RBC Global Asset Management

Economic Compass

ISSUE 35 • MARCH 2015

GLOBAL PERSPECTIVE FOR INVESTORS

DISSECTING DEFLATION

Eric Lascelles

Chief Economist

HIGHLIGHTS

- Developed-world inflation has declined for three straight years, to the extent that the Eurozone, U.S. and U.K. now flirt with deflation.
- The threat is clearly greatest for the Eurozone given the breadth of the group's deflationary impulse along both geographic and price basket lines.
- Fortunately, any economic damage from deflation in the Eurozone should be more limited than commonly imagined, as a mere 41% of the deflationary impulse is rooted in "bad" causes, and 59% comes from temporary rather than persistent forces. The figures are even better for the other countries.
- We construct five inflation forecasting techniques whose collective wisdom argues that total inflation should be higher next year in the Eurozone, U.S., U.K. and Canada.

Developed economies have now stumbled through three consecutive years of declining inflation. The result of this journey is that the Eurozone now wallows in slight deflation, the U.S. and U.K. totter on the brink and Canadian inflation is well shy of normal (Exhibit 1). Deflation is undesirable in that it can distort and ultimately undermine economic activity.

Professional forecasters (present company included) have repeatedly failed to anticipate the extent of this deflationary trend (Exhibit 2). While some of the current deflationary pressures are easy enough to explain away as the short-lived spawn of plummeting commodity prices and lingering economic slack, this is not the whole story.

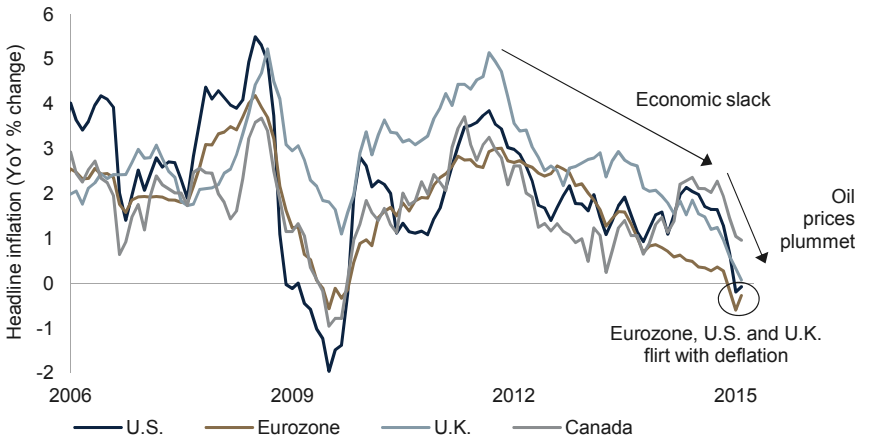
The white-hot questions demanding answers are:

1. Why is inflation currently so low?
2. How economically problematic is this?
3. Where will inflation go from here?

We initially tackled these questions in an *Economic Compass* published in early 2014 entitled "Deflation Doubtful." It reached the tidy conclusion that a permanent deflationary trap had not been sprung. However, that view demands a second opinion given that:

- Inflation has fallen further
- Oil prices have since collapsed

Exhibit 1. Unusually low inflation spans major economies



Source: Bureau of Labor Statistics, Office for National Statistics, Statistics Canada, Statistical Office of the European Communities, Haver Analytics, RBC GAM

- Currency markets are agitated, emitting both upward and downward inflationary pressures
- We have developed a new system for dissecting deflationary pressures in a way that separates "bad" from "good" deflation, gauges the likely persistence of deflationary pressures, and assesses whether they come from domestic or global forces
- We have also built several new forecasting models that offer greater insight into the inflation outlook

Casting a wider net

We start by gauging the deflationary impulse's breadth.

Core inflation excludes food and energy prices[1] from the inflation index in an effort to secure a smoother and thus clearer picture of the inflation trend. Eurozone core inflation rests at 0.7%, the U.K. at 1.2%, the U.S. at 1.7% and Canada at a perky 2.1%. These are low and have been on a downward trajectory for all save Canada, but they are certainly not emitting outright deflation signals.

That said, some quite rightly quibble with the construction of the core inflation measure. How can one justify permanently excluding food and energy from the spending basket[2] when these components are no less consequential to the average person – and in some ways feel even more relevant given their universality,[3] visibility[4] and the high frequency[5] of their purchase.

Fortunately, there are other ways to unmist inflation's windowpane without making arbitrary exclusions, and without sacrificing timeliness.[6] Three popular alternative core-inflation measures are median inflation, trimmed-mean inflation and reweighted-mean inflation (Textbox A).

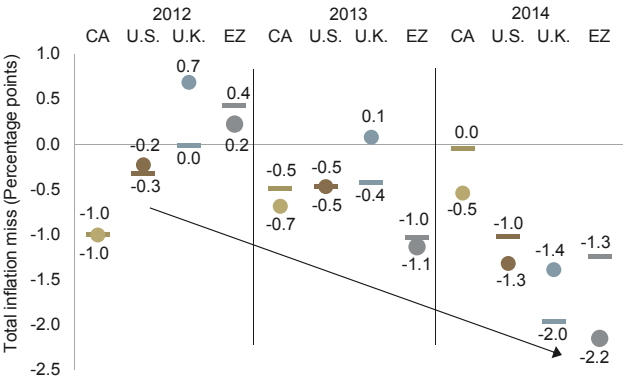
Evaluated together,[9] these alternative inflation measures confirm that inflation is lower than normal (Exhibit 3) and that the phenomenon is not merely a function of cratering oil prices. Still, the deflationary impulse is not quite as powerful as it first appears, with even the Eurozone still well clear of "true" deflation according to these measures.

Considerable breadth, nevertheless

The deflationary pressures may be somewhat milder than first appearances, but they are still fairly broad.

Globally, inflation is low almost everywhere. Within the most acutely affected region – the Eurozone – more than half of member nations have negative annual total inflation, and almost 60% have core inflation below 1% (Exhibit 4). It isn't just a handful of waterlogged nations across Europe's periphery pulling the figures down.

Exhibit 2: Sharp drop in inflation caught forecasters by surprise



Note: Dash represents difference between actual and consensus inflation forecast. Circle represents difference between actual and target inflation.
Source: Haver Analytics, RBC GAM

TEXTBOX A
ALTERNATIVE MEASURES OF CORE INFLATION

Median inflation: The median inflation measure defines the rate of inflation as the rise or fall in the price of the middle item in the consumer price index (CPI) basket, such that half[7] of the (weighted) CPI components are rising more quickly and half are rising less quickly. If this means that the overall rate of median inflation in a month is defined as the rate at which toothpaste prices are rising, so be it. Technically speaking, this approach renders extreme outliers unimportant: it doesn't matter whether car prices are rising by 10% per year or 90% per year – in both scenarios they are in the upper half of the basket and that is the extent of their influence.

Trimmed-mean inflation: Trimmed-mean inflation excludes certain items in the CPI basket, much like the traditional core inflation measure, but not arbitrarily or permanently. Rather, in each time period, it eliminates the basket components that are rising and falling to the greatest degree.[8] Only the remaining components are used to compute the trimmed-mean inflation rate. This measure would exclude food and energy prices if they happened to be behaving unusually. But it could just as easily exclude something else.

Reweighted-mean inflation: Finally, reweighted-mean inflation includes all CPI components, but adjusts their relative importance based on their past volatility. The more volatile the component, the less weight it receives (relative to its normal weight). Thus, nothing is excluded, but the bumpiness of the overall inflation index is nevertheless dampened.

Across CPI components, the breadth of the deflationary force is much greater for the Eurozone than for the U.S. or Canada (Exhibit 5).[10] For the Eurozone, 63% of its CPI components are rising by less than 1% per year. For the U.S. and Canada, the disinflationary trend was more pervasive a year ago, and the fraction is now down to 47% and 35%, respectively.

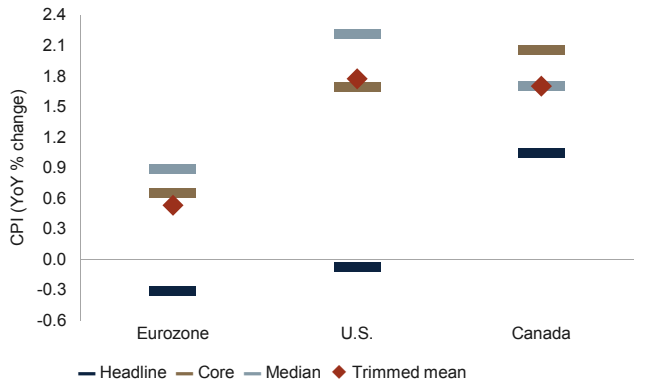
Aggregated into thematic categories, we can see that energy, health, education and transportation prices demonstrate the greatest cross-region weakness (Exhibit 6).[11]

There are two other interesting trends worthy of comment (Exhibit 7). First, goods inflation is much weaker than services inflation, reflecting the substantial influence of declining commodity prices. Second, market-based measures of inflation are much weaker than regulated prices (those set or substantially determined by policymakers), confirming the economic aspect of the deflation story.

This initial inflation check-up can be summarized in three key findings:

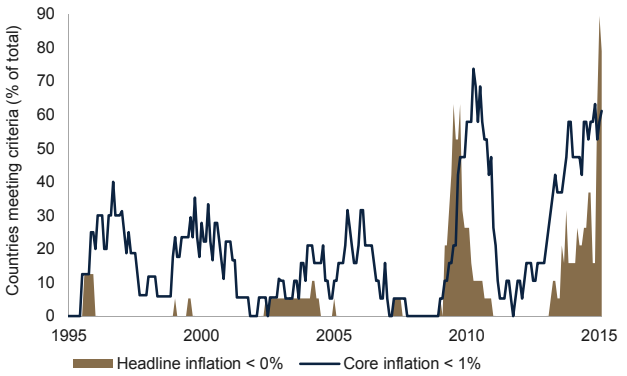
- Inflation is low for all of the regions, and spans many types of products
- The situation is by far the most acute in the Eurozone
- However, when measured across a broader set of inflation metrics, the true inflation trend is not so much deflationary as disinflationary (meaning prices are rising less quickly, not falling outright)

Exhibit 3: Alternate inflation measures are much less low



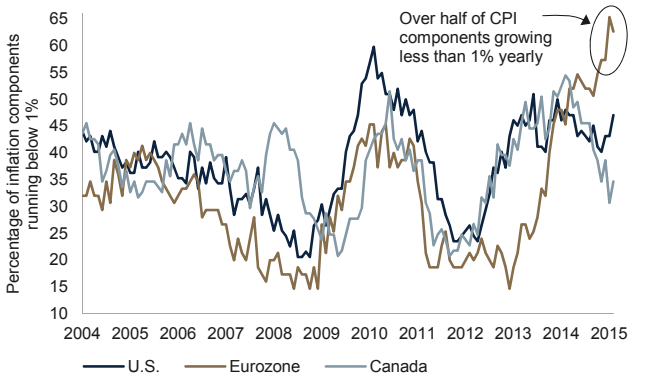
Note: Based on latest data available. Eurozone median and trimmed mean CPI calculated by RBC GAM. Source: Bank of Canada, ECB, Federal Reserve Bank of Cleveland, Haver Analytics, RBC GAM

Exhibit 4: Low inflation in most Eurozone countries



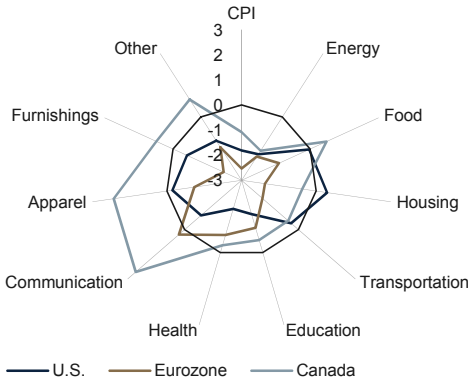
Note: Headline and core inflation of 19 countries in Eurozone.
Source: Haver Analytics, RBC GAM

Exhibit 5: Breadth of low inflation increasing in Eurozone only



Source: Haver Analytics, RBC GAM

Exhibit 6: Broad-based disinflation in developed countries



Note: Based on latest data available. Deviation of year-over-year percent change of CPI and major categories from normal defined as 15-year historical average. Source: Haver Analytics, RBC GAM

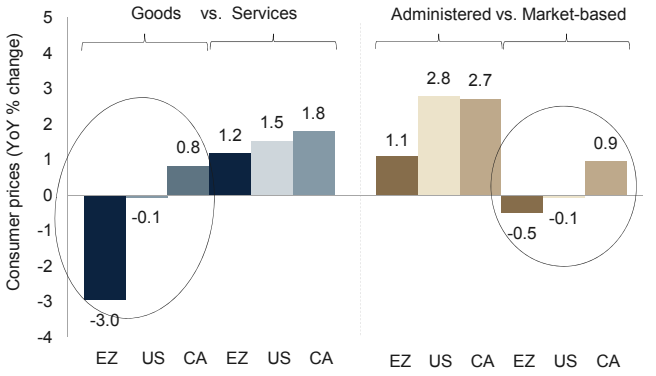
Categorizing inflation

As a generalization, deflation is best avoided due to the economic problems frequently associated with it. This is why central banks fight deflation with such ferocity.[12] But, as with many things, the true story is somewhat more nuanced. There are three key determinants of how damaging (or benign, or even helpful) a deflationary impulse is:

1. **Domestic/Global:** Some deflationary impulses come from inside a country's borders; others are global in nature. As a rule of thumb, the latter is preferable to the former because it means that the bulk of any contributing dysfunction exists outside of the country rather than within it.
2. **Demand/Supply:** Prices fall when supply exceeds demand. This mismatch can originate from either side of the ledger. Deflation originating from inadequate demand is quite undesirable because it is rooted in economic weakness. Deflation coming from excess supply, on the other hand, can be quite attractive since it usually reflects a growing productivity capacity and thus improved economic prospects. This kind of deflation acts as something of a tax cut for consumers and businesses.
3. **Persistent/Temporary:** Some deflationary impulses are persistent, meaning they are unlikely to fade quickly; others are only temporary and should rapidly dissolve. Temporary deflationary impulses are generally preferable to permanent ones. This is clearly true in the case of (bad) demand-side deflation – the shorter these episodes, the better. It is more complicated for global- and/or supply-side deflation, since these are theoretically good in the short run. Why wouldn't they therefore be even better if destined to exert persistent pressure? The complication is that when deflation drags on – for whatever reason – several problems eventually congeal:
   - Consumers defer spending knowing that prices will be cheaper in the future, undermining economic demand and corporate pricing power.
   - During severe downturns, central banks cannot lower real interest rates as much as they might like without bumping into the effective 0% nominal policy rate floor.
   - Countries in deflation gradually become less competitive since it is difficult to reduce the nominal wages of existing workers (a necessary step to keep real wages flat in a deflationary environment). Corporate profit margins are thus squeezed. This sounds attractive for workers, but eventually many of them are priced out of the labour market altogether.
   - With particular relevance to the current environment, the burden of existing debt grows heavier as falling nominal revenue streams struggle to sustain a static amount of debt.

These three determinants combine into eight different types of deflation, each with an economic impact that ranges from "very bad" to "good" (Exhibit 8). As an example, persistent domestic demand-side deflation – such as from deteriorating demographics that limit the spending appetite of a country – is a particularly nasty version of deflation, and worth worrying about. At the other extreme, a temporary bout of globally generated supply-side deflation – due to factors such as the worldwide collapse in oil prices – is an unambiguously good version that serves to put spending money in people's pockets.

Exhibit 7: Bisecting inflation pressures



Note: Based on latest inflation data for the Eurozone (EZ), U.S. (US) and Canada (CA). Categorized by RBC GAM. Source: Haver Analytics, RBC GAM

Exhibit 8: Deflation is not always bad

Types of deflationary impulses			Implications
Persistent	Domestic	Demand	Very bad
Temporary	Domestic	Demand	Bad
Persistent	Global	Demand	Bad
Temporary	Global	Demand	Neutral
Persistent	Global	Supply	Neutral
Temporary	Global	Supply	Good
Persistent	Domestic	Supply	Good
Temporary	Domestic	Supply	Good

Source: RBC GAM

Exhibit 9: Current deflation scorecard

Type of deflationary impulse			Implications	Current example	Deviation from normal inflation (ppt) Current			
					Eurozone	U.S.	U.K.	Canada
Persistent	Domestic	Demand	Very bad	Deteriorating domestic demographics	-0.10	-0.03	-0.05	-0.05
Temporary	Domestic	Demand	Bad	Domestic economic slack	-0.75	-0.40	-0.15	-0.15
Persistent	Domestic	Supply	Good	Structural adjustments/enhanced competitiveness	-0.10	0.00	0.00	0.00
				Health and education cost controls	-0.05	-0.20	-0.05	-0.05
				E-commerce	-0.03	-0.05	-0.03	-0.03
Temporary	Domestic	Supply	Good	Weather conditions (food)	-0.10	-0.05	-0.10	-0.05
Persistent	Global	Demand	Bad	Deteriorating global demographics	-0.05	-0.05	-0.05	-0.05
Temporary	Global	Demand	Neutral	Global economic slack	-0.08	-0.08	-0.08	-0.08
				Export sanctions to Russia	-0.03	0.00	-0.01	0.00
Persistent	Global	Supply	Neutral	Globalization	-0.07	-0.07	-0.07	-0.07
				Automation	-0.07	-0.07	-0.07	-0.07
Temporary	Global	Supply	Good	Oil prices	-0.60	-0.60	-0.60	-0.60
				Currency movements	0.25	-0.60	-0.20	0.50
Explained CPI deviation from target					-1.78	-2.20	-1.46	-0.70
Unexplained residual					-0.42	0.20	-0.55	-0.31
Actual CPI deviation from target					-2.20	-2.00	-2.00	-1.00
Forecast CPI (YoY % change)					0.1	-0.2	0.5	1.3
Actual CPI (YoY % change)					-0.3	0.0	0.0	1.0

Note: Estimated via internal models, third-party calculations and expert judgment. Source: RBC GAM

Our next step is to determine how much of the current deflationary impulse falls into each bucket, and in the process determine the severity of the problem (Exhibit 9). A word of warning: the scorecard system that we create lacks precision due to the enormous amount of human judgment required to categorize the various impulses and to approximate their amplitude.

Domestic forces

We start with the domestic sources of deflation – those that originate within a country's own borders. These pressures are important in that they are the only ones that policymakers can directly influence.

Persistent/Domestic/Demand

The most damaging form of deflation is persistent, domestically generated, and reflects inadequate economic demand rather than excessive supply. Demographic pressures are the most common form of this strain, with Japan as the classic example. In the current context, aging populations paired with decelerating population growth fit the bill for all four regions. Countries experiencing these conditions have been repeatedly linked to lower inflation outcomes.[13]

The main theoretical rationale for this downward pressure is that older households consume less on a per-capita basis, undermining economic demand. A secondary one is that seniors prefer low or declining prices since they are frequently on fixed incomes and rely on saved assets, both of which are eroded by inflation over time.[14] In turn, seniors exert pressure on politicians and policymakers to tolerate lower inflation.

We assume that these demographic pressures are reducing Eurozone inflation by a modest 10 basis points (a basis point is 1/100th of a percentage point) per year, U.K. and Canadian inflation by 5 basis points per year and U.S. inflation by just 3 basis points per year. The variation reflects the relatively advanced state of Eurozone aging versus the others. These effects are likely to remain in place for the foreseeable future.

TEXTBOX B
THE ECONOMY AND INFLATION

The conventional thinking – seemingly supported by empirical evidence – is that the economy's influence on inflation has been ebbing for decades (Exhibit 10).

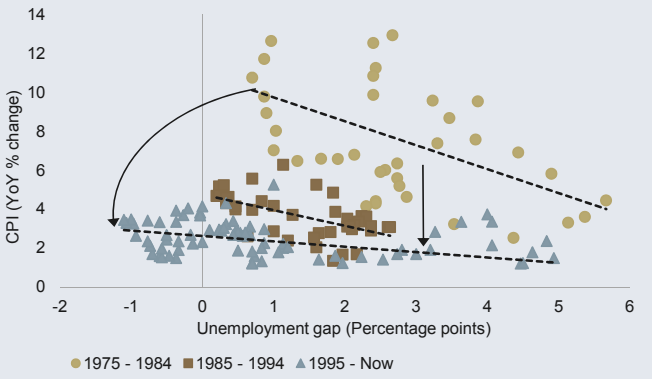
However, this assessment is too simplistic. It neglects to account for other important variables, such as the effect of global price shocks, inflation expectations and the prior inflation trends. Once we control for these variables in our Inflation Composition Model, we find that economic factors have instead exerted a roughly normal influence on inflation over the past decade (Exhibit 11).

One further step is necessary. The previous model is capable of capturing the general drift in the relationship between the economy and inflation across decades, but has little to say about year-to-year variations. Using a cross-sectional approach that evaluates the relationship across countries for each year,[15] we can comment on how the relationship between economic activity and inflation has evolved since the financial crisis (Exhibit 12).

The findings are quite interesting: a significant part of the decline in inflation over the past few years appears to be because the economic linkage was unusually flimsy between 2010 and 2012, whereas this has now reverted to a more normal relationship. Thus, the mystery is not so much why inflation is low today as why it wasn't lower before. This is somewhat reassuring, as it argues that the disinflationary pressures resulting from insufficient domestic demand are now fully and properly priced in and need not continue to push inflation lower.

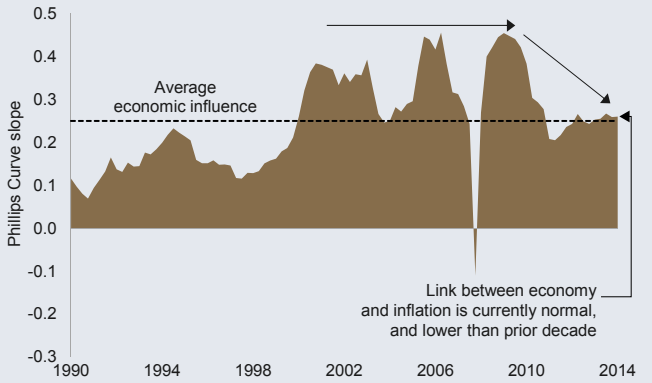
Assimilating this information, we are comfortable employing a coefficient of 0.25 for the effect of economic slack on inflation.

Exhibit 10: On the surface, a declining link from economy to inflation...



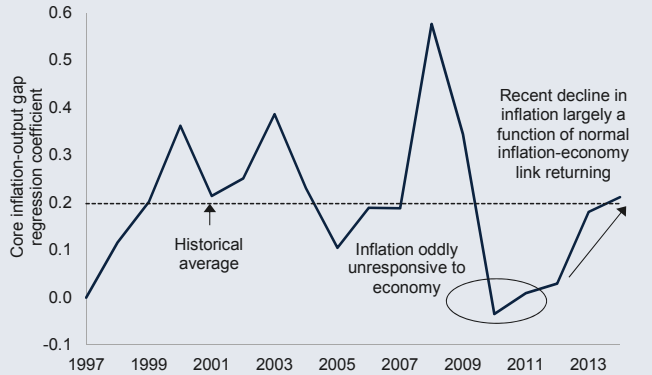
Source: Haver Analytics, IMF, RBC GAM

Exhibit 11: ...but a more sophisticated examination argues the relationship is roughly normal



Note: The theoretical importance of economic slack on inflation is estimated via an econometric model that is estimated via rolling 10-year periods. The chart depicts the average reading from the models for the U.S., Eurozone, U.K. and Canada. Source: Haver Analytics, IMF, RBC GAM

Exhibit 12: Output gap was oddly unimportant to inflation post-crisis and is now regaining its usual influence



Note: Based on regression of annual core inflation and output gap from 1997 to today for 20 countries. Source: Bank of Canada, OECD, Statistical Office of the European Communities, Haver Analytics, RBC GAM

Temporary/Domestic/Demand

The most common form of "bad" deflation is temporary, originates inside an economy and is due to insufficient demand. Indeed, this is one of the largest forms of deflation today. As such, it deserves particular attention.

Our set of four regions all suffer from economic slack, to one degree or another. The Eurozone has the most, underperforming its potential by around three percentage points of GDP. The U.S. is next with less than two percentage points, while we figure the U.K. and Canada have only a small amount.

The next step is to determine how deflationary this economic slack should be, a somewhat technical task that we relegate to Textbox B. Our assessment is that domestic economic factors exert a deflationary impulse of -75 basis points in the Eurozone, -40 basis points in the U.S. and around -15 basis points in the U.K. and Canada.

Economic outlook

Looking ahead, we forecast the steady reduction of economic slack in the U.S., the U.K. and the Eurozone. In turn, the deflationary impulse coming from these economies should shrink over the next year.

A key channel through which ameliorating economic health translates into higher inflation is via rising wages. Wages have lately been quite tame, but seem on the cusp of more rapid gains in the U.S. given falling unemployment rates,[16] rising wage intentions reported by small businesses, a shifting balance of power between workers and employers,[17] reports of skilled-worker shortages, an inclination among U.S. states to raise minimum wages and a trend among retailers (most prominently, Wal-Mart) to increase their minimum compensation levels.

Outside of the U.S., Germany's largest union recently negotiated its highest wage increase in years. While outside of the scope of this report, Japan's 2015 spring wage-negotiation season also seems destined for better-than-normal gains.

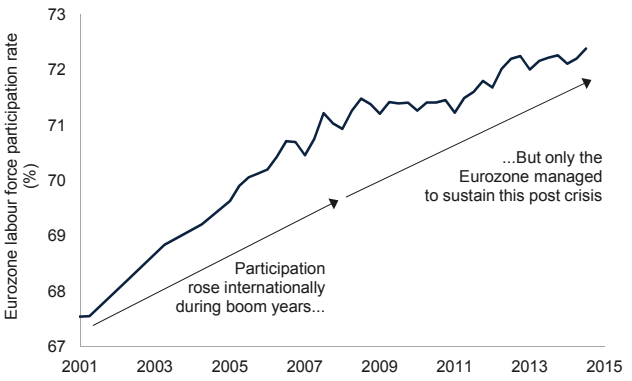
Persistent/Domestic/Supply

One of the better types of deflation is persistent, comes from domestic sources and is the product of increased supply rather than diminished demand. This form is frequently associated with surging productivity and/or competitiveness, both precursors to a larger, more vibrant economy.

Structural reforms

We detect this form of deflation operating along three avenues. First, the Eurozone is engaging in structural reforms designed to regain competitiveness after the region's sovereign-debt crisis. Competitiveness is being substantially restored by lower wages, reduced red tape, smaller governments and more flexible labour markets. Some of this progress is reflected in the rising Eurozone labour-force participation rate (Exhibit 13).

Exhibit 13: Eurozone supply-side deflation from growing labour force



Source: Statistical Office of the European Communities, Haver Analytics, RBC GAM

Health and education

Second, policymakers in all of the regions have seemingly regained control over runaway health and education costs. The deceleration in U.S. health and education inflation provides a useful illustration (Exhibit 14). Some of this may relate to softer demand, but the consumption of health care and education has hardly fallen off a cliff. Furthermore, the disinflationary trend predates the economic malaise, arguing that persistent supply-side forces (productivity gains) are the prime contributor.

Part of the health disinflation narrative is specific to the U.S. Obamacare has secured some efficiencies,[18] and there is precedent for periods of healthy policy upheaval reducing U.S. health-care inflation if only because care providers know to lay low during such periods. Arguing that these savings can be sustained, the U.S. Congressional Budget Office recently downgraded its long-term health-care inflation assumptions. Both health and education services appear ripe for further structural reforms that should keep their prices rising less quickly than in the past.

This is not merely a U.S. phenomenon. Health and education inflation in the other examined regions have also ebbed by multiple percentage points over the past decade. Something that transcends nations is at work. It may be philosophical in nature: the business model in both health care and education is shifting from a "fee for service" philosophy toward a results-oriented approach.

E-commerce

The e-commerce revolution is a third source of persistent, supply-generated deflation operating on domestic shores.[19] Online vendors and the internet more generally have delivered remarkable cost savings via the avoidance of physical storefronts and achieving incredible economies of scale. Consumers have also become better informed, imposing further downward pressure on prices. Online purchases still only represent the small minority of purchases, but their role is growing.

Altogether, we figure persistent domestic supply-side deflation is shaving a significant 25 basis points from U.S. inflation, 18 basis points from the Eurozone (more from structural reforms than from health care and education savings), and 8 basis points for the U.K. and Canada. By virtue of their persistence, these are unlikely to change radically over the next year or two.

Temporary/Domestic/Supply

Possibly the most desirable form of deflation occurs when prices fall for temporary reasons originating within a country due to the provision of additional economic supply.

Recently, the main force in this space has been an unusually warm Eurozone winter (Exhibit 15) that enabled higher-than-usual farm yields for the region. The additional food supply naturally sent prices downward.

Admittedly, the deflationary food impulse defies simple classification into a single bucket, as another part of the story likely relates to the global economic slowdown in emerging markets (Exhibit 16).

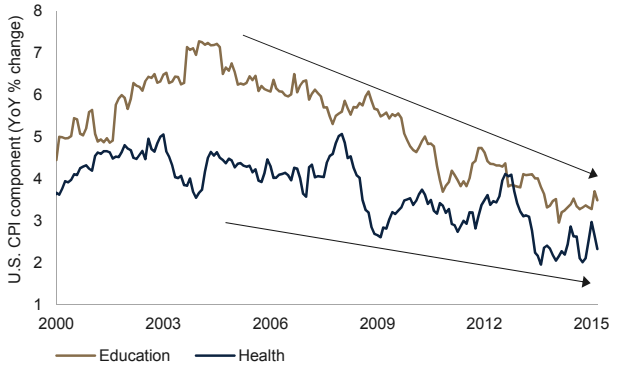
We assume these factors are depressing Eurozone inflation by 10 basis points per year. The theoretical effect is the same in the U.K. (though weather conditions take a back seat to grocer price wars), and somewhat less in Canada and the U.S. given rather more difficult winters and drought in California's food basket. Looking to the next year, this downward pressure should persist, if ease slightly. The IMF forecast through 2019 anticipates slight food-price deflation due to robust supply growth.

Global forces

We now turn to the deflationary pressures that emanate from global developments.

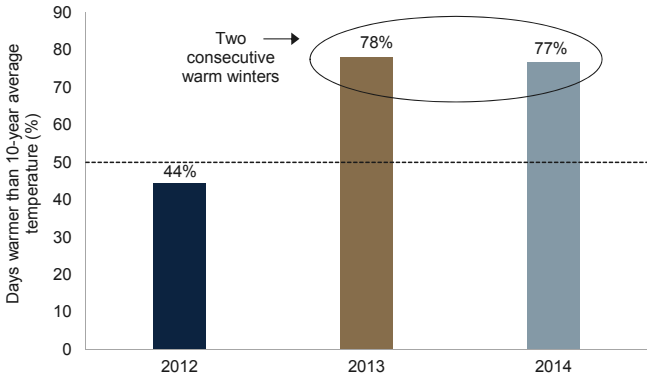
A quick preamble is useful. The rapid globalization of the past several decades has made inflation more susceptible to global influences, as demonstrated by the rising import-price coefficient in our Inflation Composition Model (Exhibit 17).

Exhibit 14: Persistent supply-side disinflationary impulse from education and health



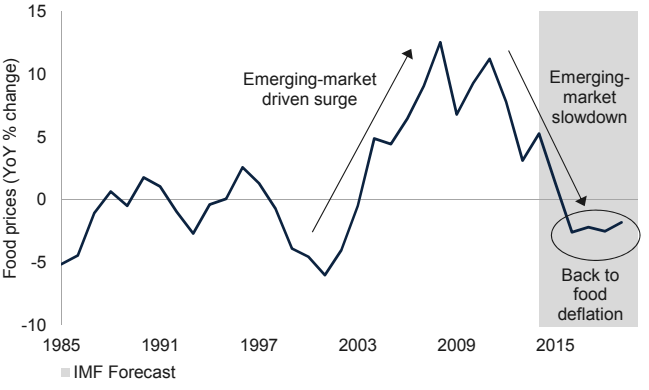
Source: Bureau of Labor Statistics, Haver Analytics, RBC GAM

Exhibit 15: Unseasonable warmth spurs Eurozone food production



Source: Bloomberg, RBC GAM

Exhibit 16: IMF forecasts more food deflation



Note: 5-year average of food inflation. Source: IMF, Haver Analytics, RBC GAM

Consistent with this, we calculate that global forces are generating more than half of the overall deflationary impulse for three of the four regions we examine, with the Eurozone the lone exception (Exhibit 18).

Persistent/Global/Demand

Persistent, global demand-driven deflation is an undesirable strain, and most commonly manifests via demographics, much like its domestic sibling.

Just like the four regions in our investigation, the entire world is undergoing a demographic transition marked by an aging population and lower fertility rates. Illustrating this starkly, China's working-age population begins to decline next year. We assume that global demographic pressures are subtracting 5 basis points from annual inflation rates.

Temporary/Global/Demand

Temporary deflation coming from feeble global demand is a neutral form of deflation in the sense that it does not reflect a weak domestic economy (good), doesn't last long enough to generate the most serious problems associated with deflation (good) but nevertheless signals economic weakness somewhere in the world (bad).

We identify two key sources of this effect today. The first is simply the fact that the global economy is performing below its potential. Most of this comes from the developed world, but emerging-market economic underperformance (Exhibit 19) is also a contributing factor. We assume this global slack subtracts 8 basis points[20] from inflation in each region this year, and slightly less next year.

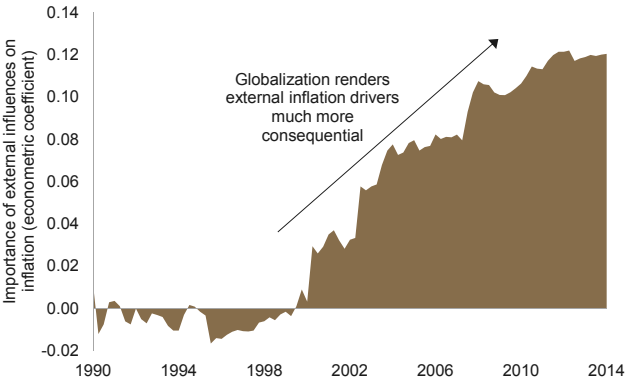
Europe, and to a lesser extent, the U.K., also grapple with a minor secondary source of this kind of deflation, in the form of the Russian trade embargo that limits Russia's demand for goods from its traditional trading partners. We assume these embargos remain in place over the coming year.

Persistent/Global/Supply

Another neutral form of deflation occurs when the source is persistent, manifests globally and relates to additional supply rather than insufficient demand.

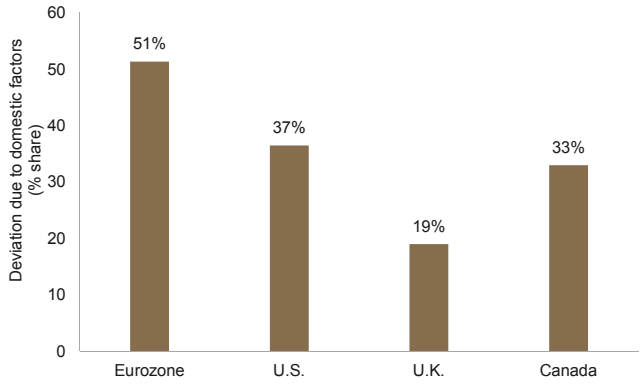
There are two deflationary forces at work that fit this description. The first is globalization.

Exhibit 17: Global influences increasingly consequential for domestic inflation



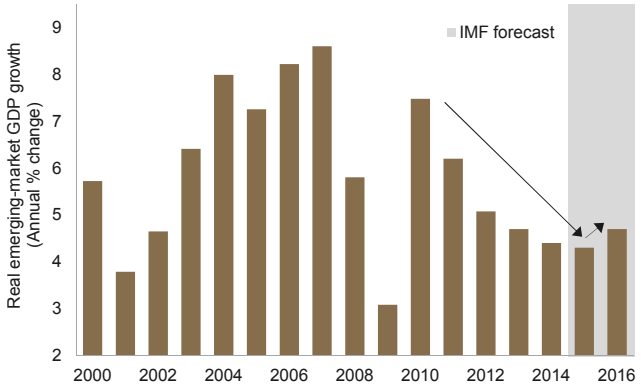
Note: The theoretical importance of external influences on inflation is estimated via an econometric model using the extent to which import prices (deviation from GDP deflator) influence total CPI over a rolling 10-year period. Average of models for U.S., Eurozone, U.K. and Canada.
Source: Haver Analytics, IMF, RBC GAM

Exhibit 18: Domestic deflationary forces take back seat for most regions



Note: Deviation from normal inflation due to domestic factors.
Source: Haver Analytics, RBC GAM

Exhibit 19: Emerging market slowdown is deflationary



Source: IMF, Haver Analytics, RBC GAM

The economies of scale, improved selection and intense international competition spurred by the globalization boom of the past few decades have been catalysts for global economic supply and have also reliably weighed on inflation.

Globalization's deflationary impulse is probably not quite as large as it first looks due to the upward pressure that this boom has simultaneously exerted on commodity prices, but it is still moderately negative. We assume it is subtracting a net 7 basis points from inflation this year. Based on our work in an *Economic Compass* from August 2014 entitled "Wither Globalization?", we believe globalization's influence is beginning to ebb.

The other deflationary force in this category is automation. Around the world, scientific advances in computers and machinery permit ever more production at reduced costs. We assume this also subtracts 7 basis points per year from inflation. However, in contrast to globalization, we suspect this effect is strengthening over time.

Temporary/Global/Supply

The last of the eight types of deflation is temporary deflation that emanates from global supply-side factors. This is a "good" variety. Today, lower oil prices and currency swings provide two such influences.

As a starting point, it is easy to see how deflationary impulses from exchange rates and commodity prices first appear in producer prices and are then transmitted – in diminished form – to consumers (Exhibit 20). In the case of the Eurozone, it is telling that while all of the measures are low, the extreme weakness of the total CPI reading appears to be inconsistent with the rest. Perhaps this is a hint that it will not persist at current levels.

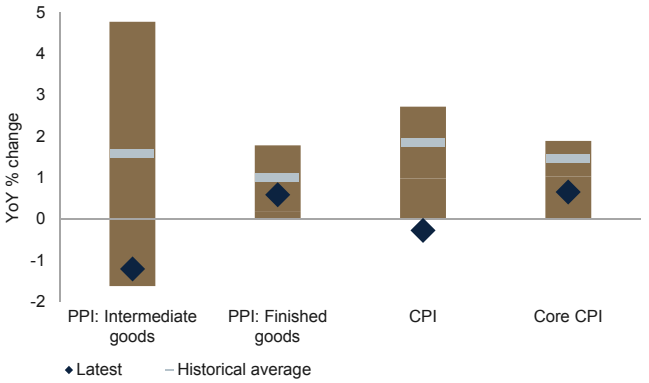
The oil impulse

The decline in global oil prices, and thus in inflation, is mainly due to a surge in new supply[21] enabled by technological advances in U.S. oil extraction. Theoretically, this is subtracting at least 60 basis points from inflation in each of the examined regions. This is a "good" thing in the sense that it acts as something of a tax cut for consumers.

Gazing forward, we expect this influence to reverse over the next year, and to instead be adding 30 basis points to inflation per region. The logic behind this sharp change is that oil production is quite simply no longer viable for a large fraction of the world's extractors at current prices (Exhibit 21).

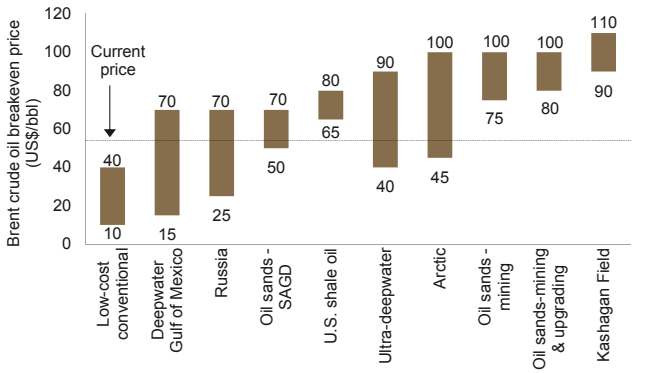
The necessary decline in oil production to restore balance between supply and demand is only slight (Exhibit 22)

Exhibit 20: Eurozone inflation is low right across production chain



Note: Historical average since 2003 for finished goods, 1998 for all others. Top and bottom of box represent one standard deviation from historical average. Source: ECB, Haver Analytics, RBC GAM

Exhibit 21: Falling oil prices limited by production constraints



Note: Price necessary to provide a sufficient upfront return on capital to justify additional operations. Source: TD Securities, Bloomberg, RBC GAM

and we already see clear evidence of the beginning of an adjustment (Exhibit 23). Providing further support to this view, the most reliable predictor of rising prices is whether the futures market expects prices to rise. And indeed it does.

The currency impulse

Currency swings can provide another temporary (because currencies don't push in one direction forever), global (because currency valuations are set on the global stage) deflationary force. Currency-based deflation can't truly be described as originating from either supply or demand, but to the extent that the deflation comes from a strong currency, and a strong currency reflects a strong economy, it has more in common with supply-side deflation than anything else.

The U.S. dollar has strengthened by about 15% on a trade-weighted basis over the past year, leaving most other

currencies in its wake. These movements have not yet fully bled into the inflation figures, with the likely effect to date subtracting 60 basis points from U.S. inflation and 20 basis points from the U.K.,[22] while adding 25 basis points to the Eurozone and a big 50 basis points for Canada.[23]

In a year's time, U.S. dollar strength should reach somewhat further and continue to be visible in the inflation figures. As such, we look for another deflationary impulse of -60 basis points for the U.S. and -10 basis points for the U.K., versus +0.75 basis points for the Eurozone and +0.15 basis points for Canada. This means inflation should substantially revive in the Eurozone but could remain quite weak in the U.S.

Unexplained deflation

Although this scorecard construction exercise has identified and classified many different sources of deflation, the results still do not quite fully reconcile the extent of the actual deflationary impulse (refer again to Exhibit 9).[24] It underestimates the deflationary pressures in three of the four regions, with the "misses" ranging between -55 basis points (meaning inflation is lower than our scorecard can explain) and +20 basis points.

These are actually very useful forces to isolate given the possibility that they will persist into the future. In fact, one of our forecasting techniques in the "Inflation forecast" section is constructed on this premise.

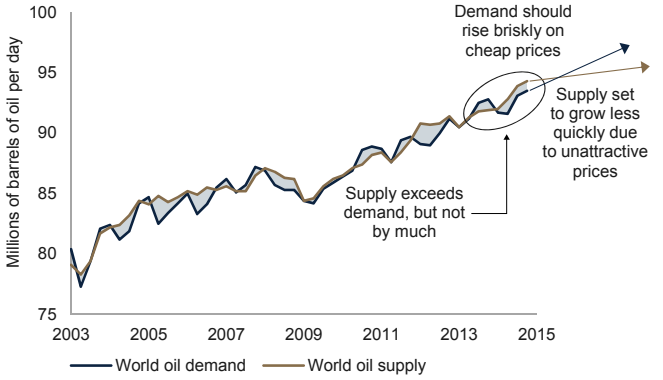
Deflation angels or demons?

Having distilled deflation into eight elemental parts, we can now moralize over the results. The findings are mostly welcome ones.

Good deflation

Most of the deflation in the world today is not especially problematic. The Eurozone has the worst composition, and yet only 90 basis points of its deflationary impulse is bad, representing just 41% of the total (Exhibit 24). This problematic deflation by itself is only capable of holding Eurozone CPI down to around +1.0%.

Exhibit 22: Oil market can restore balance quickly

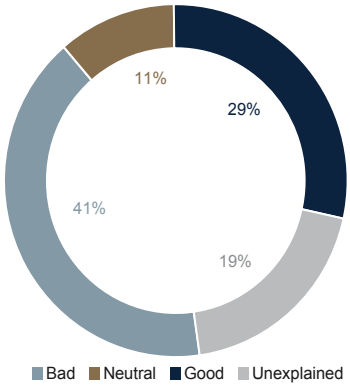


Note: Shaded area represents gap between quarterly production and demand.
Source: International Energy Agency, RBC GAM

Exhibit 23: U.S. oil adjustment begins

Source: Baker Hughes, RBC GAM

Exhibit 24: Less than half of Eurozone deflation is "bad"



Note: Estimated based on Deflation Scorecard. Source: Haver Analytics, RBC GAM

The bad portions for the other three countries are much lower – ranging between 13% and 25% – and the magnitude of the these effects is even less, spanning -25 basis points to -48 basis points (Exhibit 25).

Temporary deflation

Further good news is that nearly 60%, or 131 basis points, of the Eurozone's deflationary impulse is temporary. Less than a quarter is persistent (Exhibit 26). It is a similar story for the other countries with the exception of Canada (but this is mainly because the absolute size of Canada's deflationary impulse is so small).

Global deflation

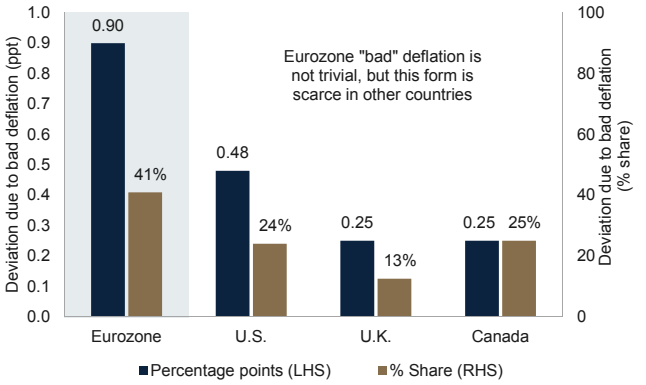
Finally – and as already depicted in Exhibit 18 – most of these deflationary impulses are rooted in global rather than domestic factors, with the exception of the Eurozone. This argues that – again, with the exception of the Eurozone – there is nothing overly wrong with most domestic economies, and that policymakers should not be scrambling to address the deflation on their shores.

Model-based inflation fair value

Having fully explored a bottom-up scorecard-based approach, we now turn to a more traditional econometric model for another opinion. Our Kitchen Sink Inflation Model combines a large number of economic variables to explain the current level of inflation in each region (Exhibit 27).

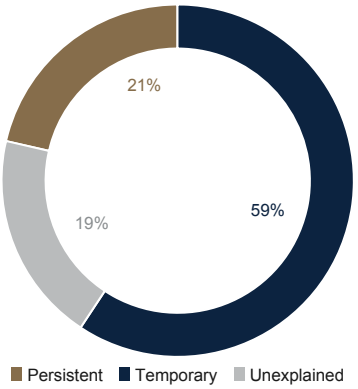
The model confirms that inflation should indeed be quite low in all regions, but actual inflation in the Eurozone (Exhibit 28) and the U.K. again register softer than expected. Conversely, the Kitchen Sink Inflation

Exhibit 25: Bad deflation not trivial for Eurozone, but small elsewhere



Note: Deviation from normal inflation due to bad deflation in percentage points (ppt) and % share. Source: Haver Analytics, RBC GAM

Exhibit 26: Most Eurozone deflation is only temporary



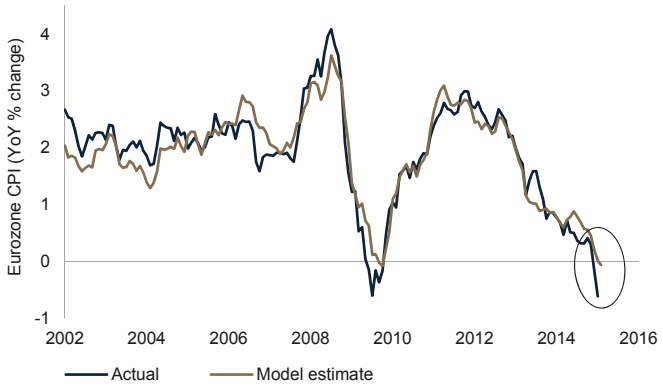
Note: Estimated based on Deflation Scorecard. Source: Haver Analytics, RBC GAM

Exhibit 27: Current inflation versus Kitchen Sink Model

		Actual	Kitchen sink model	Gap (ppt)
U.S.	Total CPI	0.0	-0.8	0.8
	Core CPI	1.7	1.4	0.3
Eurozone	Total CPI	-0.3	-0.1	-0.2
	Core CPI	0.7	1.0	-0.3
U.K.	Total CPI	0.0	0.9	-0.9
	Core CPI	1.2	1.3	-0.1
Canada	Total CPI	1.0	0.7	0.3
	Core CPI	2.1	1.9	0.2

Note: YoY % change for actual and model based on February 2015 data. Kitchen Sink Model is an atheoretic combination of several different economic market variables with a bearing upon inflation. Source: Haver Analytics, RBC GAM

Exhibit 28: Kitchen Sink Model says Eurozone inflation is too low



Note: Estimate based on RBC Kitchen Sink Model. Source: Haver Analytics, RBC GAM

Model argues that U.S. and Canadian inflation should actually be somewhat lower than they are. Interestingly, the strongest of these claims is that the U.S. total inflation should be lower (Exhibit 29) – precisely the same conclusion reached by the scorecard approach.

Are inflation expectations destiny?

All of the logic in the world can argue that inflation should rise in the future, but if investors, businesses and consumers don't believe it will, then it is all for naught. In other words, it is important that inflation expectations not be sucked down the drain alongside inflation.

The importance of expectations

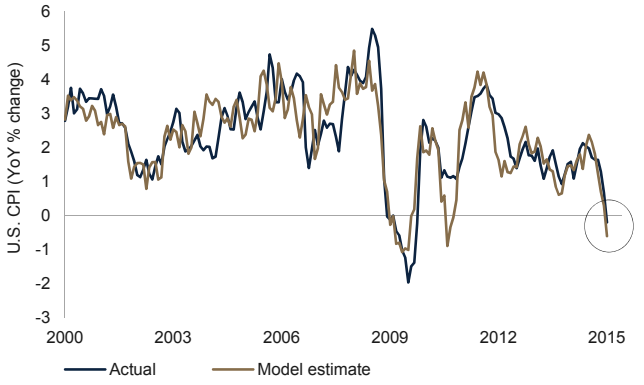
There's good news and bad news about how inflation and inflation expectations interact. The good news is that – over the span of decades – long-run inflation expectations have gradually become less agitated by swings in short-run inflation (Exhibit 30). This provides an important theoretical dampener to recent deflationary pressures.

However, this heartening trend may have partially reversed in just the past few years based on some fresher (but less precise) analysis we have conducted (Exhibit 31). This is not to the point of completely unwinding the hard work of the past few decades, but it acknowledges a slight vulnerability.

Market-based inflation expectations

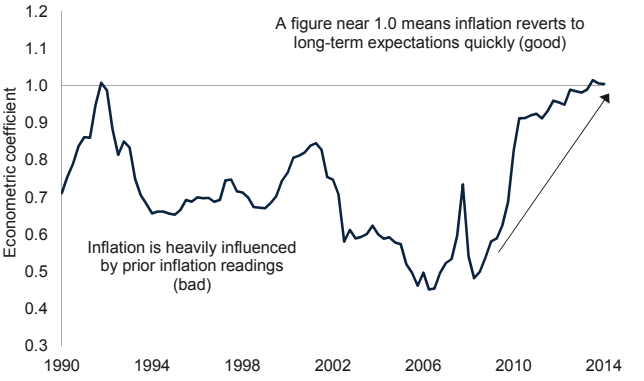
In practice, market-based inflation expectations[25] have indeed seemingly responded to this vulnerability, falling significantly – by between 75 and 100 basis points (Exhibit 32).

Exhibit 29: Kitchen Sink Model says U.S. inflation is too high



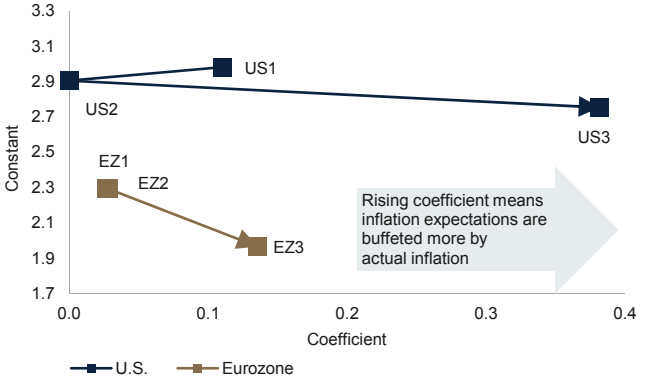
Note: Estimate based on RBC Kitchen Sink Model. Source: Haver Analytics, RBC GAM

Exhibit 30: Long-term trend towards anchored inflation expectations...



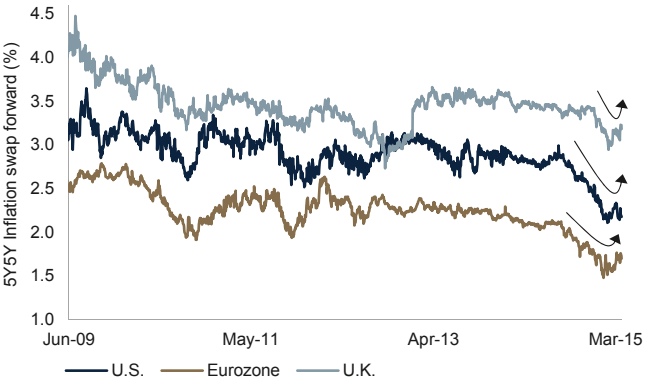
Note: The theoretical importance of inflation expectations versus the recent inflation experience is estimated via an econometric model that rolls over a 10-year period. Average of models for U.S., Eurozone, U.K. and Canada. Source: Haver Analytics, IMF, RBC GAM

Exhibit 31: ...but inflation expectations recently begin to lose anchor



Note: Coefficient and constant from regressions of month-over-month change in 5Y5Y inflation swap forward against month-over-month change of year-over-year change in inflation for U.S. and Eurozone. Time periods used for regressions are 2010 to 2011 (US/EZ 1), 2012 to 2013 (US/EZ 2) and 2014 to latest (US/EZ 3). Source: Bloomberg, Haver Analytics, RBC GAM

Exhibit 32: Market's inflation expectations very low but rising



Source: Bloomberg, RBC GAM

However, the concomitant risk of getting stuck in low inflation may be overstated for three reasons. First, these market-based measures of inflation expectations demand careful interpretation as they also reflect a (usually benign) risk premium.[26] Many experts – including the U.S. Federal Reserve (Fed) – believe that this risk premium has lately withered away, meaning that actual inflation expectations have not fallen by as much as the market-based measures initially suggest.

Second, these market-based inflation expectations have lately begun to rebound, reclaiming as much as a quarter of their losses over the past few months.

Third, history shows that during oil-price crashes, inflation expectations tend to overreact. Inevitably, when oil prices normalize, inflation expectations come soaring back to a disproportionate degree (Exhibit 33).

Survey-based inflation expectations

Survey-based inflation expectations[27] are showing slightly greater resilience than the market-based measures (Exhibit 34).

In the U.S. and Eurozone, business inflation expectations are holding up well. Consumer inflation expectations have admittedly slid somewhat – particularly in the Eurozone – but not to an unprecedented degree.

Our overall assessment of inflation expectations is that the decline in market-based measures is undesirable though less problematic than it first looks, and that the decline in survey-based measures is fairly pedestrian. As such, while these are unwelcome developments, they will not by themselves choke off any re-inflation efforts.

Inflation forecast

We now shift into forecast mode, projecting the likely rate of inflation in one year's time. This is done via a combination of qualitative and quantitative tools.

Qualitative assessment

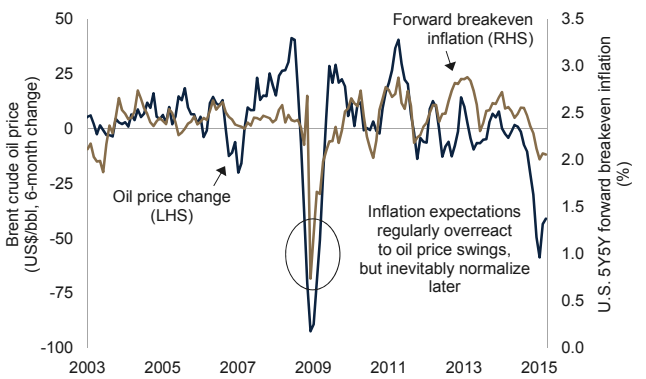
Qualitatively, we suspect annual inflation figures could edge a hair lower in the near term as the indirect effects of lower oil prices[28] continue to filter into consumer prices. But, over the span of the next year, the more likely direction for inflation is up.

Our forecasts for robust economic growth in the U.S. and the U.K., and for improving growth in the Eurozone certainly make a promising case. We find that economic activity leads core inflation by four to six quarters, and it is widely established that core inflation in turn anticipates total inflation.

Furthermore, our assessment that oil prices should rise will remove a powerful deflationary force and turn energy prices into an inflationary one. Even if our forecast is incorrect and oil prices continue to trawl the depths, the downward pressure on inflation will begin to leak out of the index in the fall of this year.

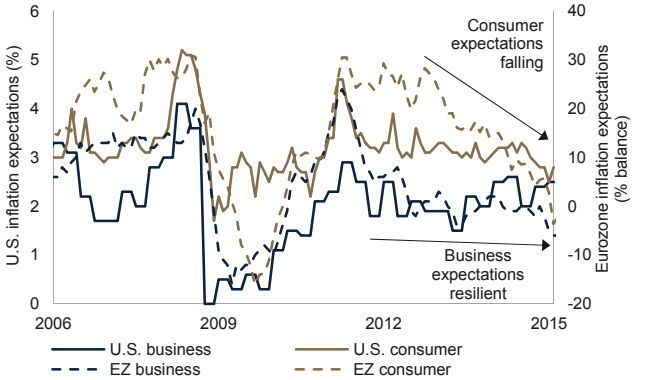
Setting aside where currencies go in the future, the lagged effect of the weaker euro should provide clear upward pressure on Eurozone inflation, enabling an escape from falling prices in the not-too-distant future. Certainly, the world's central banks – with the notable exception of the Fed – are doing all that they can to assist (Textbox C). Given its divergent currency and relatively hawkish central bank, U.S. inflation looks set to have the least vigorous rebound.

Exhibit 33: Inflation expectations overreact to oil



Source: Haver Analytics, RBC GAM

Exhibit 34: Inflation expectations: businesses unbowed; consumers slipping



Note: Eurozone (EZ) expectations measured as percent of respondents expecting an increase minus percent of respondents expecting a decrease.
Source: Duke Fuqua School of Business, European Commission, Michigan Survey of Consumers, Haver Analytics, RBC GAM

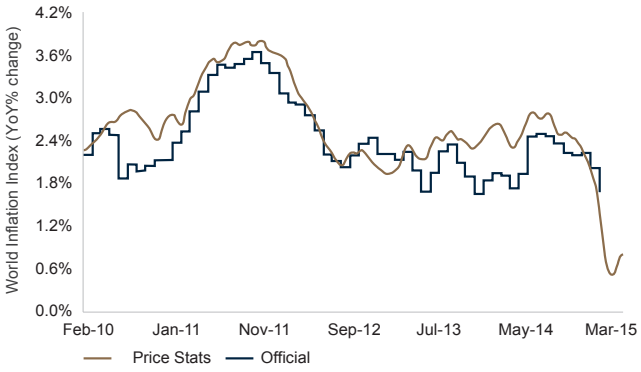
Real-time inflation measures already detect the beginning of an upward turn in inflation (Exhibit 35), and usage of the word "deflation" is already in retreat in online newspaper articles in each of the four regions.

Lower inflation expectations provide a slight counterpoint to these arguments, but not enough to fully neutralize their thrust.

Quantitative assessment

Fortunately, we can advance beyond this qualitative assessment into the more rigorous world of models. The nature of models is that none perfectly depict reality, but by interpolating between five different techniques we should be able to arrive at a serviceable forecast (Exhibit 36).

Exhibit 35: Real-time index indicates inflation finally rebounding



Note: Official Index is a weighted aggregate of official CPI's of all constituent countries. Source: State Street Global Markets Research

TEXTBOX C
CENTRAL BANKS AND INFLATION

Central banks have considerable interest in the rate of inflation, and most have mandates that explicitly target inflation of around 2.0%.

To the extent that central banks are willing to subtly deviate from this target, they may be slightly more tolerant of high inflation than low inflation at present:

- Inflation has regularly undershot their target for several years, suggesting some tolerance for slightly higher-than-normal inflation in the future.[29]
- Central bankers are keen to avoid the mistake of 1937, when interest rates were raised prematurely, extending the Great Depression. As a result, they are likely to allow the economic expansion to run a bit too hot, enabling a bit more inflation.

How do central banks achieve their inflation target? The most obvious way is to cut (raise) rates as appropriate to stimulate (restrain) the economy until inflation rises (falls) back to a normal level. Central banks have been doing quite a bit of this lately, with the goal of reviving future inflation. The effects of any action tend to take four to six quarters to be fully absorbed into the economy, and if recent progress seems slow (or even non-existent!) let us remember that central bankers are grappling with an unusually large number of deflationary headwinds, and that many of the pressures come from outside their countries and so are not amenable to domestic resolution.

What happens when (as in the present case), deflationary impulses such as poor demographics, globalization, automation, e-commerce and structural reforms threaten to tilt the inflation rate persistently below 2.0%? Central banks can fight back in three ways:

1. They can work to ensure that inflation expectations do not fall, and hope that this provides a sufficient offset.
2. They can place monetary policy at a permanently more stimulative-than-usual setting (though not necessarily as stimulative as right now), as may prove necessary in the coming years.
3. They can allow their balance sheets to grow slightly more quickly than the pre-crisis 2% annualized norm.[30] By expanding the monetary base a bit more quickly, more money is theoretically injected into the economy and helps to prod inflation along.

The first two approaches deploy our Simple Forecast Model, which takes human projections for three economic variables[31] and calculates where consumer prices should naturally settle under that scenario. The first variation takes the one-year forecast as is; the second variation takes the change in the forecast between today and one year from now, and then adds this difference to the current inflation rate.

The third approach uses our Inflation Impulse Model, which has the attraction of not requiring any human assumptions about the future, though at the cost of reduced precision.

The final two approaches extend the aforementioned scorecard-based system into the future (Exhibit 37). The first variation optimistically assumes that the unexplained portion of the current deflationary impulse vanishes by next year. The second variation assumes that the unexplained portion persists.

When combined via a simple average, these models argue that inflation should be higher next year in six of eight categories.[32] As to the exceptions, the first is for Eurozone core inflation, which is forecast to be 0.1 percentage point lower, at 0.6%. The second is for Canada, which is forecast to have core inflation of 1.9% rather than 2.1%.

Bottom line

This report offers several key findings.

First, we can explain most – but not quite all – of why inflation is so low. Fortunately, even if the unexplained deflationary pressures persist, total inflation should nevertheless be positive and indeed outright higher than today in the Eurozone, the U.S., the U.K. and Canada. In short, the deflationary trap has not been sprung.

Second, most of the deflationary pressures in the world today are not especially corrosive and the bulk are temporary, meaning on both counts that the economic damage is likely to be smaller than feared.

Third, to the extent we may be underestimating deflationary pressures, this risk is clearly greatest for the Eurozone. The depth, breadth and nature of the deflationary pressures there are all more pernicious than in the other countries.

As for market implications, bond yields should follow inflation somewhat higher over the next year, the recent flurry of central-bank easing should begin to ebb, and the Fed should be able to raise the fed funds rate in 2015 after all.

Exhibit 36: Inflation model forecasts for Q1 2016

		Average model forecast	Simple Forecast Model 1 (forecast level)	Simple Forecast Model 2 (forecast chg + current actual)	Inflation Impulse Model	Scorecard 1 (without unexplained residual)	Scorecard 2 (with unexplained residual)
U.S.	Total CPI	1.2	1.3	1.5	-	0.9	1.1
	Core CPI	2.0	1.8	2.1	2.0	-	-
Eurozone	Total CPI	1.0	0.7	0.3	-	1.7	1.3
	Core CPI	0.6	0.3	0.4	1.1	-	-
U.K.	Total CPI	1.6	2.2	1.4	-	1.7	1.2
	Core CPI	1.7	1.7	1.8	1.5	-	-
Canada	Total CPI	1.8	1.8	1.9	-	1.8	1.5
	Core CPI	1.9	1.7	2.1	1.8	-	-

Note: Forecasts for 2016 Q1 inflation in YoY % change, generated by RBC GAM Simple Forecast Model, Inflation Impulse Model and Scorecard Model as at March 24, 2015. Simple Forecast Model uses economic and financial market forecasts to predict the future level of inflation. The Inflation Impulse Model relies upon existing data without any assumptions. Scorecard Model takes bottom-up approach. Source: Haver Analytics, RBC GAM

Exhibit 37: Deflation scorecard forecast

Type of deflationary impulse			Implications	Current example	Deviation from normal inflation (ppt) 2016–Q1			
					Eurozone	U.S.	U.K.	Canada
Persistent	Domestic	Demand	Very bad	Deteriorating domestic demographics	-0.10	-0.03	-0.05	-0.05
Temporary	Domestic	Demand	Bad	Domestic economic slack	-0.60	-0.25	-0.05	-0.15
Persistent	Domestic	Supply	Good	Structural adjustments / enhanced competitiveness	-0.05	0.00	0.00	0.00
				Health and education cost controls	-0.05	-0.15	-0.05	-0.05
				E-commerce	-0.05	-0.07	-0.05	-0.05
Temporary	Domestic	Supply	Good	Weather conditions (food)	-0.08	-0.05	-0.05	-0.05
Persistent	Global	Demand	Bad	Deteriorating global demographics	-0.05	-0.05	-0.05	-0.05
Temporary	Global	Demand	Neutral	Global economic slack	-0.05	-0.05	-0.05	-0.05
				Export sanctions to Russia	-0.03	0.00	-0.01	0.00
Persistent	Global	Supply	Neutral	Globalization	-0.06	-0.06	-0.06	-0.06
				Automation	-0.10	-0.10	-0.10	-0.10
Temporary	Global	Supply	Good	Oil prices	0.30	0.30	0.30	0.30
				Currency movements	0.75	-0.60	-0.10	0.15
Explained CPI deviation from target					-0.17	-1.11	-0.32	-0.16
Forecast CPI (YoY % change)					1.7	0.9	1.7	1.8

Note: Estimated via internal models, third-party calculations and expert judgment. Source: RBC GAM

Notes

[1] Or, in the case of Canada, eight volatile items that ultimately include a significant swath of food and energy.

[2] The definition of core inflation varies by region, but generally excludes food and energy prices.

[3] Every household consumes food and energy, whereas not all consume education, health care or any number of other items in the consumer price index.

[4] In contrast, many costs – especially for services – are incurred in a passive fashion, automatically accruing as an installment to a monthly credit card bill.

[5] Weekly purchases, at least, versus many other items in the spending basket that are purchased irregularly or on a monthly or less frequent basis.

[6] After all, a moving average of total inflation ultimately provides a true sense of the underlying trend, but it is unavoidably quite lagged such that it is not especially useful as a timely gauge of activity and thus is not practical as an investment tool.

[7] In this exercise, each consumer price index (CPI) component is weighted according to its importance in the basket.

[8] Those outside of +/-1 standard deviation from the average.

[9] Not every measure exists for each region. We used off-the-shelf metrics for the U.S. and Canada and built our own for the Eurozone. For the U.K., we were unable to find pre-existing measures and lacked the necessary resources to build them ourselves.

[10] We have not performed this calculation for the U.K.

[11] Canada's unusually high communications inflation is mainly due to a government-mandated move to shorter mobile phone contract lengths and reduced telecom promotions.

[12] Central banks also seek to avoid undesirably high inflation, instead targeting a middling inflation rate of around 2.0%.

[13] Such as in a 2014 IMF Working Paper by Anderson, Botman and Hunt, entitled "Is Japan's Population Aging Deflationary?"

[14] Even when returns rise in response to higher inflation, investors suffer a net loss since investment taxes are paid on both the real and inflation component.

[15] The cross-sectional model focuses on core CPI rather than total CPI as a way of compensating for the fact that it does not control for global price shocks or other variables.

[16] Including a now unusually low short-term unemployment rate in the U.S. – a key gauge of economic slack.

[17] Such as an increased inclination to quit a job voluntarily.

[18] While premiums have risen for many, this largely reflects the inclusion of previously "uninsurable" Americans, and so mainly represents an increase in the amount of health care provided, rather than the price for a unit of health care.

[19] One can debate whether this is a domestic or global source of deflation.

[20] The theory behind this figure is that a foreign output gap should be around one-quarter as important as a domestic one given that one quarter of the average country's economic activity is trade-oriented.

[21] Admittedly, an element of the decline in oil also relates to slower emerging-market demand growth, but this is already implicitly included in the global economic slack variable, and furthermore we consider this the lesser influence. It is impractical in this scorecard-based system to fracture each driver into multiple categories.

[22] The British pound is weaker versus the U.S. dollar but much stronger versus the euro.

[23] It is not that the Canadian currency move has been larger than the others, but rather that it a) came earlier and so is more fully reflected in current economic figures; and b) is a more relevant variable for its economy given the high trade orientation of Canada toward the U.S.

[24] The gap may represent any number of things. Most obviously, we may have omitted an important deflationary impulse or mischaracterized the size of an impulse. Alternately, the statistical accuracy of the inflation figures themselves may not be perfect.

[25] The inflation expectations are for six to ten years into the future because this sidesteps near-term distortions without retreating too far into the future.

[26] People are normally willing to forfeit a bit of additional yield if they can eliminate the uncertainty associated with fluctuating inflation. Thus, a real return bond will generally trade at a slight premium to a nominal bond.

[27] Which generally gaze less far into the future than market-based measures, and so should in theory be more rather than less susceptible to swinging inflation.

[28] Which are arguably larger than commonly imagined.

[29] This isn't supposed to matter as central bankers are instructed to "let bygones be bygones" over past inflation misses, but in practice many are closet price-level targeters that would frankly prefer that their historical average inflation rate begin edging back toward 2%.

[30] Of course, the monetary base has grown by leaps and bounds due to quantitative easing in recent years, but this is a special and theoretically temporary set of actions.

[31] The output gap, import prices and inflation expectations.

[32] A total CPI and core CPI forecast for each of four regions.

RBC Global
Asset Management