

Treasury Inflation-Protected Securities (TIPS)



UNITED STATES
DEPARTMENT OF
THE TREASURY



Office of Debt Management
U.S. Treasury Department
August 2008

TIPS Market Overview

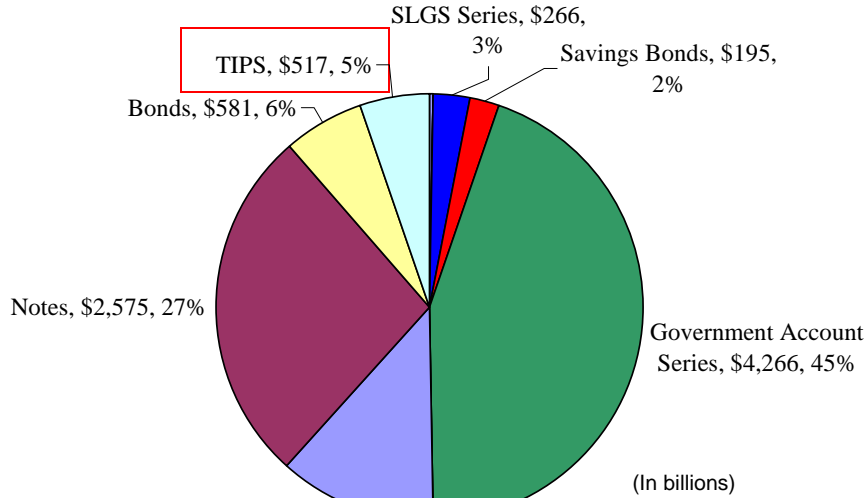
- The U.S. Treasury is the largest issuer of inflation linked bonds globally.
- There are 27 issues outstanding ranging in tenor from 2009 to 2032.
- A full, liquid real rate curve exists out to 10 years.
- To date only three TIPS issues have matured – the Jul 2002, Jan 2007, and Jan 2008 issues.
- As of July 31, 2008, TIPS outstanding totaled over \$515 billion; or about 11% of marketable Treasuries outstanding.
- Average daily trading volume of TIPS by primary dealers in 2008 is close to \$9 billion.¹

¹ Estimates provided by Federal Reserve Bank of New York.

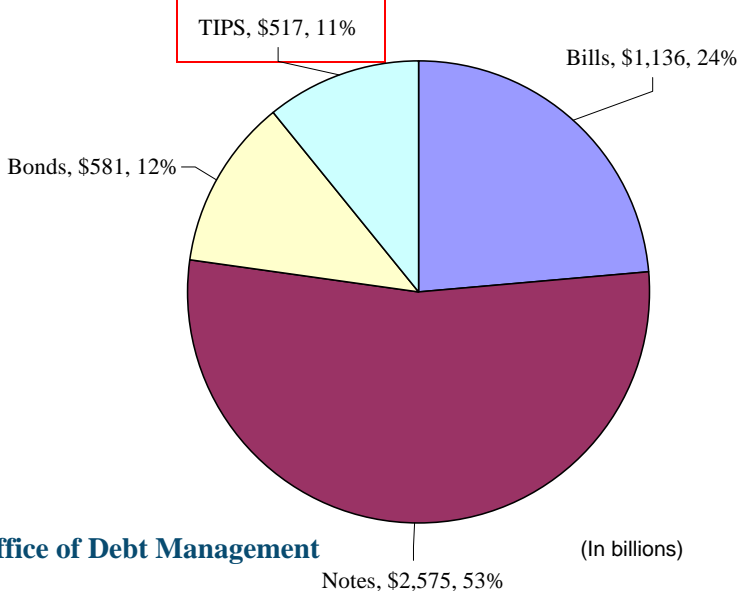


TIPS Component of the Treasury Debt Portfolio as of July 31, 2008

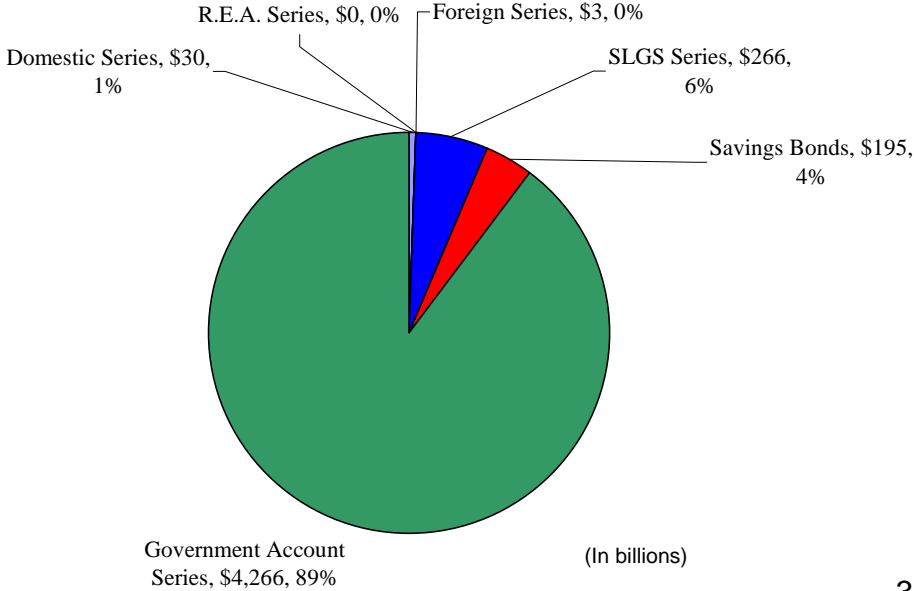
\$9.6 Trillion in Debt Outstanding



\$4.8 Trillion in Marketable Debt Outstanding



\$4.8 Trillion in Non-Marketable Debt Outstanding



TIPS Issuance and Schedules

- TIPS were first auctioned in January 1997 with a tenor of 10 years.
- At the May 2004 Quarterly Refunding, to provide additional funding, Treasury announced the reintroduction of the 5-year TIPS and the initiation of the 20-year TIPS¹.
- Current TIPS Auction Schedule:
 - Semi-Annual 10-Year (Jan, Jul) with a Quarterly reopening (Apr, Oct)
 - Annual 20-Year (Jan) with a Semi-Annual reopening (Jul)
 - Annual 5-Year (Apr) with a Semi-Annual reopening (Oct)

2008 TIPS Calendar

TIPS Auctions and Months in **RED** font
 Typical Announcement Dates in **GREEN** font

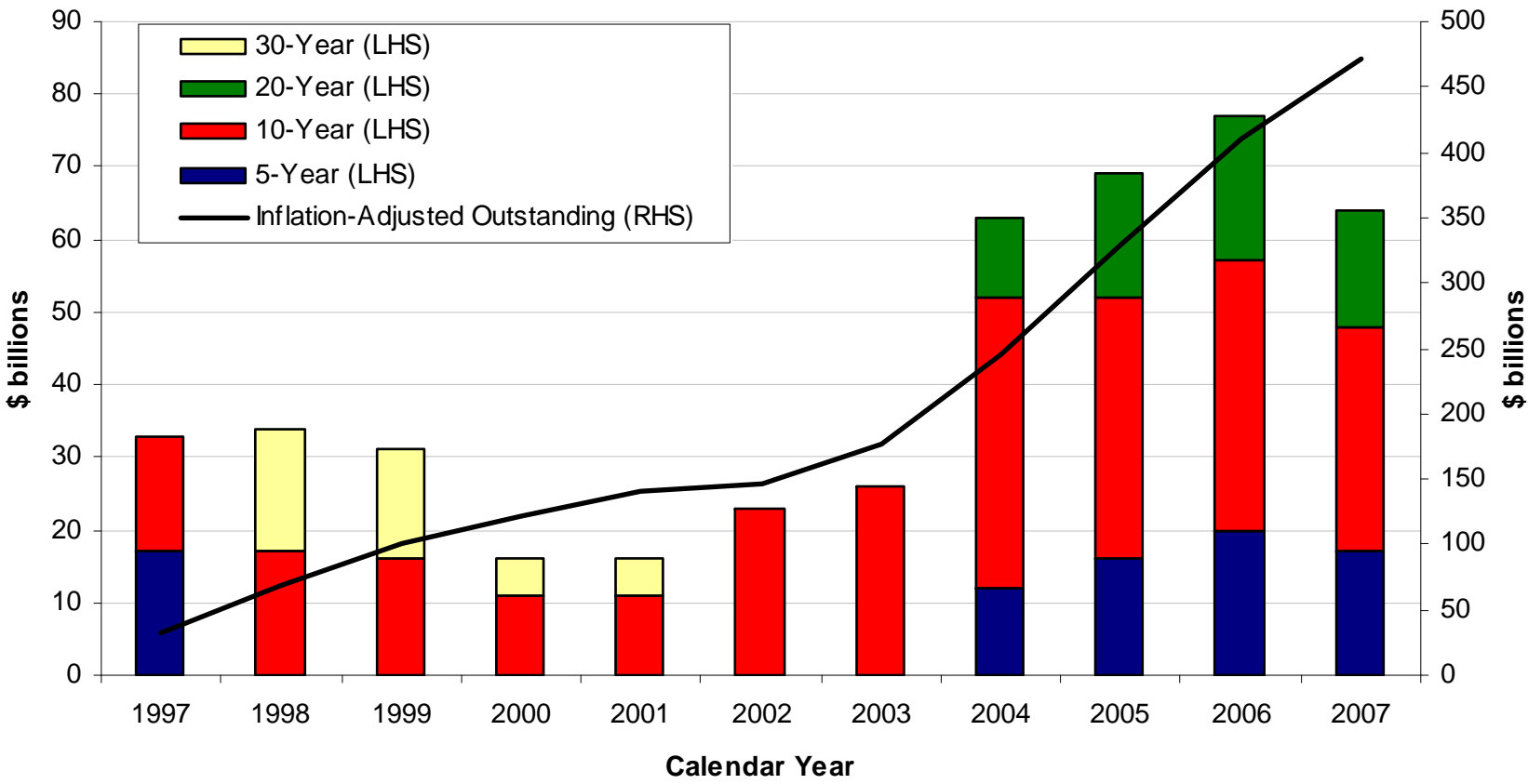
| <u>January</u> | | | | | | | <u>April</u> | | | | | | | <u>July</u> | | | | | | | <u>October</u> | | | | | | | | | | |
|----------------|----|----|----|----|----|----|--------------|----|----|----|----|----|----|-------------|----|----|----|----|----|----|----------------|----|----|----|----|----|----|---|---|---|---|
| Su | Mo | Tu | We | Th | Fr | Sa | Su | Mo | Tu | We | Th | Fr | Sa | Su | Mo | Tu | We | Th | Fr | Sa | Su | Mo | Tu | We | Th | Fr | Sa | | | | |
| | | | 1 | 2 | 3 | 4 | 5 | | | | 1 | 2 | 3 | 4 | 5 | | | | 1 | 2 | 3 | 4 | 5 | | | | | 1 | 2 | 3 | 4 |
| 6 | 7 | 8 | 9 | 10 | 11 | 12 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | | | | |
| 13 | 14 | 15 | 16 | 17 | 18 | 19 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | | | | |
| 20 | 21 | 22 | 23 | 24 | 25 | 26 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | | | | |
| 27 | 28 | 29 | 30 | 31 | | | 27 | 28 | 29 | 30 | | | | 27 | 28 | 29 | 30 | 31 | | | 26 | 27 | 28 | 29 | 30 | 31 | | | | | |

¹ Due to lower borrowing needs resulting from an improving budget, the 5-year TIPS was discontinued in Sept 1998, and the 30-year TIPS was discontinued in Oct 2001.



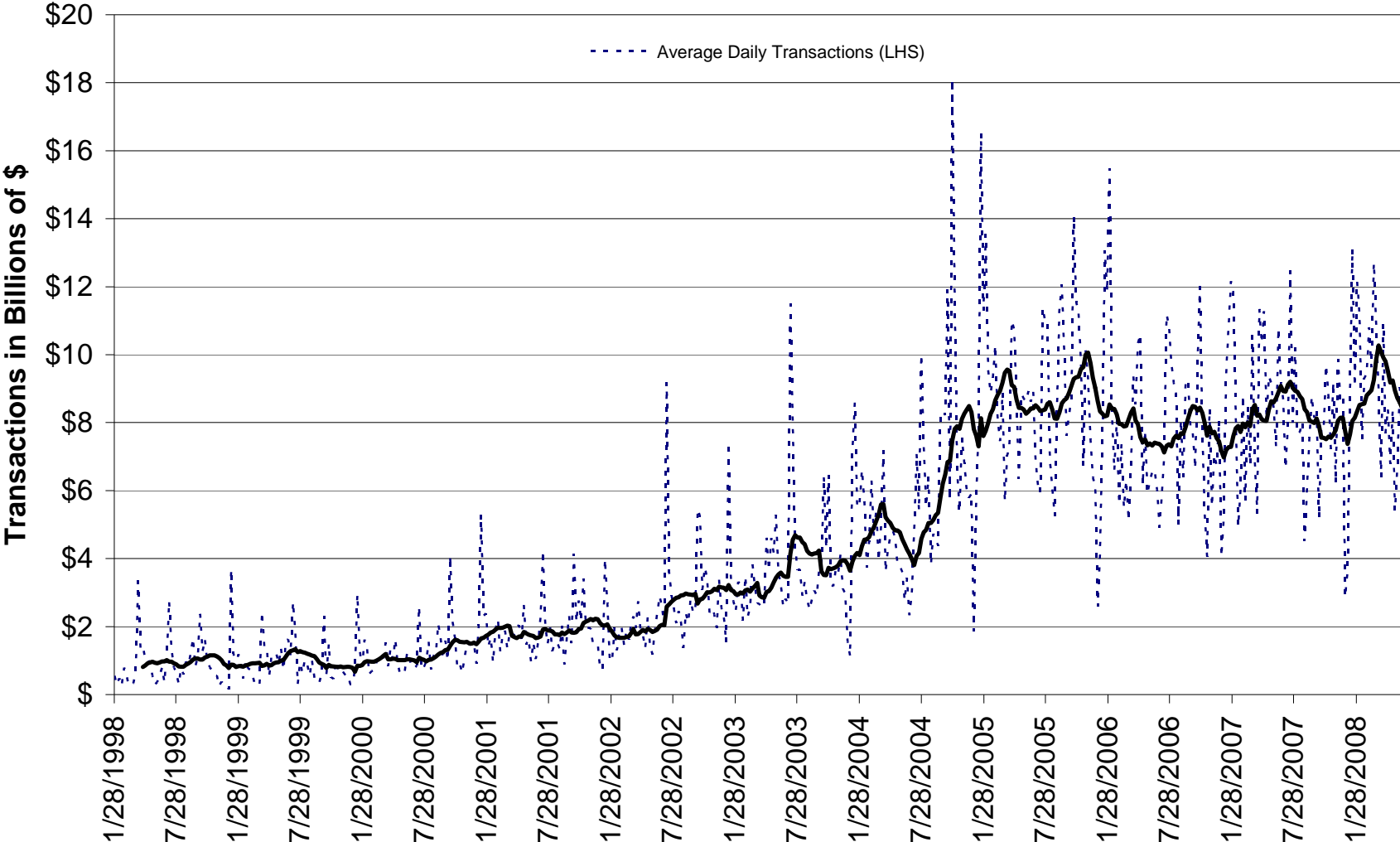
Historical TIPS Securities Issuance and Amount Outstanding

TIPS Annual Issuance and Outstanding



Primary Dealer Trading Activity in TIPS

Average Daily Transactions in TIPS by Primary Dealers



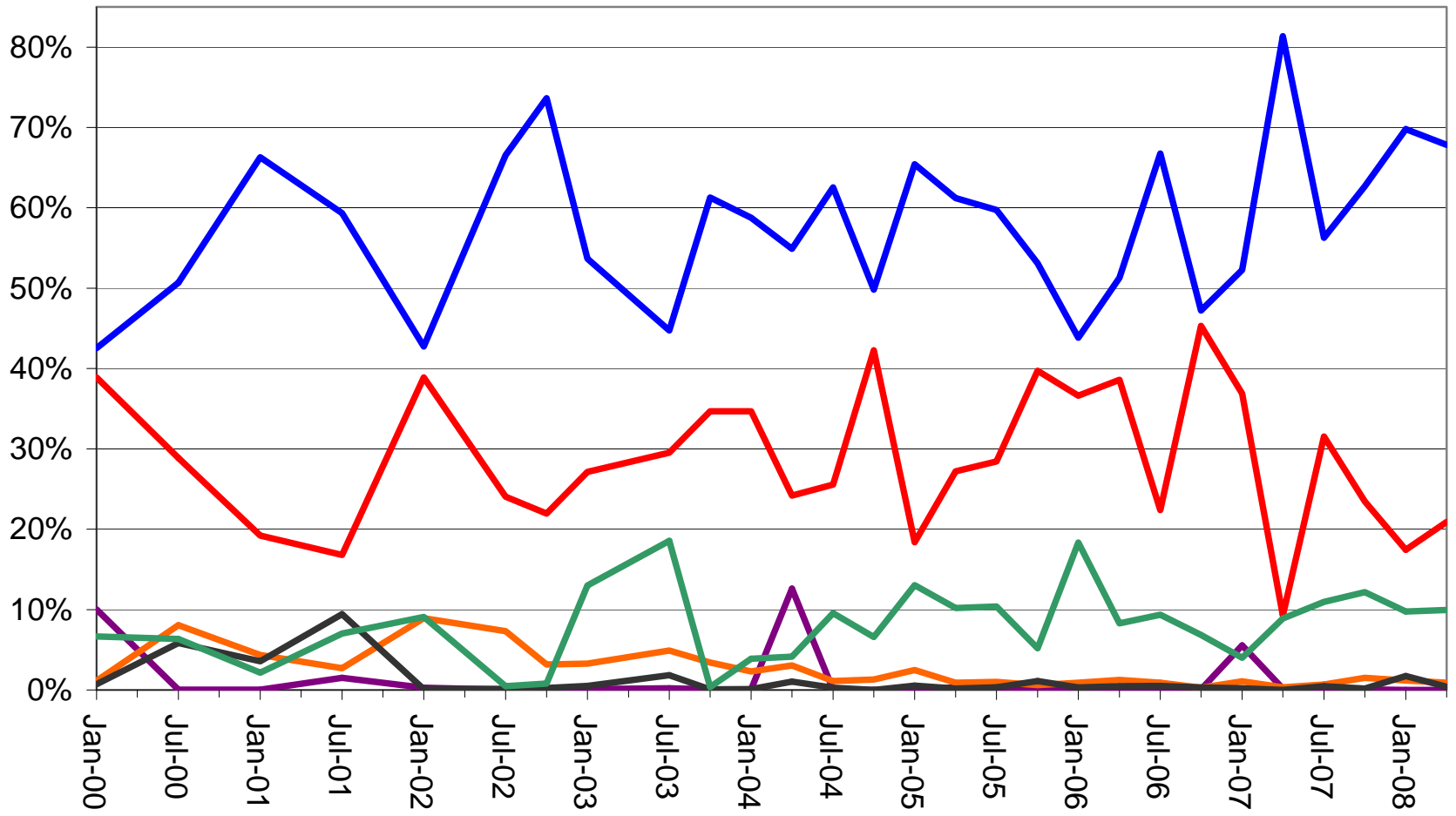
Source: Federal Reserve Bank of New York

Week

Participation in 10-Year TIPS Auctions by Investor Class

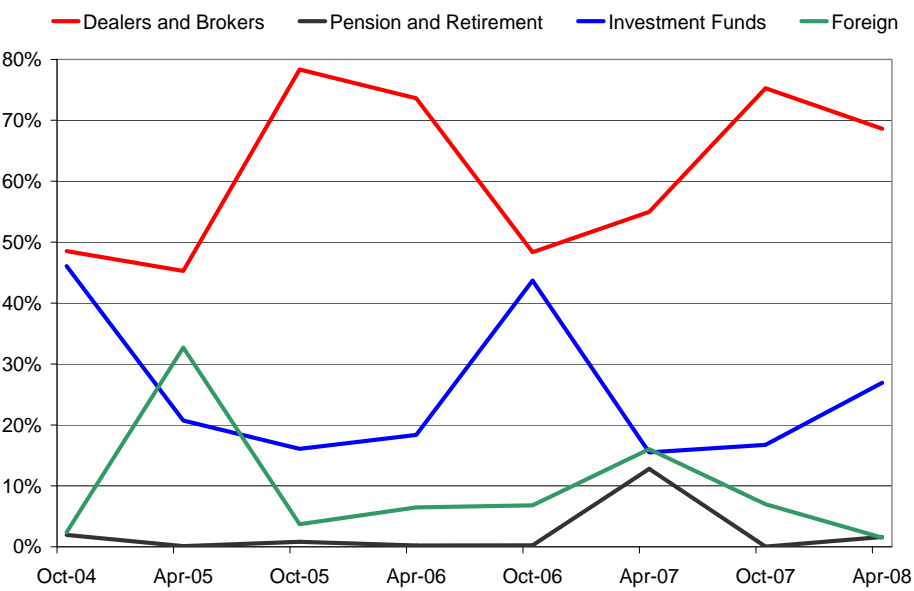
TIPS Investor Participation - 10 YR

- Depository Institutions
- Individuals
- Dealers and Brokers
- Pension and Retirement
- Investment Funds
- Foreign

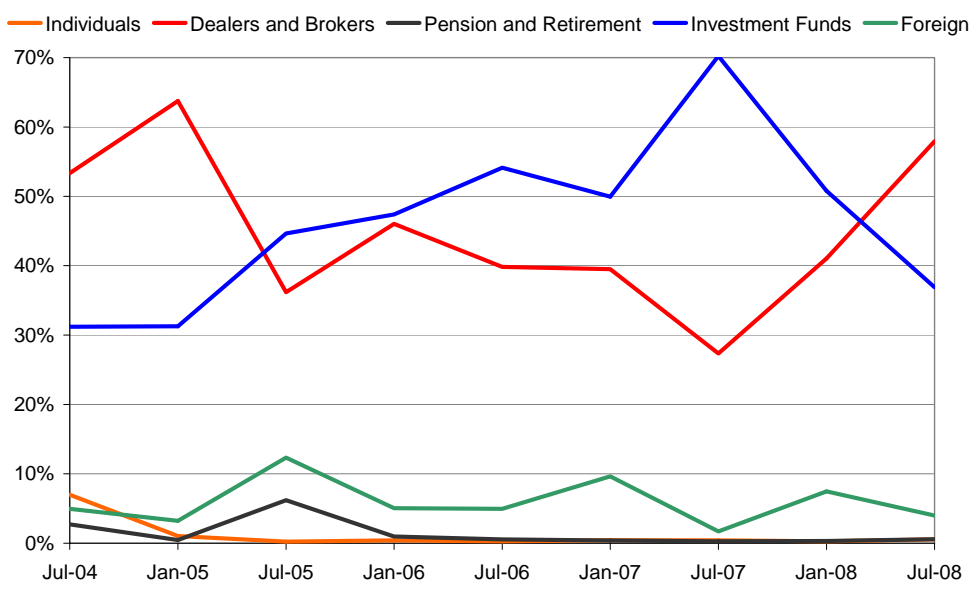


Participation in 5- and 20-Year TIPS Auctions by Investor Class

TIPS Investor Participation - 5 YR

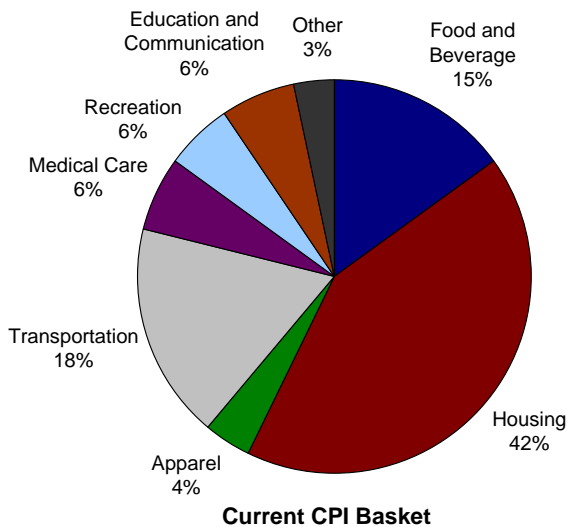


TIPS Investor Participation - 20 YR



What index does Treasury use to measure inflation?

- The inflation accrual to the principal of TIPS is linked to Consumer Price Index Urban Non-Seasonally Adjusted (CPI-U NSA) lagged by 3 months.
- The payment of principal at maturity is guaranteed against deflation as measured by CPI-U NSA lagged 3 months at maturity (a deflation floor).
- What is the CPI-U?
 - The CPI-U includes 87% of the US population and includes wage earners and clerical worker households as well as groups such as professional, managerial, and technical workers, the self-employed, short-term workers, the unemployed, and retirees and others not in the labor force. ¹

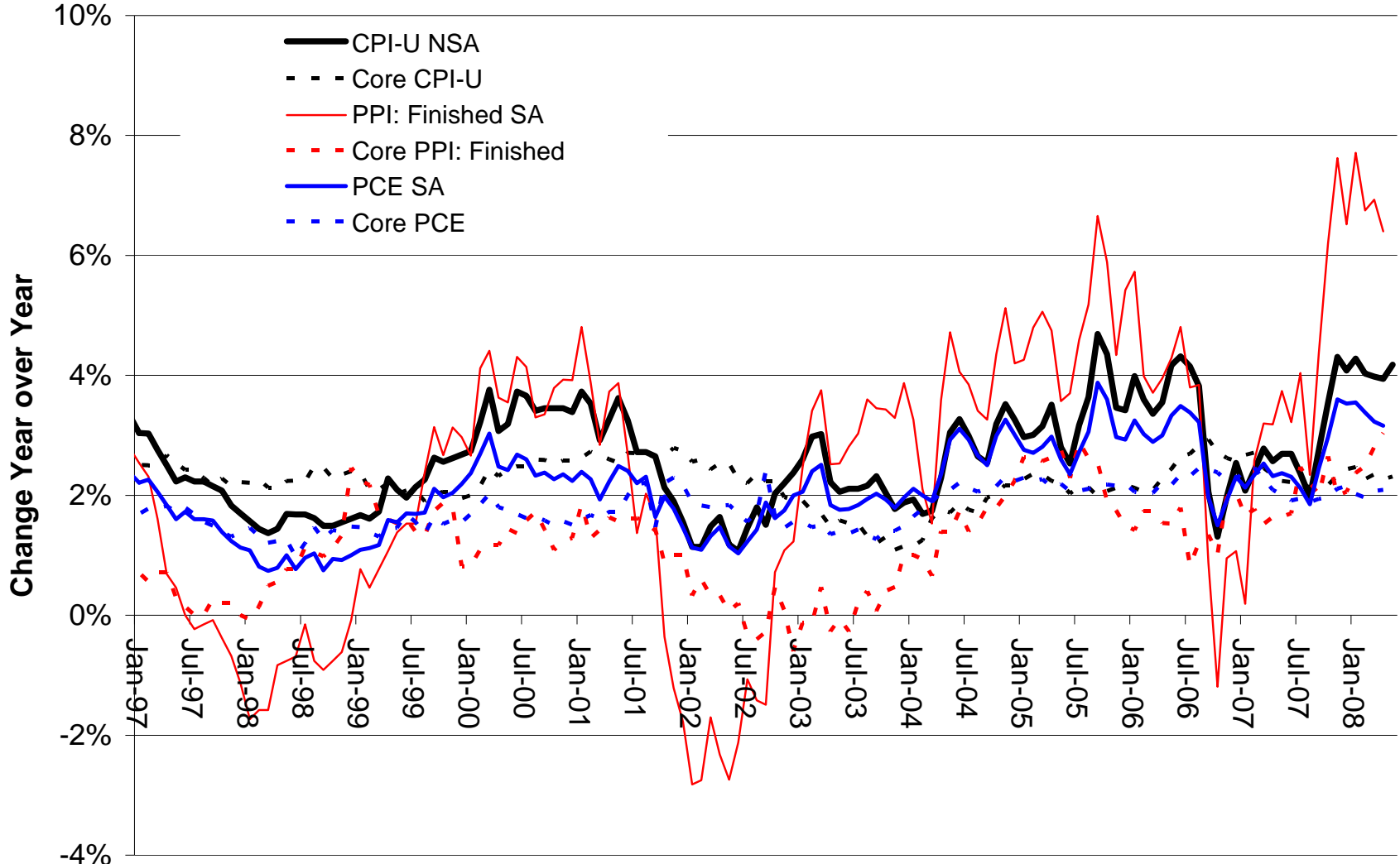


¹ Bureau of Labor Statistics



CPI-U NSA versus Other Common Measures of Inflation

Comparing Different Inflation Measures

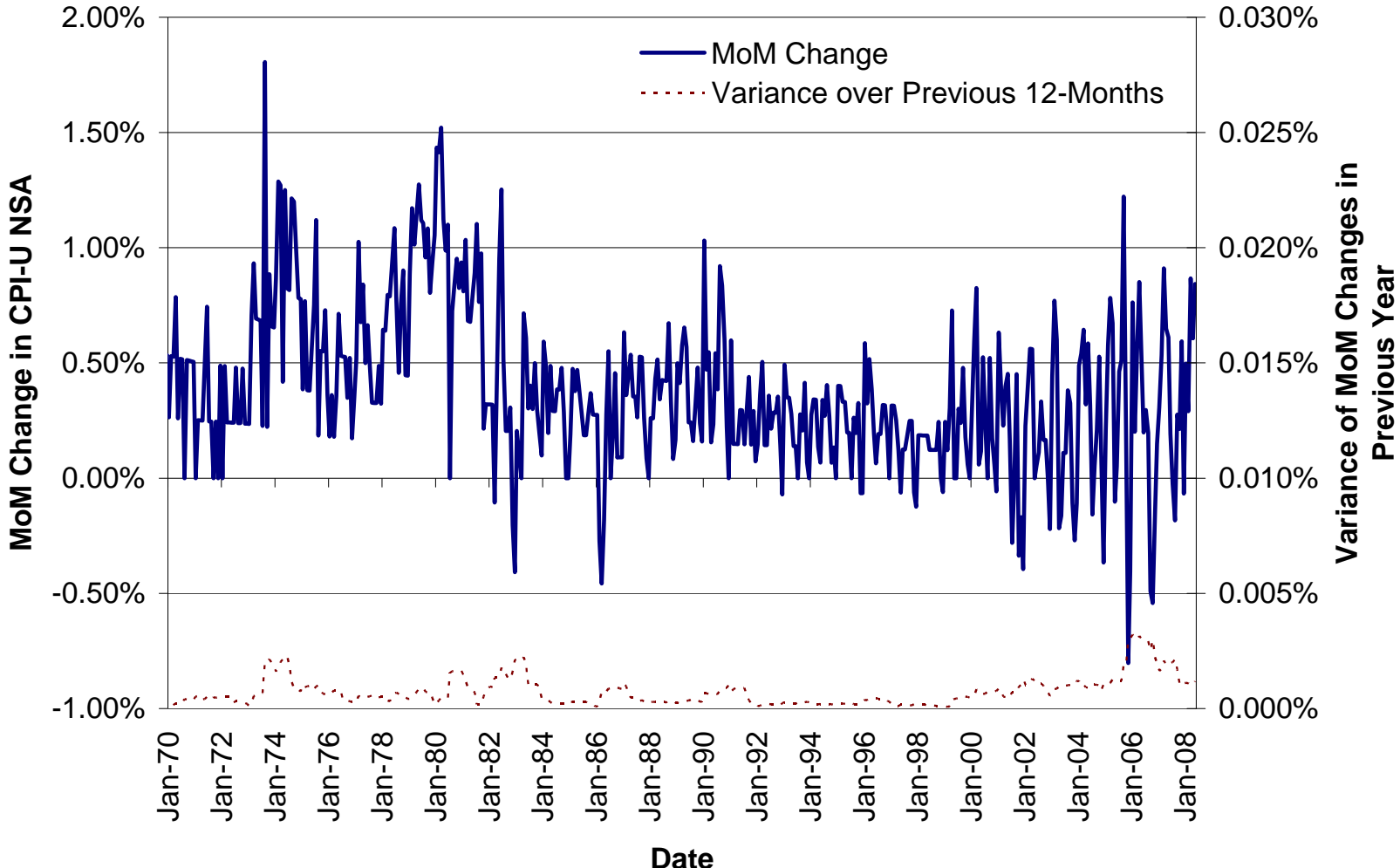


Source: BLS/ BEA/ FRB Cleveland / Haver



Inflation Volatility

Volatility in CPI-U NSA



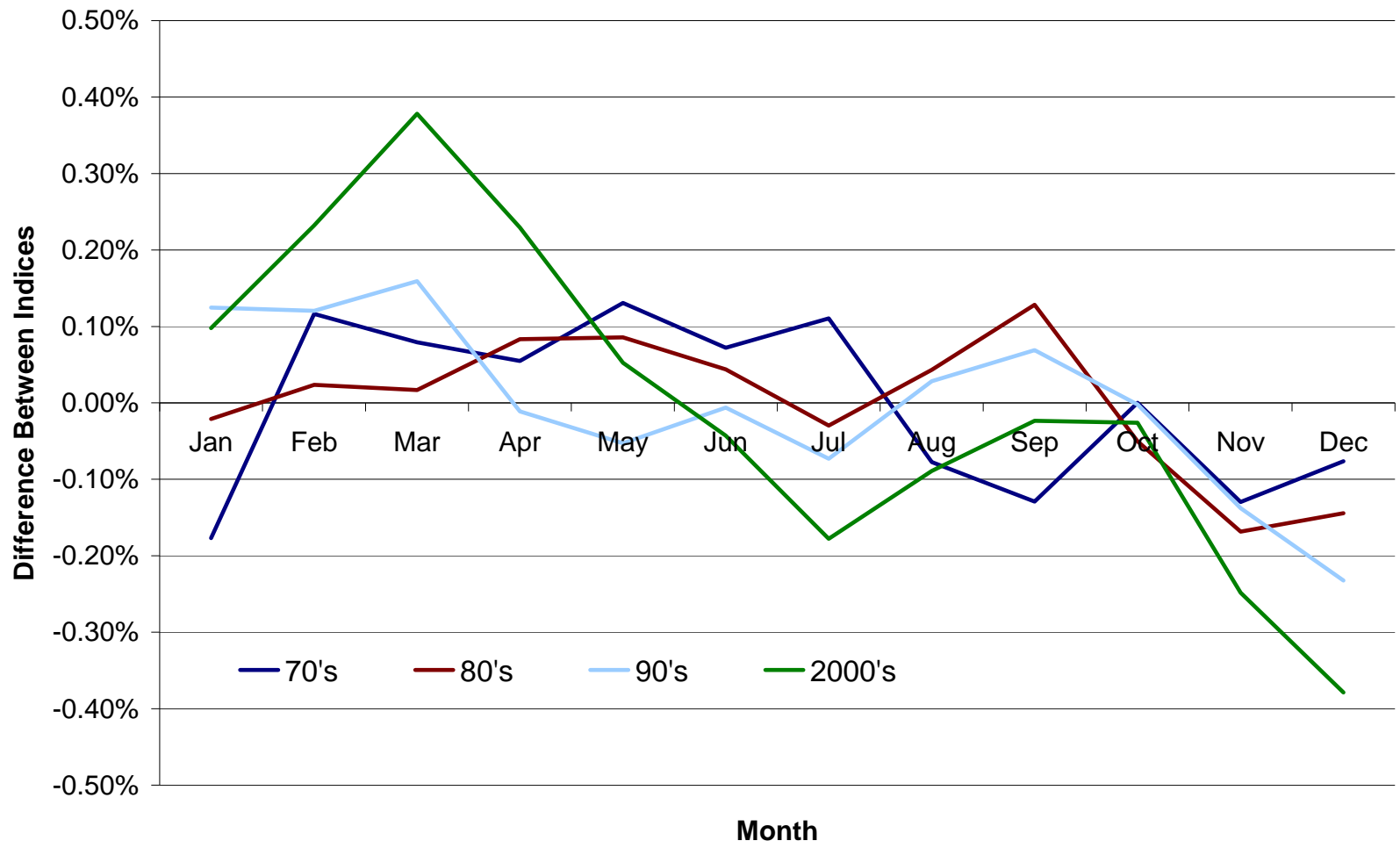
Source: BLS / Haver



Office of Debt Management

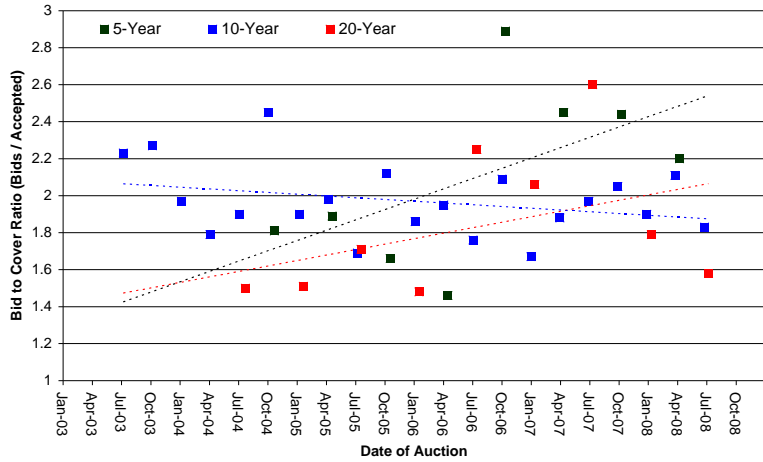
Inflation Seasonality

Average CPI-U NSA - CPI-U SA by decade since 1970

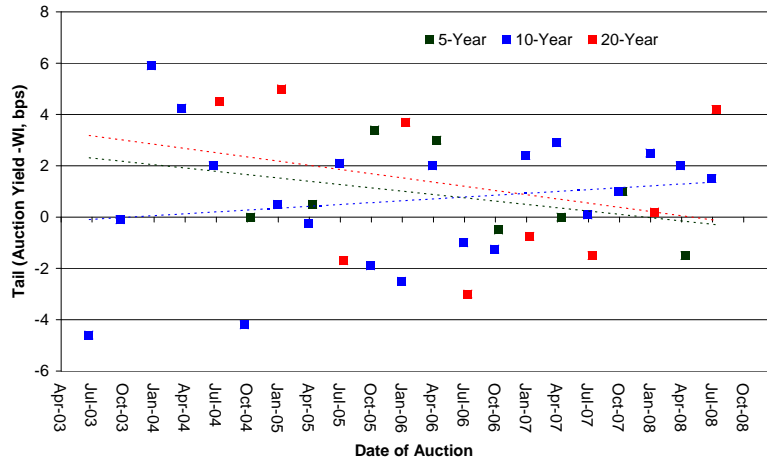


Auction Results and Metrics

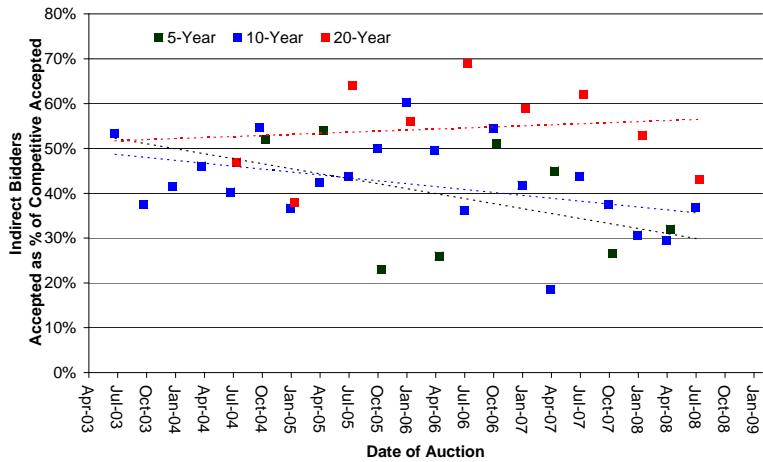
Bid to Cover Ratio at TIPS Auctions



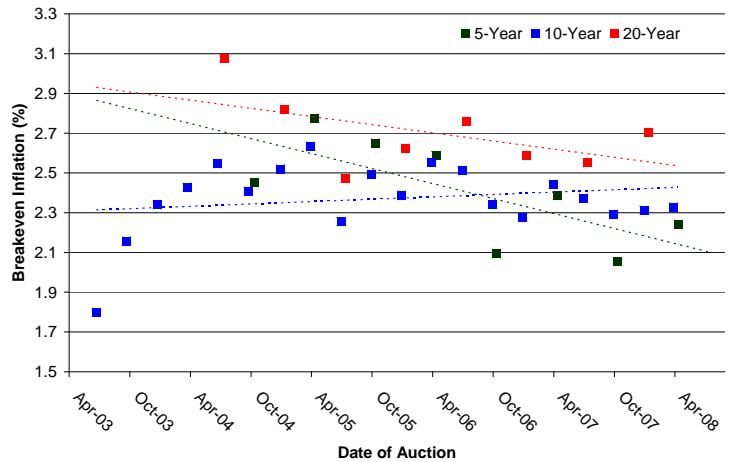
TIPS Auction Performance (Auction Tails)



Indirect Bidders in TIPS Auctions



Auction Breakeven Inflation



TIPS correlation to Other Asset Classes for Two Timeframes

Since 2004

Since 1998

| Correlation to Lehman TIPS Aggregate Total Return | | | | Correlation to Lehman TIPS Aggregate Total Return | | | |
|---|--------------|--------------|--------------|---|--------------|--------------|--------------|
| Index | Daily | Monthly | Quarterly | Index | Daily | Monthly | Quarterly |
| S&P 500 Total Return | -0.28 | -0.46 | -0.38 | S&P 500 Total Return | -0.20 | -0.25 | -0.52 |
| Morgan Stanley (MSCI) REIT Index Total Return | -0.19 | -0.18 | 0.22 | Morgan Stanley (MSCI) REIT Index Total Return | -0.15 | 0.03 | -0.16 |
| Traded Weighted Broad - Dollar | -0.13 | -0.21 | -0.46 | Traded Weighted Broad - Dollar | -0.13 | -0.23 | -0.06 |
| Gold | 0.17 | 0.28 | 0.41 | S&P Goldman Sachs Commodity Index Energy Total Return | 0.12 | 0.14 | 0.09 |
| S&P Goldman Sachs Commodity Index Total Return | 0.22 | 0.07 | 0.02 | Oil | 0.12 | 0.10 | 0.08 |
| Oil | 0.23 | 0.02 | 0.02 | S&P Goldman Sachs Commodity Index Total Return | 0.12 | 0.16 | 0.10 |
| S&P Goldman Sachs Commodity Index Energy Total Return | 0.23 | 0.04 | 0.02 | Gold | 0.16 | 0.27 | 0.11 |
| US Aggregate Lehman Total Return | 0.86 | 0.79 | 0.88 | US Aggregate Lehman Total Return | 0.73 | 0.80 | 0.83 |
| Nominal Treasury Lehman Total Return | 0.88 | 0.86 | 0.92 | Nominal Treasury Lehman Total Return | 0.76 | 0.83 | 0.87 |

| | | | | | | | |
|------------------------|-----------|-----------|-----------|------------------------|-----------|-----------|------------|
| Time Frame - Beginning | 6/1/2004 | 5/28/2004 | 6/30/2004 | Time Frame - Beginning | 4/15/1998 | 4/30/1998 | 12/31/1998 |
| Time Frame - Ending | 8/14/2008 | 7/31/2008 | 6/30/2008 | Time Frame - Ending | 8/14/2008 | 7/31/2008 | 6/30/2008 |
| Observations | 1061 | 51 | 17 | Observations | 2604 | 124 | 39 |

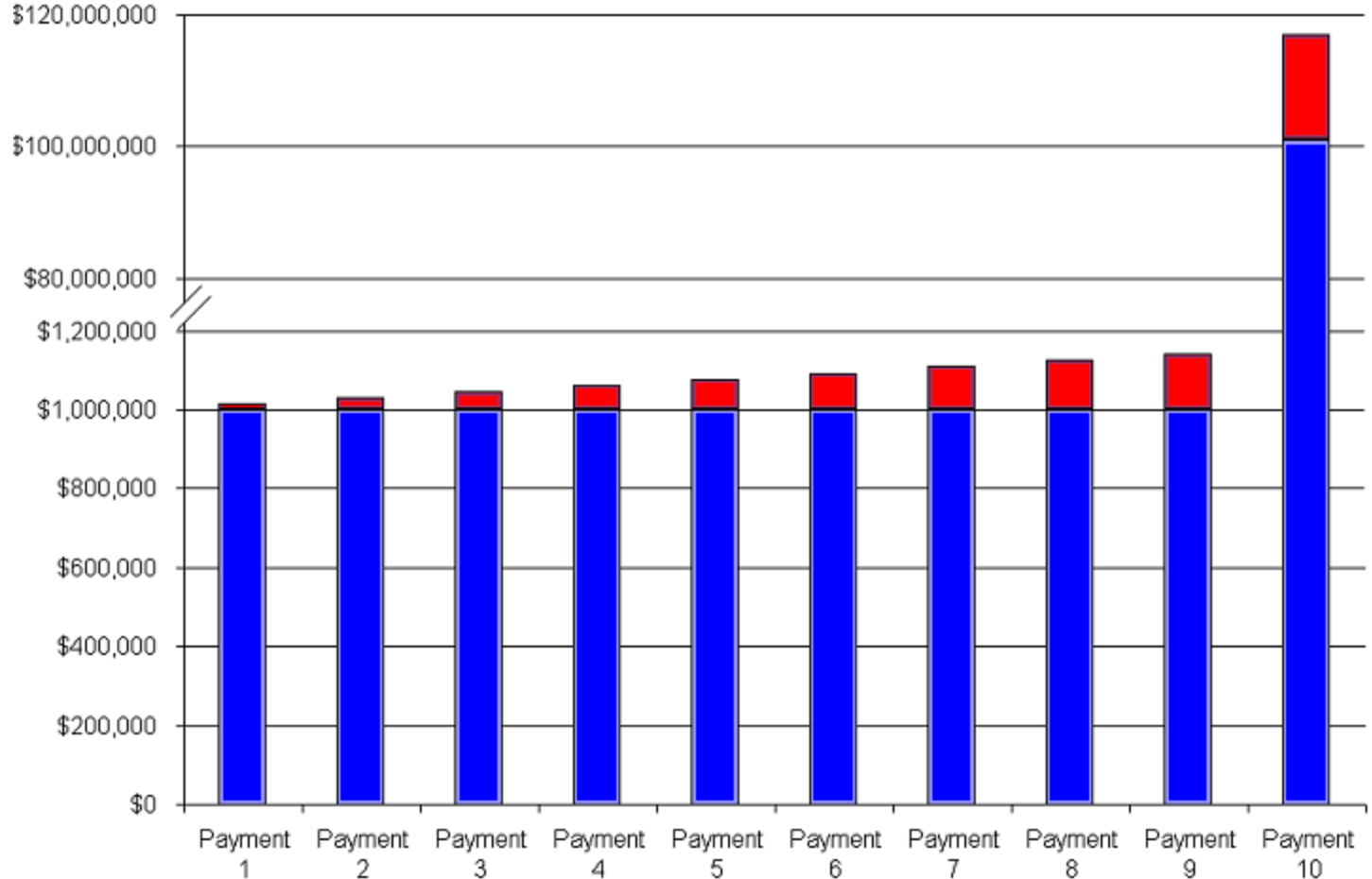
Source: Bloomberg, Lehman



Case Study: Flow of Payments from a 5-Year TIPS

Assumptions: Annual inflation = 3%; Coupon Rate = 2%;
Size Purchased at Auction = \$100,000,000 ; Maturity = 5 Years

Blue = Payment before Inflation adjustment **Red** = Payment from inflation adjustment



Tax Treatment

- TIPS are taxed not only on the coupon payment but also on the inflation that accrues to the principal.
- For Example:
 - If Investor A purchases TIPS on January 1 and holds it the entire year, Investor A will owe taxes on two coupon payments as well as the accrual of inflation to the principal during that year.
- The following document provides additional information regarding the tax treatment of TIPS: http://www.treasurydirect.gov/instit/statreg/auctreg/auctreg_gsrntax.pdf



Appendix - Structure of TIPS

Formula

Reference $CPI = CPI - U$ NSA lagged 3 months translates to

$$CPI_r = CPI_{m-3} + \frac{d-1}{m} * (CPI_{m-2} - CPI_{m-3})$$

Where CPI_r = Reference CPI; CPI_{m-3} = CPI - U NSA 3 months prior;
 CPI_{m-2} = CPI 2 months prior;
 d = day of the month;
 m = days in current month

CPI_r is the CPI - U NSA of 3 months prior on the 1st of any given month.
 For Example: July 1, 2008 uses April CPI as its reference.

Otherwise CPI_r is the linear interpolation between the CPI - U NSA of 3 months prior and 2 months prior as shown in the equation.

Index Ratios for adjusting the principal of a TIPS
 (Coupon Payments = Index Ratio * Principal * Coupon Rate/2)
 Base CPI = Reference CPI on the dated day of original issue.
 CPI_b = Base CPI
 Index Ratio = $\frac{CPI_r}{CPI_b}$

Alternatively, Reference CPIs and Index Ratios are available at <http://www.treasurydirect.gov/instit/annceresult/tipsdpi/tipsdpi.htm>

Example

Calculating Reference CPI

For July 22, 2008

$$CPI_{m-3} = CPI_{April} = 214.823; CPI_{m-2} = CPI_{May} = 216.632;$$

d = 22; m = 31

using

$$CPI_r = CPI_{m-3} + \frac{d-1}{m} * (CPI_{m-2} - CPI_{m-3})$$

$$CPI_r = 214.823 + \frac{22-1}{31} * (216.632 - 214.823)$$

$$CPI_r = 216.048$$

Calculating an index ratio

Using the Jan 2018 10 - Year; Cusip = 912828HN3

Base CPI = 209.49645

CPI_b = Base CPI = CPI_r on Dated Date of issue

Dated Date of issue = 1/15/2008

$$\text{Index Ratio on 7/22/2008} = \frac{CPI_r}{CPI_b} = \frac{216.048}{209.496} = 1.03127$$

Appendix - Glossary of Terms

- ◆ **Bid to Cover** – amount of competitive bids received divided by amount of competitive bids accepted.
- ◆ **Tail** – difference between the when-issued rate of a security and the stop out yield at the time of auction.
- ◆ **Breakeven Inflation** – rate of inflation which makes a TIPS equivalent in cash flows to a synthetic nominal security.
- ◆ **Indirect Bidder** – competitive bidders bidding through a primary dealer at an auction.
- ◆ **Lag** – the time between two events. In the case of TIPS, the time between the occurrence of inflation (in the form of CPI-U NSA) and its application to the principal of the TIPS security.
- ◆ **Accretion** – expansion to the value of an asset. In this case accretion is the expansion of the original principal of a TIPS by CPI-U NSA lagged 3 months.
- ◆ **Interpolation** – construction of new data observations between known observations. In the case of TIPS, CPI-U NSA is only reported monthly. Daily CPI levels are linearly interpolated from the monthly figures to create daily accrual to the principal of TIPS.
- ◆ **Total Return** – change in market price of an asset plus any disbursements (coupon payments, dividends, etc.) divided by market price at the beginning of the period.



Appendix - Additional Resources

- U.S. Treasury Office of Debt Management – www.treas.gov/offices/domestic-finance/debt-management
- FRB Cleveland - www.clevelandfed.org
- FRB New York - www.newyorkfed.org
- Federal Reserve Board - www.federalreserve.gov
- Bureau of Labor Statistics - www.bls.gov
- Bureau of Economic Analysis – www.bea.gov
- TreasuryDirect (Bureau of Public Debt) – <http://www.treasurydirect.gov/instit/annceresult/tipsdpi/tipsdpi.htm>

