

2012 SCEA/ISPA Joint Annual Conference & Training Workshop

Using Treasury Securities to Develop Inflation Indices

Orlando, Florida
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Table Of Contents

- ▶ Problems with Current Methods
- ▶ Alternative Methodology
- ▶ Applying Risk
- ▶ Problems with Current Methods vs. Alternative Methodology

Table Of Contents

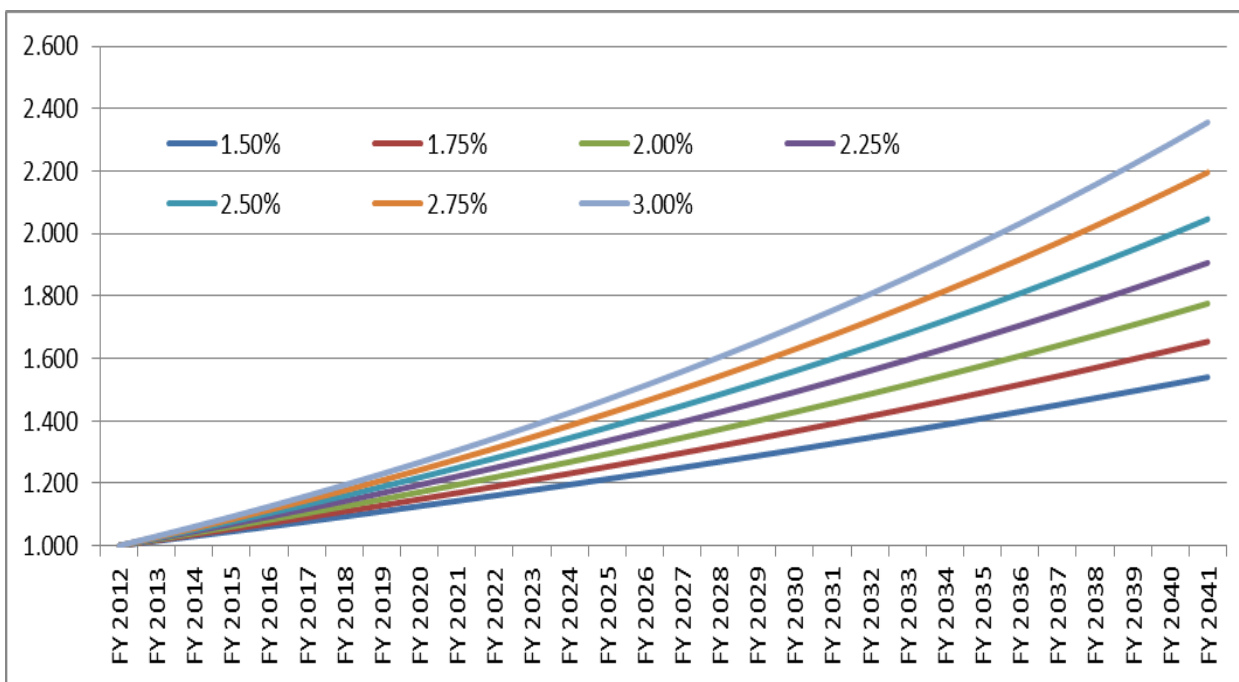
- ▶ Problems with Current Methods
- ▶ Alternative Methodology
- ▶ Applying Risk
- ▶ Problems with Current Methods vs. Alternative Methodology

Problems With Current Methods

- ▶ Typically, inflation indices (either those provided by OSD or custom indices) used for cost estimation assume a set inflation percentage from the present to the end of the estimate
- ▶ A study performed by Christensen, Kankey, & Sweitzer for the SCEA/ISPA conference in 1999 found that political agendas may create a bias in OMB inflation forecasts (the basis for OSD)
- ▶ The basis for Government Inflation Indices are typically macro indicators however, in a 2006 report Ang, Bekaert, & Wei concluded that surveys and asset market inflation estimation tools dominate macro variable inflation forecasts
- ▶ Inflation assumptions are a source of cost uncertainty, however in most cost models they are fixed and do not contribute to the overall confidence of the estimate

Inflationary values have similar volatility compared to other cost parameters, yet inflationary estimates are typically fixed

- ▶ Inflationary fluctuations can cause large increases in a program's total cost over the life cycle of a program
- ▶ Assuming fixed inflationary values infers there are no economic risks and may misrepresent the confidence level for a particular estimate
- ▶ Choosing a fixed 1.5% inflationary value instead of 3.0% over the life cycle of a 30 year estimate will result in a 53% cost variance for the final year



Adjusting inflation indices in accordance with the Air Force's Cost Analysis Agencies Cost Risk Analysis Handbook*

- ▶ The handbook does not require or recommend that uncertainty be placed on published inflation tables. However...
- ▶ If the Program Office has suitable data to demonstrate that the inflation experienced and projected for a specific commodity is significantly different than the published inflation, then that difference should be modeled. Further, uncertainty should be applied to the adjustment that is used.

*AFCAA CRH Final 29 Dec 2006 section 3.5.5 page 33

Table Of Contents

- ▶ Problems with Current Methods
- ▶ Alternative Methodology
- ▶ Applying Risk
- ▶ Problems with Current Methods vs. Alternative Methodology

Alternate Methodology – Definitions

- ▶ Yield Curve – “...determines the value that investors place today on nominal payments at all future dates—a fundamental determinant of almost all asset prices and economic decisions” (Gürkaynak, Sack, & Wright 2006)
- ▶ Arbitrage Rule – the idea that identical securities in liquid markets should have the same return
- ▶ Securities
 - Traditional Treasury Securities – Consist of Treasury Notes (Zero Coupon, <1 year maturity), Treasury Bills (Maturity of 1-10 Years, with 6 month coupon payments), and Treasury Bonds (Maturity of 20-30 years, with 6 month coupon payments) <http://www.treasurydirect.gov/indiv/products/products.htm>
 - Treasury Inflation-Protected Securities (TIPS) - The principal of a TIPS increases with inflation and decreases with deflation, as measured by the Consumer Price Index. TIPS pay interest twice a year, at a fixed rate. The rate is applied to the adjusted principal; so, like the principal, interest payments rise with inflation and fall with deflation. (http://www.treasurydirect.gov/indiv/products/prod_tips_glance.htm)

The Yield Curves of 2 identical securities will be the same. Therefore, by comparing the yield curves of two securities that are identical except one has inflation risk and the other does not, we can derive the market's required compensation for taking on inflationary risk (i.e. the expected inflation of the market)

Alternate Methodology – Approach

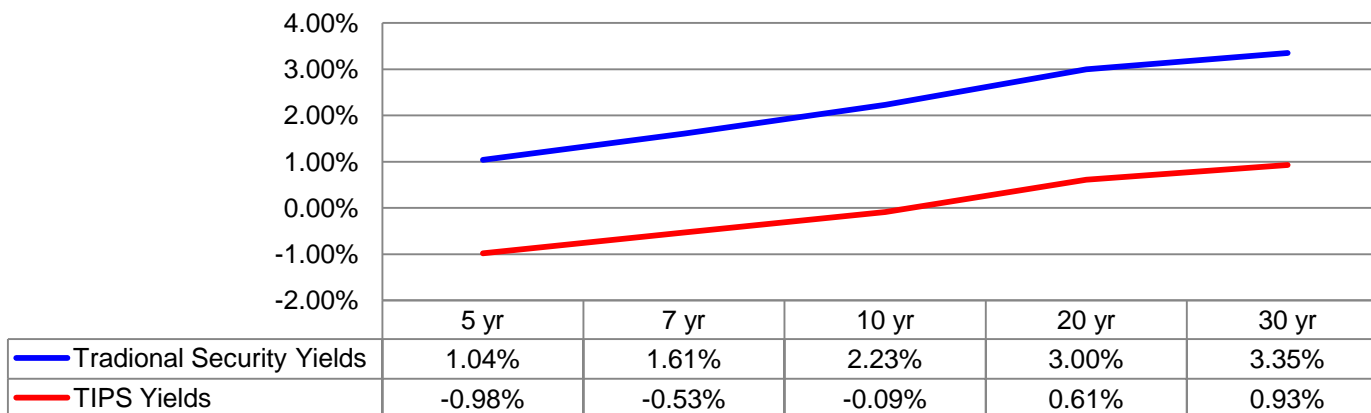
Using securities to estimate the expected inflation of the market

- ▶ Method effectively “surveys” those in the market (and with money at stake) about their inflation expectations
- ▶ TIPS and traditional Treasury Securities (a.k.a. Treasury, Notes, Bills, or Bonds depending on maturity) allow us to easily conduct this analysis
- ▶ To accomplish this analysis:
 - Download yield curve data for the entire life cycle of the program to be estimated
 - Subtract the difference to determine the raw inflation rate for that year’s cash flows and apply outlay rates (See back up slides for “backing out” outlay rates from OSD inflation indices using solver) to determine weighted inflation indices
 - Calculate the spread’s volatility over time to determine uncertainty (standard deviation)

Alternate Methodology – Step 1 Construct Yield Curves for Traditional and TIPS Securities

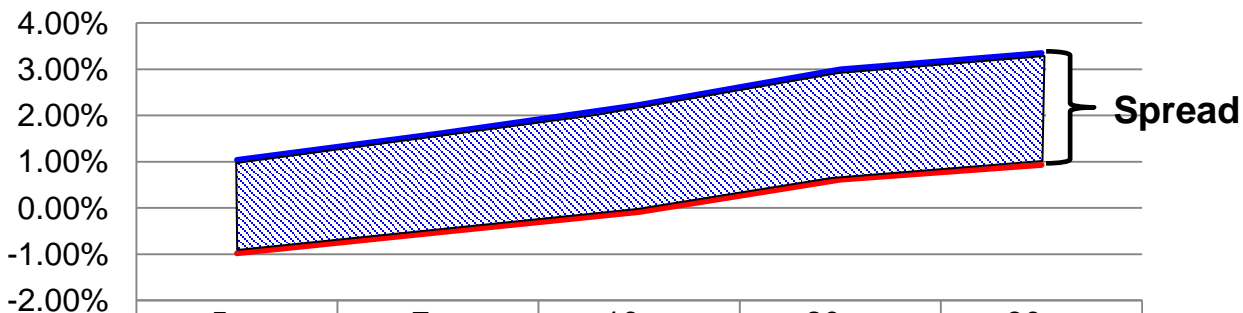
- ▶ Good news: the Department of the Treasury does most of the work for you
 - Go to - <http://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/default.aspx>
 - Select Daily Treasury Yield Curve Rates (Traditional Security Yields) and Daily Treasury Real Yield Curve Rates (TIPS Yields)

Traditional/TIPS Yield Curves



Alternate Methodology – Step 2 Determine “Spread” Between Curves, Calculate Expected Inflation, and Apply Outlay Rates

Traditional/TIPS Yield Curves



	5 yr	7 yr	10 yr	20 yr	30 yr
— Traditional Security Yields	1.04%	1.61%	2.23%	3.00%	3.35%
— TIPS Yields	-0.98%	-0.53%	-0.09%	0.61%	0.93%

► Spread Equals:

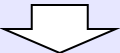
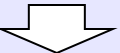
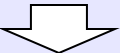

- For T_{1-5} , Expected inflation equals $1.04\% - (-0.98\%)$ or 2.02%
- For T_{5-7} , Expected inflation is $[1 + (1.61\% - 0.53\%)]^7 = (1.0202^5) * (1 + r_{5-7})^2$ or $r_{5-7} = 2.44\%$

Table Of Contents

- ▶ Problems with Current Methods
- ▶ Alternative Methodology
- ▶ Applying Risk
- ▶ Problems with Current Methods vs. Alternative Methodology

Alternate Methodology – Step 3 Measure Spread Volatility to Apply Uncertainty

- ▶ For simplicity, measure the spread at program life-cycle end date, for our example we will use Long Term Composite (
- ▶ Use historical data to determine how the spread has moved over time:
 - Data Available on treasurydirect.gov website
 - Recommend using monthly data for a fixed period, in this example 5 years

Date	LT Real Average (10> yrs)	LT COMPOSITE (>10 yrs)	Spread
3/30/2007	2.3%	4.88%	2.58%
4/30/2007	2.29%	4.83%	2.54%
5/31/2007	2.52%	5.07%	2.55%
6/29/2007	2.62%	5.19%	2.57%
7/31/2007	2.41%	4.97%	2.56%
			
3/30/2012	0.57%	2.96%	2.39%

Mean = 2.133%

Standard Deviation = 0.466%

Table Of Contents

- ▶ Problems with Current Methods
- ▶ Alternative Methodology
- ▶ Applying Risk
- ▶ Problems with Current Methods vs. Alternative Methodology

Problems with Current Methods vs. Alternative Methodology

- ▶ **Problem:** Inflation indices vary over time, but OSD tables provide set inflation percentages from the present to the end of the estimate

Alt. Methodology: Estimating inflation values based on the difference between Traditional Securities and TIPS yields within applicable outlay rates provides a more accurate representation of inflation over the life cycle of an estimate

- ▶ **Problem:** Political agendas may create a bias in OMB inflation forecasts (the basis for OSD)

Alt. Methodology: Estimates inflation using markets that are immune to manipulation and bias

- ▶ **Problem:** The basis for Government Inflation Indices are typically macro indicators that are shown to be relatively poor estimation tools

Alt. Methodology: “surveys” those in the market (and with money at stake) about their inflation expectations, which is shown to be a superior method of estimation

- ▶ **Problem:** Inflation assumptions are a source of cost uncertainty, however in most cost models they are fixed and do not contribute to the overall confidence levels of an estimate

Alt. Methodology: Using historical data to determine how the spread moves over time provides the statistical parameters required to model uncertainty within an estimate