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Global Economics Analyst

Doing the Numbers on DM Recession Risk

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- Following the recent market selloff, many financial variables are now at levels usually associated with recessionary or near-recessionary conditions. But what is the true risk of recession across the advanced economies?
- To answer this question, we construct a cross-country model that explains recessions—defined as year-on-year declines in real GDP per capita—using a range of economic and financial variables. Our cross-country approach has two advantages over single-country models. First, recessions are relatively rare events, so it is important to use as much data as possible. Second, a common framework across all of the major advanced economies helps to gauge who is most at risk.
- The estimation results are quite intuitive. At short horizons of less than a year, weak recent growth momentum, output above potential, and declines in equity and house prices are the best recession predictors. At longer horizons, an inverted yield curve and—especially—a high credit/GDP ratio relative to recent norms also signal elevated risk.
- Our model suggests that the risk of recession has risen somewhat in recent months as equity prices have slumped and the yield curve has flattened. However, it remains below the historical average in most advanced economies, including the US, the Euro area, and particularly the UK. Recession risk is high in commodity producers such as Canada and Norway and also fairly high in Japan.
- Statistical recession models are subject to several caveats, including the fact that no two cycles are the same. That said, the model results are consistent with our standing growth forecasts as well as our earlier finding that any DM spillovers from worse-than-expected outcomes in China and other emerging economies should be manageable.

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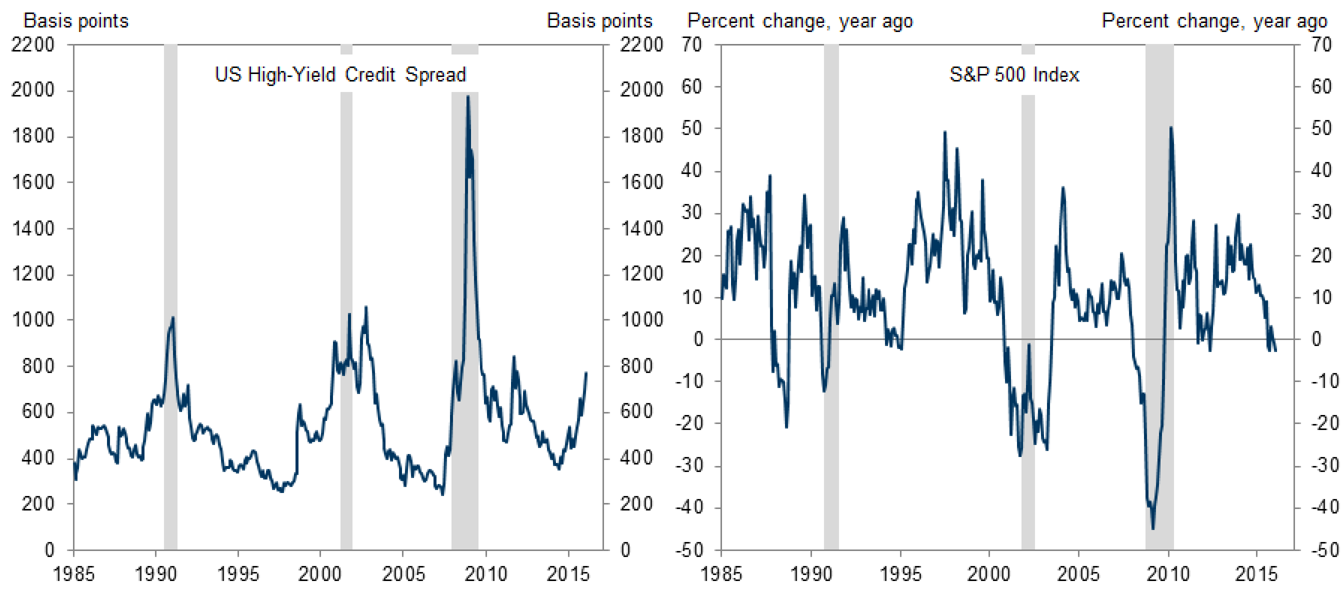
Financial markets now signal a high probability of another recession. As shown in Exhibit 1, high-yield spreads are at levels almost never seen outside of recessions. The message from the equity market is less clear-cut, but there are only a few non-recessionary instances over the past three decades in which the S&P 500 performed as poorly as it did over the past year.

Exhibit 1: Financial Markets Signal High Recession Risk



Source: Bank of America, Merrill Lynch, Standard and Poor's

But before concluding that a recession is inevitable, it is wise to remember Paul Samuelson's famous dictum that the (equity) market has predicted nine of the last five recessions. There are several episodes over the past few decades—including the 1987 stock market crash, the 1994 bond market rout and Mexican peso crisis, the 1998 LTCM failure, the 2002-2003 corporate credit/Iraq War slump, and the 2011-2012 European sovereign crisis—that looked severe from the perspective of the financial markets but did not result in a US recession. In each case, at least some financial markets were priced for significant recession risk, if not an outright slump. This created significant investment opportunities for investors willing adopt a more constructive view.

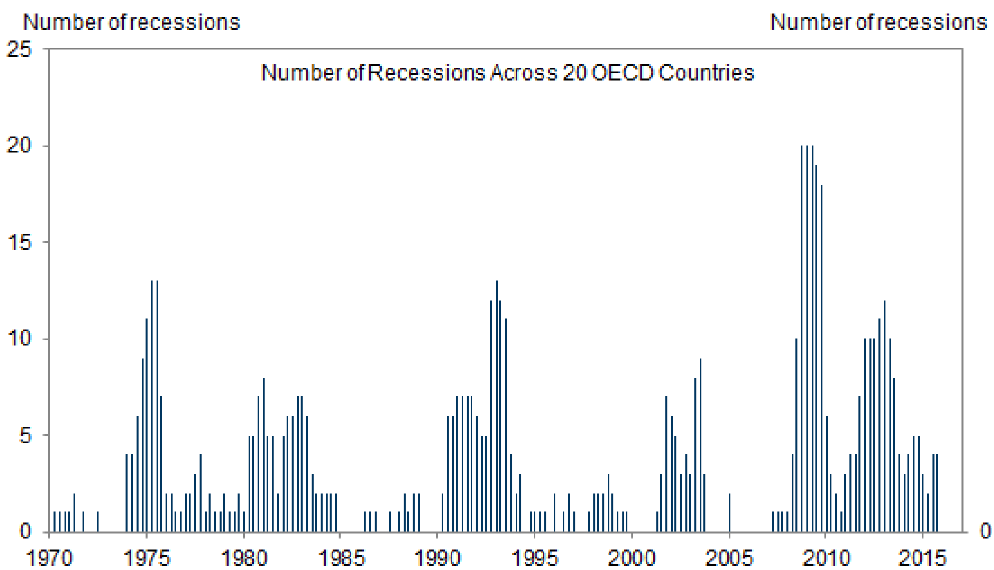
A Cross-Country Recession Model

To assess whether the current episode is another false alarm, we build a model that uses economic and financial variables to predict recessions. Our indicators are relatively standard in the literature on recession risk. They include past GDP growth, the output gap, the slope of the yield curve, equity and house price changes, and changes in the overall debt/GDP ratio. However, our model differs from most existing work in that we use panel data for all OECD economies, not just a single time series for a particular country such as the US.

Such a cross-country perspective is important for two reasons. First, we are interested in recession probabilities across a range of economies. Second, the added statistical power of a cross-country panel model is very welcome because recessions are relatively rare events. In particular, it allows us to put more weight on the implications of macro forces and not just financial indicators. But there are also costs associated with an international perspective. For example, we cannot use as many indicators to gauge recession risk, such as high-yield spreads, which are not available for many countries.

Our data set includes quarterly data for 20 advanced countries since 1970. We exclude emerging markets, which typically feature very different business cycles—periods of rapid growth that either never show the outright declines in activity seen in advanced countries (e.g. China) or are punctuated by severe financial crises. We define a recession as a quarter in which the year-over-year growth rate in real GDP per capita is negative. This criterion follows the IMF and provides an intuitive classification of the business cycle. In the case of the US, it leads to very similar recession timing to the NBER's recession classification used above. We tried alternative classification schemes—such as two consecutive negative growth quarters in real GDP—and found qualitatively similar results. Exhibit 2 shows the implied number of recessions in our sample of 20 countries since 1970.

Exhibit 2: Counting Recessions



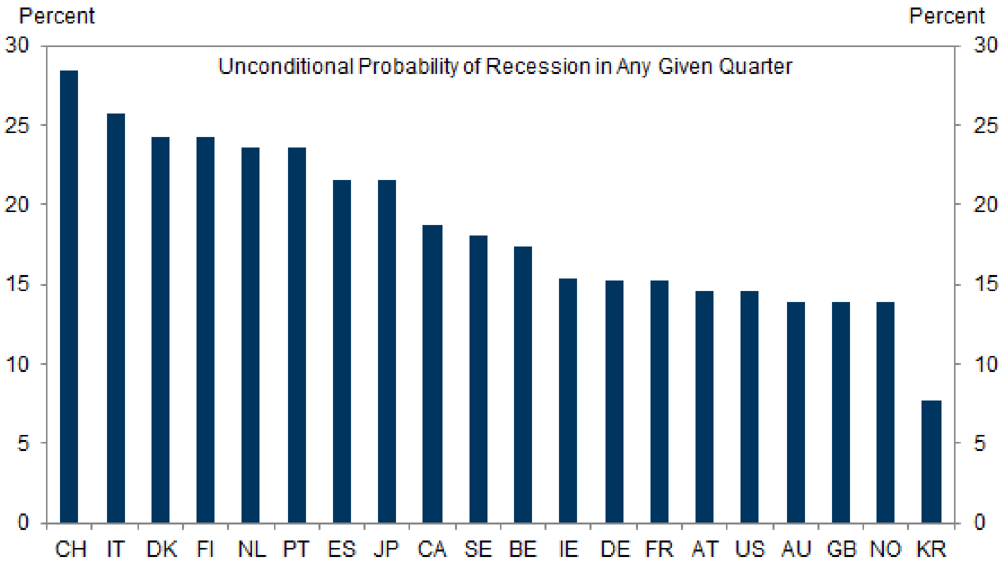
Source: Goldman Sachs Global Investment Research

Having defined recession quarters, we construct recession "alarm" indicators for different horizons, including the current quarter, the next year (including the current quarter) and the next two years (again including the current quarter).[1] For example, the "next year" indicator would cover the incidence of a recession in 2016. Exhibit 3 shows the implied unconditional probabilities of being in recession in that quarter. The main take-away is that unconditional recession probabilities are sizable. For the US economy, for example, the unconditional probability of being in recession is 15% in any given quarter, and as high as 34% over any given two years (not shown).

1. The setup and database are similar to our analysis of asset price "busts" a few years ago. See Jan Hatzius and Sven Jari Stehn, "The Risk of Another Bust," US Economics Analyst, August 15, 2014.

Moreover, unconditional recession probabilities vary significantly across countries. For example, Italy and Japan have had high average recession risk, whereas Korea, the US and the UK have had relatively low recession risk.

Exhibit 3: Unconditional Recession Risk across Countries



Source: Goldman Sachs Global Investment Research

We then estimate a so-called "probit" model to explore the drivers of recession risk over these different horizons. Specifically, we regress the above "alarm" indicators on (1) a country-specific "dummy" to capture local average recession risk; (2) macro variables (including growth in year-over-year real GDP per capita and the IMF's estimate of the output gap); and (3) financial indicators (including recent equity and house price growth, and the 5-year change in the credit/GDP ratio).[2.] We lag the information sufficiently to ensure that we have a predicted value from the model for the current quarter and start the sample in 1980.[3.]

Exhibit 4 shows our results. The first row for each variable in the table shows its economic importance, summarized by the marginal effect of a unit change in that variable on the probability of recession (holding all other variables at their sample average). The second row shows the statistical significance, summarized with the t-statistic and asterisks that denote statistical significance.

2. For the US economy, we use the Fed staff's estimate of the output gap which we believe captures the state of the cycle more accurately than the IMF's (which is still significantly negative).

3. We experimented with richer specifications that include other variables, e.g. investment, consumption, current account, consumer confidence, and PMIs. The main insight was that the fit does not rise dramatically when we include more information.

Exhibit 4: Coefficient Estimates

Recession Probability Model (1980Q1-2015Q4)	1Q	4Q	8Q
Lagged Growth	-5.1	-10.1	-7.4
(yoy, %)	[-12.1]**	[-12.4]**	[-8.6]**
Lagged Output Gap	1.5	6.9	10.3
(% of GDP)	[6.3]**	[11.1]**	[13.9]**
Yield Curve Slope	-0.4	-4.5	-7.1
(pp)	[-1.3]	[-6.8]**	[-8.7]**
Equity price change	-0.17	-0.83	-0.76
(last 2Q, %)	[-5.7]**	[-10.4]**	[-8.1]**
House price change	-0.5	-1.3	-1.1
(lagged, yoy, %)	[-6.0]**	[-7.0]**	[-4.8]**
Credit Ratio Change	0.03	0.35	0.70
(lagged, 5y, %)	[1.3]	[6.4]**	[9.9]**
Observations	2555	2523	2469
R squared	0.59	0.46	0.38

* denotes significance at the 5% level and ** at the 1% level.

Source: Goldman Sachs Global Investment Research

Our main results are as follows. First, the state of the cycle matters: solid growth momentum and greater slack lower the risk of recession significantly. The effect of recent growth is stronger for the risk of near-term recession; the output gap matters more for future recessions. Second, financial conditions (including the slope of the yield curve, equity prices and house prices) are powerful recession predictors, especially on a 4-quarter horizon. Thus, while the markets frequently sound false alarms, ignoring them entirely would be a grave mistake. Third, credit run-ups are helpful to predict recessions, especially at the longer 8-quarter horizon. And fourth, neither the age of the recovery nor the depth of the previous recession matter once the other variables in the model—especially the output gap—are included.[4.]

Recession Risk Has Risen Only Modestly

Exhibit 5 shows the estimated recession risks for the current quarter, the next 4 quarters, and the next 8 quarters for all the economies in our model. According to our model, the risk of recession is below the historical average in most of the major countries, including the US, the Euro area, and the UK, which benefit from good growth momentum, continued spare capacity, and declining debt/GDP ratios.[5.] In

4. See Zach Pandl, "Going the Distance," US Daily, November 9, 2015.

5. The estimated risk is particularly low in the UK because recent growth momentum and the credit/GDP ratio look particularly favorable there. We believe the message for the UK is probably a bit too positive, partly because the model cannot take into account broader issues such as the upcoming EU referendum.

contrast, the model shows much higher recession risks in other countries including Canada and to some degree Japan. This is largely because growth in these economies is already either negative or very low.

Exhibit 5: Estimated Recession Risk Over Next Four Quarters

	Latest Recession Probabilities					
	1Q		4Q		8Q	
	Current	Average*	Current	Average*	Current	Average*
Australia	**4**	14	**13**	23	**21**	35
Canada	**55**	19	**84**	35	**93**	58
Switzerland	**76**	28	**90**	45	**95**	62
Denmark	**2**	24	**9**	40	**16**	55
Euro area	**7**	19	**24**	33	**38**	49
Japan	**8**	22	**42**	39	**62**	57
Korea	**1**	8	**8**	12	**18**	18
Norway	**50**	14	**81**	33	**88**	48
Sweden	**1**	18	**6**	25	**14**	35
UK	**1**	14	**3**	19	**3**	26
US	**7**	15	**18**	24	**23**	34
DM	**9**	17	**25**	28	**34**	41

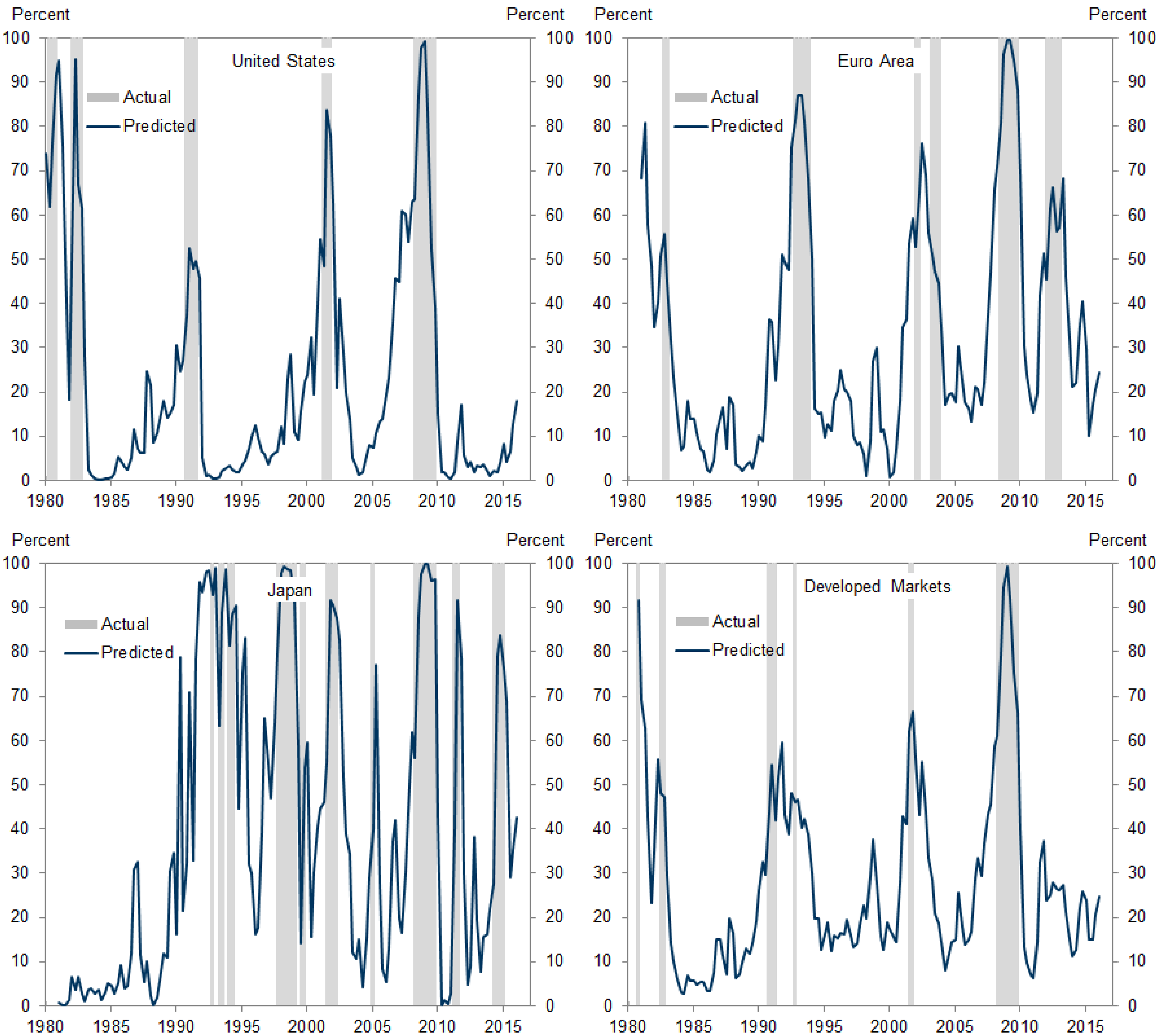
* 1980-2015

Source: Goldman Sachs Global Investment Research

Exhibit 6 provides some more historical perspective by plotting the four-quarter recession probability against actual recessions for the major economies. The US shows a rise over the past year, largely because of weak equity market performance and a shrinking output gap. However, the estimated probability remains well below the levels historically associated with recessions. In the Euro area, recession risk is likewise below historically worrisome levels, and a bit lower than a year ago as growth momentum has improved. In Japan, recession risk remains high; however, much of this is because the weak long-term growth trend and the unusual volatility of its GDP data make Japan unusually recession-prone under our definition. And across the advanced economies overall, recession risk is roughly in line with the average of the post-crisis period as well as prior periods of sustained expansion in the 1990s and 2000s.

[5] The estimated risk is particularly low in the UK because recent growth momentum and the credit/GDP ratio look particularly favorable there. We believe the message for the UK is probably a bit too positive, partly because the model cannot take into account broader issues such as the upcoming EU referendum.

Exhibit 6: Recession Risk Mostly Below Average

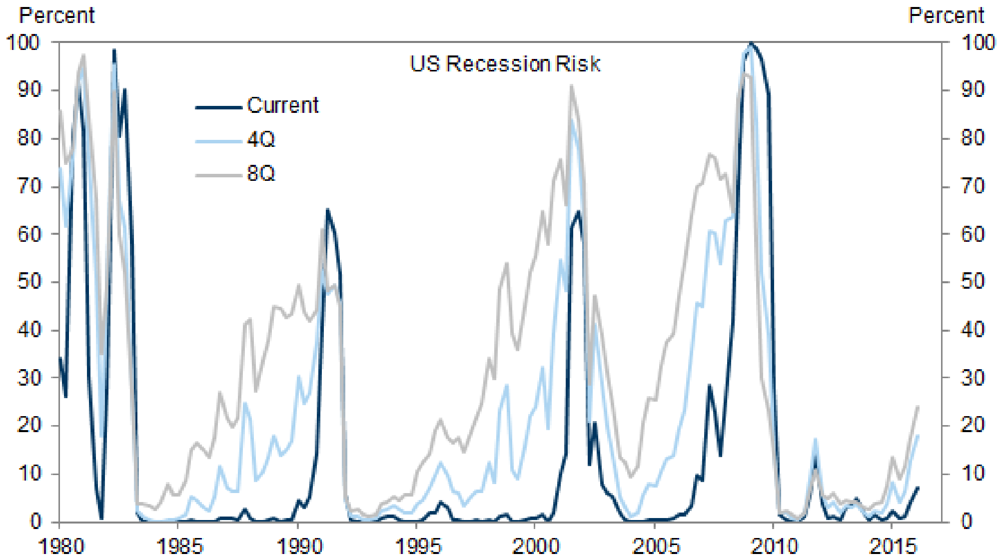


Source: Goldman Sachs Global Investment Research

Exhibit 6 also shows that the fit of the model is quite good; in general, recession risk was high before and during past recessions but not otherwise. However, a few caveats should be borne in mind. First, the out-of-sample performance of the model may not match the in-sample fit. This is partly because the model is estimated using revised rather than first-release data and, more broadly, because no two recessions are the same. Second, the yield curve term is problematic at the moment because of the unusual setting of monetary policy – i.e., the combination of QE and rates at or near the effective lower bound. Third, the estimates are somewhat sensitive to the sample period.

Before we conclude, it is worth looking briefly at the historical performance of the model at different horizons, at least for the case of the US. In past recession episodes, Exhibit 7 shows that the 8Q recession risk usually rises well before the 4Q and 1Q risk, as one would hope. The reason is that the 8Q model puts a large weight on indicators such as the change in the credit/GDP ratio, which are most useful at longer horizons, while the 4Q and 1Q models are more sensitive to indicators such as recent growth momentum. This is another reassuring finding, although the caveats noted in the previous paragraph apply here as well.

Exhibit 7: US Recession Risk at Different Horizons



Source: Goldman Sachs Global Investment Research

Limited Risk = Good Opportunity?

Our analysis suggests that recession risk across the advanced economies—while slightly higher than a year ago—remains below historically worrisome levels. This is consistent with our forecast of continued decent global growth, as well as the results from our global spillovers model showing that worse-than-expected outcomes in China and other emerging economies should be manageable from the perspective of the advanced economies.[6.]

For investors, our findings have relatively upbeat implications. They reinforce the message from our Global Markets team that the recent market weakness should provide good risk-adjusted opportunities for those brave enough to defy Mr. Market's gloomy prognosis about the world economy.

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6. See Jan Hatzius and Sven Jari Stehn, "Kicking the Tires on Our 2016 View," Global Economics Analyst, January 15, 2016.

Disclosure Appendix

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We, Jan Hatzius, Jari Stehn and Karen Reichgott, hereby certify that all of the views expressed in this report accurately reflect our personal views, which have not been influenced by considerations of the firm's business or client relationships.

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