

Treasury Borrowing Advisory Committee Presentation

- ***WAM and the Debt Portfolio***
 - ***Historically, Treasury has used the Weighted Average Maturity (WAM) of the debt portfolio as a simple proxy for the portfolio's structure, cost and risk. Since the 2008/09 financial crisis, Treasury has extended the WAM from 49 months to 68 months and the WAM is now at levels approaching multi-decade highs.***
 - ***WAM, however, is just one metric and, as with all simple proxies, WAM does not fully capture several important characteristics of the Treasury portfolio. We would like the Committee to comment on WAM as a metric for measuring the debt portfolio. What other metrics should Treasury monitor and publish with respect to the Treasury portfolio? Please discuss.***

WAM is approaching multi-decade highs

- The weighted average maturity (WAM) of outstanding Treasury debt has risen significantly from the lows of 49 months and is now approaching multi-decade highs
- Is WAM an accurate measure of Treasury's costs and risks?

Pros

- A single summary indicator of Treasury's risks
- A simple, easy to communicate, metric

Cons

- May overstate /understate shifts in roll-over risk
- Does not capture the concentration of roll-over risk
- Not a sufficient statistic to capture the ex-ante cost of issuing debt
- Does not capture the “completeness” of the market

Weighted average maturity of the outstanding Treasury debt has risen to close to 30y highs

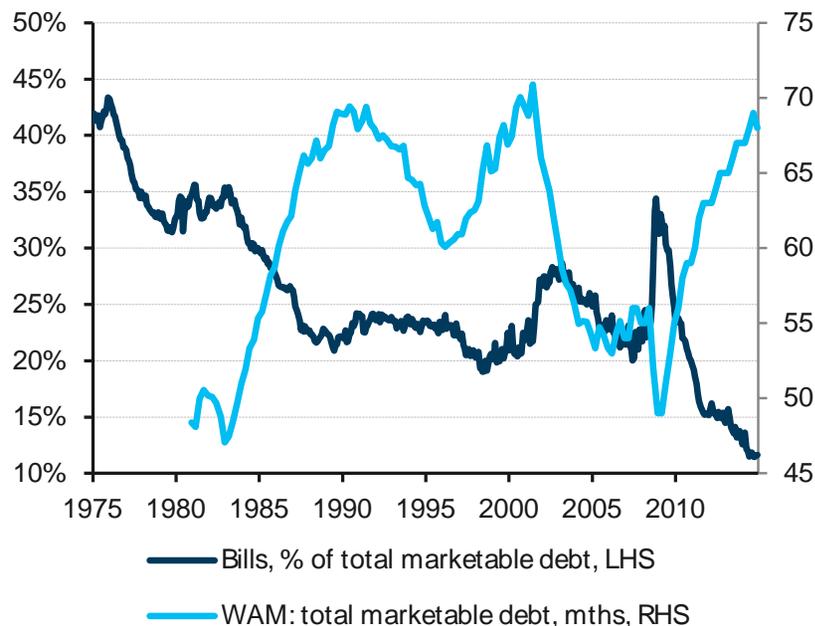


Source: Haver Analytics, US Treasury

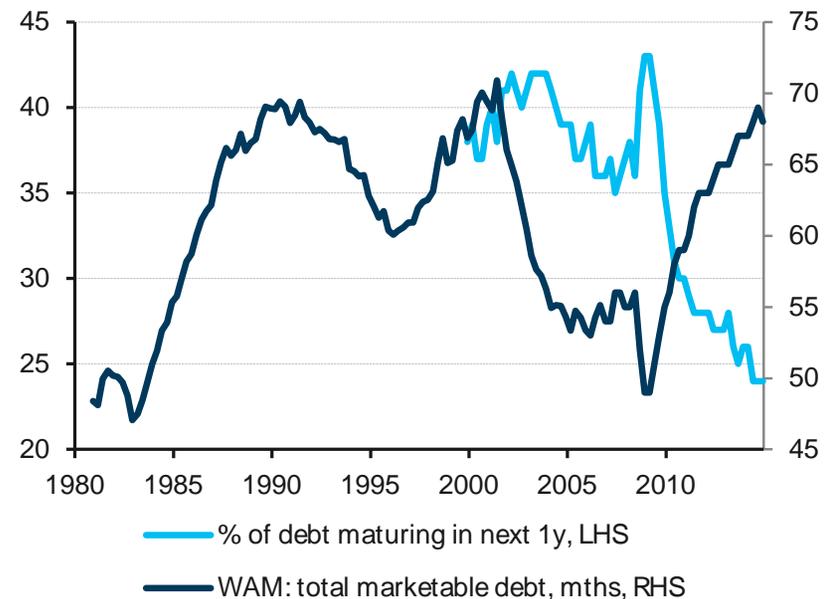
Is WAM a good measure of Treasury's roll-over risk?

- WAM is a proxy for measuring roll-over risk. Higher WAM typically implies lower roll-over risk
- However, changes in WAM may overstate or understate the shifts in the degree of roll-over risk
- **Alternate Metric: % of outstanding debt maturing over the next year (T-bills and <1y)**
- Average maturity has risen from the lows but only back to the levels seen in 1990 and 2000. However T-bills, as a % of outstanding debt and % debt maturing in the next one year are much lower
- **Extension of WAM is actually understating the reduction in the near term roll-over risk**

Bills, as % of total debt, are at much lower levels even as WAM has increased to near record highs



Debt maturing in 1y, as % of total debt, is at much lower level, even as WAM has increased to highs

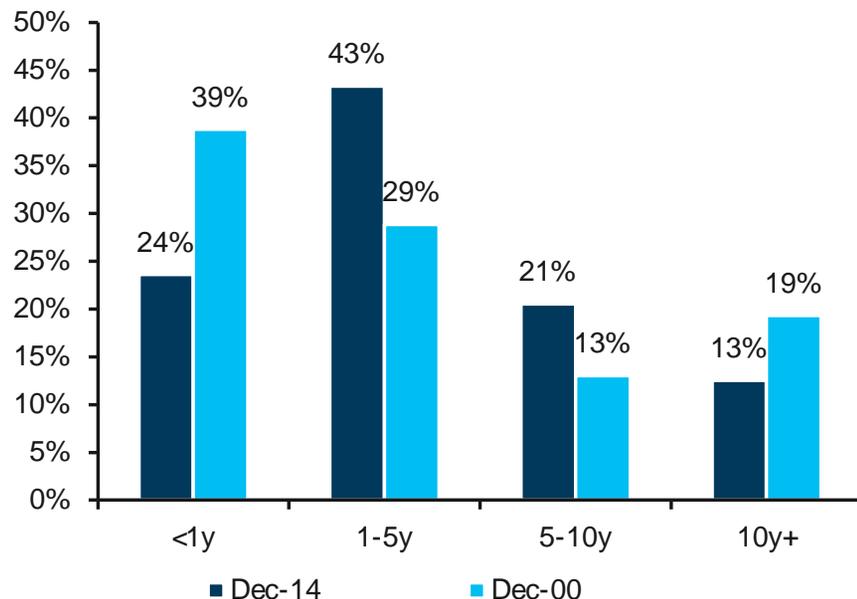


Source: Haver Analytics, US Treasury

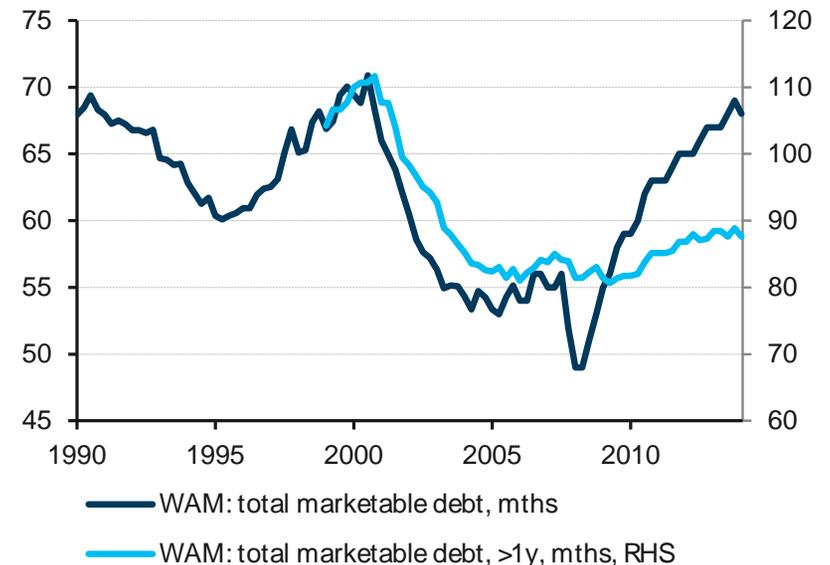
Why is the rise in WAM understating the reduction in near term roll over risk?

- The reason why the increase in WAM so far has understated the reduction in near term roll-over risk is because the Treasury universe is still relatively front loaded
- As compared with Dec-2000, when WAM was at similar levels, % maturing at in 1-5y is greater and % maturing in 10y+ is lower
- WAM of the Treasury universe, maturing in >1 years, is well below the historical highs

% Debt maturing in <1y is well below 2000 levels but it has mainly gone up in the 1-5y sector



WAM of the Treasury universe >1y is well below historical highs

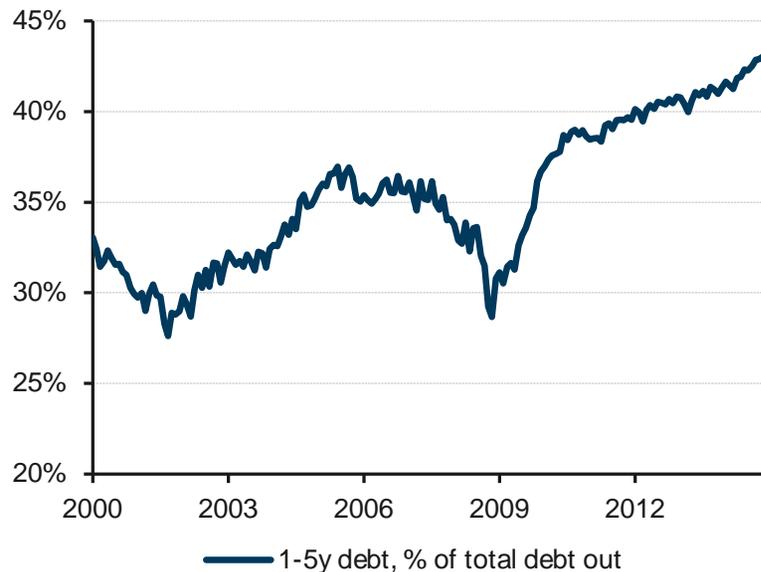


Source: Haver Analytics, US Treasury

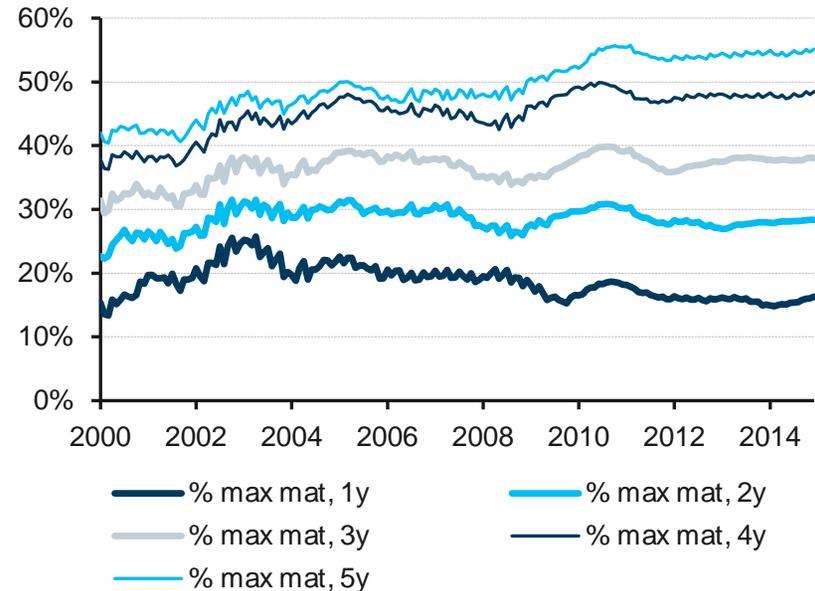
WAM does not capture concentration of roll-over risk

- WAM is silent about the distribution of outstanding debt. As seen earlier, roughly similar WAMs can correspond to different distributions
- **Alternate Metric: highest % maturing in any period of x years (beyond the first year*)**
- For instance, currently the highest % maturing in any 5y period (beyond the first year) is 55%. In 2000, that was 40%. Same is the case with periods of other lengths
- **Concentrated roll-over risk has risen even as near term roll over risk has fallen**

Debt maturing in 1-5y, as % of total debt, has increased, suggesting shifting of rollover risk from 1st year



Highest % maturing in any given window has not fallen even as near term roll over risk has



Note: * The rhs figure reflects max maturing excluding the first year as the first year is already captured by metrics focused on near term roll over risks. Source: Haver Analytics, US Treasury

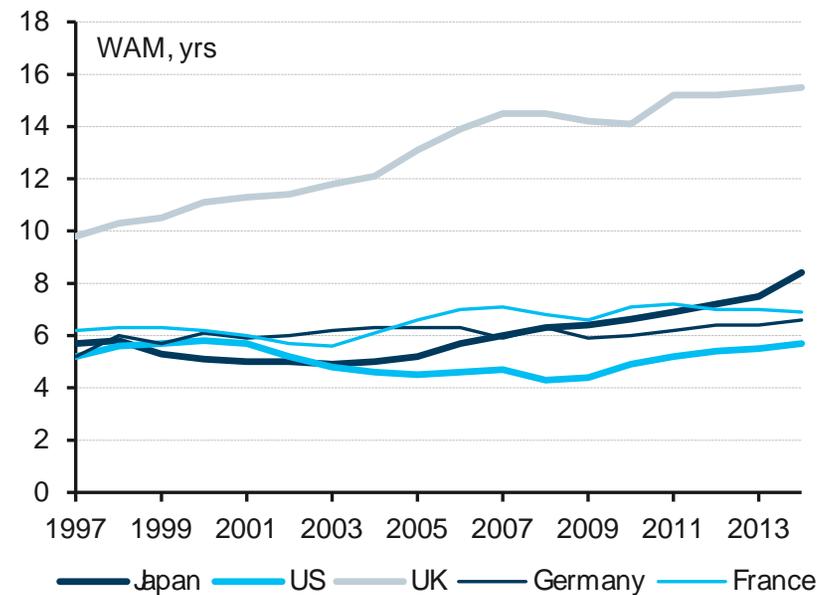
Distribution of Outstanding Debt: A global perspective

- WAM is high in a historical context but is low in a global context.
- Near term roll over risk is higher than other major government bond issuers.

Treasury's roll-over risk is still high in a global context

| | WAM (yrs) | % of debt maturing | | | |
|---------|-----------|--------------------|------|-------|------|
| | | <1y | 1-5y | 5-10y | 10y+ |
| US | 5.7 | 24% | 43% | 21% | 13% |
| Germany | 6.6 | 14% | 41% | 29% | 16% |
| France | 6.9 | 19% | 34% | 26% | 20% |
| Japan | 8.4 | 9% | 40% | 26% | 25% |
| UK | 15.5 | 10% | 24% | 20% | 46% |

WAM of US Treasury debt is at the lower end of the range for major issuers



Source: US Treasury, MOF Japan, Bloomberg

Is WAM a good proxy for cost of issuing debt?

Treasury's Primary Goal: to finance government borrowing needs at the lowest cost over time

Methodology: issue debt in a regular and predictable pattern, provide transparency in our decision-making process, and seek continuous improvements in the auction process

How to measure the cost of issuing debt?

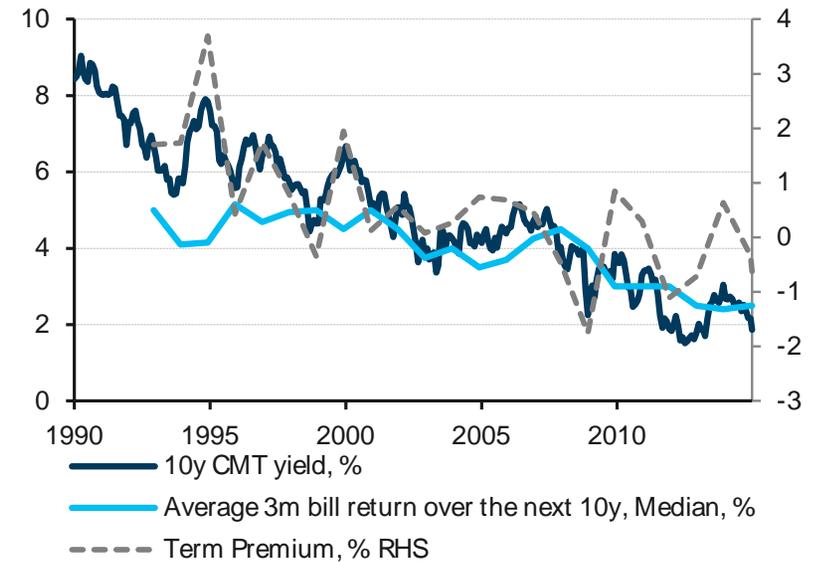
- Treasury yields = Expectations of the path of short rates + Term premium
- Term premium = compensation demanded by investors for taking duration risk
- **Hence, term premium can be thought of as Treasury's ex-ante cost of issuing fixed rate debt vs T-bills /FRNs**
- Increasing WAM typically comes at a cost as term premium is usually significantly positive
- As a result, there usually exists a trade-off between reducing roll-over risk (via issuing long term debt) and reducing cost (via issuing short term debt).
- However, this does not always have to be the case

Source: US Treasury

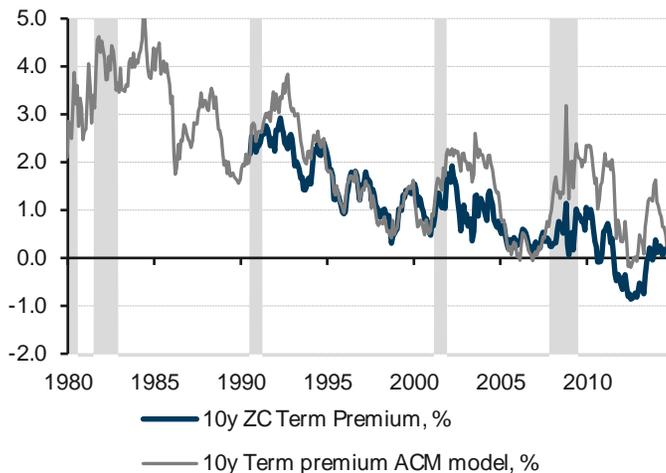
Term premium is well below pre-crisis levels, perhaps negative

- How does one measure term premia?
 - Survey based measures: Difference between current 10y yields and the expected average of 3M T-bills/FF rate over the next 10y years
 - Survey of professional forecasters (top right)
 - NY Fed Survey of primary dealers / market participants (bottom right)
 - Term structure models (bottom left)
 - Kim and Wright (2005)
 - Adrian, Crump and Moench (2013)
- Both methodologies suggest term premium is currently very low, perhaps negative. Hence, even though WAM is at historically high levels, ex-ante cost of issuing term debt is well below pre-crisis levels

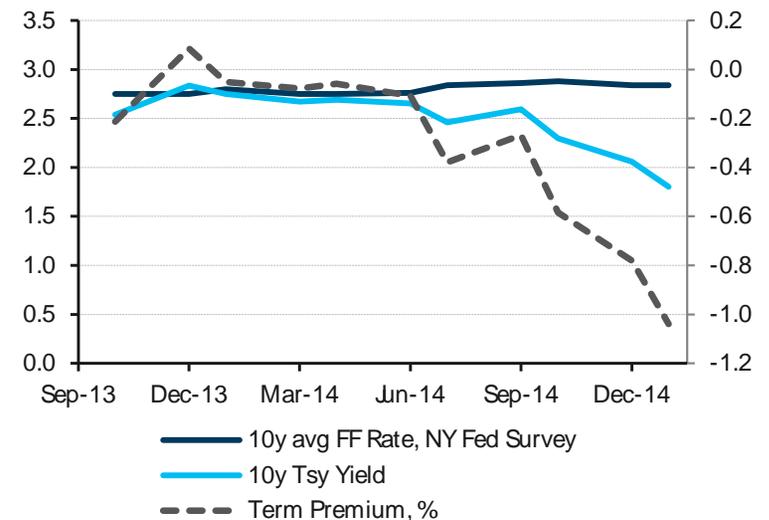
Survey based measures show term premium is currently negative



Models based measures also show term premium is currently negative



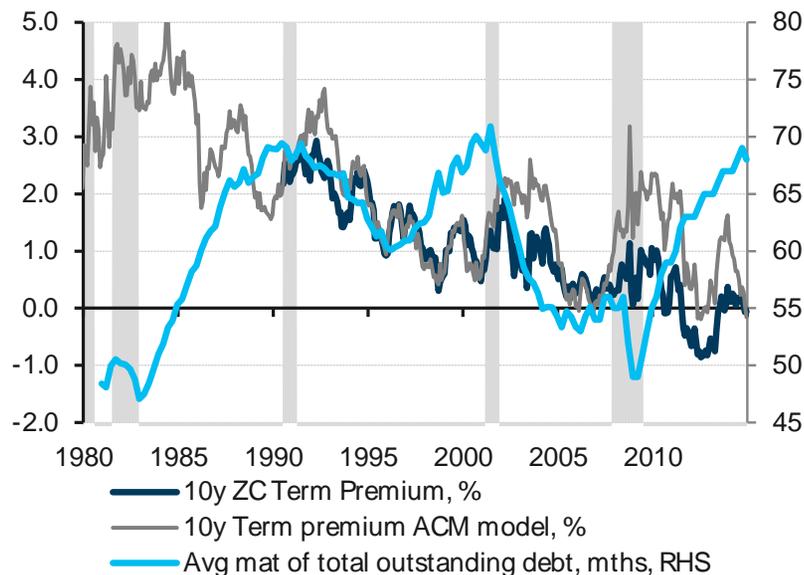
Source: Haver Analytics, New York Fed, US Treasury



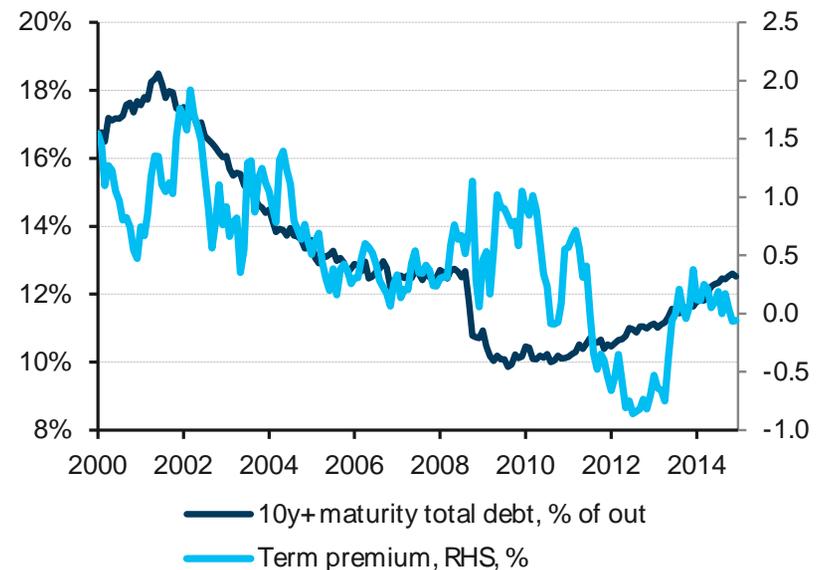
WAM is at the highs but ex-ante costs are quite low

- WAM is close to the historical highs but ex-ante cost of issuing term debt is perhaps negative (given that term premium is arguably negative)
- % maturing in the long end is low in a historical context. More room for issuing longer dated debt

WAM is at the highs, but ex-ante cost of debt issuance is well below pre-crisis lows



Scope for long end universe to expand

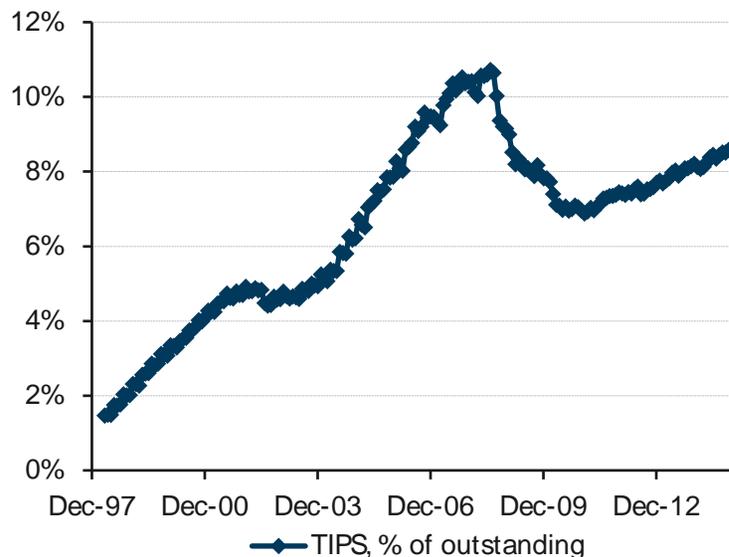


Source: Haver Analytics, US Treasury

Measuring ex-ante cost of issuing Nominals vs TIPS

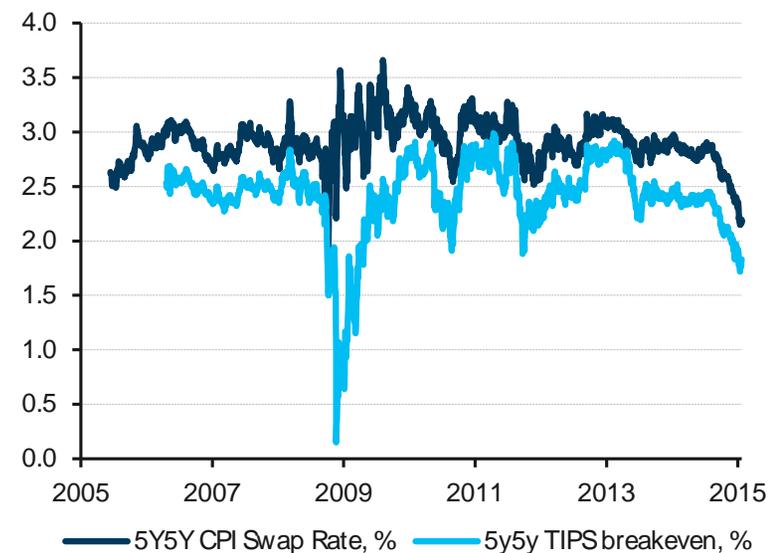
- With the share of TIPS in the outstanding universe having risen, nominal term premium also does not fully capture the trade-off the Treasury faces
- Ex-ante cost of issuing Nominal Treasuries vs TIPS: Inflation Risk Premium – Liquidity Premium
- Inflation risk premium = Compensation demanded by investors for taking inflation risk
- Liquidity Premium = What investors are willing to pay to own a more liquid security (Nominals)
- Hence ex-ante cost in issuing nominal Treasuries vs TIPS are higher when inflation risk premium is higher and perceived liquidity premium is lower

Share of TIPS in the outstanding universe has increased over the last few years



Source: Haver Analytics, US Treasury

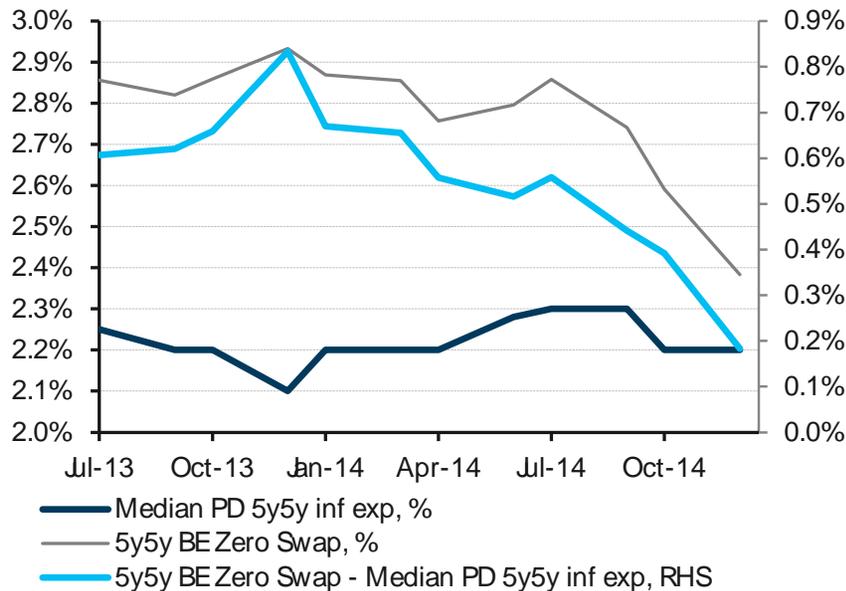
TIPS breakevens have tightened sharply over the last few months. CPI Swap rates at lows



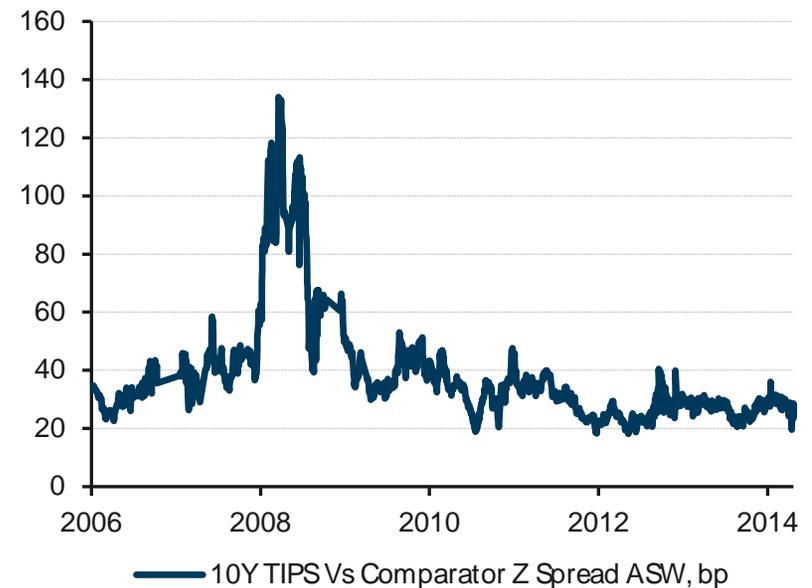
Ex-ante cost of issuing Nominals vs TIPS has declined

- Measuring Inflation risk premium using the difference between market and survey based measures
- 5y5y inflation swap rates have fallen over the last few months. However, the NY Fed survey of primary dealers show 5y5y inflation expectation have remained stable. This suggests that inflation risk premium has compressed.
- Measuring Liquidity premium: Asset swap differential between TIPS and nominal Treasuries. Excluding the 2008 crisis, the differential has remained in the 20-40bp range at the 10y tenor (TIPS being cheaper than Nominals)
- This suggests that ex-ante cost of issuing nominal Treasuries vs TIPS has fallen over the last few months as inflation risk premium has fallen and liquidity premium has remained stable

Survey based measures of medium term inflation expectations have remained unchanged



TIPS trade at a discount to nominal Treasuries on Asset Swap

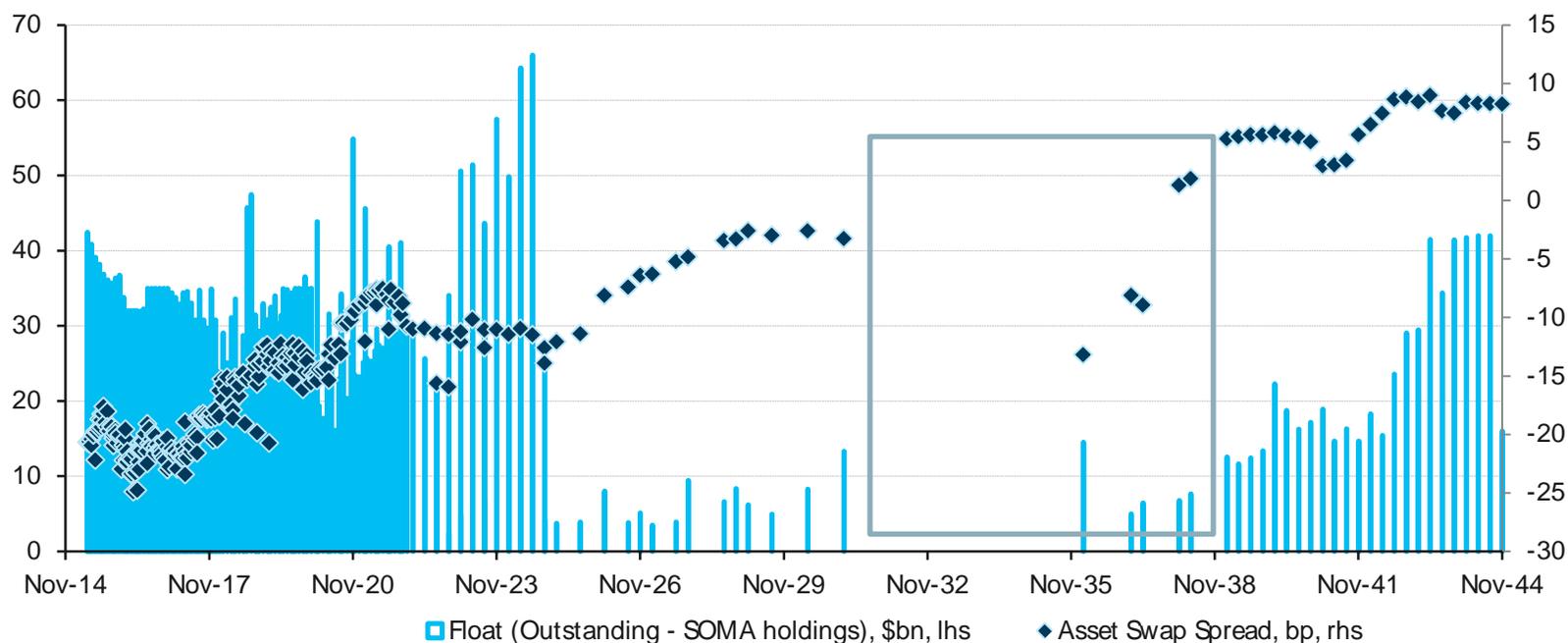


Source: Haver Analytics, New York Fed

Measuring the “completeness” of the market

- WAM does not say anything about idiosyncrasies of the distribution of the outstanding debt
- There are no nominal Treasuries maturing between Feb 2031 and Feb 2036. Further, the total amount outstanding between Feb 36 and May 38 (both included) is \$112bn of which \$72bn is held by the Fed. Hence, the total float available to investors in this sector is very small
- Feb 2036 are trading significantly rich on the curve as they are likely to be the CTD in the US Futures contract for many years. This richness has spilled over to nearby issues as well.
- At current auction schedule, it will be a while before new 10y securities issued by the Treasury start filling the gap. The Treasury may consider issuing securities in this sector to iron out such dislocations.

Outstanding debt is unevenly distributed with no bonds maturing between 2031 and 2036

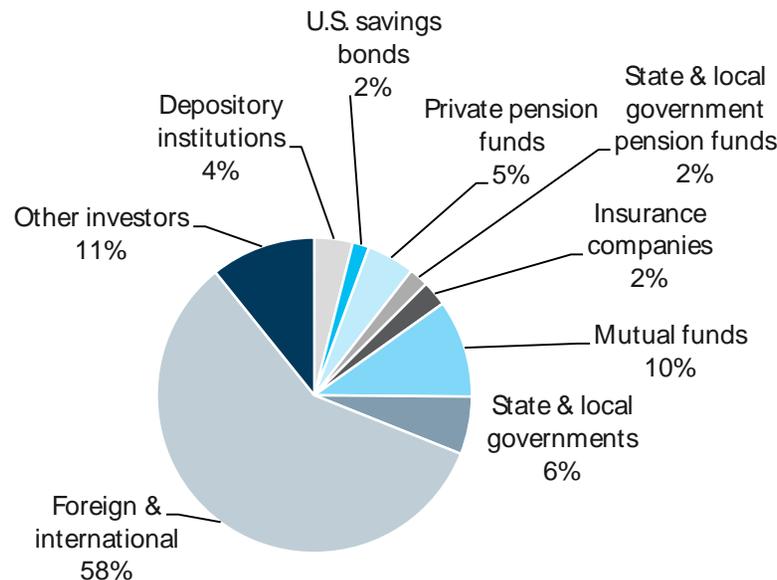


As of Jan 26. Source: New York Fed, US Treasury

Measuring the Ownership concentration risk

- WAM , obviously, does not say anything about the ownership structure of the outstanding debt
- Foreign investors hold almost 60% of privately held Treasury debt.
- In contrast depository institutions hold just 4%
- The Treasury may consider ways to diversify the investor base.

Breakdown of ownership of privately held Treasury debt



As of Q3 14. Source: Haver Analytics, US Treasury

Foreign investors hold ~60% of privately held Treasury debt and Depository Institutions only 4%



— Foreign ownership, % of private held debt

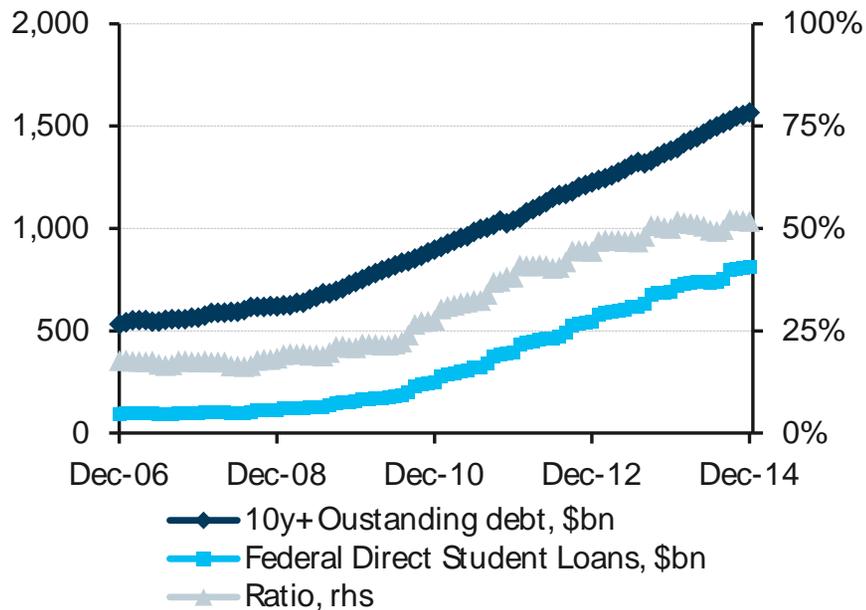


— Dep Inst, % of private held debt

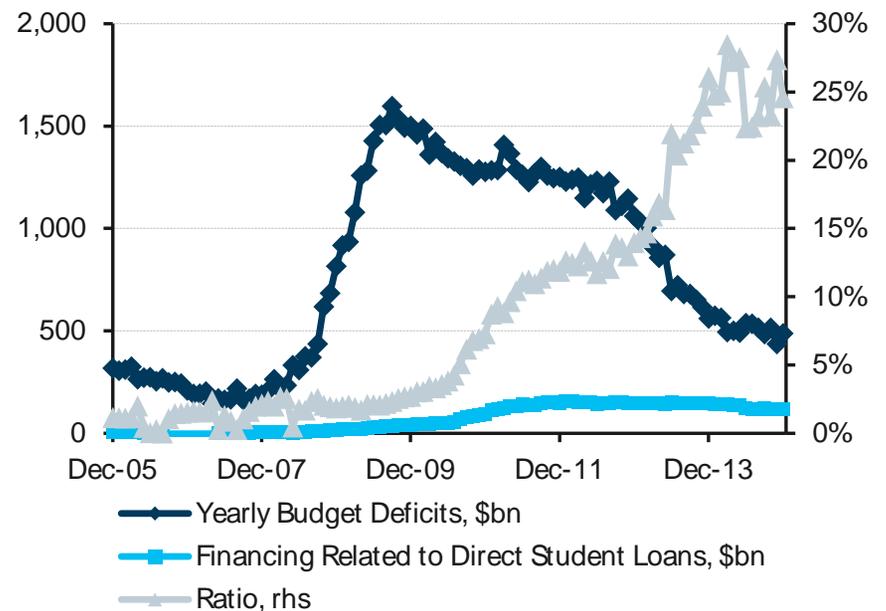
Government ownership of financial assets has risen substantially from pre-crisis levels

- Government's holdings of financial assets have increased substantially since the crisis. For instance, direct student loans on government balance sheet are almost \$0.8trn (equivalent to roughly 50% of outstanding 10y+ debt).
- Further, funding needs related to acquiring financial assets, mainly direct student loans, are increasingly becoming a significant share of overall borrowing needs (equivalent to 25% of budget deficits in 2014)
- According to OMB, direct loan accounts are expected to increase by another \$1trillion or so over the next decade.
- Other financial assets include operating cash balance (2014 average: \$83bn) and GSE preferred stock (\$140bn)
- Should the portfolio be considered net of financial assets?

Direct student loans on government balance sheet equate to roughly 50% of outstanding 10y+ debt



Financing needs related to direct student loans have average ~25% of deficits recently

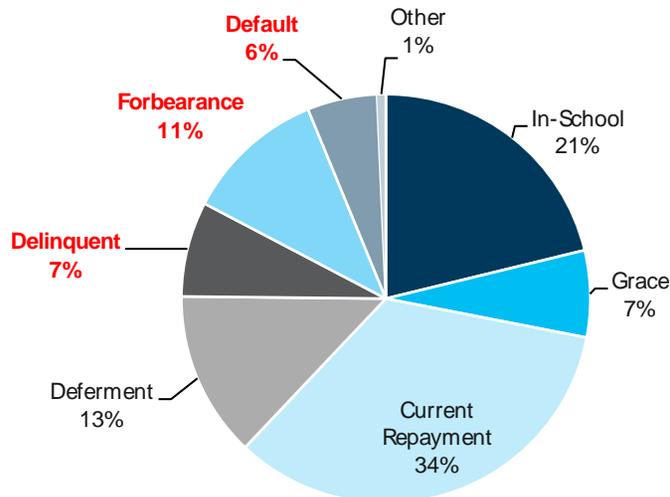


Source: OMB, Haver Analytics, Federal Reserve, US Treasury

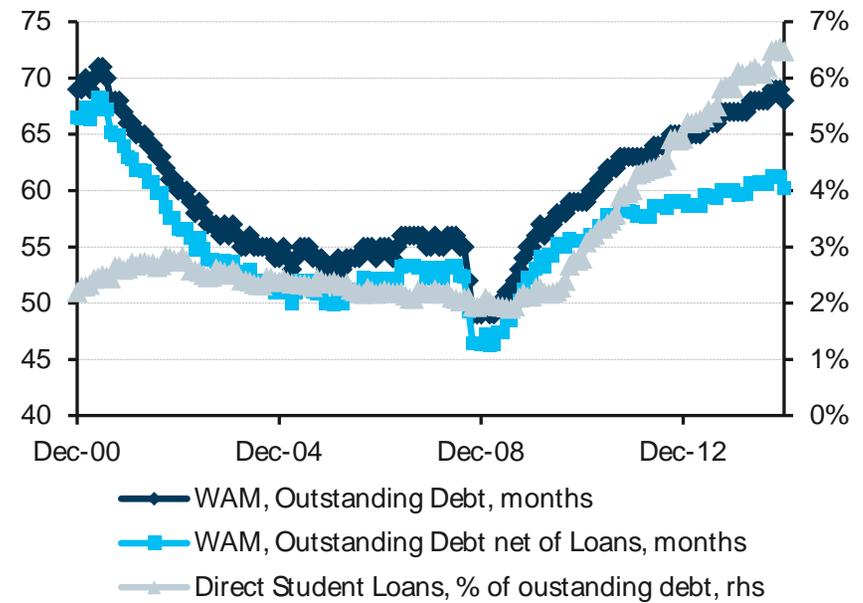
Should the portfolio be considered net of financial assets?

- Credit / Liquidity / Cash flow profile of the asset should be taken into account before netting.
- Direct student loans are not liquid and ~25% are either in forbearance, delinquent or in default. Further they are long dated assets with an uncertain cash flow profile
- Asset liability management approach should be favored. Options range from issuing structures with embedded optionality to a mix of existing coupon maturities to match the cash flow profile of student loans. The former allows for more accurately matching the cash flow risk and the latter does not require any new form of issuance.
- Scope for further rise in WAM given the increase in holdings of long dated assets

Roughly 25% of direct student loans are either in forbearance, delinquent or in default



WAM of debt net of student loans has risen to a lesser extent



Note: WAM of student loans assumed to be 15 years for the rhs figure for illustrative purposes. Source: Department of Education, US Treasury

Recommendations on Debt Management

Communication

The Treasury could publish a base case forecast of issuance trends over a certain period (say 1y)

- **WAM of issuance**
- **% to be issued in different buckets / instruments**
- **Actual issue sizes**

Each option entails a trade-off between guidance and flexibility

Measurement Metrics

The Treasury could publish current and a base case forecast (x years out) (where applicable)

1. Roll-over risk:

- % of debt outstanding maturing in the near term
- % of debt outstanding maturing within a x-year window at any point in time

2. Range of ex-ante measures of cost of issuing various forms of debt

- % issuance in a given sector* Term premium at that tenor
- % issuance in TIPS * (Nominal Liquidity premium – Inflation Risk Premium)

3. Completeness of Market:

- Lowest float maturing in a certain window (say 5y / 10y)
- Measure of aggregate dislocations (RMSE) of securities by sector

4. Various measures of WAM

- Outstanding debt / Coupon Universe
- Consolidated Debt / Debt Net of Fin. Assets (after accounting for Fair Value and Maturity)

References

- <http://libertystreeteconomics.newyorkfed.org/2014/05/treasury-term-premia-1961-present.html>
- http://www.newyorkfed.org/markets/primarydealer_survey_questions.html
- <http://www.imf.org/external/pubs/ft/tnm/2012/tnm1202.pdf>
- http://www.brookings.edu/~media/research/files/papers/2014/09/30_government_debt_management_zlb/30_government_debt_management_zlb.pdf
- <http://www.imf.org/external/np/mfd/pdebt/2003/eng/am/120903.pdf>
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