SPECIAL REPORT

TD Economics

January 7, 2016

DON'T LET ZERO GET IN THE WAY OF THE LOWER BOUND

Highlights

- Three building blocks created a potent formula for negative yields in Europe: monetary policy, inflation expectations and the term premium.
- Increased demand from central banks is competing with increased demand from the more heavily regulated private sector, weighing on the term premiums (and thus yields) in both the U.S. and Europe. However, although U.S. Treasuries share common features with their European counterparts, U.S. yields are increasingly being driven by upward-biased fundamentals.
- International cross-currents will serve to temper the speed of adjustment in U.S. yields, but not prevent it altogether. In contrast, the U.S. backdrop will likely exert some pull-influence on European yields in 2016 and beyond.
- Meanwhile, increased public and private demand for government bonds is pushing investors to other products, leading to market oddities and unprecedented conditions.

The post-financial crisis world has tested many normative beliefs, the latest being that zero was the lower bound for nominal bond yields. Among 21 advanced countries, almost 22% of their outstanding sovereign bonds, or about US$7.1 trillion worth of debt instruments, are trading at negative yields. This phenomenon is most predominant in Europe, while Canadian and American bond yields have skirted this outcome thus far.

In many ways, the European experience is being imported into the U.S. government bond market. International financial linkages are keeping U.S. yields lower than would otherwise be the case. The cross-influence of ten-year government yields among eight developed countries[1] confirms that common factors within these countries contributed to just over 70% of the movement in their yields over the 1996 to 2014 period. This relationship has increased since the 1987 to 1995 period, when it represented a share of 55%. This partly explains how the Federal Reserve could hike rates by a well-telegraphed 25 basis points in December, and 10-year treasury yields could fall roughly 10 basis points in the days that followed alongside parallel moves among counterparts.

But, interconnectivity does not mean equivalence. There are three building blocks of a country's bond yields: the expected future path of real short-term interest rates, inflation expectations and the term premium. In Europe, all three components conspire to create a negative yield environment, typically out to the belly of the curve (5-year), followed by exceptionally low yields thereafter that hover barely above zero for countries with strong credit rankings. However, these same forces are also causing historically wide negative

CHART 1: PERSISTENT PRESSURE ON EUROPEAN YIELDS HAS CAUSED HISTORICALLY WIDE NEGATIVE SPREAD TO THEIR U.S. COUNTERPARTS

Source: Tulett Prebon, Board of Governors of the Federal Reserve System, TD Economics

Beata Caranci, VP & Chief Economist 416-982-8067
Maria Solovieva, CFA, Senior Business Analyst 416-380-1195

TABLE 1: PREVALENCE OF NEGATIVE POLICY RATES IN EUROPE

	Euro zone European Central Bank		Switzerland Swiss National Bank		Denmark Danmarks Nationalbank		Sweden Sveriges Riksbank	
Official Rates	*as of December 9/ 2015*		*as of December 3/ 2015*		*as of December 3/ 2015*		*as of December 3/ 2015*	
Ceiling	Main refinancing rate*	0.05%	Upper target LIBOR	-0.25%	Lending rate	0.05%	Lending rate	0.40%
Mid	-	-	Sight deposit *	-0.75%	-	-	Repo rate (official policy rate)*	-0.35%
Floor	Deposit rate	-0.30%	Lower target LIBOR	-1.25%	Rate on certificates of deposit*	-0.75%	Deposit rate	-1.10%

Source: ECB, Danmarks Nationalbank, Sveriges Riksbank, Swiss National Bank

** Central bank's reference interest rate*

spreads to their U.S. counterparts, where the underlying fundamentals of the building blocks are higher (chart 1).

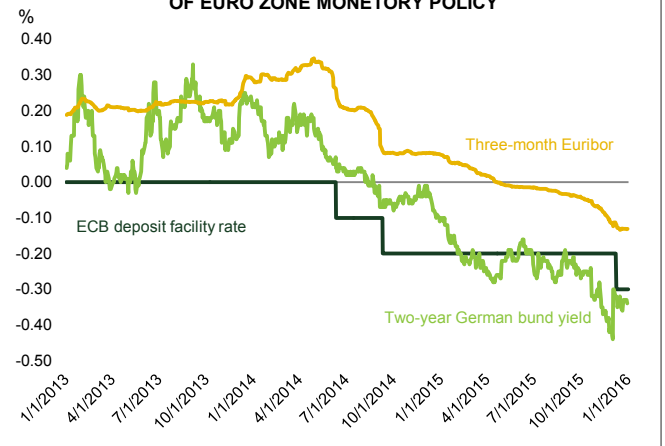
The bottom line is that international cross currents will serve to temper the speed of adjustment in U.S. yields even within a rate-hike cycle, but are unlikely to prevent upward movement altogether. Likewise, the Federal Reserve's rate-hike cycle is expected to be more gradual than during previous periods, reinforcing a more subdued speed of curve shifting (see TD Economics report: "U.S. Long-term Financial Asset Returns: An Economic Perspective"). Because international influences flow in both directions, the U.S. backdrop is likely to act as a pull-influence on European yields in 2016 alongside a central bank that will continue to step on the policy accelerator. We anticipate 10-year treasuries will be roughly 30 basis points higher by the end of 2016. The equivalent German bunds will likely be pulled up by at least a comparable extent over this time period.

To believe this premise, it's important to understand the push-and-pull market forces. Among euro area sovereign bonds, the European Central Bank's (ECB) negative deposit rate is anchoring down entire yield curves, but doesn't explain why negative yields persist beyond the 2-year term. European inflation expectations are anchored lower than in the U.S., but this too fails to fully explain yield differentials between the regions. A key distinction appears to be within the term premium. It is estimated to be in negative territory for many highly rated sovereign bonds within the euro area, and not for the U.S. The term premium is an unobserved variable within a bond's yield estimation, which captures the additional yield that investors require in order to commit to holding a long-term bond instead of rolling over a series of shorter term instruments. However, this is an over simplification. In practice, the term premium captures other appealing features within a security, such as liquidity or the ability to satisfy regulatory requirements. These forces are exacerbating the condition of lower yields in Europe relative to the U.S., where they are also observed, but to a lesser degree. Pressure on the term premium should lessen with time, and we explore all three building blocks below.

Europe's policy-push shifts down the yield curve

The negative policy setting among a number of European central banks can be thought of as a necessary, but not sufficient condition, to sustaining negative yields further up the curve. The central banks in Denmark, Sweden, Switzerland and the euro area have cut interest rates below zero (table 1). Denmark was first to break ranks in 2012 in order to dissuade foreign inflows that threatened the stability of its currency peg to the euro. The other three central banks followed suit much later, starting with the ECB cutting its deposit rate to -10 basis points in June 2014 and simultaneously lowering the refinancing rate (the main policy rate) from 0.25% to 0.15%. Doing so preserved the corridor of 25 basis points between the interest rate ceiling and the floor. Two more parallel moves occurred in September and December, with the deposit rate now resting at -30 basis points. The refinancing rate in the latest policy move was left unchanged at 0.05%. This policy action, along with other measures[2], were intended to reinvigorate lending

CHART 2. NEGATIVE SHORT-TERM BOND YIELDS AND INTERBANK RATES ARE THE DIRECT CONSEQUENCE OF EURO ZONE MONETORY POLICY



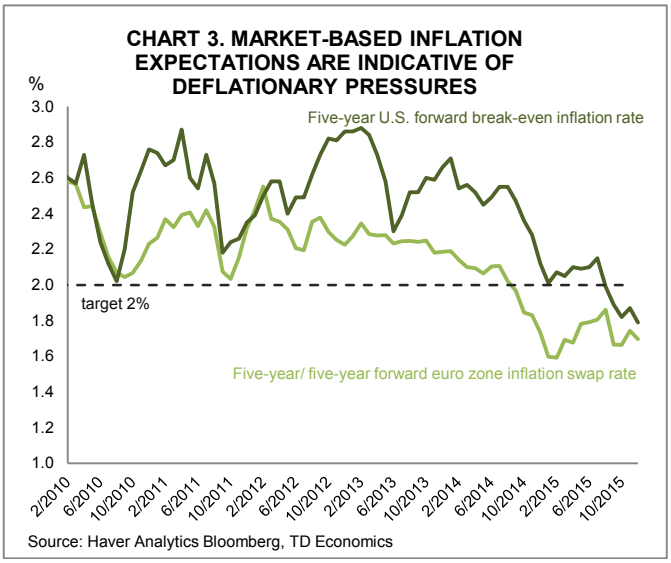
Source: ECB, Reuters.

activity by discouraging banks from holding excess reserve balances and to reduce financial fragmentation within the European Banking system. From the ECB's perspective, stronger economic underpinnings should ultimately safeguard inflation expectations closer to its target of just below 2% in the medium term.

In contrast, the target range for the fed funds rate is currently at 0.25-0.50%. The Federal Reserve never pursued negative policy rates, even amidst the financial crisis, and instead preferred implementing aggressive quantitative easing at that time. This automatically anchored the short-end of the yield curve at a higher level. As chart 2 demonstrates, euro area 2-year government yields, which are closely linked to the monetary policy rate, have been entrenched below zero since the ECB policy moves. Similarly, 3-month Euribor fixing (an interbank lending rate) was eventually re-priced into negative territory by April 2015.

In this context, it makes perfect sense why European yields at the shorter end of the curve are sitting in negative territory, while their American counterparts hold above the zero threshold. With the U.S. embarking on a modest rate-hike cycle, this will further pin the yield curve at a higher level than its European counterpart.

Differences in the short-end of the curve can be explained by policy decisions. But, it doesn't shed light on why yields are negative as far out on the maturity spectrum as 5 and 10 years for countries like Germany and Switzerland. The second building block, inflation expectations, is one element that comes into play here.



The wedge on inflation expectations

One of the most significant factors determining bond yields is inflation expectations. Bond investors inherently assume inflation risk – an uncertainty about real returns due to a change in realized inflation. The significance of inflation is particularly relevant for highly rated sovereign bonds, because the other influential variable – credit risk – is considered negligible.

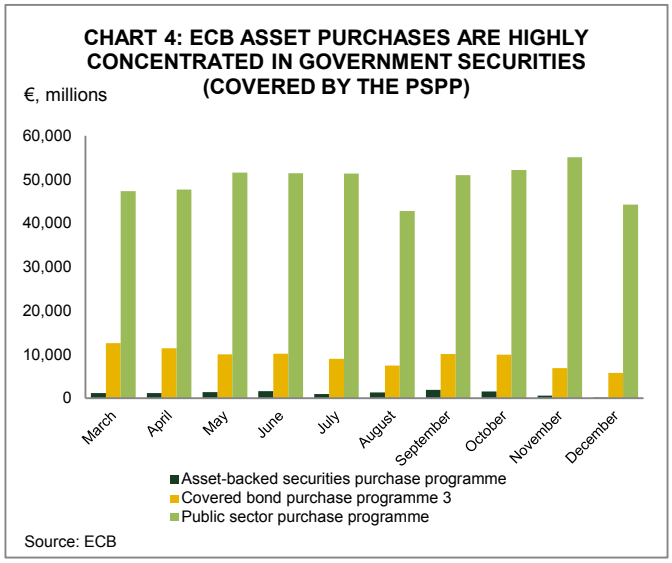
As demonstrated in chart 3, long-term inflation expectations in the US have held consistently and noticeably above its European counterpart since the debt crisis peaked in 2012. The market-based measure, calculated as the 5 year-over-5 year inflation swap, has only recently dropped below 2%. This in large part relates to expectations of oil prices, and likely captures some measure of market expectations that a higher fed funds rate will further temper inflationary pressures.

As we mentioned earlier, common factors among various countries have become increasingly important in influencing bond yields. The inflation expectations chart offers a glimpse of how interconnected sentiment can be between countries, without resulting in equivalence.

Central bank demand rises for government debt

Along this vein, both the Federal Reserve and the ECB embarked on quantitative easing (QE), in part to combat low inflation expectations stemming from a weak economic outlook. But, differences in timing between the regions, as well as economic and financial backdrops, have exacerbated negative yields in Europe. Central bank purchases have had the effect of removing securities, particularly in longer-dated assets, from the secondary market, which then gets captured within term premium estimations.

From March 2015 and over the subsequent 17 months, the ECB will purchase at least €1,056 billion securities from the secondary market via a combination of sovereign bonds, ABS and covered bonds. However, as chart 4 demonstrates, the bulk of the purchases are occurring within the larger sovereign debt market. Additionally, the ECB's purchase efforts remain concentrated around long-term maturities, as demonstrated by its portfolio duration weighted average of eight years. In turn, these factors are contributing to longer-dated European sovereign yields hovering around negative territory (table 2). For downward pressure on sovereign yields to moderate from increased



central bank demand, supply needs to at a minimum remain stable. Satisfying this condition is questionable. The age of austerity in Europe prompted many euro zone countries to reduce their reliance on debt financing. The IMF estimates that the European area fiscal deficit will shrink to 1.7% in 2016 and 1.2% in 2017, a significant change when compared to 6.2% in 2009[3]. Germany has been reporting a budget surplus since 2012 and its forecasted fiscal balance is expected to be 0.3% and 0.4% of GDP in 2016 and 2017, respectively. ECB asset purchases are not only predominantly aimed at government bonds, but sizable volume reductions are allocated to countries with the highest capital key[4]: Germany and France. As demonstrated in chart 5, after accounting for the originally-proposed asset purchases and reinvestment volumes, net government bond issuance is expected to fall by €475 billion by the end of March 2017.

In comparison, during the 6-year expansion period of the Federal Reserve's balance sheet (from the end of 2008 to the end of 2014), the Department of Treasury offered the markets a total of $6.7 trillion of Treasury assets, while the Federal Reserve purchased approximately $2 trillion. Even in this more favorable demand-supply environment, treasury term premiums were deep in negative territory. Pressure persists on that front because as long as the Fed continues with asset reinvestment, they are removing duration from the market. But, the downward pressure on the term premium, and thus longer dated yields, is occurring to a much lesser degree than when the Fed was actively conducting purchases to expand their balance sheet – like the ECB is doing today.

While the ECB's extended QE program maintains downward pressure on sovereign yields, it's more likely at this stage to offer a view on where the floor to yields exists, rather than create an intensification of downward pressure. The ECB has made many public statements confirming that it is committed to creating as few distortions as possible in the asset classes from a liquidity and pricing perspective, so it may increase the number of assets available for purchases

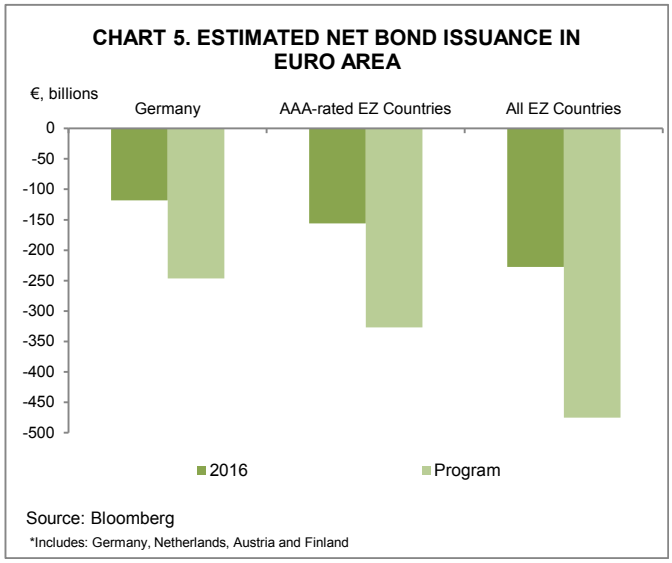
TABLE 2: EUROPEAN SOVEREIGN DEBT YIELD HEATMAP* (%)

	1 month	3 month	6 month	1 year	2 year	3 year	4 year	5 year	6 year	7 year	10 year	30 year
Germany	-0.431	-0.433	-0.331	-0.355	-0.341	-0.277	-0.170	-0.067	0.055	0.201	0.596	1.410
Finland					-0.306		-0.154	0.008			0.874	
Netherlands				-0.382	-0.329	-0.255	-0.174	-0.050	0.083	0.233	0.755	1.537
Austria					-0.257	-0.232	-0.133	-0.046	0.106	0.337	0.864	
Belgium				-0.386	-0.305	-0.259	-0.117	0.017	0.167	0.361	0.914	1.931
France	-0.416	-0.367	-0.353	-0.345	-0.284	-0.198	-0.063	0.080	0.194	0.376	0.937	1.935
Ireland				-0.281	-0.153	-0.064		0.147			1.119	1.119
Spain	-0.185	-0.125	-0.037	-0.019	0.084	0.195	0.500	0.674	0.807	0.970	1.734	2.871
Italy	-0.274	-0.128	-0.045	-0.027	0.099	0.154	0.429	0.618	0.896	1.093	1.601	2.664
Portugal					0.117	0.279	0.723	1.104	1.387		2.497	
Greece								8.014			8.339	7.766
non-EZ countries												
Denmark				-0.330	-0.179	-0.063		0.275			0.880	
Sweden	-0.429	-0.385	-0.426		-0.449			0.224		0.524	0.932	
Switzerland					-0.991	-0.963	-0.889	-0.790		-0.562	-0.163	0.611

less than or equal to -0.2 | between -0.199 and 0 | between 0.001 and 1 | more than or equal to 1.001 | more than or equal to 1.001

**December 2015 daily averages*

Source: Reuters, Tullet Prebon, Sveriges Riksbank, Swiss National Bank



if such a need emerges. The Governing Council has already extended the list of entities whose securities are Public Sector Purchase Programme-eligible three times since the implementation of the program. Recently, debt instruments issued by euro zone regional and local governments were added to the list. These measures have maintained a stability of asset supply in the past ten months of quantitative easing.

The coming months will convey the degree of push-and-pull forces occurring between international yields among competing demands, as the picture is continuously evolving. For instance, there is evidence of improving quality of sovereign debt in the euro area. This offers up more product to other investors looking for high quality liquid assets. Chart 6 paints a picture of market perception of the risk associated with euro area countries. Since the peak of the sovereign debt crisis in 2012, European credit default swap spreads, which capture the price of transferring credit exposure, have improved. If the ECB is successful and economic conditions in the peripheral countries improve and their credit outlook betters, the depth of the high-quality asset pool will increase. This will alleviate some pressure on the term premium, and by extension, yields will edge up alongside their U.S. counterparts.

Increased regulation prompts private sector to demand more high quality assets

However, the degree to which this can occur depends materially on competing influences from the private sector. The impact from QE purchases on the term premium is being heightened by competing demand from the private sector for high quality liquidity assets in response to regulatory changes, such as Basel III's Liquidity Coverage Ratio (LCR). This is occurring in both Europe and the United States, but the weight on longer-term sovereign yields is once again lighter in the U.S. due to more ample supply conditions among other assets.

Although high quality assets span a number of financial instruments, they provide a varying degree of liquidity buffer and the quality ranking of similar assets may differ across jurisdictions. For instance, cash is ineligible as a high quality liquid asset (HQLA) in the U.S., while the European Commission gives it top ranking. With regard to government-guaranteed securities, authorities on both sides of the Atlantic define them as highest on the spectrum of quality. But, the overall size and composition of the European pool of HQLA is a fraction of that in the United States. This further emphasizes the differences in demand dynamics between the two markets.

In the U.S., the estimated total size of the highest-rated securities used for LCR purposes is close to $16 trillion. This includes the biggest market of sovereign debt – U.S. Treasuries, and Ginnie Mae-backed RMBS (Residential Mortgage Backed Securities). Defined as the second highest ranking HQLA assets are the rest of agency RMBSs with a total value of $4.5 trillion, alongside other sovereign debt securities (table 3). These securities make up a sizeable supplemental asset pool even after adjusting for 15% haircuts applied to their market value due to their lower ranking. Moreover, additions to the definition of what securities qualify as HQLA may continue to occur

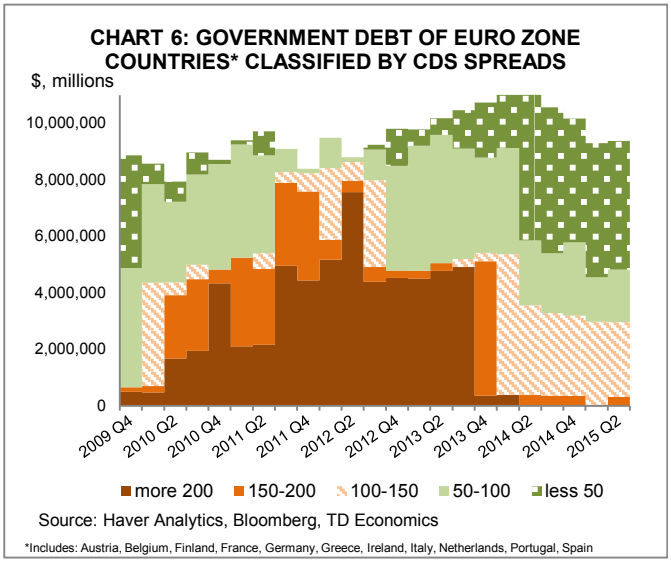


TABLE 3: HIGH QUALITY LIQUID ASSETS, COMPARISON BETWEEN THE U.S. AND E.U.

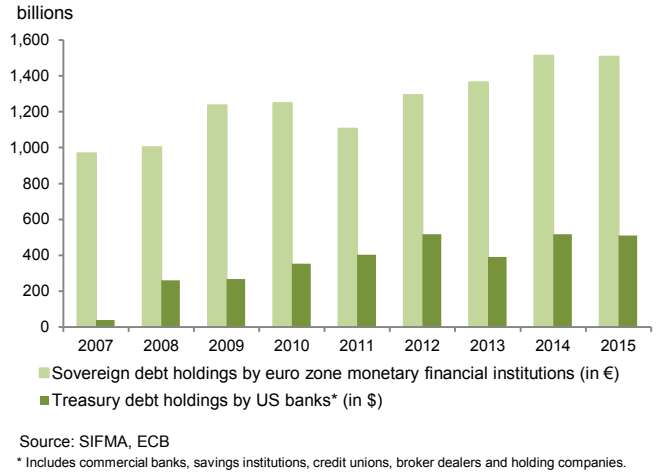
Europe	Level 1 asset	Level 2A asset	Level 2B asset
HQLA	- Cash - Deposits at central bank - Government or government guaranteed bonds - EU covered bonds with ECAI* 1 rating	- Third country government bonds - Bonds issued by public entities with a 20% risk weight (equivalent S&P A+ to A-) - EU Covered bonds with an ECAI* 2 rating - non-EU covered bonds rated ECAI* 1 and corporate bonds rated ECAI* 1.	- High quality securitized RMBS (retail mortgage backed securities), - Auto, SME (small and medium enterprises) and consumer loans - Corporate bonds rated at least ECAI* 3 - Shares that are part of a major stock index and other high quality covered bonds
Haircut	No haircut to all assets, except covered bonds: 7% haircut applied	minimum 15% haircut	minimum haircut varying between 25 and 50%
Limit to inclusion	No limit to all assets, except covered bonds: 70% cap applied	must be less than 40% of HQLA	must be less than 15% of HQLA
** External Credit Assessment Institution (ECAI). ECAI rating is given by ECAI registered in accordance with EC regulation (No 1060/2009), it is a standardized rating assigned to map credit assessments to corresponding risk weight. For a summary on ECAI recognition refer to: http://www.fsma.be/en/Supervision/finbem/bo/Article/imp/Supervisory%20Disclosure%20under%20Basel%20II/laws_regulations/ecai_recognition.aspx*			
United States	Level 1 asset	Level 2A asset	Level 2B asset
HQLA	- Federal Reserve bank balances - Foreign withdrawable resources - U.S. Treasury securities - Government National Mortgage Association (GNMA) -backed RMBS - Securities issued or guaranteed by certain sovereign entities and multilateral development bank (MDB)	- Securities issued or guaranteed by a U.S. government-sponsored enterprise (GSE) - Securities issued or guaranteed by certain sovereign entities or MDBs	- Investment grade corporate debt securities issued by non-financial sector entities - Publicly traded common equity shares of companies included in the Russell 1000 index or eligible foreign index
Haircut	No haircut	15% haircut	50% haircut
Limit to inclusion	No limit	No individual limit Level 2A plus level 2B must be less than 40% of HQLA	must be less than 15% of HQLA

Source: European Commission: http://europa.eu/rapid/press-release_MEMO-14-579_en.htm;Office of the Comptroller of the Currency. U.S. Department of the Treasury: http://www.occ.gov/news-issuances/federal-register/79fr61440.pdf

in the United States. For instance, municipal bonds were recently proposed to be added to the list, with the market estimated at $3.7 trillion.

In contrast, the total size of all bonds issued by euro area central governments is only €7 trillion, of which approximately €1.5 trillion is held by monetary financial institutions, in comparison to only about $500 billion of U.S. Treasuries held by American banks (chart 7). Furthermore, the euro-denominated mortgage-backed asset market is much smaller (€810 billion), less liquid, and is not guaranteed by the government; therefore, heavy haircuts of 25-50% are applied to these assets for LCR purposes. European regulatory authorities have taken steps to address some of these market-specific demand pressures. For instance, to compensate for differences in the government-guaranteed securities market size, European covered bonds and asset-backed securities (unlike their U.S. equivalents) are included as HQLA, albeit as lower-grade with 7-15% haircuts applied. These instruments offer some offsetting purchase options to sovereign debt for HQLA regulatory requirements, but represent a relatively smaller share of that market – estimated at €3 trillion at the end of 2014.

CHART 7: SOVEREIGN AND TREASURY DEBT HOLDINGS BY FINANCIAL INSTITUTIONS



Source: SIFMA, ECB
* Includes commercial banks, savings institutions, credit unions, broker dealers and holding companies.

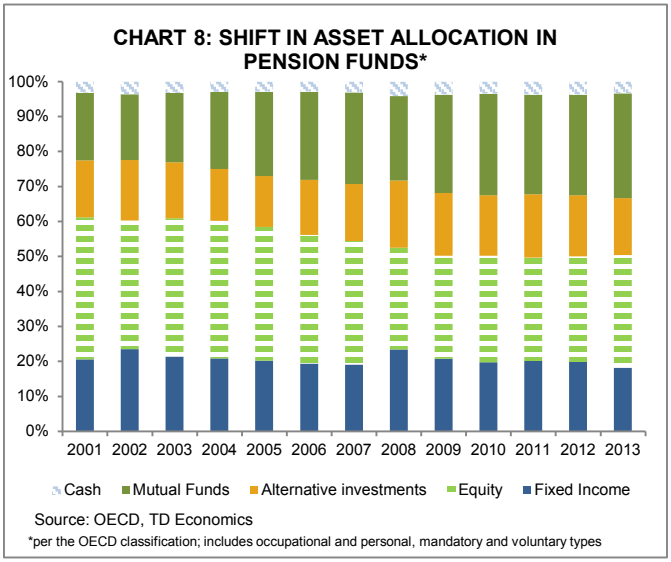
Regulatory demands result in a term premium on sovereign debt yields in both the U.S. and Europe being lower than would otherwise be the case. But it's also not a condition that remains static. The largest ramp-up in purchases to satisfy regulatory HQLA requirements has already occurred by financial institutions. Chart 7 shows that after an initial jump during the financial crisis, sovereign debt holdings by European monetary financial institutions and Treasury holdings by U.S. banks have increased to historically high levels. An LCR-monitoring exercise conducted by the Basel Committee supports this view. According to

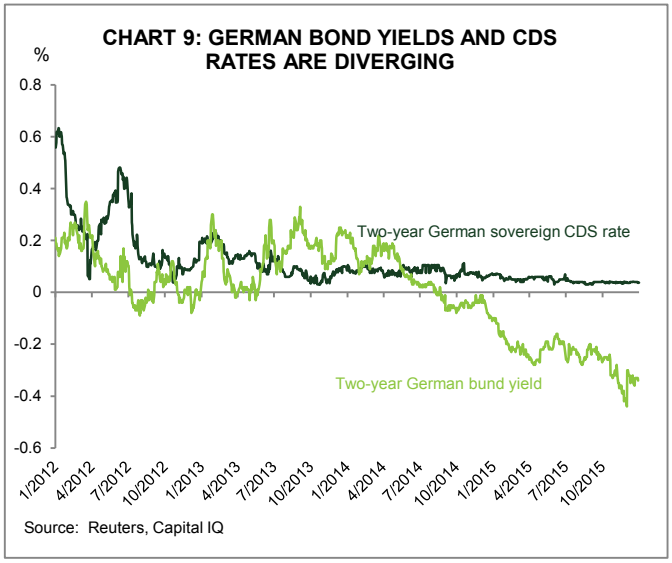
their report, 80% of the 210 banks in the sample reported a ratio that had already met or exceeded a 100% minimum requirement by the end-June 2014 reporting period[5]. This means that term premiums on sovereign bonds will remain depressed by ongoing reinvestment demand, but downward pressure itself shouldn't intensify from this influence alone.

Market distortions are a by-product of demand and supply forces

The potent combination of heightened public and private demand has compressed term premiums, reflecting an important influence contributing to exceptionally low sovereign bond yields. However, government debt is used as a pricing benchmark for other financial instruments. The end result is that exceptionally low sovereign yields have lead to a number of market oddities and unprecedented conditions. Unintended consequences have cropped up that are hard to estimate, but apparent in both Europe and the U.S.

Current low rates and excess liquidity are encouraging asset overvaluation. The initial market reaction to ECB QE in March was strong enough to encourage a bond buying spree across a spectrum of credit ratings, reaching far beyond the scope of the highest quality bonds. For instance, countries like Ireland and Spain, with respective sovereign debt ratings of A and BBB+, have also seen negative yields for notes and short-term bonds. Some corporate bond yields of consumer finance and telecommunication corporations, to name a few, with ratings equal to or less than single A, also acquired a negative sign. Negative yields even managed to expand into Central and Eastern Europe. For example, the influence of deeply negative Swiss yields allowed Poland to issue CHF580 million in bonds with a 3-year maturity at a yield of -0.231%. Poland's S&P sovereign rating is A-.





In an exceptionally low yield environment, there is also evidence that global investors have turned to alternatives to maximize their returns. Chart 8 demonstrates a shift in asset allocation of pension funds. Even after accounting for the equity market correction in 2008, the biggest investors have been reallocating their portfolios away from traditional asset classes. The low yield environment of the past 5 years has impacted liabilities within pension fund balance sheets. According to the report by Mercer, the S&P 1500 (U.S.) pension funded status declined from 88% in 2013 to 79% in 2014, which was partially caused by the decrease in interest rates[6]. In Europe, the landscape is not as straight forward: countries like Cyprus, Ireland and UK are experiencing a deficit in their defined benefit plans, while Belgium, Croatia, Denmark and Germany have reported an increase in surpluses in 2014. These countries' reported surpluses stem from mandatory pension liabilities' funding requirements.

Other market oddities are becoming evident in the spreads of some sovereign CDS, which are hovering over the zero rate threshold, but are reluctant to cross it (chart 9). Simply put, a CDS is similar to an insurance contract, while a CDS spread represents a price the buyer of the contract is willing to pay to the seller to remove credit risk exposure of the underlying asset. Generally, this price should reflect the credit risk comparable to bond spreads, even if they don't move at the same time and magnitude. Since the zero bound rate notion has been discredited, CDS spreads should

theoretically turn negative. However, in practice, it's very unlikely, as negative spreads would imply that the insurer takes on the risk and pays for it. As a consequence, these securities are going to deviate further from underlying fundamentals making them less attractive as hedging instruments. The list goes on with potential market distortions and unprecedented outcomes, far too many to tackle in this report. The discussion above merely offers a shortlist of how unintended consequences reinforce symptoms of financial market fragility due to a deterioration of bond market liquidity.

Bottom line

The bottom line is that the prevalence of negative yields in Europe is largely unique to that region, but the persistence of a low yield environment will not be unique within global financial markets. The building blocks of European yields have all conspired to produce a heavy weight via the expected future path of real short-term interest rates, inflation expectations and, in particular, the term premium. The term premium for U.S. treasuries has some common features to their European neighbors, particularly when it comes to the downward influence stemming from regulation. However, because conditions differ in most other areas of the building blocks, that interconnectivity will only serve to temper the speed of adjustment in U.S. yields, and not prevent an upward shift altogether. By extension, international influences flow in both directions and the U.S. backdrop is likely to exert some pull-influence on European yields in 2016. All this points to the notion that the trough in global yields is likely in the rear-view mirror – barring a significant weakening in economic conditions. However, by the same token, there is not an economic or market foundation for a large step-up in those highly desired sovereign yields any time soon.

Beata Caranci, VP & Chief Economist
416 -982-8067

Maria Solovieva, CFA, Senior Business Analyst
416-380-1195

End Notes:

1. G7 countries (Canada, France, Germany, Great Britain, Italy, Japan and the United States) plus Switzerland.
2. Including euro and US dollars long –term refinancing operations, TLTRO (Targeted Longer-Term Refinancing Operation), and asset purchase programs, such as ABSPP (Asset-Backed Securities Purchase Programme), CBPP (Covered Bond Purchase Programme) and PSPP (Public Sector Purchase Programme). Refer to TD Economics Report "EZ Credit" for more information.
3. International Monetary Fund, Fiscal Monitor 2015. Retrieved November 2015, from International Monetary Fund: http://www.imf.org/external/pubs/ft/fm/2015/02/fmindex.htm
4. Each national central bank of EU accounts for a fixed percentage of ECB's capital (capital key). This percentage reflects the respective country's share in the total population and gross domestic product of the EU: https://www.bundesbank.de/Redaktion/EN/Topics/2014/2014_01_16_understanding_the_capital_key.html
5. Basel III Monitoring Report. (2015, March). Retrieved November 2015, from Bank for International Settlements: http://www.bis.org/bcbs/publ/d312.pdf
6. Mercer. (2015, January 6). Retrieved November 2015, from Mercer Global Homepage: http://www.mercer.com/content/mercer/global/all/en/newsroom/SP-1500-pension-funded-status-declines-in-2014-as-low-interest-rates-and-new-mortality-tables-overpower-positive-asset-returns.html#