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Could inflation accelerate sharply due to the weak Canadian dollar? An estimate of the effect of currency depreciation on prices

When a currency depreciates, like the Canadian dollar has been doing in recent years, positive impacts on the economy are generally expected, in particular thanks to an increase in exports. Business investment can also head up if businesses become more profitable and growth in foreign demand justifies greater production capacity. That said, currency depreciation also brings its share of inconveniences. The most predominant negative effect is probably consumers' loss of purchasing power.

This *Economic Viewpoint* shows that many prices can indeed rise in response to depreciation of the exchange rate. On the other hand, the total effect on inflation is actually quite limited. In fact, not only are there many prices that do not react much to exchange rate fluctuations, but some trends in the opposite direction—like lower gasoline prices—can compensate for the increases observed elsewhere.

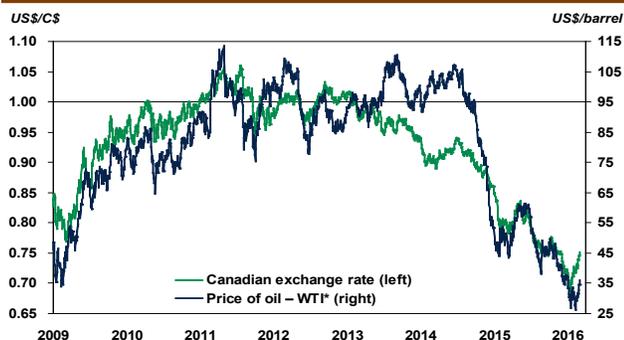
THE CANADIAN DOLLAR HAS BEEN DEPRECIATING SINCE 2013

The Canadian dollar reached a cyclical low of US\$0.6808 at the beginning of this year. Three years earlier, its value was hovering around parity with the U.S. currency, so it has suffered a total loss of around 30% since then. But the bulk of the depreciation was observed starting in mid-2014, in parallel with the collapse in oil prices (graph 1). More specifically, between June 2014 and January 2015 the Canadian dollar lost around US\$15. After that, a degree

of stabilization was observed at around US\$0.80, but the loonie quickly resumed its depreciation in July 2015 until it touched bottom last January. More recently, the exchange rate ticked up to around US\$0.75, but this rally looks rather fragile.

Oil prices are not the only variable behind the loonie's depreciation in recent years. Among other things, the currency has been influenced by changes in interest rates, including the two rate cuts ordered by the Bank of Canada (BoC) in 2015, and by the generalized strength of the U.S. dollar since 2014.

Graph 1 – The depreciation of the Canadian dollar is mainly caused by low oil prices



* West Texas Intermediate.
Sources: Datastream and Desjardins, Economic Studies

SO FAR, THE EFFECTS ON TOTAL INFLATION APPEAR TO BE LIMITED

Exchange rate trends can affect prices through various channels. First, directly, through imported goods and services that cost more when the currency depreciates. Even the prices of goods and services produced in Canada can rise if the businesses that produce them first have to import inputs, such as equipment, parts or miscellaneous components. More indirectly, prices can rise if economic activity accelerates following depreciation of the exchange rate. Inflationary pressures are then caused by the decrease in excess production capacity and by the greater scarcity of

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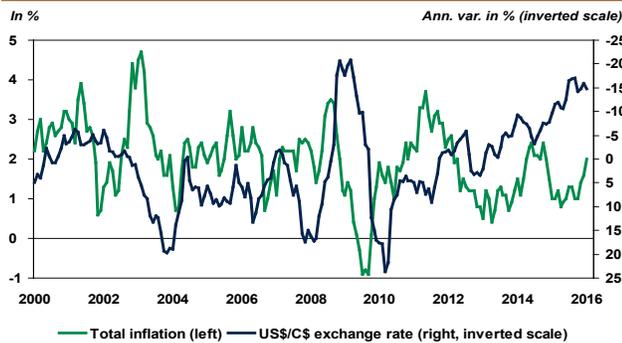
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labour. Foreign demand can also influence domestic prices. If more foreigners want to shop here, businesses that are struggling to meet demand could decide to raise their prices.

So goes the theory; but in concrete terms, if we look at the Canadian inflation trend in recent years, we note that it has not risen much, suggesting that the depreciation of the currency has not had much of a pass-through effect on prices (graph 2). At best, we note a recent rebound in price fluctuations, suggesting the beginning of a delayed effect.

Graph 2 – Inflation in Canada has barely budged despite the depreciation of the Canadian dollar



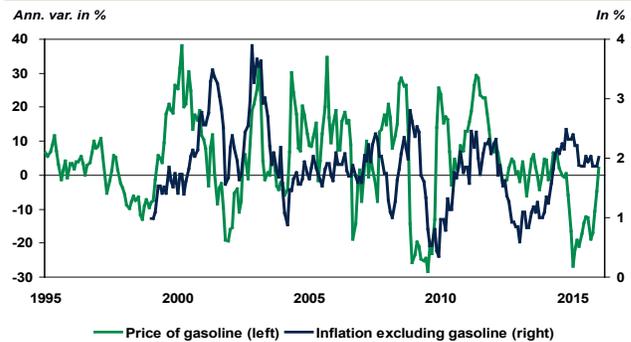
Sources: Statistics Canada and Desjardins, Economic Studies

There are many reasons why a 30% shock to the exchange rate does not affect prices evenly across the board. For one thing, not all goods and services are affected in the same way. Imported goods would normally react more than goods or services that are not imported. Second, businesses can use some leeway to avoid passing on the bill to their customers. For example, retailers' list prices reflect not only the wholesale purchase price of goods, but also the cost of store rental, employees' wages and various other expenses. The same logic applies to businesses that import input. The cost of that input represents only a portion of their total costs. Finally, many businesses use exchange rate hedging tools, limiting their exposure to currency fluctuations in the short term.

On a different note, the state of the economy and the way monetary policy is conducted also have great influence over prices, which can greatly disguise or lessen the pass-through effect of the exchange rate. Currently, the Canadian economy is growing at a slower than normal pace, which is compatible with lower inflation. As for monetary policy, it is difficult to imagine that inflation could skyrocket, since the BoC's primary mission is to keep inflation low (between 1% and 3% with a median target of 2%). The fact that inflation expectations are firmly anchored close to the target is making the BoC's job easier.

More unusual mechanisms can also interfere in the relationship between the exchange rate and prices. This is the case with oil in Canada, which is affecting both the exchange rate and inflation. In recent years, gasoline and other fuel prices have dropped sharply due to the collapse in oil prices, and this has partly compensated for the effect that the exchange rate has had on other prices. If we exclude gasoline, inflation stood at close to 2% in 2014 and 2015 (graph 3).

Graph 3 – Over many months, low gasoline prices have offset increases in other prices

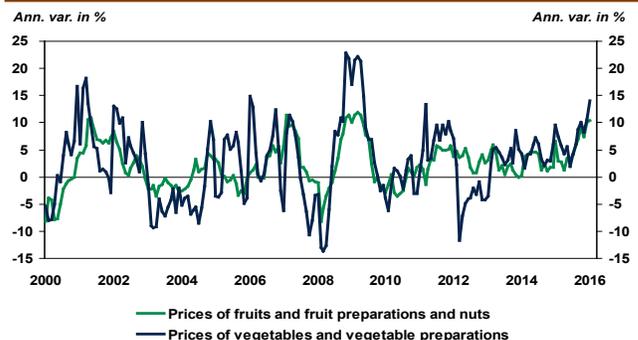


Sources: Statistics Canada and Desjardins, Economic Studies

UNEQUAL PRICE VARIATIONS BETWEEN VARIOUS GOODS AND SERVICES

Analyzing price trends by category of goods and services provides a more precise picture of the exchange rate's effect. We may assume that the plunge in the Canadian dollar has contributed to some disparities. As far as food is concerned, the annual growth in produce prices accelerated mainly in 2015 (graph 4). The same phenomenon occurred in 2008–2009 when the Canadian dollar experienced another period of weakness. The change over time in the growth of prices of furniture and household items tells pretty much

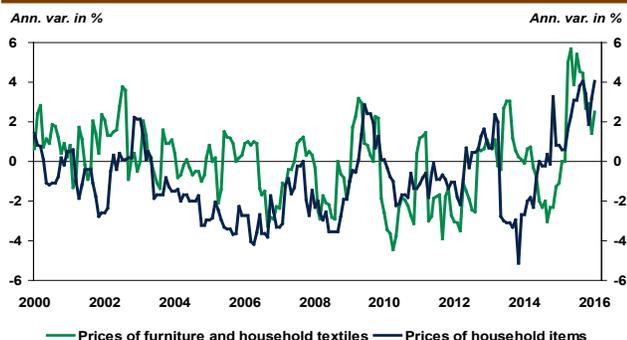
Graph 4 – Significant increases in food prices



Sources: Statistics Canada and Desjardins, Economic Studies

the same story, with clear acceleration since 2015 (graph 5). Upwards price movement was also observed in 2008–2009, although to a lesser extent.

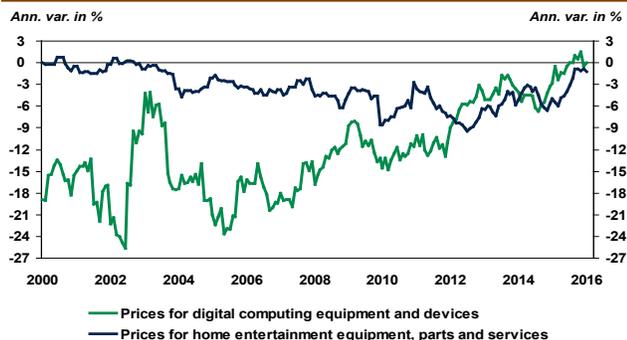
Graph 5 – Changing trend in household furnishings and equipment



Sources: Statistics Canada and Desjardins, Economic Studies

It is not necessary that the price of a good or service increase to suspect that exchange rate depreciation is having an effect. Prices that were in the habit of falling, but which are now diminishing to a lesser extent, or remaining stable, may also be affected by the depreciation of the loonie. This would appear to be the case for digital computing equipment and electronic devices (graph 6). The prices of these goods have been declining steadily over the past decade, but the picture has recently changed; they are now barely budging.

Graph 6 – Goods whose prices are declining more slowly than before



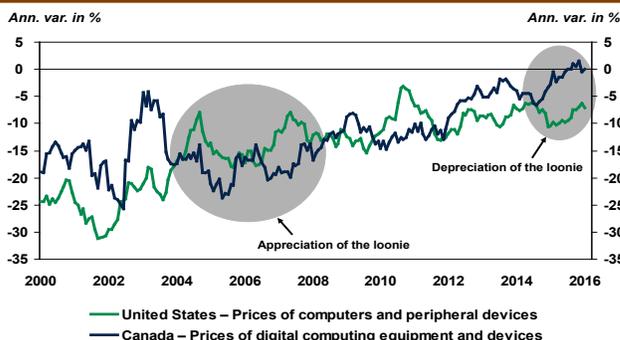
Sources: Statistics Canada and Desjardins, Economic Studies

PRICE VARIATIONS ABROAD MUST ALSO BE TAKEN INTO ACCOUNT

Analyzing price trends in Canada alone can turn out to be a misleading exercise for detecting a link with the exchange rate. Parallel price trends may be observed in both Canada and the United States, which would suggest less influence by the exchange rate. Conversely, when divergent trends are observed between the two countries, that suggests a clearer pass-through from exchange rate fluctuations.

Let’s take another look at computer goods. For more than a decade now, price growth has stayed below zero, both in Canada and in the United States. The growth has become less negative over time on both sides of the border, but divergences have appeared nonetheless (graph 7). Since 2014, computer goods prices have declined far less in Canada than in the United States, and they even rose slightly over a short period of time. Moreover, from 2003 to 2008, we note that prices fell further in Canada, when the loonie was appreciating. We would note, though, that the comparison between the two countries could be biased by what is really included in this category of goods. We are faced with two different sources of data, with different aggregation methods. That said, looking at the trends of these prices in the United States still provides a fairly good indication that an exchange rate pass-through exists for this category of goods.

Graph 7 – Computer prices have continued to decline in the United States recently, but not in Canada



Sources: Statistics Canada, Datastream and Desjardins, Economic Studies

Trends in clothing prices in Canada and the United States is another interesting case to analyze. Since 2014, the change in clothing prices in Canada has been greater than that observed in the United States (graph 8). In the past, the reverse situation occurred, when the loonie was in an appreciation phase.

Graph 8 – Clothing prices rose faster in Canada than in the United States in 2014 and in 2015



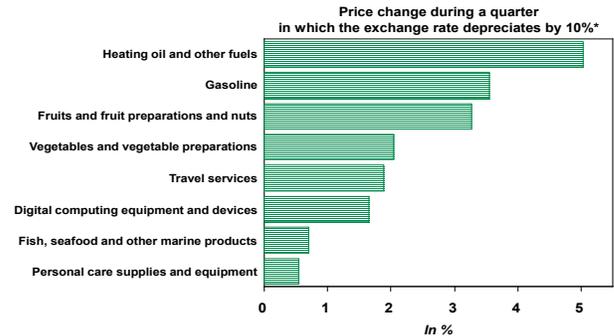
Sources: Statistics Canada, Datastream and Desjardins, Economic Studies

MODELLING EXCHANGE RATE PASS-THROUGH TO PRICES

Econometric equations have been estimated in order to isolate the effect of the US\$/C\$ exchange rate on various sub-components of the consumer price index (CPI) (see box for more details about the method). The equations take into account price trends in the United States as well as other factors that can influence Canadian prices, such as the state of the economy and the degree of monetary easing. The analysis of the results focused on the short-term effect of the exchange rate, the effect after one year, and the total long-term effect.

Our estimates show that very few prices react to exchange rate movements to a significant degree in the short term, i.e. during the same quarter in which currency movement is observed (graph 9). The prices that react the most in the short term are those of fuel oil and other fuels, with

Graph 9 – Only a few prices react instantly to exchange rate movements



* Only those results that appear to be statistically significant in the econometric equations are presented. Source: Desjardins, Economic Studies

a quarterly adjustment estimated at 5% in response to a 10% depreciation of the exchange rate. Gasoline stands in second place with an adjustment estimated at 3.6%. Only

Estimate of exchange rate pass-through

The pass-through of exchange rate movements was estimated for about 60 sub-components of the Canadian CPI. The equation below was estimated for each of the sub-components using quarterly data.

$$\Delta(\log(P_t)) = c + \sum_{i=0}^4 \beta_i \Delta(\log(e_{t-i})) + \sum_{i=1}^4 \alpha_i \Delta(\log(P_{t-i})) + \sum_{i=0}^4 \phi_i \Delta(\log(P_{US,t-i})) + \theta X_{t-1} + \varepsilon_t$$

Where:

- “P” is the price index for the sub-component being analyzed
- “P_{US}” is the equivalent U.S. price for the sub-component being analyzed
- “e” is the US\$/C\$ exchange rate
- “X” is a matrix of complementary variables that can affect prices, including the output gap
- “ε” is a random variation

The coefficient β₀ corresponds to the proportion of an exchange rate shock that instantly passes through to the price index.

The total long-term effect of an exchange rate shock on the price index is:

$$\frac{\sum_{i=0}^4 \beta_i}{(1 - \sum_{i=1}^4 \alpha_i)}$$

Only the most significant results are presented in table 1 on page 5. An estimate of the total effect of the exchange rate on the CPI was obtained by aggregating all the results for the sub-components according to their respective weight in the CPI.

The selection of sub-components was designed to produce a clear distinction between the various goods and services and to facilitate comparison with prices in the United States. However, it was not possible to find a U.S. equivalent for all the sub-components that were selected for Canada. Nevertheless, estimates were calculated for nearly 85% of the Canadian CPI basket. The sub-components that were omitted include mortgage interest cost, homeowners’ replacement cost and property taxes. These three components together make up approximately 12% of the CPI basket. It was assumed that the exchange rate had no effect on mortgage interest cost or on property taxes. In the end, the aggregate pass-through effect constitutes a weighted average representing over 90% of the CPI basket.

one service category shows up in this rating: that of travel services, with a price adjustment of 1.9%, once again in response to a 10% depreciation of the exchange rate.

A greater number of CPI sub-components show sensitivity to the exchange rate over a longer period of time. Table 1 presents the 20 most significant results found, taking into account the total exchange rate effect and the speed at which the pass-through takes place. The percentage of the total effect achieved after one year provides a good indication of that speed. The effect after one year also tells us to what degree the inflation rate could rise during the year following an exchange rate shock.

It is not surprising to note that those prices that react strongly in the short term also show up in the ranking of effects measured over the long term. However, the number one sub-component in this regard is digital computing

equipment and devices; for these, over 60% of exchange rate movements pass through to prices. This means that a 10% depreciation of the exchange rate results in a price adjustment of around 6%, all other things being equal. If we look at the effects after one year, the top-ranking sub-component is fuel oil and other fuels.

It may seem surprising to see that for some results, the effect after one year is stronger than the total effect. These results are not necessarily peculiar, because it is possible that prices might need to be revised over time to adjust to changes in demand. Demand could decline too much in response to the initial price increases, which would then justify lowering prices to win customers back.

Finally, the results presented represent the expected effect of the exchange rate on prices, assuming that all other variables remain unchanged. Thus, we find that the depreciation of

Table 1 – Pass-through of a 10% depreciation in the exchange rate to various sub-components of the consumer price index

Var. in %	<i>Weight in the CPI*</i>	<i>Effect after one quarter</i>	<i>Effect after one year</i>	<i>Total effect</i>	<i>Percentage of the total effect after one year</i>
Digital computing equipment and devices	0.67	1.7	3.9	6.3	61.3
Vegetables and vegetable preparations	1.30	2.0	5.8	5.3	110.5
Fuel oil and other fuels	0.32	5.0	6.1	4.6	130.7
Gasoline	4.77	3.6	4.0	4.2	95.4
Natural gas	0.94	n.s.	3.8	3.8	100.3
Fruits, fruit preparations and nuts	1.35	3.3	3.5	3.4	101.6
Fish, seafood and other marine products	0.43	0.7	2.7	3.2	81.9
Meat	2.05	n.s.	2.7	2.9	93.3
Reading material (excluding textbooks)	0.30	n.s.	2.2	2.3	97.7
Air transportation	1.25	n.s.	3.2	2.0	158.8
Travel services	2.12	1.9	1.4	2.0	71.5
Personal care supplies and equipment	1.17	0.5	1.1	1.7	64.2
Household equipment	1.78	n.s.	1.6	1.7	93.4
Home entertainment equipment, parts and services	0.61	n.s.	1.2	1.4	85.4
Clothing	3.96	n.s.	1.3	1.1	116.2
Homeowners' maintenance and repairs	1.26	n.s.	1.0	1.0	100.8
Purchase, leasing and rental of passenger vehicles	7.38	n.s.	0.9	1.0	94.5
Footwear	1.25	n.s.	0.7	0.9	71.0
Other recreational equipment	0.16	n.s.	0.7	0.8	85.0
Health care goods	1.64	n.s.	0.4	0.6	66.0

n.s.: result not significant; * 2013 reference basket with prices of January 2015, table CANSIM 326-0031.

Sources: Statistics Canada and Desjardins, Economic Studies

the exchange rate should have driven gasoline prices up considerably (in the order of 4% per 10% of depreciation). But in fact, the plunge in oil prices more than offset the effects of the currency's depreciation, and gasoline prices fell. Seen from a different angle, we can assert that the depreciation of the Canadian dollar cancelled out a portion of the decline in gasoline prices caused by the collapse of crude oil prices.

CONCLUSION: THE RISK OF STRONG INFLATION IS SMALL

Based on our estimates, even though certain prices appear to react strongly to the exchange rate, we cannot conclude that a high risk exists of strong inflation in Canada in the years ahead. The results presented in table 1 on page 5 represent a little over one third of the CPI basket. If we aggregate the estimates of all the sub-components, we find that every 10% tranche of depreciation in the exchange rate raises the consumer price index by a mere 0.70%. The estimated effect after one year, which is more representative of the potential impact on the inflation rate, is slightly lower: 0.67%.

Since 2013, the depreciation of the Canadian dollar amounts to nearly 30%, suggesting that, on average, prices will end up rising by around 2%. That number may seem more significant if we compare it to the median inflation target. However, since the loonie's depreciation has taken place over a few years, the effect on the inflation rate will also be spread over a long period of time. Moreover, contrary to price levels, the effect on the inflation rate is temporary. Once the price increase is past, inflation returns close to a normal level, unless some other shock generates another increase.

Finally, we must not overlook the existence of factors that compensate for the inflationary pressures caused by the exchange rate. In particular, low oil prices have been making a negative contribution to the CPI for more than a year now. The fragile state of the Canadian economy also generates deflationary pressures. And for further reassurance, the worst of the depreciation by the Canadian dollar is probably behind us.

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