to pursue. What *is* clear, in my view, is that there will be a sell-off in risk assets at some point, and the investors who are unprepared are those who will potentially fare the worst.

Geopolitics and Defense stocks

Noah Poponak contends that elevated geopolitical risk reinforces a cyclical pick-up in Defense spending that was already in train

Many active and former military personnel, as well as other defense industry participants, describe the current geopolitical environment as one of the most complex they have seen in their lifetime because of the number of separate major challenges occurring at the same time. Since the drawdown following the Iraq and Afghanistan conflicts, new threats have emerged in several theaters, driving a need for higher defense dollars, capability, and capacity. Indeed, the Global Peace Index, which measures a country's level of "Negative Peace" based on domestic and international conflict, societal safety and security, and militarization, is the highest in many years—supporting the notion that that the geopolitical environment has become less certain recently.

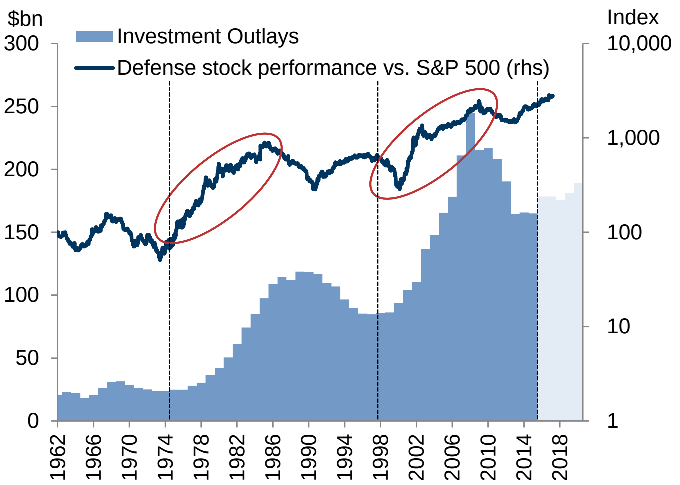
How does this geopolitical backdrop impact Defense stocks? Clearly, geopolitics meaningfully influence US defense strategy, policy, and budgets. However, geopolitics are difficult to predict; and even when predicted accurately, are difficult to quantify in defense budget dollar or defense contractor revenue terms. As a result, geopolitics tend to be a secondary, albeit important, factor in our view on Defense stocks.

Focus on the budget cycle

Instead, our larger focus is on the US defense budget cycle. Defense stocks are highly correlated with the budget: When it is rising, especially in its earlier years of doing so, Defense stocks very consistently outperform the market.

Budget boost to performance

DOD investment outlays, $bn; Defense stock performance vs. S&P 500, log scale (rhs)



Source: FactSet, DOD.

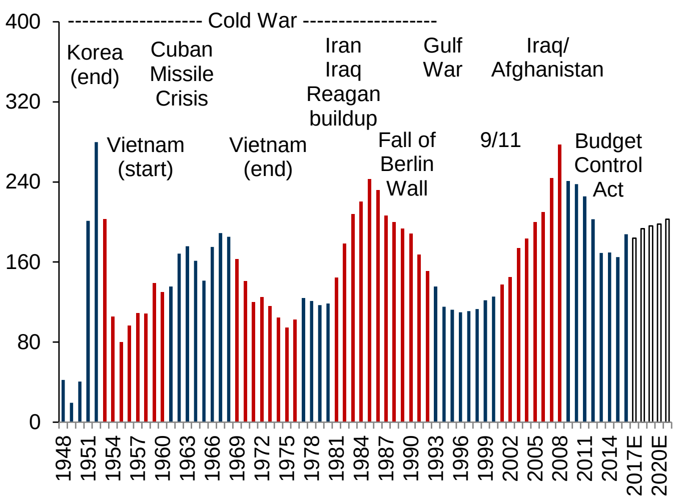
Several factors besides geopolitics drive the direction of the defense budget, including the level of debt-to-GDP and other spending priorities that may take or give up share of the government wallet. Also critical is the timing of the defense budget cycle; the lower the starting point of defense spending, the easier it is to achieve growth, and vice versa. The US Department of Defense (DOD) budget has been consistently cyclical over time, and those cycles have been dependably long—with upturns and downturns both nearly a decade in duration on average. So once the defense budget begins moving in a given direction, it usually does so for a very long time. Following a 40% peak-to- trough decline in total DOD investment spend from 2008 to 2015, the defense budget has started to inflect upward. This early inflection, combined with the historical duration of upturns and the current geopolitical environment, leads us to believe that the defense budget could grow for the next several years, supporting our Attractive view on the Defense sector.

Geopolitics matter more than politics

That isn't to say that geopolitics never matter; again, they are clearly important to defense spending decisions. On the other hand—and somewhat surprisingly—there is little relationship between defense spending growth and the political party in control of US government. Over the last half-century+ of defense spending, real dollar growth in the defense budget is nearly identical on average under Republican vs. Democratic political control. Notable defense buildups in Democratic administrations include the Korean War and the Cuban Missile Crisis, and in Republican administrations, the Reagan Buildup and Iraq and Afghanistan conflicts. Downturns also occurred with both parties in power—i.e., the recent downturn and the scaling back of defense spending with the end of the Cold War. And today, a Republican administration and an uncertain geopolitical environment have coincided with a defense budget already showing signs of a cyclical upswing.

The long history of defense spending

DOD investment, $bn; red and blue indicate Republican or Democratic White House, respectively



Source: DOD FY2016 Green Book, FY17 FYDP, White House.

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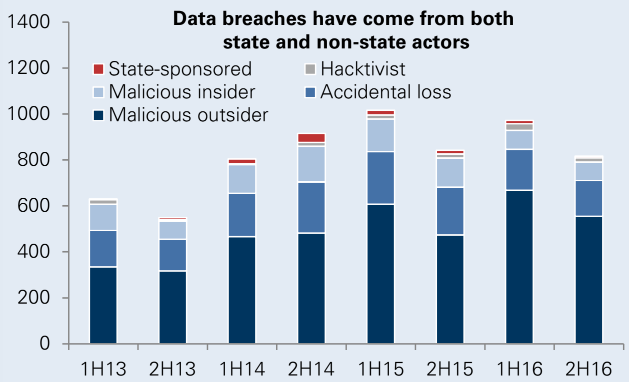
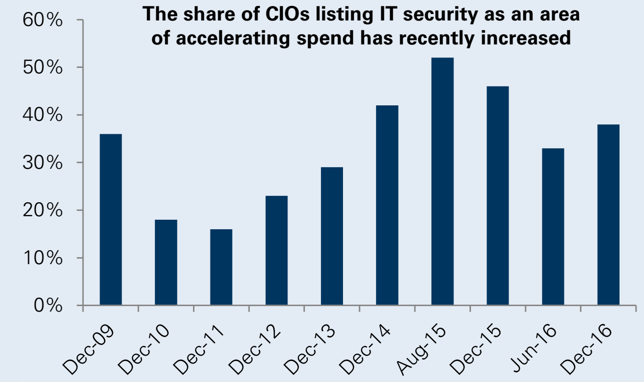
Geopolitics in cyberspace

The cybersecurity threat

There have historically been three "war domains" defined by NATO: Air, Land, and Sea. In 2016, this definition was formally broadened to include a fourth dimension: Cyber. When geopolitical risk changes, so does the likelihood of both sophisticated nation-state attacks and increased government spending, globally, on cybersecurity. At the same time, the proliferation of malicious non-state actors—evidenced by the ransomware that recently impacted users worldwide—has itself created a new breed of geopolitical threat to public and private targets. We highlight two stocks we consider well-positioned in this environment.



Covers breach incidents globally.
Source: Gemalto (www.breachlevelindex.com).



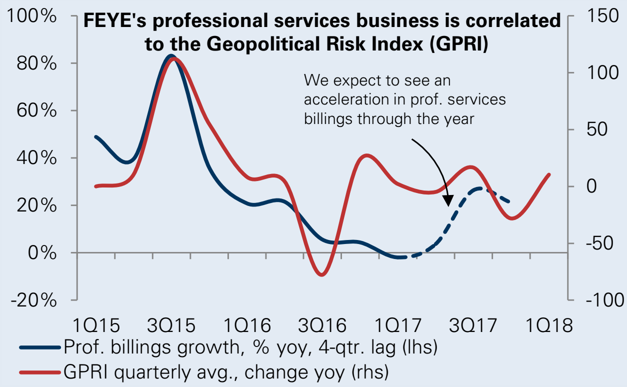
Source: Goldman Sachs Global Investment Research CIO IT Spending Survey.

FEYE (Buy): on the frontier of advanced threat intelligence

FireEye sells software to detect and prevent advanced threats; it also has an incident response business that responds directly to breaches. FireEye's business is weighted toward sophisticated, well-funded customers. Taken together, we believe FireEye has more exposure to changes in geopolitical risk than other security software companies. We see two areas of technology differentiation: 1) best-in-class threat intelligence, driven by a feedback loop between the incident response and product businesses; 2) an advanced machine learning engine, which dynamically inspects traffic to identify suspicious activity.

Valuation: Our 12-month PT is $19, based on 85% fundamental value (4.0X 2018E Sales) and 15% M&A value (4.5X 2018E sales).

Key Risks: Competition, execution on roadmap & channel strategy.



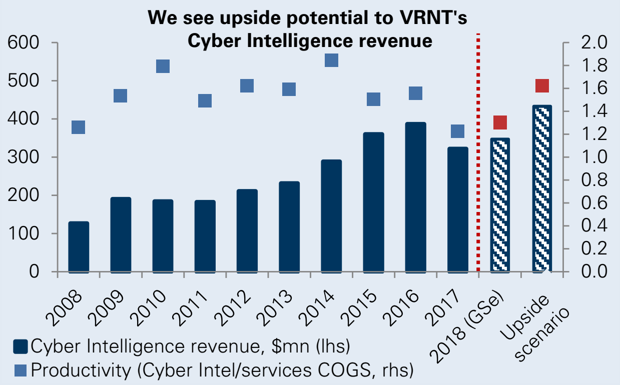
Source: Dario Caldara and Matteo Iacoviello, Federal Reserve Board; company data, Goldman Sachs Global Investment Research.

VRNT (Buy): advanced analytics for security and cyber intel

Verint's core intellectual property is distilling actionable intelligence from large volumes of unstructured data; in some cases, this data can be used to stop terrorist attacks before they happen. Customers include government, critical infrastructure, and intelligence agencies, which we believe are more likely to buy Verint's technology when geopolitical risk is perceived to be high.

Valuation: Our 12-month PT is $48, based on 85% fundamental value (17X 2018E EPS) and 15% M&A value (3.5X 2018E sales).

Key Risks: Execution and trajectory of government contracts.



Source: Company data, Goldman Sachs Global Investment Research.

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For more, see Americas: Technology: Security and Analytics: FEYE and VRNT: Two stocks to own in uncertain geopolitical times, 16 May 2017.

A Japan-Russia rapprochement?

Kathy Matsui sees scope for some progress on a 70-year dispute between the two countries, creating opportunities for FDI

Japan and Russia have yet to officially conclude a post-WWII peace treaty due to the long-standing territorial dispute over four islands to the north of Hokkaido (called the Northern Territories by Japan and the Southern Kuril Islands by Russia). However, Japanese Prime Minister Abe has made resolving this dispute a diplomatic priority, and has met with Russian President Putin 15 times since the beginning of 2013 (more than double his meetings with former US President Obama).

It is highly uncertain whether any progress toward reconciliation between Japan and Russia will be achieved—particularly given the sensitivities vis-à-vis the United States. However, due to the intensifying level of bilateral dialogue since May 2016 and the apparent willingness on both sides to increase economic cooperation (particularly in the areas of energy, infrastructure, and capital goods), there may be some scope for progress this time. A potential rapprochement could have significant economic consequences, and could also benefit Japanese companies with significant Russian exposures and investments over time.

Significant room for growth

While the absence of a peace treaty has not precluded bilateral economic engagement, trade and investment linkages between Russia and Japan are currently small. Annual trade volumes averaged less than $6 bn prior to 2003, then reached a historical peak of roughly $35 bn in 2013 before falling to US$15 bn ann. in May 2016. As of 2015, Russia was Japan's 15th-largest trade partner, accounting for just 2% of Japan's total trade. Energy dominates the trade relationship: LNG, oil and coal account for three-quarters (74%) of Japan's total imports from Russia, and Russia is Japan's third-largest supplier of both oil and coal. Meanwhile, Russia represents only 1% of Japan's total exports, with automobile-related industries representing 80% of the total.

Similarly, Japanese FDI into Russia remains very limited. The cumulative amount fell to $1.8 bn in 2015 from a historical peak of $2.7 bn in 2012. Although there have been some outbound acquisitions from Japan into Russia since 2014, the overall volume of transactions remains minimal.

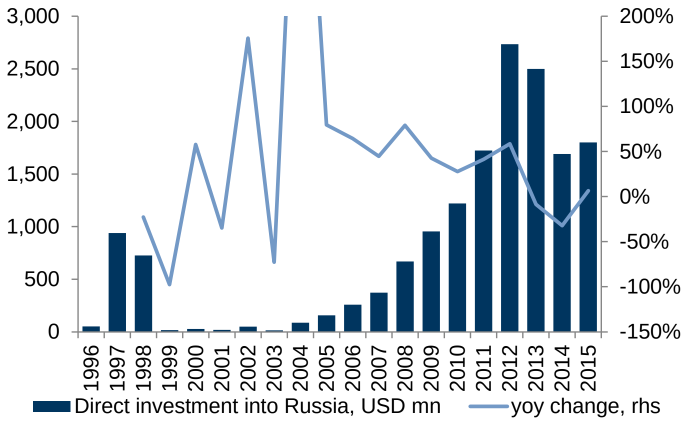
Focus on Far-East FDI

While current levels of bilateral trade and investment are low, Japan has proposed to Russia an eight-point economic cooperation plan targeting energy, infrastructure, technology, and healthcare. In particular, both governments are keen to develop Russia's resource-rich Far East, where Japan is already the top source country for greenfield investments. According to fDi Markets, Japan has invested $4.2 bn in 32 projects there since 2003 (China ranks second with $1.7 bn in 19 projects). The majority of these projects are concentrated in the resources sector, namely metals and coal/oil/natural gas.

More broadly, there is some evidence for growing interest in expanding FDI into Russia among Japanese firms. A June 2016 survey of Japanese companies operating in Russia conducted by the Japan External Trade Organization (JETRO), a government agency, showed that the share of firms intending to expand their Russian operations has risen from a low of 5% in January 2015 to 27% as of April 2016.

FDI limited (so far)

Cumulative Japanese FDI into Russia, USD mn outstanding



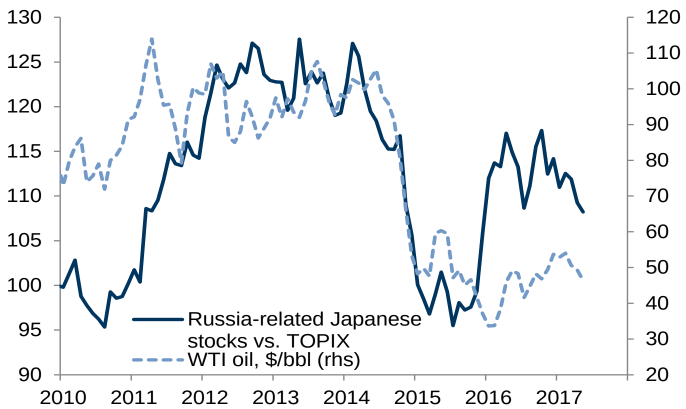
Source: JETRO.

Equity implications

In the event of any meaningful progress on the territorial dispute, we expect the greatest impact to be on Japanese companies with relatively significant exposures to or investments in Russia concentrated in the areas of plant engineering, trading, oil/gas, automobiles, machinery, and food/fisheries (for a complete list, see here). For instance, a rapprochement could potentially pave the way for reducing auto import tariffs, one of the major obstacles for Japanese automakers in the Russian market. And Japanese engineering firms could benefit from expanded LNG development in Russia with Japan's involvement. Looking beyond geopolitics, however, oil is likely to be a key driver of these stocks, given the importance of energy to Russia's economy and as a destination of Japanese investment.

Oil in the driver's seat

Russia-related Japanese stocks vs. TOPIX; WTI oil price, $/bbl (rhs)



Source: Bloomberg, Goldman Sachs Global Investment Research.

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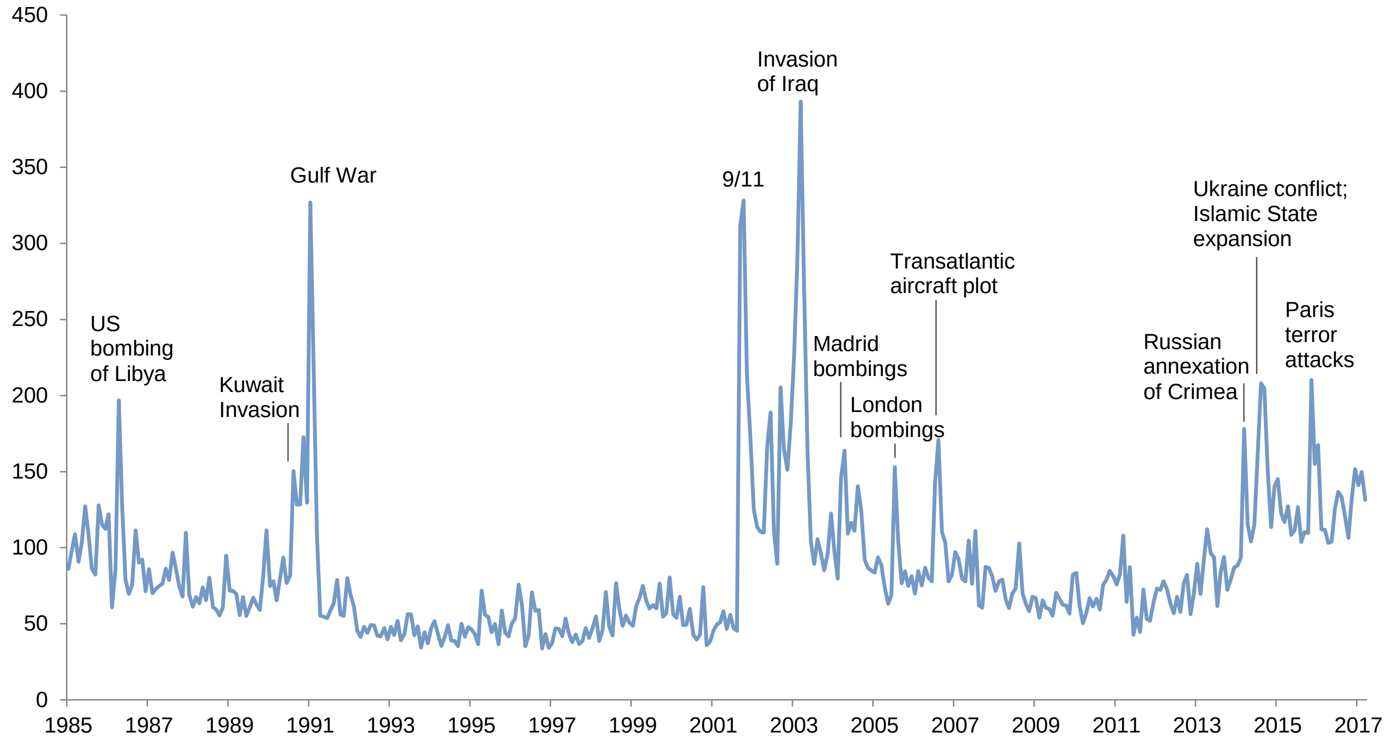
For more, see *Japan and Russia: Implications of Potential Rapprochement, 12 October 2016*.

Measuring geopolitical risk

Geopolitical tensions, which take many different forms, are difficult to measure. One proxy for assessing the geopolitical environment is the news-based Geopolitical Risk Index developed by economists from the Federal Reserve Board.

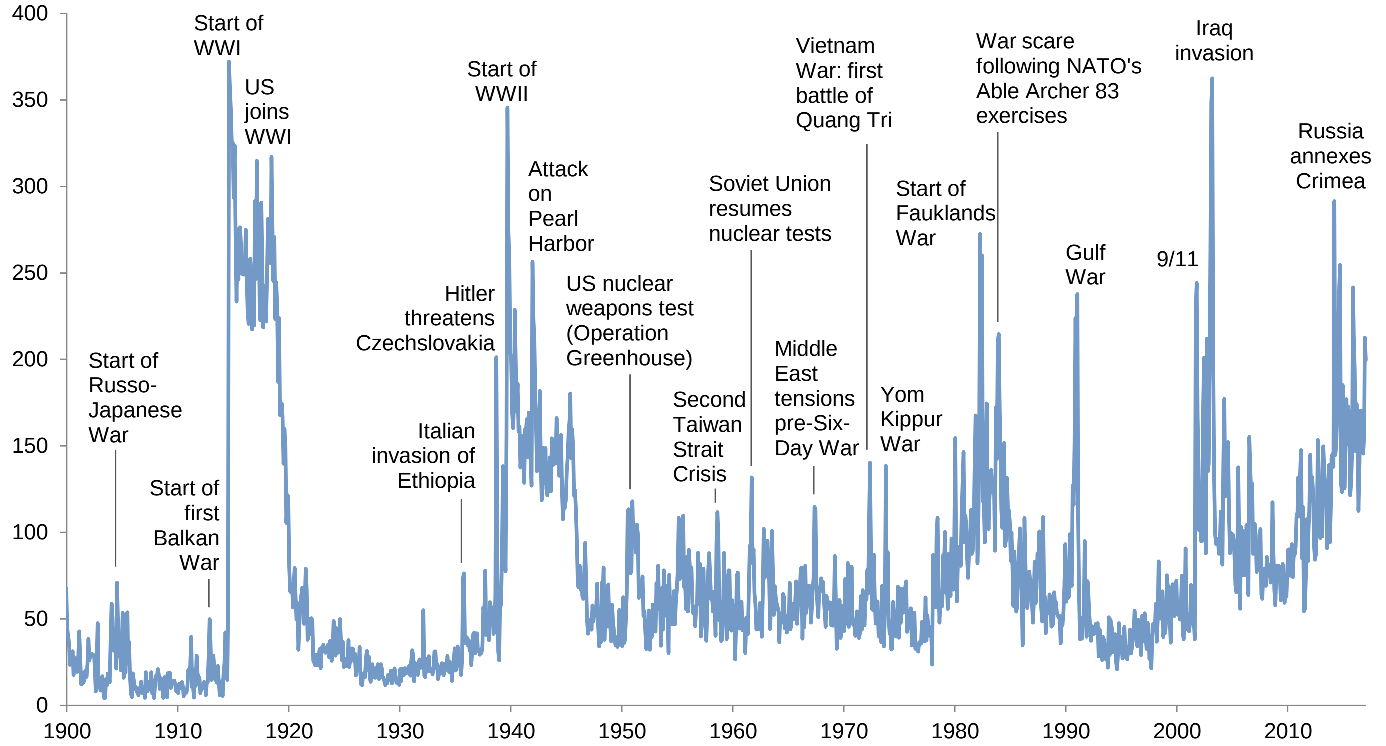
1985-Present

Geopolitical Risk Index



1900-Present

Geopolitical Risk Index



Source: Dario Caldara and Matteo Iacoviello, Federal Reserve Board. See also https://www2.bc.edu/matteo-iacoviello/gpr.htm.
The index from 1985 on counts the number of articles in 11 US, UK, and Canadian newspapers mentioning phrases related to geopolitical tensions. The index from 1900 on performs the same analysis using the archives of three newspapers, the New York Times, the Wall Street Journal, and the Financial Times. The choice of newspapers for both indices implies a measure of geopolitical risk as covered by the Anglo-Saxon press.

Summary of our key forecasts

	GDP Growth (% yoy)				FX				Equity				Rates (% eop)				Revision Notes
	2017		2018		3-mth		12-mth		3-mth		12-mth		Policy*		10-yr		
	GS	Cons	GS	Cons	GS	Cons	GS	Cons	GS	Cons	GS	Cons	2017	2018	2017	2018	
GLOBAL	3.6	3.3	3.8	3.4	-	-	-	-	-	-	-	-	-	-	-	-	
					EUR/$		EUR/$		SP500		SP500		Fed Funds				
US	2.1	2.2	2.2	2.3	1.08	1.07	1.05	1.08	2350	-	2325	-	1.25 to 1.50	2.25 to 2.50	3.00	3.50	On May 10, we raised our 6/12-month EUR/USD targets to 1.07/1.05, respectively, from 1.04/1.00 previously, reflecting stronger growth outside of the United States and reduced scope for monetary policy divergence.
					EUR/$		EUR/$		Euro Stoxx 50		Euro Stoxx 50		MRO Rate				
EURO AREA	1.6	1.7	1.4	1.6	1.08	1.07	1.05	1.08	3600	-	3800	-	0.00	0.00	-	-	On May 10, we raised our 6/12-month EUR/USD targets to 1.07/1.05, respectively, from 1.04/1.00 previously, reflecting stronger growth outside of the United States and reduced scope for monetary policy divergence.
					EUR/$		EUR/$		DAX 30		DAX 30						
GERMANY	1.5	1.7	1.4	1.6	1.08	1.07	1.05	1.08	-	-	-	-	-	-	0.80	1.35	On May 10, we raised our 6/12-month EUR/USD targets to 1.07/1.05, respectively, from 1.04/1.00 previously, reflecting stronger growth outside of the United States and reduced scope for monetary policy divergence.
					$/JPY		$/JPY		TOPIX		TOPIX		Policy Deposit				
JAPAN	1.4	1.2	1.1	1.0	114	113	118	116	1500	-	1600	-	-0.10	-0.10	0.20	0.50	On May 10, we lowered our 3/6/12-month USD/JPY targets to 114/116/118, respectively, from 118/120/125 previously, reflecting stronger growth outside of the United States and reduced scope for monetary policy divergence.
					$/CNY+		$/CNY+		MXCN		MXCN		7-Day Repo				
CHINA	6.8	6.6	6.3	6.3	6.95	6.95	7.20	7.07	-	-	75	-	3.00	3.00	-	-	On May 10, we raised our 3/6/12-month USD/CNY targets to 6.95/7.00/7.20, respectively, from 7.00/7.15/7.30 previously, as part of our revised forecast for reduced USD appreciation.
					$/BRL		$/BRL		BOVESPA		BOVESPA						
BRAZIL	0.6	0.6	2.6	2.2	3.00	3.19	3.25	3.25	-	-	-	-	8.75	8.75	-	-	
Commodities	Brent crude oil ($/bbl)				Copper ($/mt)				Gold ($/toz)				Corn (cent/bu)				
	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	
	59	58	58	57	6200	-	5500	5720	1200	-	1250	1250	350	-	335	-	

Note: Recent revisions marked in red; GDP consensus is Bloomberg; all other consensus is Reuters; commodity 12-mo consensus is Reuters for 2017 average.

+ CNY daily fix

Source: Bloomberg, Thomson Reuters, Goldman Sachs Global Investment Research.

Glossary of GS proprietary indices

Current Activity Indicator (CAI)

Our CAI measures the growth signal in a broad range of weekly and monthly indicators, offering an alternative to Gross Domestic Product (GDP). GDP is a useful but imperfect guide to current activity. In most countries, it is only available quarterly and is released with a substantial delay, and its 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 aim to address GDP's shortcomings and provide a more timely read on the pace of growth. We currently calculate CAIs for the US, Euro area, Japan, UK, and 29 other countries. For more, see *Global Economics Analyst: Trackin' All Over the World – Our New Global CAI, 25 February 2017.*

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. Each FCI is calculated as a weighted average of a policy rate, a long-term riskless bond yield, a corporate credit spread, an equity price variable, and a trade-weighted exchange rate; in the Euro area we also include a sovereign credit spread. The weights mirror the effects of the financial variables on real GDP growth in our models over a one-year horizon.

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.

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.

Real-Time Inflation and Activity Framework (RETINA)

RETINA provides a comprehensive econometric methodology able to filter incoming information from the most up-to-date high frequency variables in order to track real GDP growth in the Euro area. Along with a GDP tracker, RETINA also captures the interrelated mechanisms of the area-wide pricing chain, providing a short-term view on inflation dynamics.

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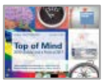

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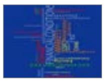

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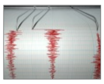

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Reg AC

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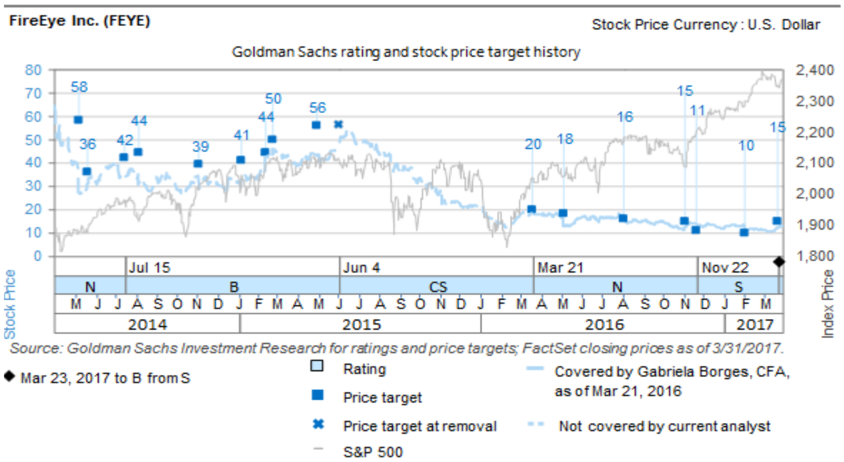

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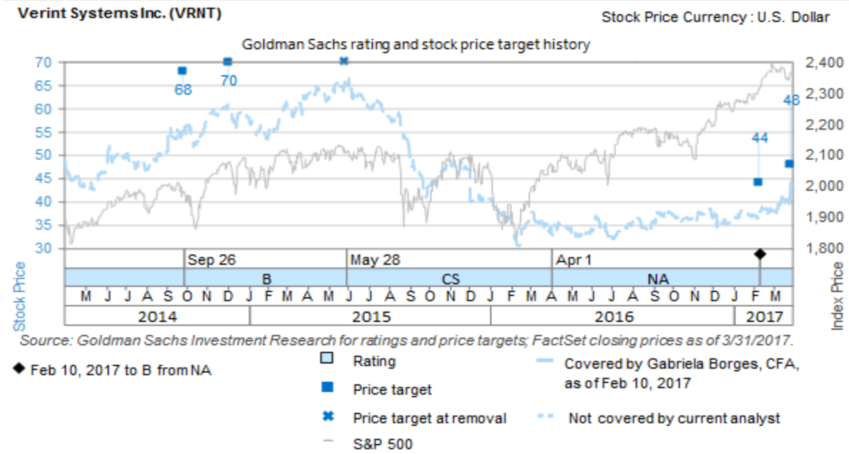

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