Macro Keys
Do-It-Yourself CPI & TIPS Modelling

Economics & Macro Strategy

Global

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An interactive tool that compares CPI estimates to TIPS breakevens
Inflation outcomes play a central role for investors and for the Fed at this point in the economic cycle. We have developed an interactive tool to model CPI inflation and TIPS inflation breakevens, which can be accessed here: LINK.

Using our estimates or your own assumptions for core inflation, food price inflation, and energy prices, as well as some energy price passthrough to core inflation, our model produces CPI estimates that can be compared to TIPS breakevens out to two-year maturity, plus a rich/cheap analysis of inflation breakevens on these short-maturity TIPS.

The base case for CPI and TIPS
UBS estimates CPI inflation accelerating from its current -0.1% y/y in March to 2.2% y/y next February. Our forecast incorporates a levelling out of in oil prices (WTI at about $57 next February), acceleration in core prices to 2.0% y/y from this March's 1.8% y/y, and food price inflation running slightly below its recent pace. In that environment, we see April 2016 TIPS breakeven as 60 bps cheap to modelled inflation.

An inflationary scenario: Oil prices bounce to $75
Allowing oil prices to reverse half of their recent decline, rising to $75, plus passthrough from oil into core prices, CPI inflation reaches 3.6% y/y next February, and April 2016 TIPS breakeven inflation appears cheap by 200 bps.

A disinflationary scenario: Oil slipping to $40, and passthrough to core prices
In the disinflationary scenario, we allow oil prices to renew their decline and some of that decline to passthrough into softer core CPI. Even in that scenario, with CPI up just 1.2% y/y through February 2016, April 2016 TIPS breakeven inflation appears rich by just 40 bps.

Take it for a spin!
The table below shows a range of oil price and core CPI assumptions and our analysis of April 2016 TIPS inflation breakevens. Better—our interactive model allows you to assess TIPS breakevens based on your own assumptions for trends in oil prices, core CPI, and food prices, as well as allowing for a range of passthrough from energy into core prices

Figure 1: BEI maturity: April 15 2016s, rich(+)/cheap(-), bps

	Core inflation, underlying monthly pace, %		
	0.15	0.20	0.25
WTI oil price, with passthrough to core			
$30	+160	+120	+70
$50	-20	-70	-110
$70	-160	-200	-250
$90	-270	-310	-350

Source: UBS

Scenario Modelling for TIPS Breakevens

Opening our interactive TIPS breakeven model (**LINK**) will display a breakeven rich/cheap analysis based on UBS estimates for the consumer price index.

Altering the inflation assumptions generates a rich/cheap analysis of different scenarios. Those scenarios depend on your or our assumptions for the core CPI, food CPI, oil prices, and passthrough from oil price changes into core CPI.

To generate different scenarios: In the inputs area, select "user" rather than "UBS", and enter estimates for

- The underlying pace of seasonally adjusted core CPI (average m/m % change)
- Seasonally adjusted food CPI (average m/m % change)
- Oil prices (WTI, year-end estimates)

You can also allow for oil price changes to spill into core CPI, adjusting the underlying pace that you have allowed for. The "Pass thru" slider at the bottom left of the page allows for passthrough from your oil price estimates into the core CPI. That passthrough has varied over time—evident in the 1970s-80s, close to zero in the 1990s to mid-2000s, but picking up again more recently. We estimate that since 2005, a 1% rise in oil prices has tended to be associated with an eventual 0.014 pct pt increase in core prices, spread over two years. The degree of passthrough likely depends on the credibility of monetary policy—we allow you to vary those cost-pushes from zero to the estimated recent 1.4%.

The "reset to defaults" button returns all CPI and oil price inputs to UBS estimates.

We will issue updated valuation models with each CPI print, significant moves in real or nominal yields, or meaningful alteration in our CPI forecasts.

Figure 2: Inflation and TIPS Breakeven Model screenshot, April 23, 2015

US Rates Strategy and Economics

Interactive Inflation and TIPS Breakeven Valuation Model

Inputs	Core %	Food %	WTI price $
select >>	UBS	UBS	UBS
... custom:	avg. monthly rate		$ price
Q115	0.13	0.2	
Q2	0.14	0.2	
Q3	0.16	0.2	
Q4	0.20	0.2	
Q116	0.18	0.2	
Q2	0.18	0.2	
Q3	0.18	0.2	
Q4	0.18	0.2	
Q117	0.18	0.2	

Pass thru 0.00%

Reset inputs

NSA CPI inflation, year-over-year % change

Feb 2015	-0.03
predicted, Feb 2016	2.16
predicted, Feb 2017	2.98

Breakevens and Modeled Inflation

BEi maturity	TIPS coupon	nominal comparator	term (yr)	term model inflation (nsa)	adj. model infl. (ann, nsa)	BEi	rich / cheap
Jul 15, 2015s	1.88	Jul 31, 15s 1.75	0.23	0.5	3.7	4.0	0.3
Jan 15, 2016s	2.00	Jan 31, 16s 2.0	0.73	1.1	2.0	1.8	-0.2
Apr 15, 2016s	0.13	Apr 30, 16s 2.625	0.98	2.0	2.1	1.5	-0.6
Jul 15, 2016s	2.50	Jul 31, 16s 3.25	1.23	2.3	2.6	2.1	-0.5
Jan 15, 2017s	2.38	Jan 31, 17s 3.125	1.73	2.1	2.4	1.7	-0.8
Apr 15, 2017s	0.13	Apr 30, 17s 3.125	1.98	n/a	2.5	1.6	-0.9

Source: UBS, Bureau of Labor Statistics, Bloomberg

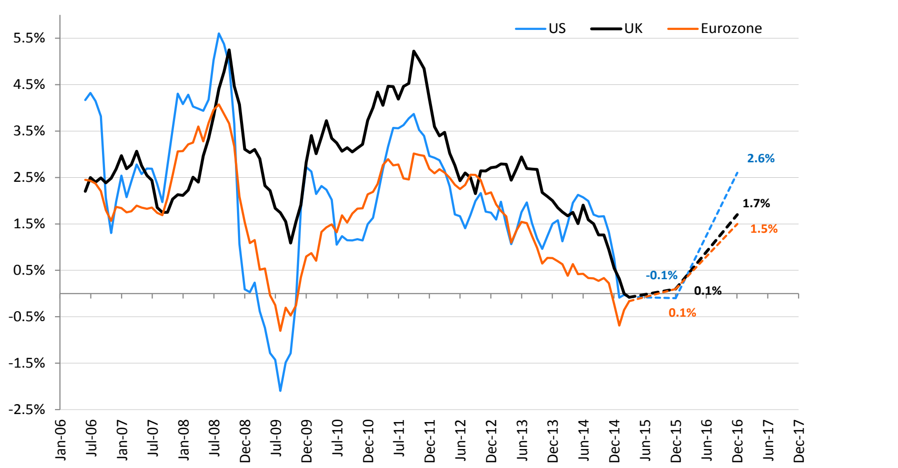
Your "Do-it-Yourself" Tool to Model US Inflation

Inflation has become one of the most talked-about topics among investors in US rates products, if not the most talked about. The Fed's key policymakers have been increasingly emphasizing inflation over other economic measures (GDP, job growth) as the pivotal variable in the timing of liftoff. In fact, the view of inflation's central role in the Fed's decision-making has become so entrenched that several investors have (somewhat cynically) told us they believed "if inflation remains subdued, the Fed will never need to hike rates".

While we certainly respect that point of view, we do not ascribe to the either of the two premises above. First, as our colleagues have persuasively argued recently, zero policy rate is in fact detrimental to the US economy (LINK). Consequently, we believe the Fed will need to raise policy rate above zero in order to bring it to a more optimal, although still highly accommodative, level even if inflation remains subdued. Second, we expect inflation to start trending upward, not only in the US, but in other major developed economies (Figure 1). Our call for the 0.1% average headline US inflation seems to contradict the previous statement. However, peeling off the top layer will show that a decent pick-up in inflation later this year would average out with the very steep drop back in January.

Given consistent feedback from investors regarding the central role of inflation forecast in their decisions at this point of the cycle, we have developed an interactive tool to help them in this endeavor. This tool is based on a somewhat simplified UBS economics model for US inflation. It produces CPI inflation forecasts over the two-year period based on a brief set of inputs controlled by the investor. Clients running rates, FX, and even some macro-focused equity and credit strategies should find it useful. Furthermore, rates investors get an extra bonus: the tool contains a rich/cheap analysis of inflation breakevens on short-maturity TIPS.

Figure 3: Y/Y headline consumer inflation in US, UK, and the Eurozone



Source: UBS, Bloomberg

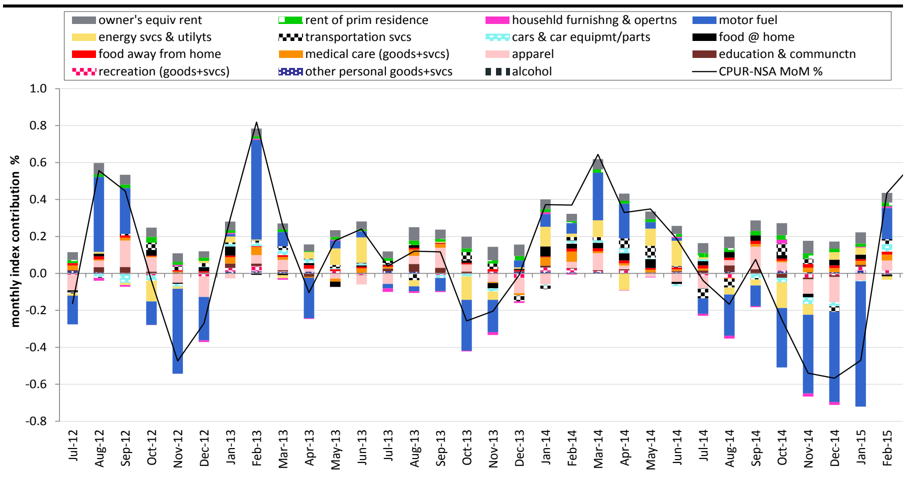
Will US inflation get its "energy" back?

As readers explore our inflation forecast tool they will discover that the crude oil price is one of the few inputs. You can default to the UBS energy CPI forecast or enter your own projections for end-of-year WTI oil prices. The steep plunge in oil prices in H2 2014 had cascaded through most of the energy complex and become

a major driver of price indices. A picture is worth thousand words, and Figure 4 really helps drive it home.

The bulk of energy influence on the overall index is captured by the columns representing motor fuel (blue), energy services and utilities (yellow), and transportation (black checkered). The latter two are a part of core inflation, which brings up an issue of how to account of the oil price "spillover effect" into core. Don't worry – our forecast tool takes care of that, too.

Figure 4: Contributions to the monthly headline NSA CPI



Source: Bureau of Labor Statistics

UBS oil analyst Bill Featherston sees oil prices as having bottomed. We foresee them reaching $52.50 in Q415 (for WTI) and averaging $62.50 in 2016.

It is essential to accurately translate shifts in crude oil prices into energy-related inflation components. For the purposes of our interactive inflation tool, we allow your inputs of WTI oil prices to influence concurrent and one-month ahead energy CPI.

The "core" of the matter

The US Core CPI tends to exhibit pronounced seasonal patterns, something TIPS investors are keenly aware of. Figure 5 shows a clear "pyramid" pattern of upswing in not seasonally adjusted core inflation in the early part of a calendar year. Thus far, 2015 data is consistent with that pattern.

Our inflation forecasting tool models future core inflation based on two key parameters: (i) an underlying trend growth rate and (ii) an oil price spillover effect. Just as with crude prices, readers will be able to either default to UBS projections or enter their own input for the extent of spillover from oil price swings into the core CPI.

Playing with passthrough

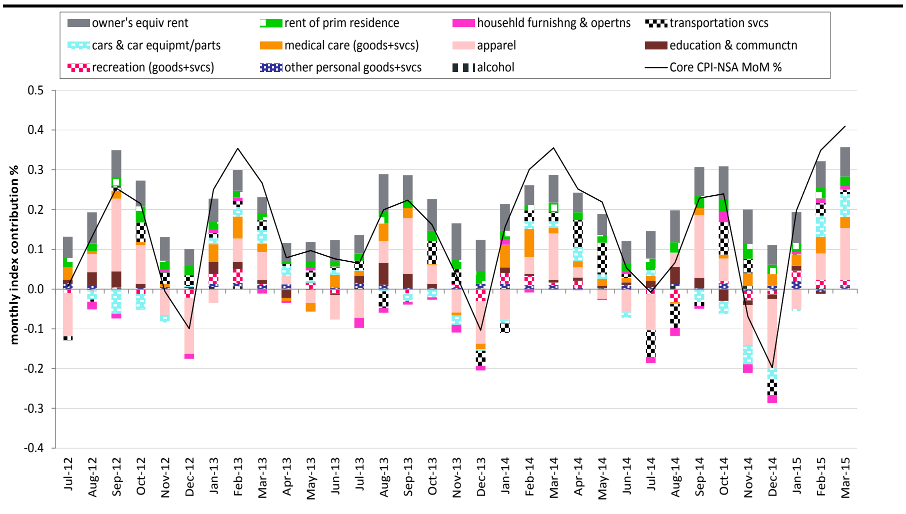
The question of passthrough into core CPI is a controversial one. For much of the last 25 years, the working assumption has been that pace of headline CPI reverts towards the pace core CPI after any deviation. However, that reversion has not

always been the norm—it certainly was not it the 1970s; and the assumption of (close to) no passthrough appears less realistic since the early 2000s.[1] Indeed, recent FOMC minutes reveal a Fed closely attuned to the disinflationary impacts of falling oil prices on core prices.

Why has passthrough picked up? Petroleum products have been rising as a share of consumer spending since 2000, after a 20-year decline. Also, the highly accommodative stance of monetary policy since the financial crisis may have hurt Fed credibility, even though long-term consumer inflation expectations have not shown any great move.

For the inflation/TIPS breakeven model, we estimated core CPI response coefficients to oil price changes over 24 months, and our model allows oil price changes to filter into your core CPI assumptions. You can vary that passthrough from zero (your estimates of the underlying pace of core CPI are used directly) to 1.4% (a 1.4% core CPI response to changes in oil prices, spread over two years).

Figure 5: Contributions to monthly changes in NSA core CPI



Source: Bureau of Labor Statistics

Food prices

We have allowed for food prices rising 0.2% per month on a seasonally adjusted basis, which can be altered in the user inputs.

What about dollar effects?

While our estimates of core inflation allow for some drag from the stronger dollar, we see that drag as slight (LINK). Fed models suggest that a sustained 10% rise in the dollar lowers their favored consumer inflation measure (PCE) by 30 bps after a year and an additional 10 bps in the following year. The dollar effects on consumer inflation are limited by importers pricing to market and by the small share of imported goods in consumer spending. Goods are only 25% of core consumer

[1] "Have rising oil prices become a greater threat to price stability?", by Martin Fukac. Federal Reserve Bank of Kansas City Economic Review, issue Q IV, 2011. https://www.fedinprint.org/items/fedker/y2011iqivp27-53nv.96no.4.html

spending, and imported goods are 25% of core goods spending: goods imports make up only about 6% of core spending.

Evaluating short TIPS breakevens

There are many factors that drive TIPS BEIs on any given trading day: supply/demand, index changes, carry projections, news headlines, etc. However, a pure long-term value of BEIs depends on whether investors believe a specific BEI is greater or less than the cumulative annualized inflation before the corresponding TIPS maturity[2]. Given that our interactive inflation model spits out monthly inflation projections for up to two years, it can be used to create a yardstick to evaluate fundamental value in short TIPS breakevens. TIPS investors can make use of the analysis in the output table on that list of all the TIPS issues with up to two-year maturity. It provides a fundamental rich/cheap assessment for these breakevens vis-a-vis the cumulative inflation computed based on the string of inflation projections generated by the model.

We have been in more than a few hypothetical discussions in the past months about where TIPS should be trading if oil prices rise to X or decline to Y. A lot of this debate revolved on guesswork and hand-waving. Our inflation tool allows readers to quantify the fundamental value in TIPS based on specific oil price scenarios. We think this is a big plus. We surmise that some of our TIPS clients have similar models developed internally. Those who do can use our tool as a sanity check; those who do not will hopefully add it to their analytical "toolkit".

[2] To be exact, the relevant inflation accretion period is not between the present day and maturity but rather lagged by two months. This is due to the mechanics of how TIPS work. Our tool takes care of this adjustment.

Let's take it for a spin!

Several scenarios:

TIPS breakevens price in very modest inflation

1.6% y/y CPI inflation through next February and 1.8% y/y through February 2016 appear consistent with current TIPS breakevens.

US Rates Strategy and Economics

Interactive Inflation and TIPS Breakeven Valuation Model

Inputs	Core %	Food %	WTI price $
select >>	user	user	UBS
... custom:	avg. monthly rate		$ price
Q115	0.13	0.1	
Q2	0.17	0.1	
Q3	0.14	0.1	
Q4	0.05	0.1	
Q116	0.04	0.1	
Q2	0.25	0.1	
Q3	0.07	0.1	
Q4	-0.10	0.1	
Q117	0.10	0.1	
Pass thru		0.00%	

NSA CPI inflation, year-over-year % change	
Feb 2015	-0.03
predicted, Feb 2016	1.55
predicted, Feb 2017	1.82

Breakevens and Modeled Inflation

BEi maturity	TIPS coupon	nominal comparator	term (yr)	term model inflation (nsa)	adj. model infl. (ann, nsa)	BEi	rich / cheap
Jul 15, 2015s	1.88	Jul 31, 15s 1.75	0.23	0.8	4.0	4.0	0.0
Jan 15, 2016s	2.00	Jan 31, 16s 2.0	0.73	0.5	1.7	1.8	0.0
Apr 15, 2016s	0.13	Apr 30, 16s 2.625	0.98	1.3	1.5	1.5	0.0
Jul 15, 2016s	2.50	Jul 31, 16s 3.25	1.23	1.7	2.0	2.1	0.0
Jan 15, 2017s	2.38	Jan 31, 17s 3.125	1.73	1.1	1.7	1.7	0.0
Apr 15, 2017s	0.13	Apr 30, 17s 3.125	1.98	n/a	1.6	1.6	0.0

Source: UBS, Bureau of Labor Statistics, Bloomberg

High oil prices, some passthrough, and an accelerating core CPI put TIPS breakevens about 200 bps cheap

If oil prices were to rise to $70 at the end of this year and $80 at the end of next year, with some passthrough into core prices, 2016 TIPS appear cheap by 170-200 basis points from January 2016 through April 2017.

US Rates Strategy and Economics

Interactive Inflation and TIPS Breakeven Valuation Model

Inputs	Core %	Food %	WTI price $
select >>	user	UBS	user
... custom:	avg. monthly rate		$ price
Q115	0.13	0.2	
Q2	0.17	0.2	
Q3	0.19	0.2	
Q4	0.21	0.2	70.0
Q116	0.23	0.2	
Q2	0.25	0.2	
Q3	0.25	0.2	
Q4	0.25	0.2	80.0
Q117	0.25	0.2	
Pass thru		0.70%	

NSA CPI inflation, year-over-year % change	
Feb 2015	-0.03
predicted, Feb 2016	3.57
predicted, Feb 2017	3.15

Breakevens and Modeled Inflation

BEi maturity	TIPS coupon	nominal comparator	term (yr)	term model inflation (nsa)	adj. model infl. (ann, nsa)	BEi	rich / cheap
Jul 15, 2015s	1.88	Jul 31, 15s 1.75	0.23	4.4	7.4	4.0	-3.4
Jan 15, 2016s	2.00	Jan 31, 16s 2.0	0.73	2.3	3.7	1.8	-1.9
Apr 15, 2016s	0.13	Apr 30, 16s 2.625	0.98	3.4	3.4	1.5	-1.9
Jul 15, 2016s	2.50	Jul 31, 16s 3.25	1.23	3.4	4.0	2.1	-2.0
Jan 15, 2017s	2.38	Jan 31, 17s 3.125	1.73	2.8	3.4	1.7	-1.7
Apr 15, 2017s	0.13	Apr 30, 17s 3.125	1.98	n/a	3.3	1.6	-1.7

Source: UBS, Bureau of Labor Statistics, Bloomberg

Even if core prices pressures remain moderate and oil stalls, TIPS breakevens look cheap

WTI prices stalled at $56 and underlying core prices accelerating gradually (per UBS estimates) leave TIPS breakevens looking 50-80 bps cheap from January 2016 through April 2017.

US Rates Strategy and Economics

Interactive Inflation and TIPS Breakeven Valuation Model

Inputs	Core %	Food %	WTI price $
select >>	UBS	UBS	user
... custom:	avg. monthly rate		$ price
Q115	0.13	0.2	
Q2	0.14	0.2	
Q3	0.16	0.2	
Q4	0.20	0.2	56.0
Q116	0.18	0.2	
Q2	0.18	0.2	
Q3	0.18	0.2	
Q4	0.18	0.2	56.0
Q117	0.18	0.2	

Pass thru 0.00%

NSA CPI inflation, year-over-year % change

Feb 2015	-0.03
predicted, Feb 2016	2.25
predicted, Feb 2017	2.05

Breakevens and Modeled Inflation

BEi maturity	TIPS coupon	nominal comparator		term (yr)	term model inflation (nsa)	adj. model infl. (ann, nsa)	BEi	rich / cheap
Jul 15, 2015s	1.88	Jul 31, 15s	1.75	0.23	2.7	6.2	4.0	-2.2
Jan 15, 2016s	2.00	Jan 31, 16s	2.0	0.73	0.9	2.3	1.8	-0.5
Apr 15, 2016s	0.13	Apr 30, 16s	2.625	0.98	2.1	2.1	1.5	-0.6
Jul 15, 2016s	2.50	Jul 31, 16s	3.25	1.23	2.1	2.8	2.1	-0.7
Jan 15, 2017s	2.38	Jan 31, 17s	3.125	1.73	1.5	2.1	1.7	-0.5
Apr 15, 2017s	0.13	Apr 30, 17s	3.125	1.98	n/a	2.1	1.6	-0.5

Source: UBS, Bureau of Labor Statistics, Bloomberg

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