

# The Use of Financial Derivatives by Canadian Firms

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- Corporations use financial derivatives to reduce the volatility of their earnings stream by hedging exposures to interest rate, exchange rate and commodity price risks.
- In Canada, about one-third of publicly listed firms use financial derivatives. The use of derivatives is widespread across all sectors of the economy and increases during periods of greater uncertainty.
- Non-financial firms that use derivatives are typically larger and more profitable and have lower volatility of earnings than those that do not use derivatives. Overall, the firm characteristics of Canadian hedgers seem to be consistent with those found in other jurisdictions.

Financial derivatives such as forwards, futures, options and swaps allow corporations to protect themselves from unpredictable changes in exchange rates, interest rates and commodity prices, thereby reducing the degree of financial risk to which they are exposed. While financial corporations are the most significant participants in derivatives markets, non-financial Canadian corporations are also important; for example, they are counterparties to around 15 per cent of the turnover in foreign exchange (FX) derivatives in Canada.<sup>1</sup> This article provides stylized facts about the use of financial derivatives by Canadian publicly listed firms from 2006 to 2013.

This topic is currently important because during the 2009–13 period, commodity prices and the Canadian dollar fluctuated significantly compared with earlier periods. Such fluctuations can result in unpredictable profit margins and losses for corporations. In turn, holding all else equal, profit volatility can increase firms' probability of distress and impair their ability to access external funding.<sup>2</sup> To the extent that the Canadian economy relies on export revenues, hedging through the use of financial derivatives can

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<sup>1</sup> Using information from the Canadian Foreign Exchange Committee (CFEC 2014), we calculate the share held by non-financial customers of the total turnover of outright forwards, swaps, currency swaps and over-the-counter options as of April 2014.

<sup>2</sup> Responses to a survey by Export Development Canada (2009) indicate that 69 per cent of the surveyed firms have been significantly affected by currency fluctuations, and that their primary objective is to manage foreign exchange risk.

smooth income from exports and ultimately enhance domestic welfare. Knowing the extent to which Canadian firms use derivatives and whether the reliance on them has changed over time can be particularly useful for gauging the potential impacts of large fluctuations in interest and exchange rates on the economy.<sup>3</sup> For example, the use of exchange rate hedges may shield a firm from a temporary exchange rate shock, and thus forestall a pass-through of the temporary exchange rate volatility to import prices. However, if the exchange rate shock is persistent or permanent, exchange rate hedges can only delay the pass-through. The general consensus in the pass-through literature is that exchange rate hedges may slow the pass-through for the length of the average maturity of the hedging instruments (Ihrig, Marazzi and Rothenberg 2006). Analysis of the use of hedging instruments has proven to be difficult because of the lack of available data on firms' use of derivatives.<sup>4</sup> We collected derivatives data at the firm level, which allows us to shed light on whether and how hedgers differ from non-hedgers in terms of various firm characteristics.

## The Use of Financial Derivatives by Canadian Non-Financial Corporations

Hedging with derivatives can transform financial risks by essentially offsetting (taking equal but opposite) positions in the derivatives market and/or the spot market for the purpose of shielding the revenue stream against adverse price movements.

Let us consider the following hypothetical example. A Canadian exporter expects to receive US\$100 million in six months. Suppose that the current foreign exchange rate for the U.S. dollar is Can\$1.20. If the value of the U.S. dollar falls by 10 per cent over the next six months, the exporter will lose Can\$12 million. To hedge such foreign exchange risk, the exporter can sell a six-month U.S.-dollar forward to lock in the current forward rate. If the forward rate is Can\$1.18, the exporter is certain to receive Can\$118 million at maturity. Bank dealers who act on behalf of clients willing to hedge need to assess the credit risk of their counterparty.

We collected data on the use of derivatives for a sample of firms listed on the Toronto Stock Exchange (TSX) for the following contracts: interest rate swaps, as well as foreign exchange futures, forwards, swaps and options.<sup>5</sup> Excluding financial firms and utilities, we obtained information for the use of derivatives contracts for 1,522 non-financial firms over the 2005–13 period.

The portion of Canadian firms that relies on derivatives contracts is significant. In total, 33 per cent of the firms in our sample use at least one of the contracts listed above; 18 per cent use interest rate swaps and 24 per cent use at least one type of foreign exchange contract. Of the firms that use FX contracts, 25 per cent use FX swaps, 54 per cent use FX forwards and 46 per cent use either FX futures or FX options.

◀ *In total, 33 per cent of the firms in our sample use derivatives contracts*

<sup>3</sup> Firms can use alternative mechanisms to hedge their risk exposures. For example, Canadian manufacturing firms that rely to some extent on imported inputs adjust their Canadian-dollar prices in response to changes in the Can\$/US\$ exchange rate (Bank of Canada 2014). Some firms may use natural hedges against exchange rate fluctuations by producing and selling in the same (foreign) currency. Natural hedging can be effective at reducing a company's foreign exchange risk, but it can take time to implement.

<sup>4</sup> Box 1 provides definitions of these instruments. We use the term "derivatives" to refer to all contracts analyzed in this article; the legal definition of derivatives sometimes excludes swaps and forwards.

<sup>5</sup> To confirm whether the firm is using certain derivatives contracts, we relied on the 2006, 2009 and 2013 annual reports of the firms in our sample downloaded from SEDAR (the System for Electronic Document Analysis and Retrieval). Although firms choose to report different details of their hedging activities, they all have to disclose whether they use derivatives.

Box 1

## Definitions of Derivatives Contracts

A **foreign exchange (FX) forward contract** is a contract to buy or sell a currency at a future delivery date with a rate adjustment to account for the yield differential between the two currencies. This is the most common type of FX hedging contract traded over the counter. It is customized in terms of size, quality and delivery date.

A **foreign exchange (FX) swap** is a contract to buy or sell a currency at a future delivery date (can be at spot) and then to reverse this position by selling or buying the same currency at a later date. For example, if a forward contract comes due but the foreign funds have not been received or the foreign funds are not yet due, the client can use the new swap to offset the maturing contract at the current delivery date, only to re-establish the desired position at a later time for a new delivery date.

**Foreign exchange (FX) options** give the right, but not the obligation, to buy or sell a currency with another currency at a specified exchange rate for a specified period. These contracts are traded on the over-the-counter derivatives market. They help to lock in the exchange rate but without the obligation to honour the contract. For example, if the

U.S. dollar is expected to depreciate against the Canadian dollar, Canadian investors in U.S. assets can hedge currency risk by buying a put option on the U.S. dollar, since the value of the options should increase if the U.S. dollar falls.

**Foreign exchange (FX) futures** are standardized cash-settled exchange-traded contracts between two specific currency pairs, although they can be exchanged for physical currencies. These contracts are traded on futures exchanges.

**Interest rate swaps** are agreements traded over the counter between two parties to exchange one stream of interest payments for another over a specific time period. The most commonly traded interest rate swaps are known as “vanilla” swaps, which exchange fixed-rate payments for floating-rate payments. The party that receives a fixed rate and pays a floating rate is the “receiver,” and the party that receives a floating rate in exchange for a fixed rate is the “payer.” Interest rate swaps help corporations manage their floating-rate debt liabilities by allowing them to lock into paying the prevailing fixed rate and receive payments that match their floating-rate debt, or vice versa.

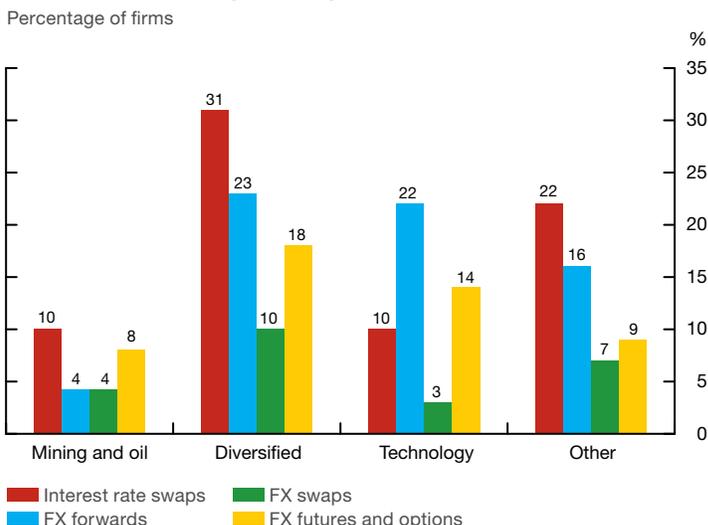
The use of financial derivatives is widespread across all sectors of the economy. For example, 24 per cent of firms in mining and oil, 37 per cent in diversified industries, 14 per cent in technologies and 24 per cent in all other sectors (communications and media, forest products, and life sciences) use at least one of the above-mentioned derivatives contracts. Interest rate swaps are the most common type of derivatives used in mining and oil and in diversified industries (**Chart 1**). FX forwards, followed by FX futures and options, are the most prevalent instruments in technologies.

The use of financial derivatives increases during periods of greater uncertainty. The use of derivatives was slightly more prevalent in the 2008–10 crisis period than in the 2005–07 pre-crisis and 2011–13 post-crisis periods for both large and small firms (**Chart 2**).<sup>6</sup> The use of interest rate swaps was higher in the 2008–10 period compared with the other two periods, because firms most likely wanted to lock in their lower cost of debt in the environment of low interest rates and somewhat elevated uncertainty about the outlook for the economy. With the expectation of an increase in interest rates, the reliance on interest rate swaps would allow firms to pay fixed interest rates while the underlying debt payment remains variable but hedged.

◀ *The use of financial derivatives is widespread across all sectors of the economy*

<sup>6</sup> The use of interest rate swaps by small firms increased from 4 per cent in the pre-crisis period to 8 per cent during the crisis. A similar trend emerges for large firms—interest rate swaps were more popular during the crisis than in the periods either before or after it.

**Chart 1: Use of derivatives, by industry sector, 2005–13**



Note: Sectors are defined according to the Toronto Stock Exchange classification. The “Diversified” category includes mostly manufacturing firms. The “Other” category consists of communications and media, forest products, and life sciences.

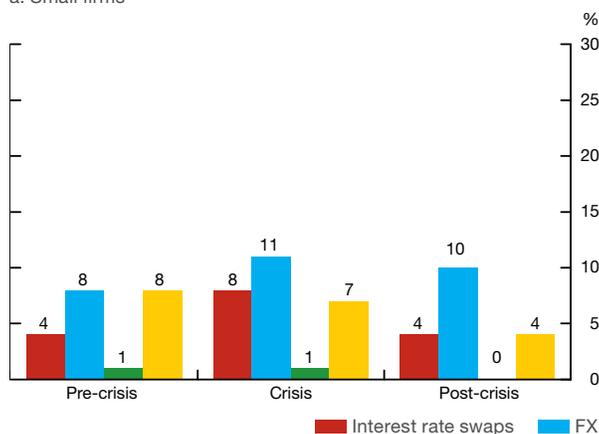
Source: Authors’ calculations

Last observation: December 2013

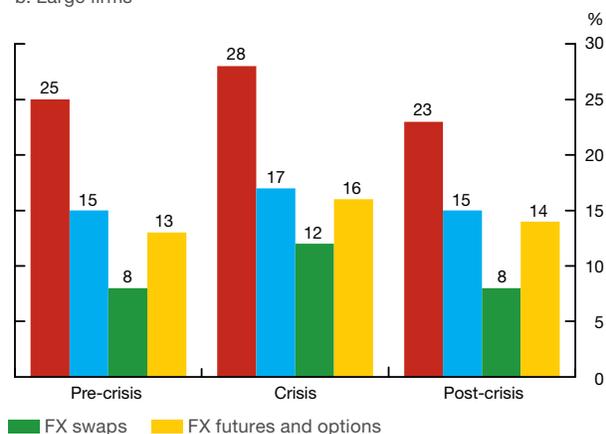
**Chart 2: Use of derivatives before, during and after the financial crisis**

Percentage of firms

a. Small firms



b. Large firms



Note: The pre-crisis period refers to the years 2005–07; the crisis period covers 2008–10; and the post-crisis period is 2011–13.

Source: Authors’ calculations

Last observation: December 2013

FX derivatives (swaps, forwards, futures and options) used by large firms were also more prevalent in 2008–10 than in the other periods.<sup>7</sup> The 2008–10 period was also characterized by higher exchange rate volatility compared with the other two periods—the standard deviation of daily exchange rates for the 2008–10 period was 8.4 per cent, while it was 4 per cent for 2011–13. Hedging activities typically intensify in times of volatile market conditions because the revenue streams of corporations become exposed to more adverse price movements and, in response, firms become more eager to rely on derivatives.

<sup>7</sup> The total use of foreign exchange derivatives during the crisis period by large firms was 45 per cent. In Chart 2, this is the sum of FX forwards, FX swaps and FX futures/options for the 2008–10 period. The usage rate of FX derivatives was 36 per cent and 37 per cent during 2005–07 and 2011–13, respectively.

In addition, the results of the Bank of Canada’s Survey on Canadian Foreign Exchange Hedging indicate that Canadian companies used more derivatives in the period of relatively more volatile exchange rates.<sup>8</sup> In the survey, Canadian firms report that the change in volatility in foreign exchange markets has been the primary driver for the shift in hedging activity.<sup>9</sup>

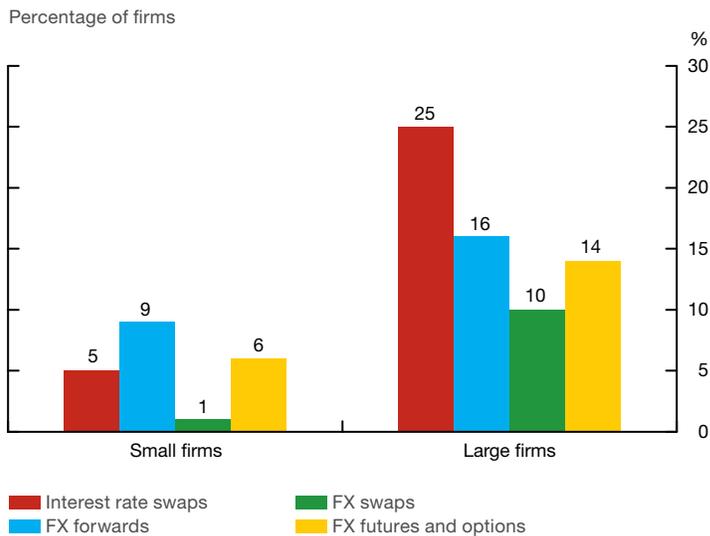
## Firm Characteristics and Hedging

Modern financial theory implies that, in the absence of market imperfections, financial decisions such as hedging do not affect the value of the firm (Modigliani and Miller 1958).<sup>10</sup> However, financial markets are not perfect and hedging can affect firm value through a number of channels. In this section, we provide some stylized facts about the characteristics of hedging and non-hedging firms.

First, firms that hedge tend to be large and mature corporations. Based on our data set, the use of derivatives is more pronounced for large firms than for smaller ones (Chart 3). Large firms are defined as those with higher market values than the sample median, which is Can\$250 million. For example, 25 per cent of all large firms use interest rate swaps, while only 5 per cent of small firms do; only 1 per cent of small firms use FX swaps, while 10 per cent of large firms report using this contract. Moreover, firms that hedge tend to be more mature, with an average age of 20 years, as opposed to 12 years for

◀ *The use of derivatives is more pronounced for larger and more mature firms*

**Chart 3: Use of derivatives, by firm size, 2005–13**



Note: “Small firms” are defined as firms with market values that are lower than the sample median.

Source: Authors’ calculations

Last observation: December 2013

<sup>8</sup> The Bank of Canada Survey on Canadian Foreign Exchange Hedging is a qualitative survey conducted annually among banks to assess their clients’ activities in Canadian foreign exchange hedging since 2004. The survey participants are banks that are active in Canadian FX markets. A summary of the results is available at [www.bankofcanada.ca/2013/11/summary-2013-survey-canadian-foreign-exchange-hedging/](http://www.bankofcanada.ca/2013/11/summary-2013-survey-canadian-foreign-exchange-hedging/).

<sup>9</sup> The survey also shows that more than 40 per cent of exporters decreased their forward hedging activity for the 2010–11 period, owing to the strength of the currency. They preferred to cover most of their transactions in the spot market as they came due, based on their expectations that the currency level would decrease in the future. In contrast, over the same period, 35 per cent of importers not only increased their hedges, but, according to anecdotal reports from banks, many of them also established hedges for a longer duration than the typical contract of three to six months.

<sup>10</sup> If capital markets are perfect, shareholders (investors) possess enough information about a firm’s risk exposures to achieve any desired risk profile by relying on a portfolio strategy that does not use derivatives and pays the same return as the derivatives at maturity.

non-hedgers. The observation that large and more mature Canadian firms tend to hedge more is consistent with patterns found for other countries (Bartram, Brown and Fehle 2009).

This finding is not surprising, given that the development of hedging strategies requires fairly sophisticated financial management and long-term investment, which large and mature firms are more likely to have in place or to devote resources to. It is also highly likely that large firms have better access to derivatives markets because of the availability of their credit ratings. When entering a derivatives contract, a bank needs to assess the credit risk of the firms and allocate an appropriate credit line, which may need to be collateralized depending on the underlying credit risk of the firm. Since large and mature firms are more likely to have credit ratings on their debt, it would be easier for banks to enter a derivatives contract with them.

Second, firms that hedge tend to have higher profit and lower volatility in their income stream. In our data on Canadian hedgers and non-hedgers, we find that hedgers are more profitable with a return on assets that is 10 percentage points higher than that of non-hedgers; and volatility in their earnings, measured by the volatility of return on assets, is much lower compared with non-hedgers (Table 1).<sup>11</sup> This is consistent with findings for other countries. Using an international sample of firms, Bartram, Brown and Conrad (2011) show that derivatives use is associated with lower cash-flow volatility, lower standard deviation of stock returns, lower systematic risk and slightly higher market values.<sup>12</sup>

◀ *Firms that hedge tend to have higher profit and lower volatility in their income stream*

**Table 1: Mean differences between firm characteristics of corporate users of derivatives (corporate hedgers) and corporate non-users (corporate non-hedgers)**

	Corporate hedgers (1) Mean	Corporate non-hedgers (2) Mean	(1) – (2) Difference
ROA (%)	5.9	-5.3	11.2
Volatility ROA (%)	1.8	3.3	-1.5
Cash holdings (%)	10.9	22	-11.1
Debt ratio (%)	20	10.9	9.1
Market capitalization (mean) (Can\$ millions)	4,008	1,316	2,692
Market capitalization (median) (Can\$ millions)	437	122	315
Firm age (years)	20.30	12.37	7.93
Number of observations	343	719	

Notes: ROA is the annual return on assets, defined as the ratio of the annual firm operating income to total assets. Volatility ROA is the standard deviation of quarterly ROA over 20 quarters. Debt ratio is the ratio of debt to total assets; cash holdings are the ratio of cash and short-term investments to assets. Firm age is the difference between the analysis year and the year a firm was founded. The mean differences in the last column are statistically significant at the 1 per cent level, based on statistical tests for comparisons of means. A corporate hedger is defined as a firm that uses at least one derivatives instrument. We use only firms that stayed in the sample for the entire period to avoid a change in the composition of firms.

Source: Authors' calculations

<sup>11</sup> In this article, a "hedger" is defined as a non-financial firm that uses at least one of the following derivatives instruments: interest rate swaps, FX swaps, FX forwards and FX futures/options. We rely on such an aggregated measure for the purpose of easier exposition. All findings reported in Table 1 hold for each derivatives instrument.

<sup>12</sup> As a result of reduced cash-flow volatility, some firms may derive benefits from the decreased cost of financial distress resulting from hedging. Typically, smaller and younger firms that are more likely to face the risk of failure may find it more important to use derivatives to decrease their probability of distress and the costs associated with it, holding all else equal (Huyhn, Petrunia and Voia 2010).

By reducing the volatility in the income stream, hedging can improve firms' capital-raising capabilities and, consequently, their investment decisions. Lower cash-flow volatility can increase firms' creditworthiness and, hence, their debt capacity, which is expected to be reflected in the terms of debt contracts, including lower interest rates and fewer investment restrictions attached to debt obligations. There is strong empirical evidence based on U.S. data that hedging leads to a lower cost of debt and to debt contracts with fewer investment restrictions, which together lead to significantly higher investment levels (Campello et al. 2011). Géczy, Minton and Schrand (1997) also find that firms reduce fluctuations in cash flows to be able to raise capital for growth opportunities. In a similar spirit, Froot, Scharfstein and Stein (1993) argue that firms that hedge are more likely to have stable operating cash flows and are thus less likely to face unexpected cash shortfalls, which improves long-term capital investment planning.<sup>13</sup>

Third, firms that hedge tend to use more external financing and have more sophisticated balance-sheet management. We observe that hedgers make greater use of bank loans and bonds to finance their investments. As shown in **Table 1**, the ratio of total debt to assets is 20 per cent for hedgers and 10 per cent for non-hedgers. Together with higher profitability and lower riskiness, the use of external financing by Canadian hedgers is consistent with the explanation that hedging has potentially increased their debt capacity and ability to access bank and capital market financing. It seems that hedgers are better at optimizing their capital structure to achieve higher profit. This is consistent with the empirical finding that increased debt capacity has a positive impact on the value of the hedging firms (Bartram, Brown and Fehle 2009). We also note that the average Canadian hedger holds less cash as a share of total assets than the average non-hedger. This could imply that hedging reduces a firm's need to hold precautionary cash; it could also imply that hedgers actively manage their balance sheets to finance profitable investment opportunities.

## Conclusion

Firms use financial derivatives to smooth their earning streams. Over the period from 2006 to 2013, one-third of the Canadian firms in our sample used interest rate swaps, FX forwards, FX futures, FX swaps or FX options. The use of derivatives is widespread across all sectors and it is slightly more prevalent in a crisis period. On average, corporate hedgers have some different characteristics from non-hedgers. Our evidence indicates that hedging may be value-enhancing, since hedgers typically have higher profit and lower earnings volatility than non-hedgers. Hedgers appear to actively manage their balance sheet by holding less cash and to access external financing in capital markets, both of which may be the result of the efficient use of derivatives contracts.

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<sup>13</sup> It is worth noting, however, that establishing a true causal effect of hedging activity on profitability and its volatility is a challenging empirical task because the endogenous relationship between hedging behaviour and firm risk has to be taken into consideration. This is an area for further research.

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