November 2021

TIPS Supply

Since January 2021, Treasury has gradually increased TIPS issuance in order to stabilize the percent of TIPS to total marketable debt outstanding and, at the August quarterly refunding, announced expectations for total gross issuance of TIPS to increase by $15 to $20 billion in CY2021. Please discuss what Treasury should consider for TIPS issuance in CY2022, in the context of the committee's views on the appropriate level of TIPS supply in the medium and long-term.

Executive summary

Valuation considerations

- Ex-post direct cost estimates conclude that the TIPS program has benefited Treasury relative to nominal securities.
- Ex-ante estimates are more ambiguous. Treasury has regularly issued TIPS at breakeven inflation rates below survey based measures of longer-term inflation expectations. However, models that adjust for the relative illiquidity of TIPS suggest that inflation risk premiums are positive, and more recently have risen.
- Some of the factors contributing to higher risk premiums, such as Fed's tolerance for above target inflation, are likely to persist.

Demand-side considerations

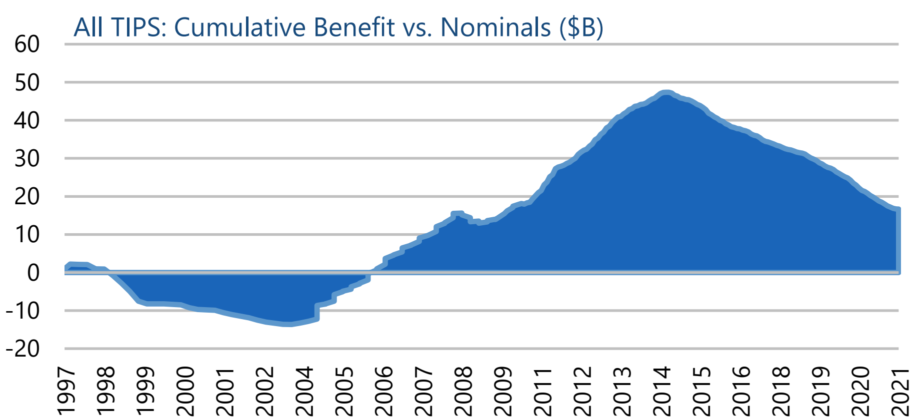
- Domestic investment fund demand has been steady and increasing in the past two years. The growth of Target Date Funds is potentially a growing source of TIPS demand.
- TIPS concentration within foreign portfolios is likely to continue mirroring Treasury issuance patterns, supporting increased TIPS issuance.

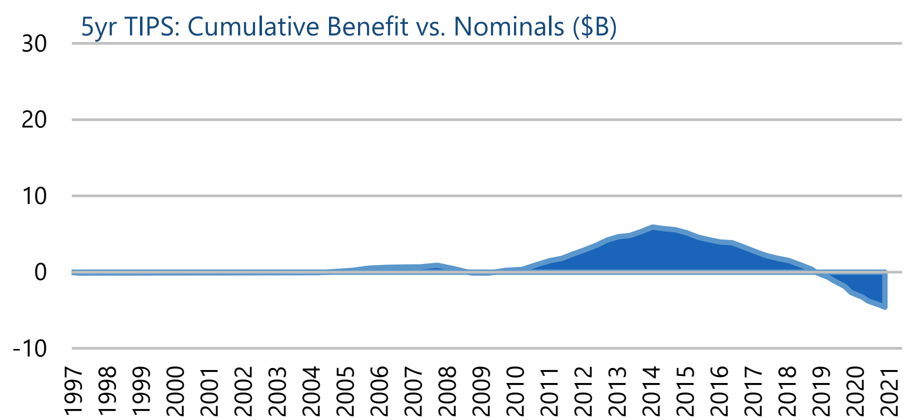
Post-pandemic, the TIPS share of Treasury debt outstanding has fallen. Treasury should gradually return the TIPS share towards the pre-pandemic range.

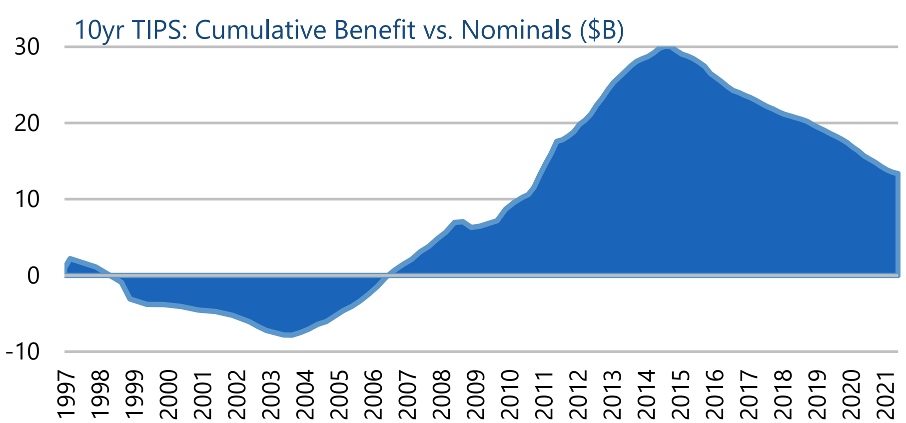
- Longer term target of 8-9% for TIPS as a share of treasuries outstanding signals a continued commitment to the TIPS program. It also allows for some cushion as TIPS share can drop following recessions.
- Post-pandemic, TIPS share declined to 7.5%, but a steady increase of $10 to $20bn per year starting in 2022 could return the TIPS share towards 8% by the end of 2024 and would be in line with a regular and predictable issuance pattern.
- We recommend that gross issuance increases be tilted toward the 5yr and 10yr tenors, given consistent liquidity and demand.

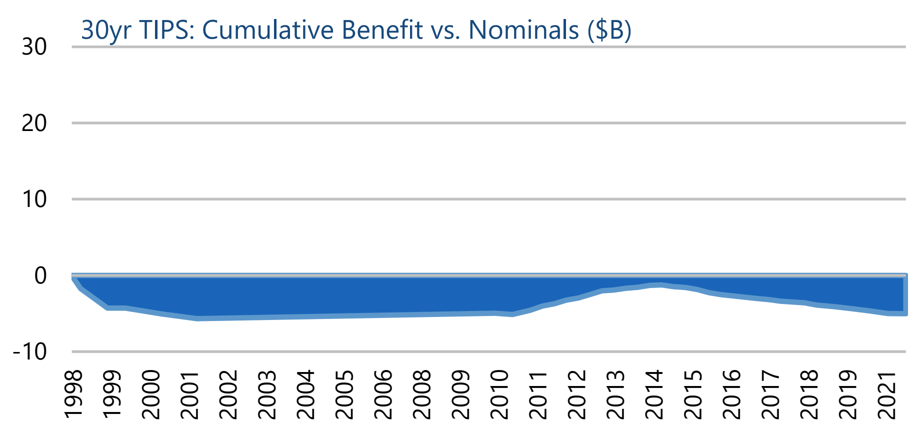
Ex-post, TIPS have benefited Treasury relative to nominal securities

- Based on debt payments to date, the TIPS program has saved Treasury an estimated $17bn relative to nominal issuance, indicating that Treasury has captured inflation risk premium over time.





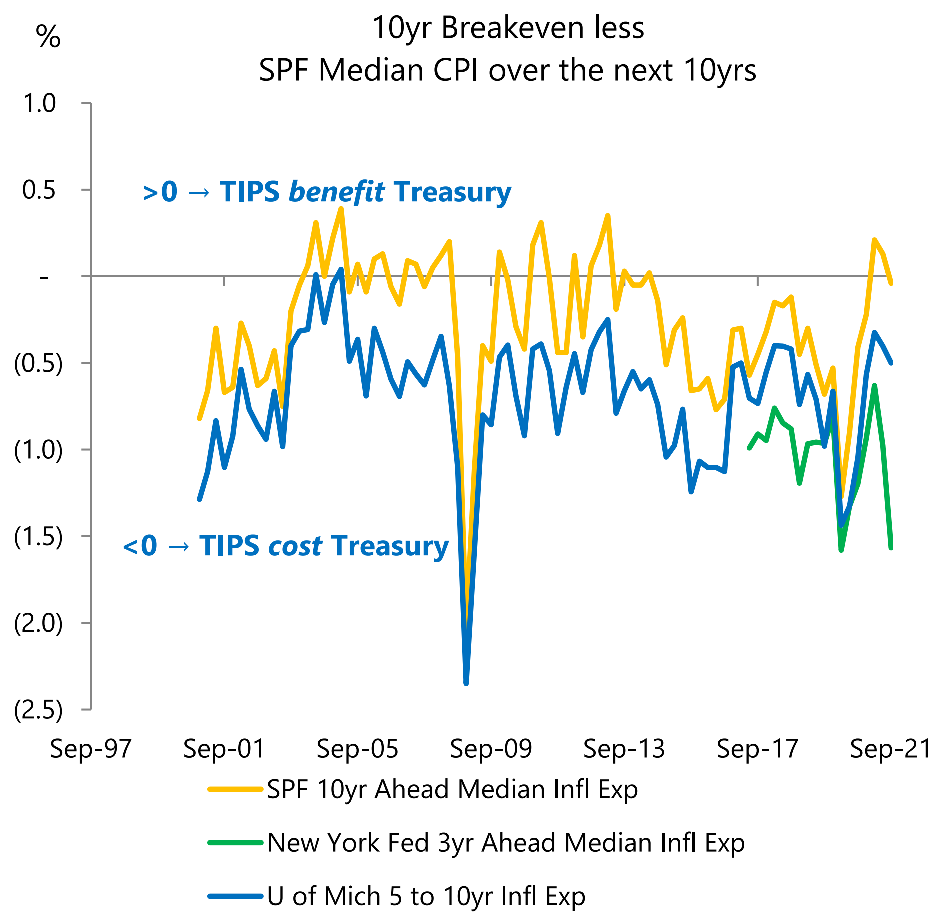


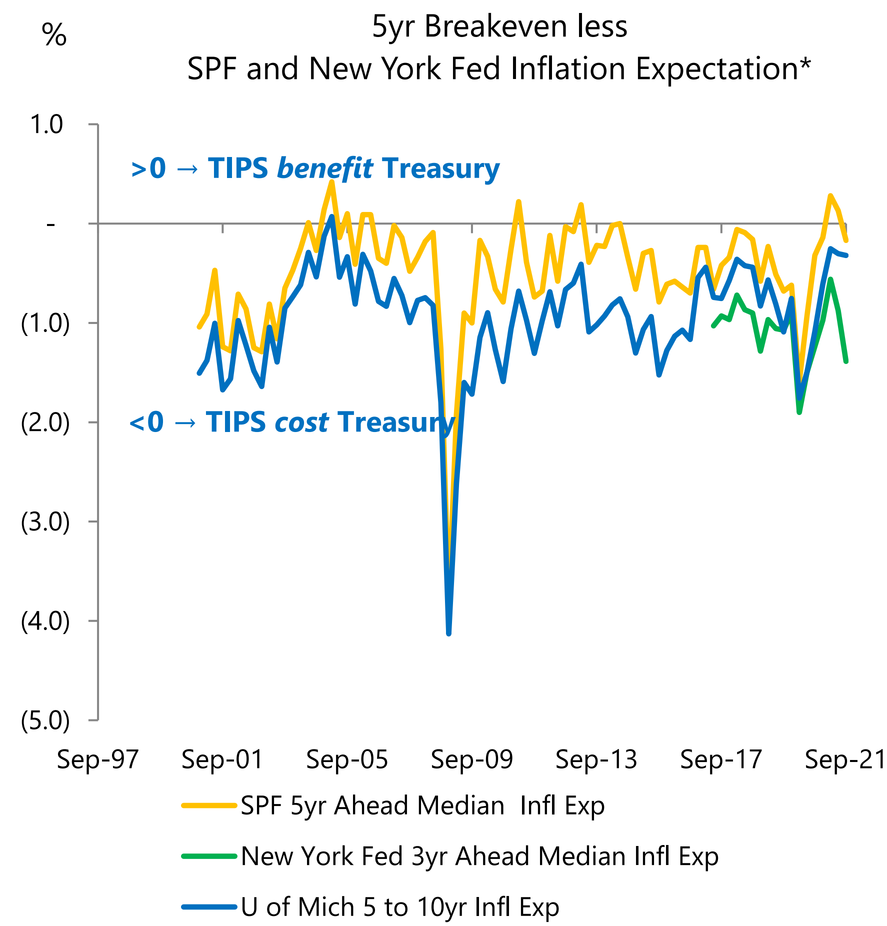


Sources: Treasury, TBAC Calculations. As of September 2021

Ex-ante estimates of the program's costs are more ambiguous

- Based on various surveys of professional forecasters' and consumers' inflation expectations, Treasury has regularly issued TIPS at a *higher* ex-ante cost than nominal securities. However, consumer surveys can be biased indicators of inflation expectations.*

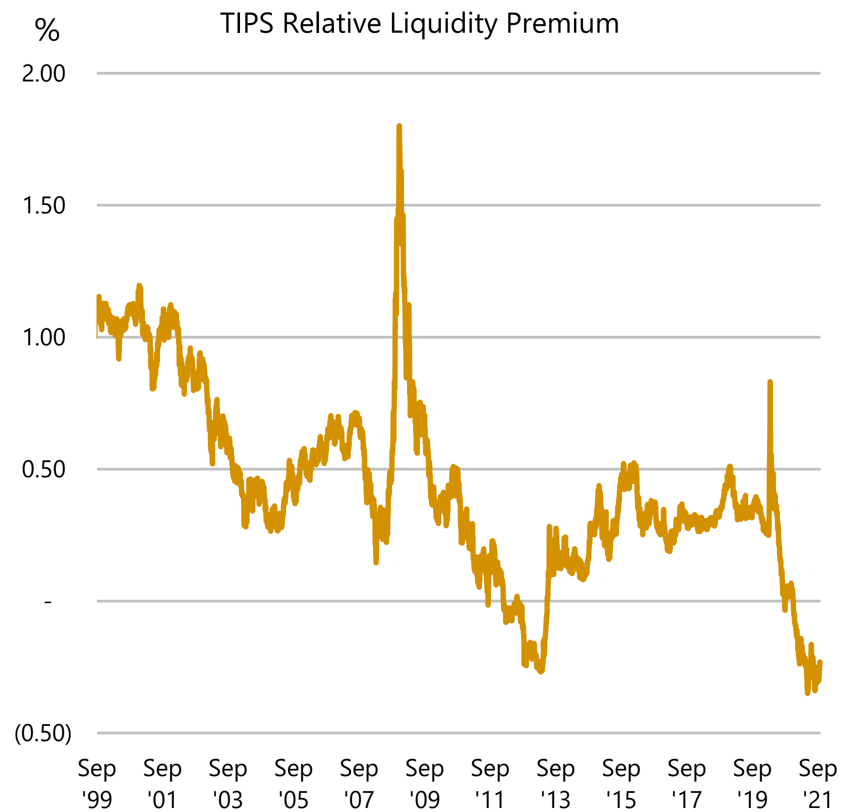




Sources: Philadelphia Federal Reserve Bank, Federal Reserve Bank of New York, University of Michigan, Haver
As of September 2021
*For example see: Malmendier et al, *Exposure to Grocery Prices and Inflation Expectations*, Journal of Political Economy, Volume 129, Number 5, May 2021.

Model based measures of TIPS inflation risk and liquidity premiums support a continued commitment to the program

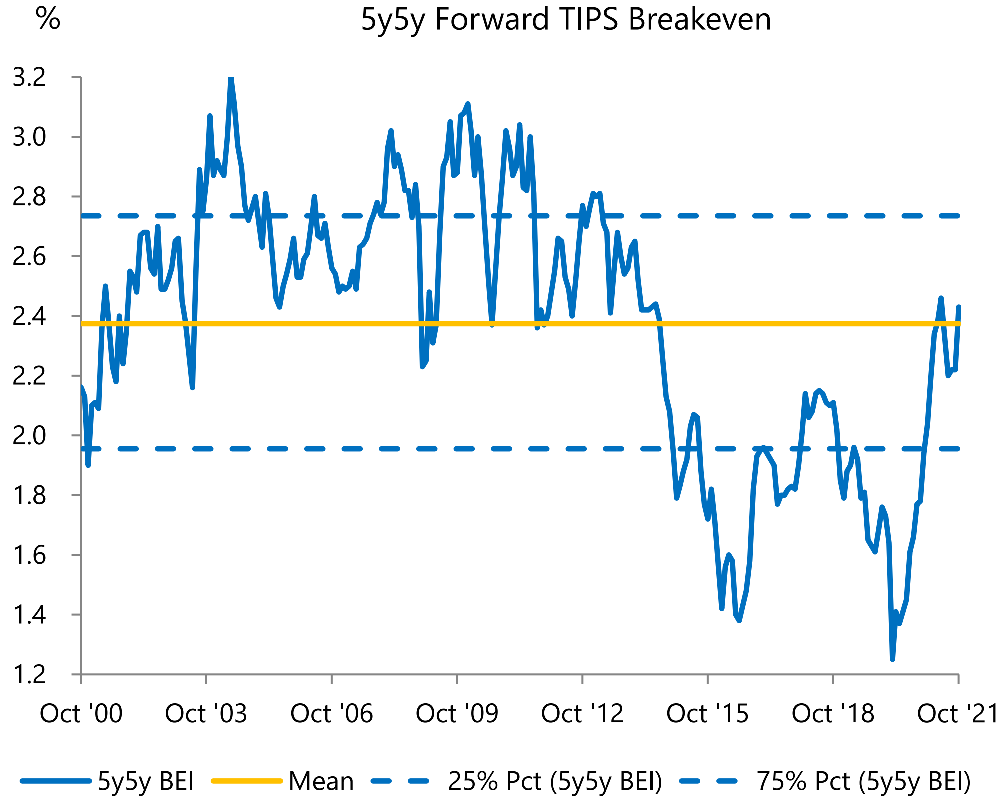
- A Federal Reserve Board Staff model estimates that inflation risk premiums have historically been positive. While they had declined over time, they have increased more recently and are just above zero. The TIPS liquidity discount to nominal Treasury securities has also recently declined.

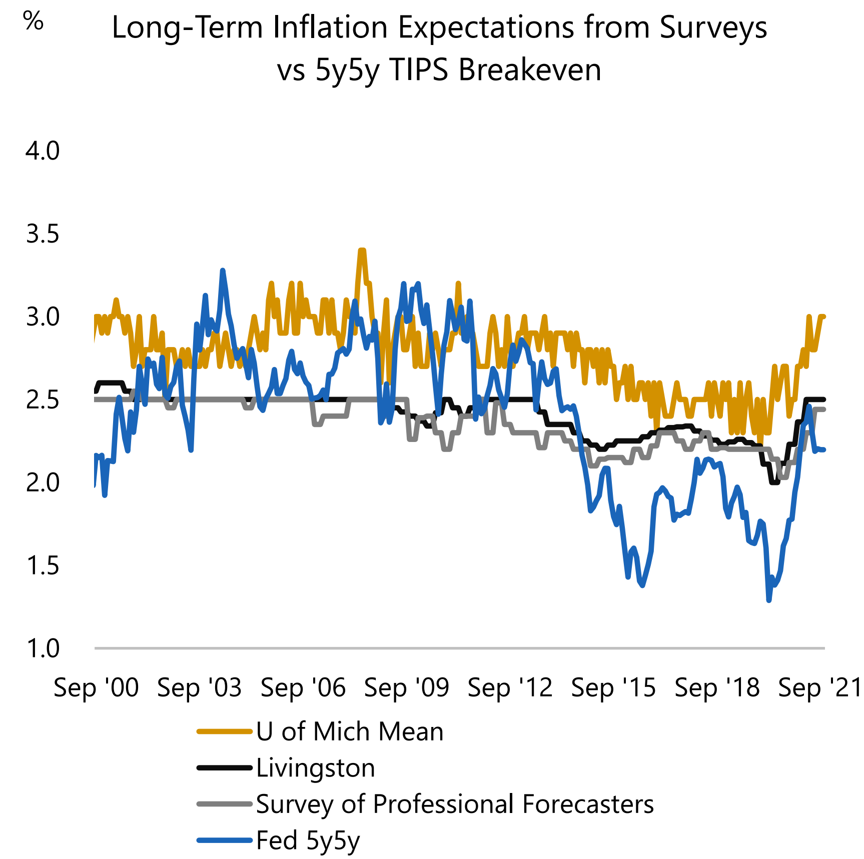


Sources: D'Amico, Kim, and Wei (2018), "Tips from TIPS: The Informational Content of Treasury Inflation-Protected Security Prices," updated by Kim, Walsh, and Wei (2019), FEDS notes, "Tips from TIPS: Update and Discussions.”. As of September 2021

Recently TIPS breakevens have risen back to the middle of their historical range

- In 2014, the 5y5y forward TIPS breakeven inflation rate declined by roughly 70bps, but it has more recently moved back to the middle of its historical range. This has happened amid rising survey-based measures of longer-term inflation expectations.

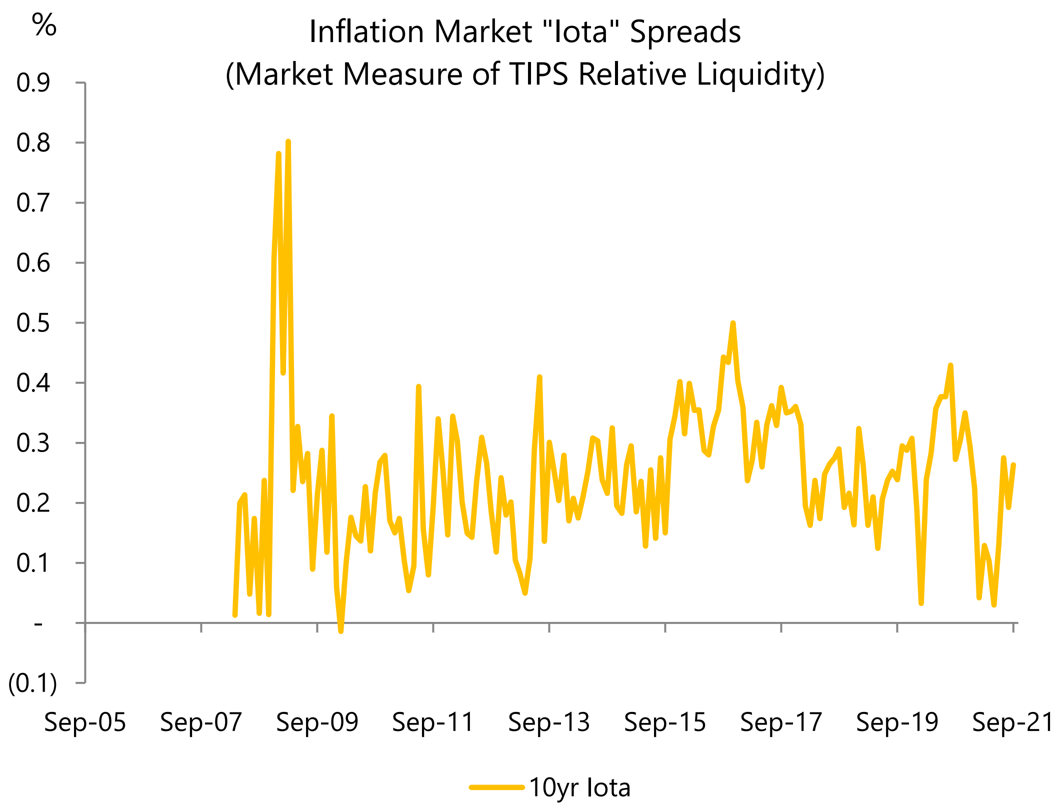


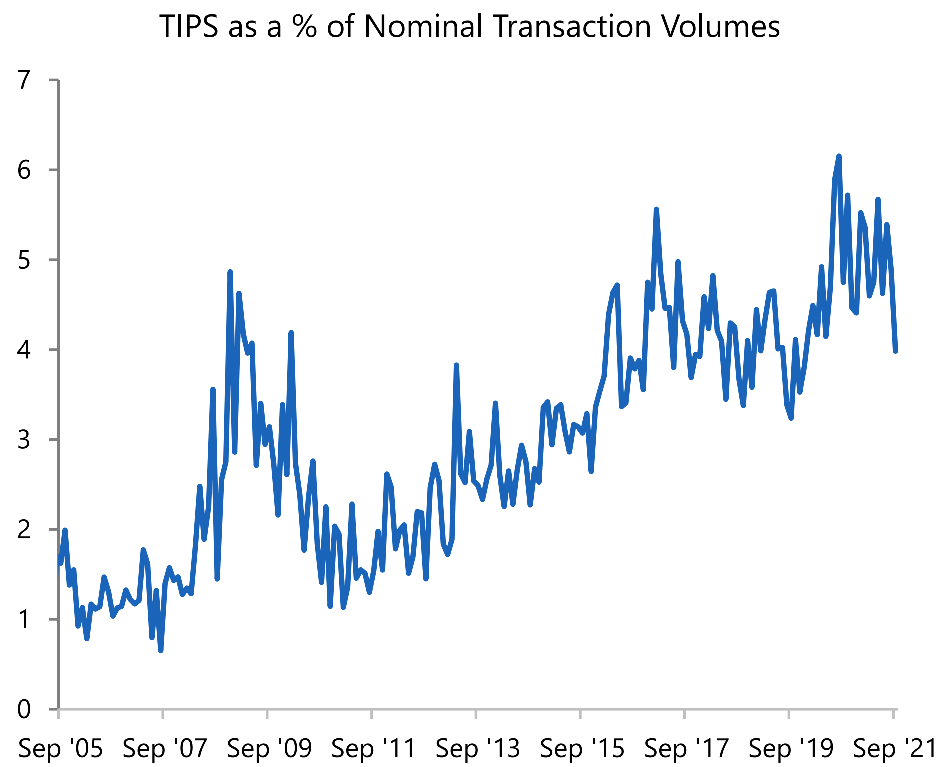


Sources: Philadelphia Federal Reserve Bank, University of Michigan, Haver.
As of October 2021

Market based measures of TIPS liquidity have been relatively steady, while volumes have steadily improved

- Inflation "iota" spreads – a market-based measure of TIPS relative liquidity – suggest that TIPS liquidity has been relatively steady since the 2008 financial crisis, and has remained within a roughly 20-30bp range.
- TIPS transactions have generally increased as a percentage of nominal transactions, although more recently have moderated somewhat.
- In the past, Federal Reserve asset programs have had only a limited discernable impact on these measures.

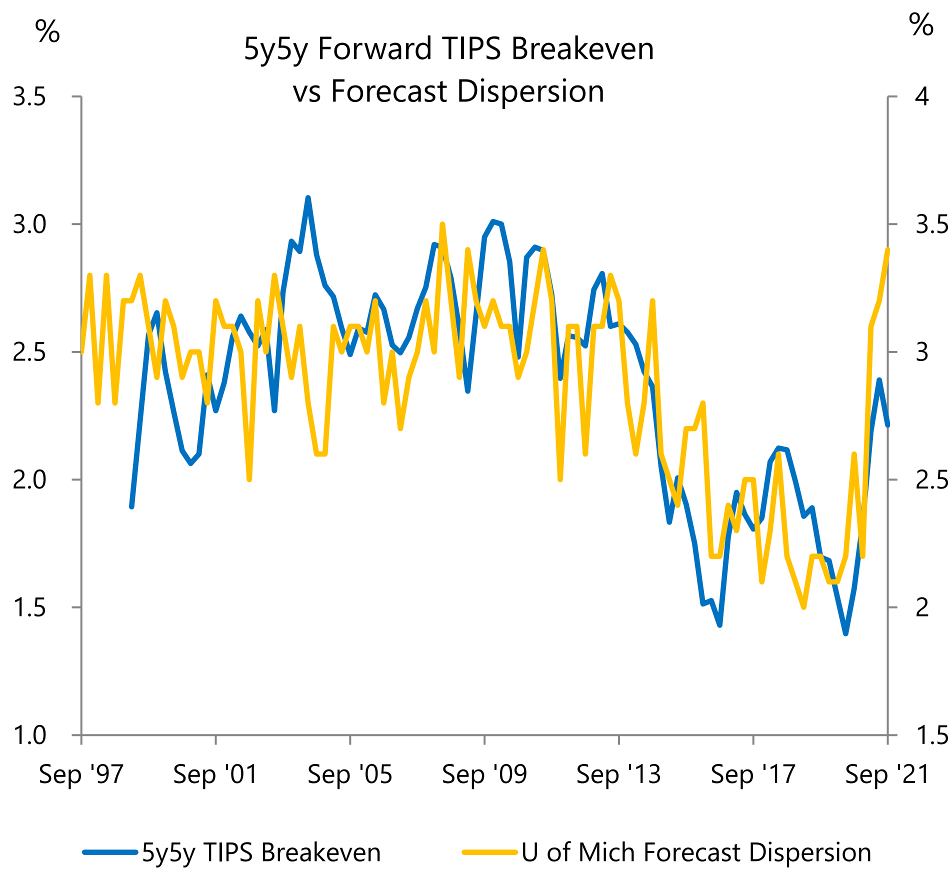


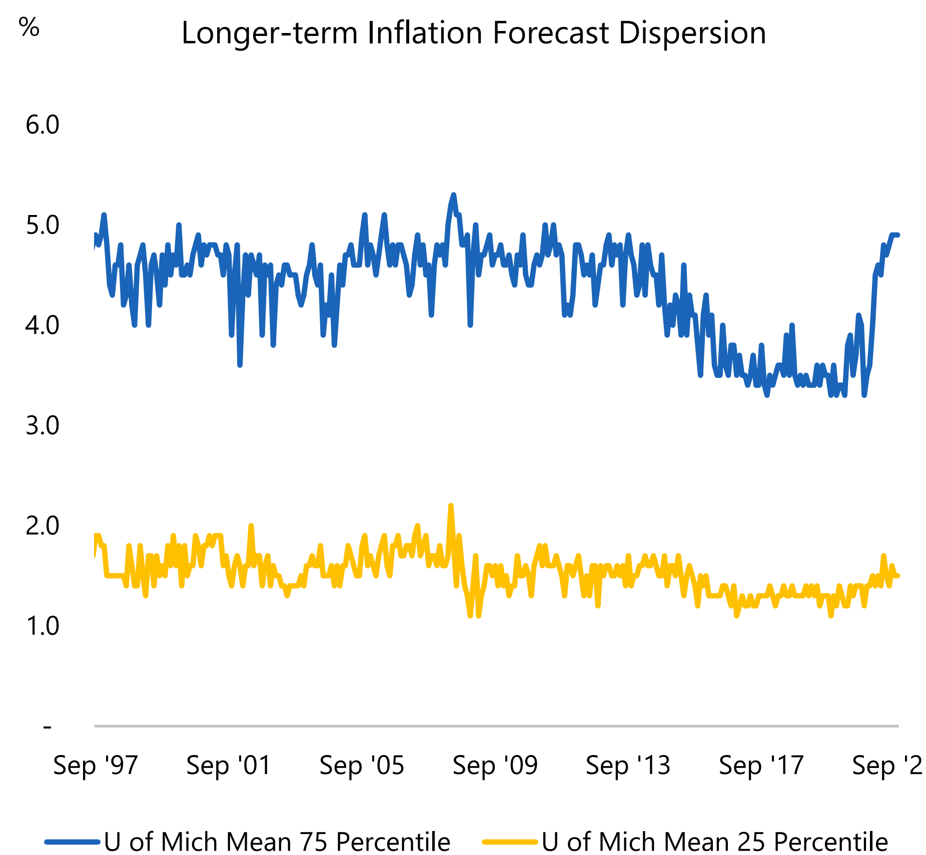


*Inflation iota spreads are defined as the spread between zero coupon inflation swaps, and constant maturity TIPS breakeven inflation rates calculated from a par yield curve.
Source: Bloomberg, Haver, Federal Reserve Bank of New York. As of September 2021

Inflation risk premiums have risen in the current uncertain environment

- Inflation forecast dispersion, a measure of inflation risks, has increased along with TIPS breakevens. According to the University of Michigan survey the 75th percentile expectation has risen over 1ppt.





Sources: University of Michigan, Board of Governors, Haver
As of September 2021

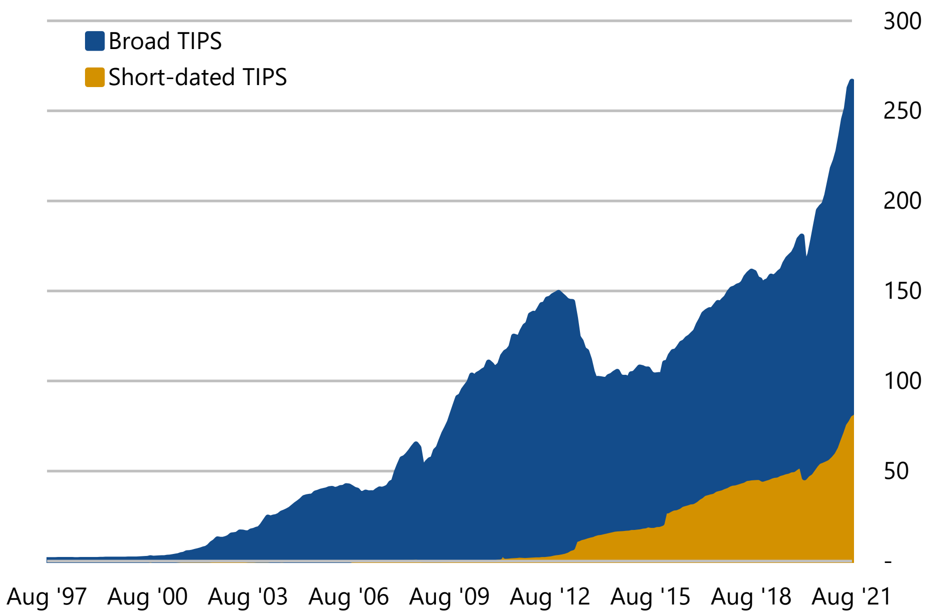
…And some of the factors that have contributed to the increase are likely to persist

- Recent changes to the Fed's monetary policy strategy and the central bank's tolerance for above target inflation argue for persistently higher inflation risk premiums.
- The recent period of elevated realized inflation has likely buoyed investors' perceptions of upside inflation risks. Although we expect realized inflation to moderate, the Fed's new-found inflation tolerance suggest that average realized inflation in the next several years is still likely to be higher than what was realized before the pandemic.
- Additional fiscal policy expansion should also support growth, inflation and inflation expectations. Trends toward supply chain diversification and greater environmental protection policies should also support prices, although manufacturing innovation could offset the price effects of these trends over time.

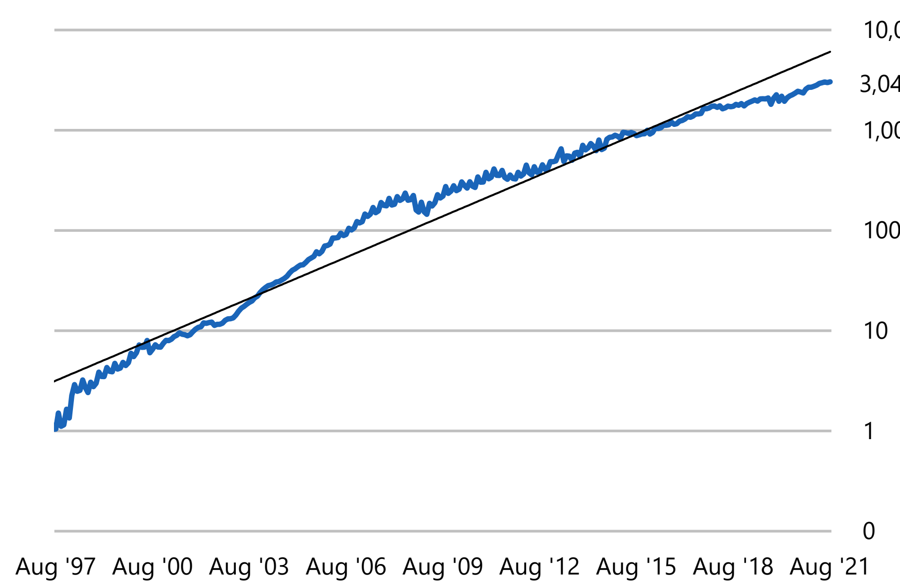
Demand considerations – strong domestic investment fund demand

- Assets in TIPS Investment Funds have grown steadily over the years, and more rapidly over the past year. Short dated TIPS have seen more demand through funds that are dedicated to low duration strategies, in addition to demand from broad TIPS funds.
- The growth of Target Date Funds (TDFs) has also added to TIPS demand, with an estimated 2% allocation to TIPS. TDFs are currently under invested in TIPS. The recent bout of elevated inflation underscored the inflation risks of near-retirement target date funds, in particular, which hold a higher percentage of their portfolios in fixed income securities.

TIPS Asset Under Management ($B)*



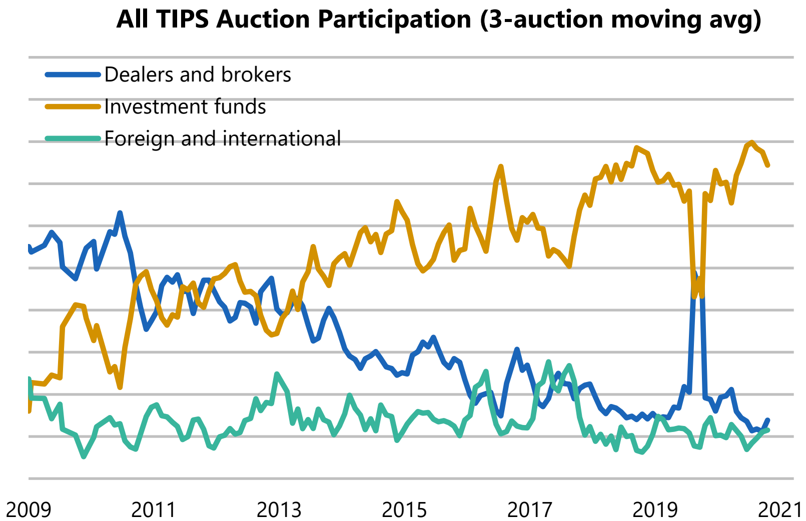
Target Date Funds Asset Under Management ($B, log scale)*

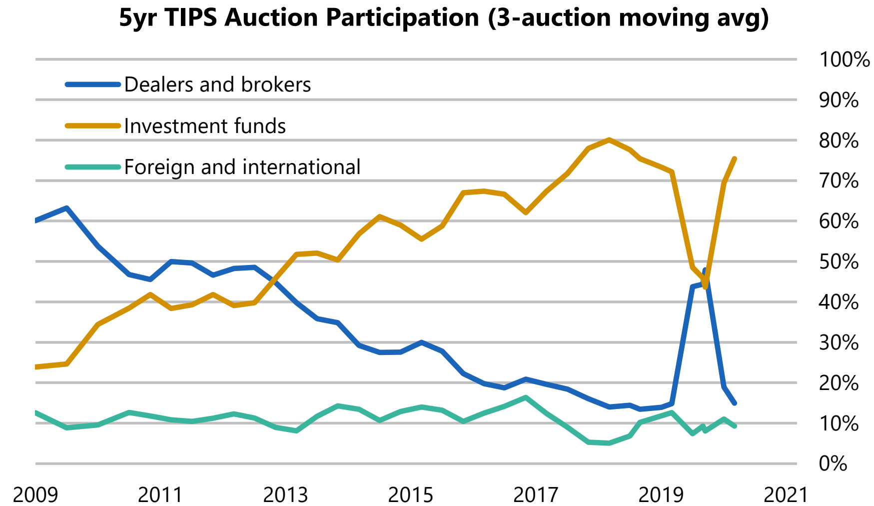


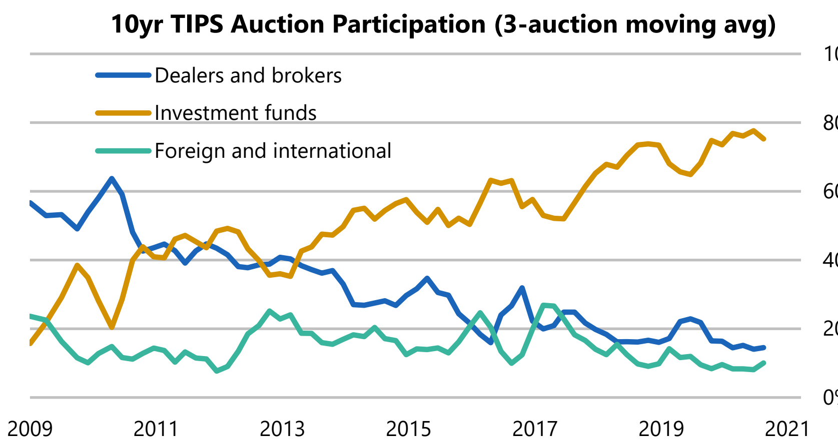
* Only includes funds/ETFs tracked by Morningstar. Short-Dated TIPS include funds/ETFs that focus on <=5yr maturity TIPS.
Sources: Morningstar
As of August 2021

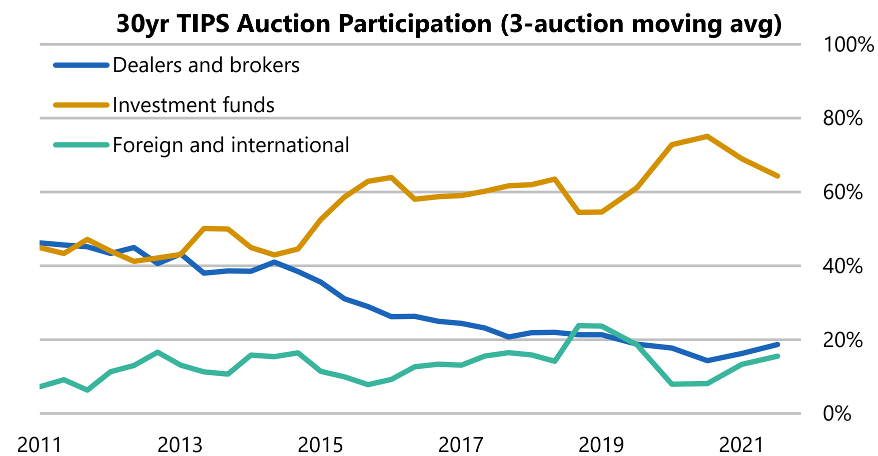
TIPS auction data also shows strong domestic investment fund demand

- The rise of domestic investment funds' demand is also evident in TIPS auction participation statistics. Investment Funds' participation has increased steadily to over 70%, taking shares from dealers.





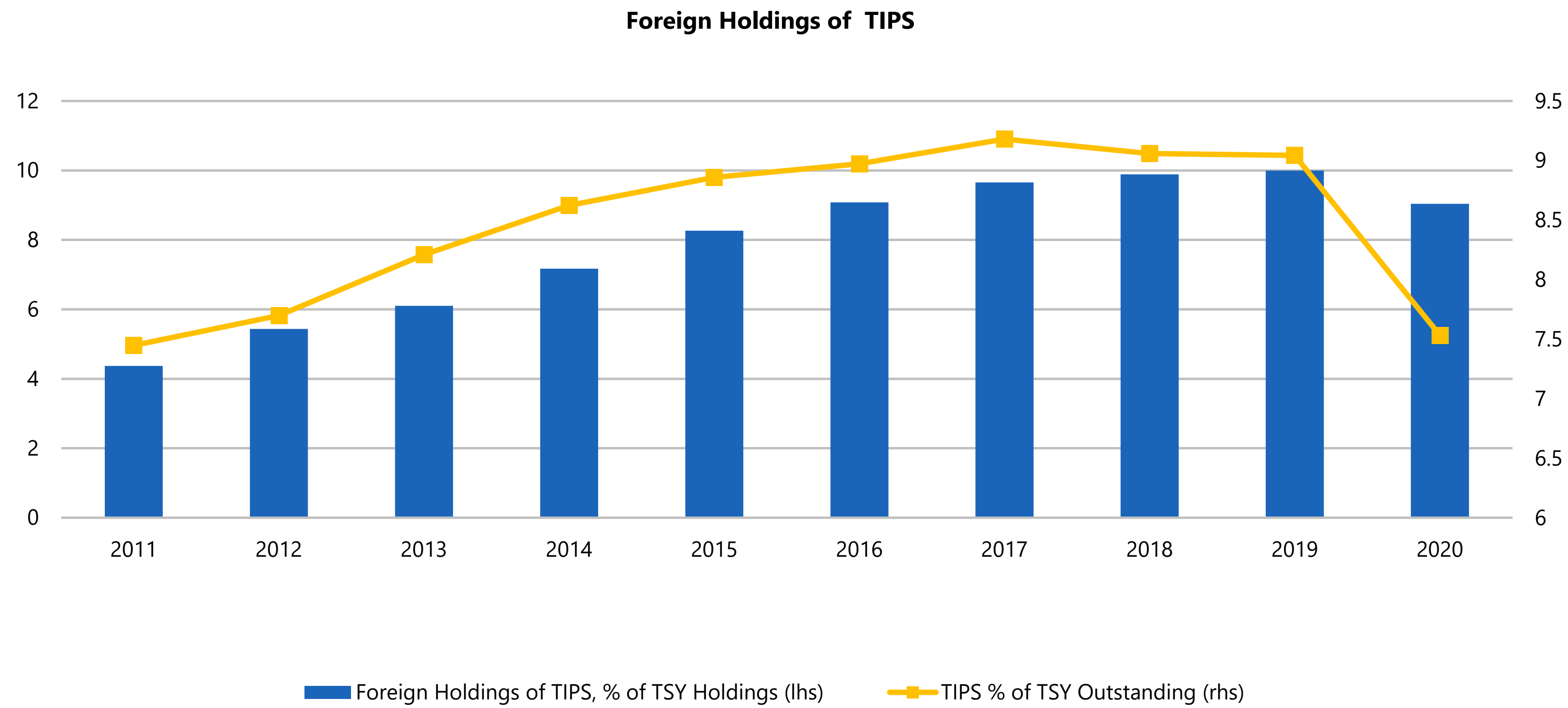




Sources: US Treasury. As of September 2021

Foreign portfolio concentration of TIPS follows Treasury issuance pattern

- In recent years, foreign holdings of TIPS have generally followed Treasury issuance pattern. Indeed, as Treasury increased the TIPS share of Treasuries outstanding from 2010 to 2017, foreign investors also increased their portfolio concentration of TIPS, in aggregate. Similarly, these portfolios mirrored the pandemic related fall in the TIPS share in 2020.
- Looking ahead, we expect this pattern to persist, and for foreign holders to increase their portfolio concentration as Treasury normalizes the TIPS share. This should support demand for the increased issuance sizes.



Sources: US Treasury Annual TIC data on Long-Term Treasury holdings of foreign investors. As of YE 2020

Other considerations - global inflation linked issuance

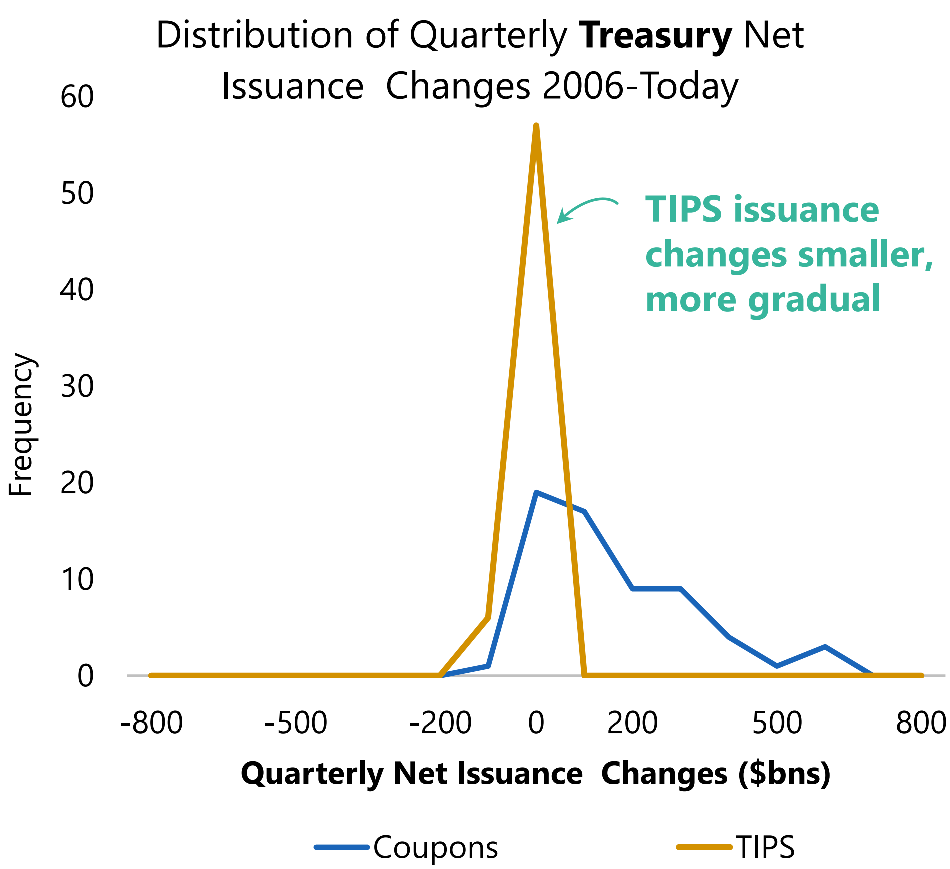
- Inflation indexed debt makes up a meaningful portion of the debt stock for a number of sovereign issuers.
- U.K. stands out at 24% Inflation Linked Debt as a percentage of Total Government Debt as many U.K. defined benefit pension liabilities have embedded inflation indexation and form a persistent demand base.
- Japan is on the lower end at <1%, most likely attributable to the issuance pause from 2008-2013, persistently low inflation and large total debt.
- Outside of U.K. and Japan, range for Inflation Linked Debt for other countries is between ~4% to ~15% with U.S. near the middle of that range.

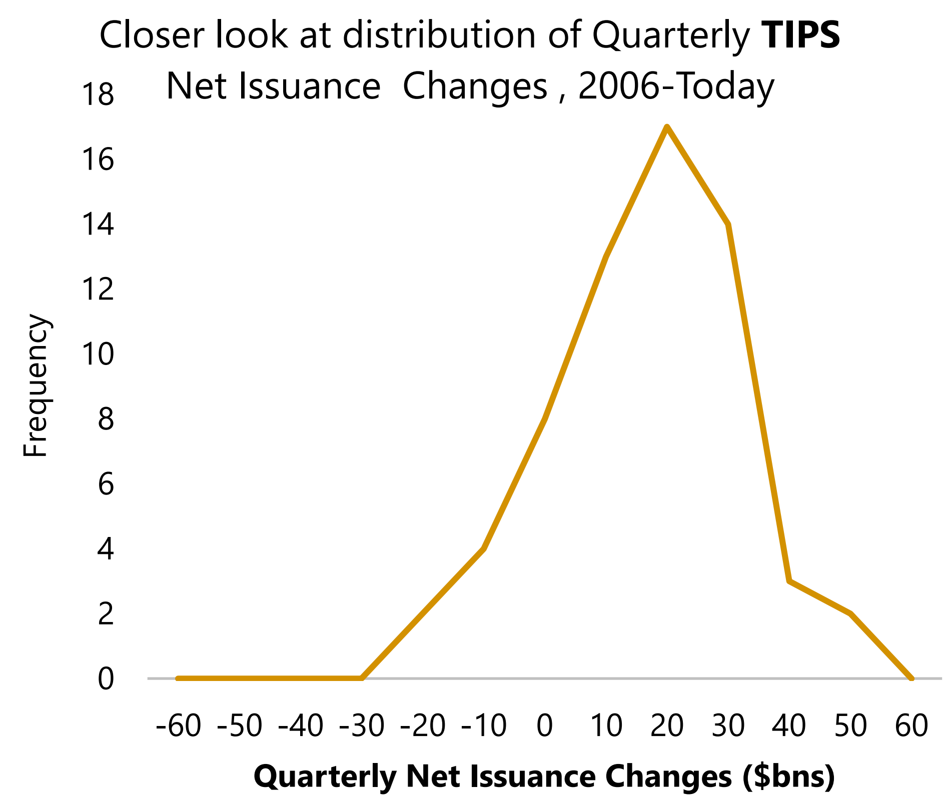
Country	ILB Market Size ($B)*	Total debt Outstanding ($B)	ILB as % of Total Debt
US	1,652	21,961	7.5%
UK	668	2,772	24.1%
France	239	2,808	8.5%
Italy	174	2,636	6.6%
Germany	87	2,384	3.6%
Japan	99	10,463	0.9%
Spain	70	1,397	5.0%
Canada	50	1,222	4.1%
Australia	31	627	4.9%
Sweden	20	127	15.7%
New Zealand	15	108	13.9%
Total	**3,105**	**46,505**	**6.7%**
Total(ex-Japan)	**3,006**	**36,042**	**8.3%**

* Inflation-uplifted notional.
Sources: Bloomberg
As of September 2021

Other considerations – comparing changes in TIPS issuance vs changes in nominal coupon issuance

- Changes in TIPS issuance have tended to be more gradual than changes in nominal coupon issuance.
- Since 2006, Quarterly TIPS issuance changes have averaged around $20-$25bn. This compares to $225bn for nominal coupon Treasuries. The maximum net issuance in any given quarter was $56bn for TIPS (4Q2020), whereas the maximum issuance for coupons was $680bn.

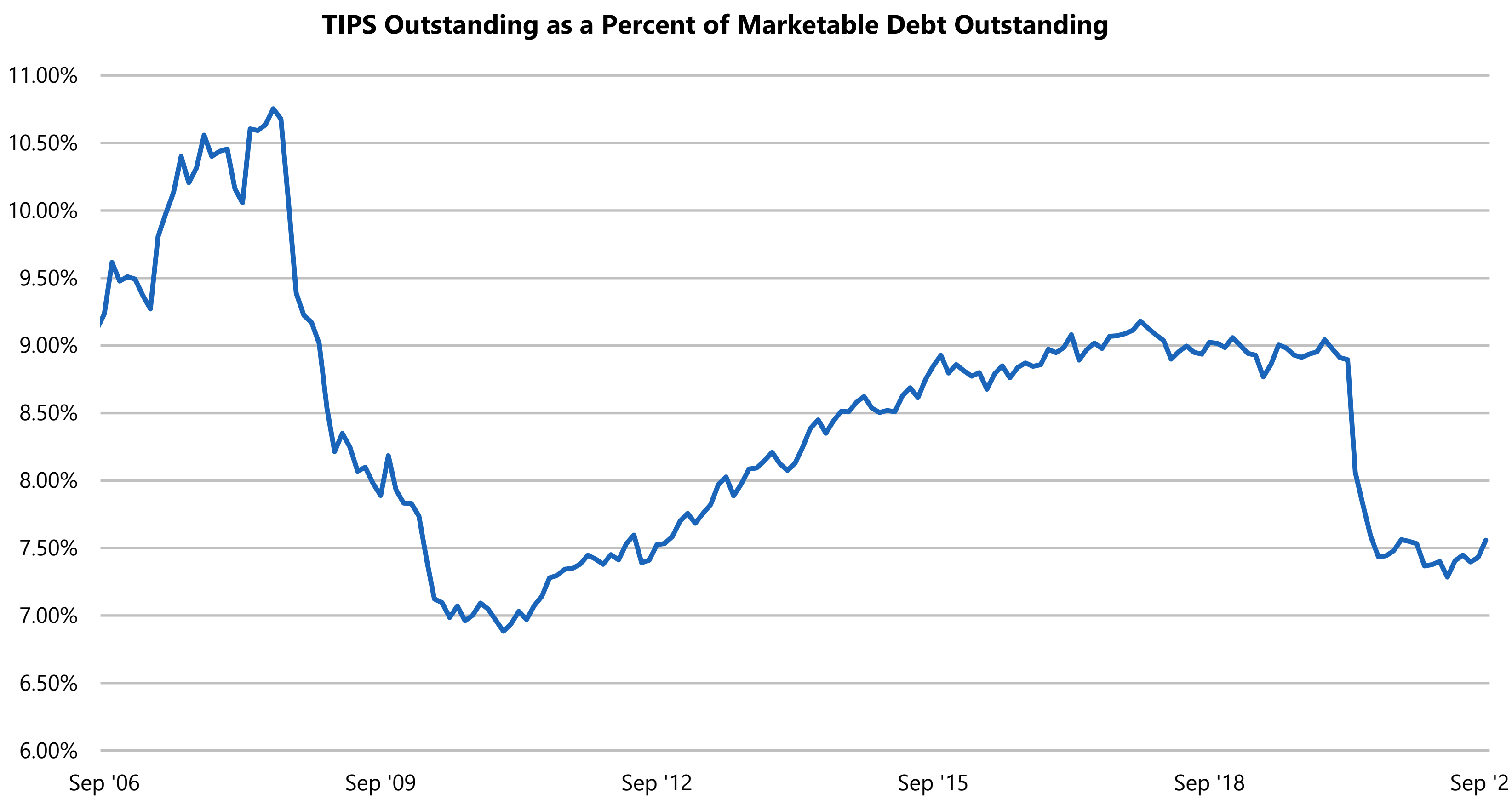




Sources: Treasury, TBAC Calculations.
As of September 2021

TIPS as a percentage of outstanding Treasuries has dropped

- In 2010, Treasury re-affirmed its commitment to the TIPS program and gradually increased the TIPS share of outstanding Treasuries to ~8-9%. Post-pandemic, TIPS share has dropped to 7.5%.
- Recognizing that TIPS share will drop during most recessions as a result of the necessary increases in nominal issuance, Treasury should prioritize returning the TIPS share back to the long-term target during normal times, so the share doesn't continue to decline over time.

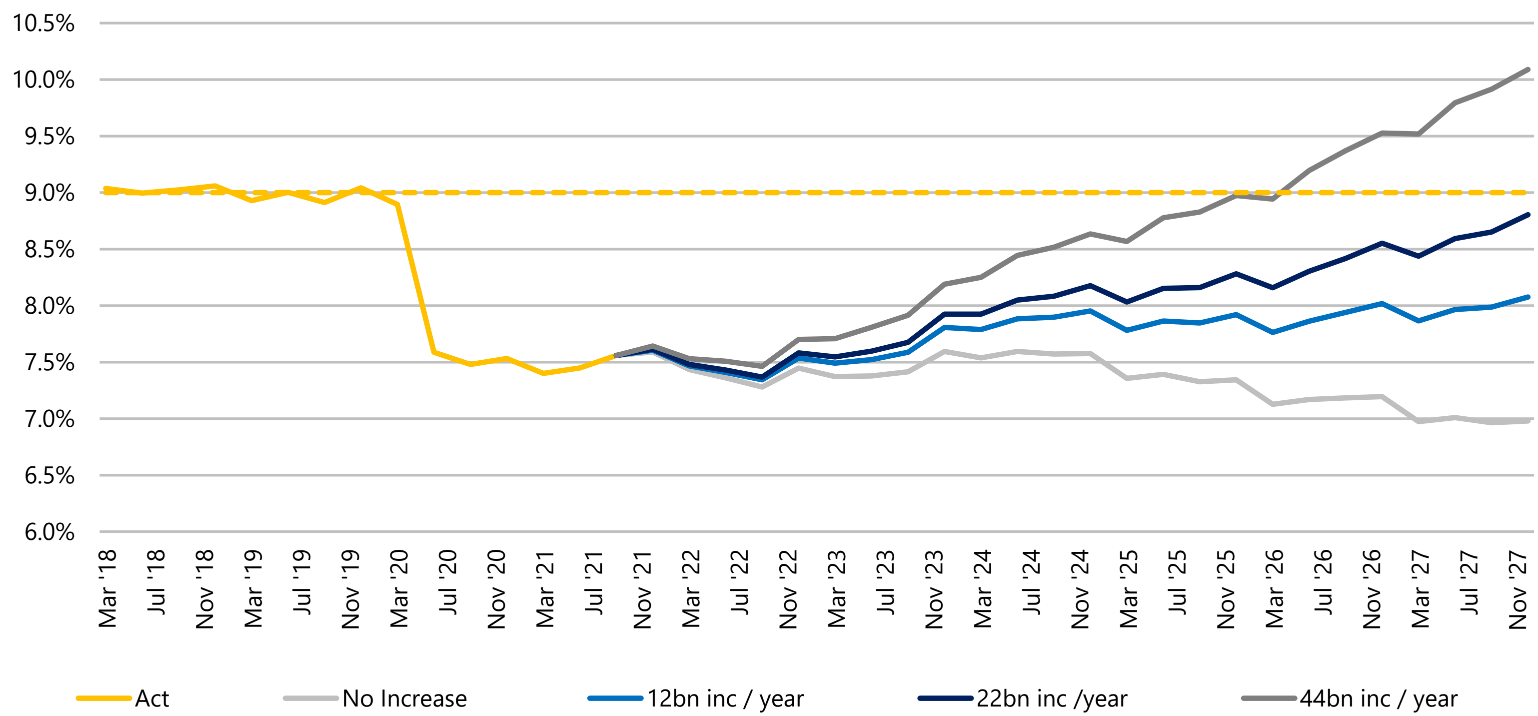


Sources: Treasury, TBAC Calculations.
As of September 2021

TIPS as a percentage of outstanding Treasuries projections

- A steady increase in TIPS issuance starting in 2022 could bring TIPS share of outstanding debt towards 8% by year-end 2024 and would be in line with the gradual increase witnessed after the Global Financial Crisis (GFC). From 2011-2014 Treasury increased the TIPS share around 0.4ppt per year.
- A more aggressive increase would restore the percentage sooner, but would also raise annual net supply significantly and could be disruptive to the market.

Projected TIPS Outstanding as a Percent of Marketable Debt Outstanding

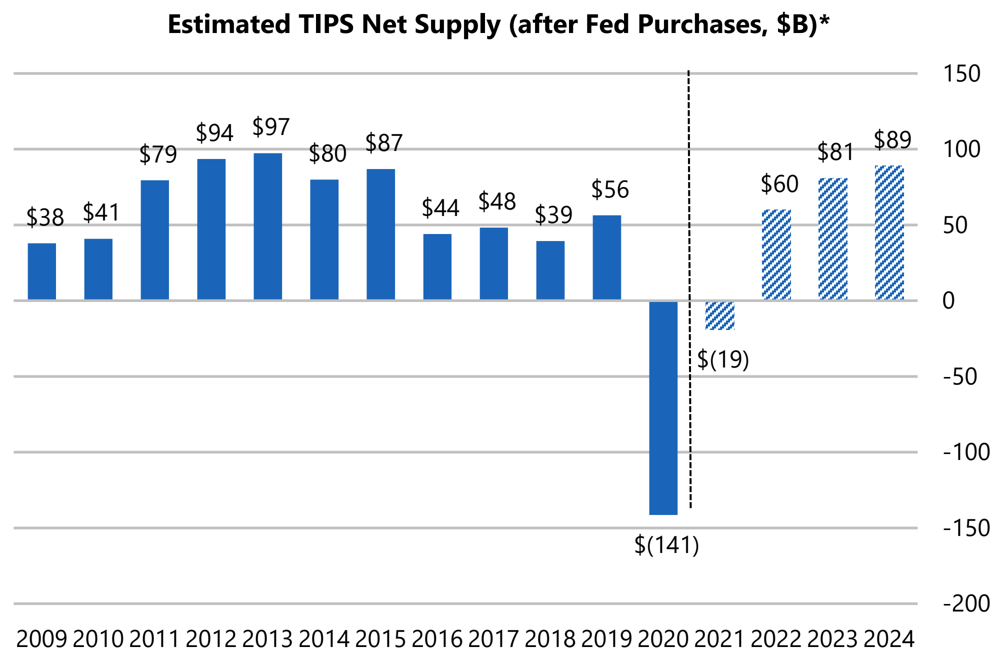


Projection scenarios: Projections are based on CBO deficit forecasts, Treasury's recent guidance and TBAC projection of coupon issuance in the future. Without any increase in TIPS issuance, the TIPS share eventually starts to fall as mandatory spending and deficits grow. TIPS principal accretion is projected to grow at 2.5% per year.

TBAC recommendation for consideration

- As shown through projections of TIPS outstanding earlier, a steady increase of TIPS issuance is needed to allow for TIPS share of Treasuries outstanding to reach 8-9%.
- An increase of $10-$20bn per year starting in 2022 could return the TIPS share towards 8% by the end of 2024.
- Note that dealer consensus expectation for 2022 gross issuance is $177bn (a continuation of current pace, and +$5bn vs 2021). Current valuation, risk premium, liquidity and demand considerations support a steady increase for 2022. Future increases for 2023 and beyond should continue to be re-evaluated as those considerations can change over time.
- Charts below use the upper-end of the recommended range ($22bn) to illustrate the potential impact on issuance sizes and net supply.

Scenario illustration 2022 TIPS issuance	5yr	10yr	30yr	Total
January		17		17
February			10	10
March		15		15
April	20			20
May		15		15
June	18			18
July		18		18
August			9	9
September		16		16
October	21			21
November		16		16
December	19			19
Total 2022	**78**	**97**	**19**	**194**
Total 2021	**70**	**85**	**17**	**172**
Increase 2021 to 2022	**8**	**12**	**2**	**22**



* Uses projected TIPS issuance growing at 22bn per year through 2024.

Sources: Treasury, Federal Reserve, Barclays Capital, TBAC Calculations

Additional consideration – issuance pattern

- **As Treasury increases TIPS issuance further, it is also worth considering additional studies regarding issuance pattern.**
- More frequent issuance could help enhance TIPS liquidity and potentially reduce concessions going into auctions. More evenly distributed issuance calendar also allows for future increases of auction sizes.
- For example, increasing 5yr auctions to 6 times per year, and 30yr auctions to 4 times per year could spread out issuances more evenly especially if auction sizes grow further. Although that would also require additional auction slots in certain months.
- Further studies are needed to determine the optimal issuance pattern if TIPS issuance grows.

Conclusions

- Post-pandemic, as issuance of nominal securities surged, the share of TIPS in outstanding debt declined notably. A steady increase of $10-$20bn per year in TIPS gross issuance is recommended to gradually normalize the TIPS share of outstanding debt.
- Such an increase would be (1) in line with previous TIPS issuance changes which have tended to be smaller than changes in coupon issuance, (2) consistent with Treasury's regular and predictable objective and (3) likely well absorbed by the market given the demand factors discussed in the presentation.
- Even with such an increase, it will take a while for TIPS share to get back to target range.
- Since TIPS share tends to drop during recessions Treasury should target gradual increases during non-recessionary times. Overtime, maintaining TIPS share at 8-9% will support the market's perception of Treasury's commitment to the program while allowing Treasury to capture the cost benefits of the product.
- A 2018 TBAC study of the ALM benefits to Treasury of issuing TIPS suggests that under most economic scenarios for growth and inflation, Treasury benefits by issuing TIPS.
- Continued monitoring of TIPS sectors is warranted to reaffirm future adjustments to auction sizes and the longer-term issuance targets, as various factors could change over time.
- As TIPS issuance increases, calendar adjustments may be warranted to promote liquidity and consistency of issuance.