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Not quite as advertised: Canada's managed float in the 1950s and Bank of Canada intervention

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Canada has perhaps the longest track record of adhering to a floating exchange rate regime, but it may well also have been the first country to adopt a managed float during the 1950s. In spite of criticisms levelled at the Canadian government's decision to float the dollar, the remarkable feature of the behaviour of the exchange rate during the so-called float is the relative stability of the nominal exchange rate, and the small volatility in its movements. This article stresses the impact of foreign exchange intervention in limiting exchange rate appreciations and in moderating exchange rate volatility, using newly found, and heretofore unused, intervention data. Until now, all studies of Canada's experience with the float have relied on official foreign exchange reserves data. A counterfactual experiment also suggests that nominal exchange rate levels, and variability, would have been different had there been no foreign exchange market intervention.

1. Introduction

Just when it seemed that momentum was gathering in favour of the view that exchange rate regimes in recent years have been gravitating towards the fixed or floating 'corner' solutions (e.g. Fischer 2001), critics began to question the so-called bipolar view. Calvo and Reinhart (2002) brought attention to the 'fear of floating' phenomenon by suggesting that the rhetoric of the pure float does not match the reality of exchange rate regime choices. They find that many countries actively manage their exchange rates. Therefore, countries which announce their intention to adopt a floating exchange rate do not actually abstain altogether from intervening in foreign exchange markets because they fear the economic consequences of large currency swings. Levy-Yeyati and Sturzenegger (2007) suggest that Calvo and Reinhart's explanation really amounts to a fear of depreciations. Exchange rate depreciations are thought to be associated with negative economic consequences stemming from exchange rate pass-through effects, as well as an increase in the likelihood that a financial crisis can erupt as

a consequence. Instead, policymakers are prompted to intervene in foreign exchange markets because they worry that an appreciation of the currency damages the export sector and, as a result, reduces economic growth.

Canada, which arguably has the longest track record in the world for adhering to a floating exchange rate regime, may perhaps best be characterized as an early example of a country that experienced a 'fear of appreciation' during the 1951–7 period investigated in this study. Hence, rather than the pure float that has usually been used to describe exchange rate policy in Canada during the 1950s (e.g. see Powell 1999), the Bank of Canada actually operated a managed float. The episode in question took place during the tumultuous decade of the 1950s when Canada began to rely on an interest rate instrument, weathered a severe crisis in monetary policy over inflation and how best to control it (Siklos 2008), only to re-enter the Bretton Woods arrangement it helped create in the early 1960s (Muirhead 1999), following another exchange rate crisis, and the resignation of the governor of the Bank of Canada.

In spite of criticisms levelled at the Canadian government's decision to float the dollar in 1950 (see Helleiner 2006, p. 83), a remarkable feature of exchange rate behaviour during the 1951–7 period is the relative stability of the nominal exchange rate. This turn of events is all the more notable in view of the seemingly large shocks that hit the Canadian economy from the Korean War and a series of recessions, among other significant economic events that mark this era in Canadian economic history. Bordo, Dib and Schembri (2007), to my knowledge, is the only recent econometric study of Canada's experience with the float during the 1950s. The authors point out that the exchange rate remained perhaps 'too stable'. Bordo *et al.* examine the macroeconomic response to various fiscal and monetary shocks, but they assume that the float was of the pure variety. Archival evidence, to be described below, suggests that the Bank of Canada intervened in foreign exchange markets, at least during the 1951–7 period. Moreover, it is empirically demonstrated that interventions were effective not only in preventing further appreciations in the Canadian currency but also served to limit the volatility of the exchange rate vis-à-vis the US dollar. Previously, studies of Canada's experience with the float during the 1950s relied on official foreign exchange reserves holdings. To my knowledge, this article is the first to also use actual intervention data in the spot market to revisit behaviour of the Canadian dollar during the 1950s.

The rest of the article is organized as follows. In the following section I provide a brief historical background of macroeconomic policies during the 1950–62 era and a summary of the thinking inside the Bank of Canada about the implications of a float. A brief literature review of retrospective studies of the 1950s flexible exchange rate period published mainly during the late 1960s and early 1970s is considered in Section 3. Section 4 describes the available data, including the foreign exchange intervention series, and

provides some econometric evidence supportive of the managed floating hypothesis. Section 5 concludes.

2. The 1950s: a tumultuous decade

The dozen or so years beginning with the 1950s were eventful to say the least. The decade began with the Korean War in 1950, which effectively lasted until the middle of 1953. The beginning of the 1950s also brought about a boom in the resource sector that was described by Smith and Slater (1961) as 'extraordinary' and which lasted until 1957. '[A]bnormally large capital inflow(s)' (Smith and Slater 1961, p. 2) ensued, with consequences for imports, which rose, while exports remained sluggish. The loan conversion programme of 1958 wherein short-term Victory Loan bonds, used to finance of expenditures associated with World War II, were exchanged for longer-term government bonds (Bank of Canada 1959) is also a significant event. In addition, there were two recessions between 1952 and 1959. Lastly, the period covered in this study also consists of the last few years of Graham Towers' term as the first governor of the Bank of Canada, while the years 1955–61 are notable as James Coyne was governor of the Bank until he resigned in 1961.[1]

Turning to the exchange rate, shortly after the end of World War II, in July 1946, the Canadian dollar was revalued to parity against the US dollar, ostensibly to reduce inflationary pressures (Wonnacott 1960). This situation was not sustainable as, almost immediately, foreign exchange reserves began to fall rapidly. By 1949, the Canadian dollar was devalued to its wartime value of around 1.08 CAD to the US dollar (or 0.92 US cents to the Canadian dollar).[2] Until 14 December 1951, when exchange controls were lifted, the Foreign Exchange Control Board (FECB) was the institution charged with maintaining exchange rate stability. The Bank of Canada was heavily involved in the day-to-day operations of the FECB. Gibbons (1953) provides an extensive description of the operations of the FECB. Paralleling the FECB was an 'unofficial' market for Canadian dollars in New York, where non-residents could also trade in the currency (also see Avison 1940).

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[1] Space limitations prevent delving into the details here, but suffice it to say that Coyne's tenure was marked by major changes in the role and influence of the Bank of Canada (Siklos 2008). As governor, Coyne helped develop a liquid money market, pursued a more activist monetary policy, and was more aggressive and talkative in public than either his predecessor or, for that matter, his contemporaries at other central banks. Shortly after becoming governor, the bank rate became an instrument of monetary policy in 1954 when its level became linked to the yield on biweekly short-term Treasury bill auctions.

[2] Several other countries, including the UK, also devalued their currencies vis-à-vis the US dollar around the same time. Strong capital inflows were believed to be one of the proximate causes of the pressure to devalue. See, for example, Binhammer (1964) for the Canadian experience.

The decision to float in 1950 was announced as a temporary or transitional measure, both to reassure the public and because several key policymakers, including Graham Towers, governor of the Bank of Canada at the time, and Louis Rasminsky, who would also eventually head the central bank during the 1960s, were advocates of the Bretton Woods international monetary order (e.g. see Helleiner 2006, chapter 3). Helleiner (2006, pp. 75–91) provides a convincing account of the politics of the move to a float. He argues that the float was part of an attempt to 'depoliticize' the exchange rate (Helleiner 2006, p. 84), while senior officials, including Rasminsky, felt it was both politically as well as administratively impractical to maintain foreign exchange or capital controls.[3] This stands in sharp contrast with the situation in Europe at the time where capital controls were still in place. As stated in the original press release, dated 30 September 1950, announcing the float:

> Fluctuations in the basic rate will no doubt occur from time to time in accordance with changing conditions of supply and demand. After a short transitional period it is expected that reasonably stable conditions will develop in the exchange market. (Rasminsky 1952–5)[4]

Figure 1 helps set the stage for the analysis to follow. The left-hand-side scale plots the nominal exchange rate, defined here as CAD cents per US dollar, from the first quarter of 1949 until the second quarter of 1962, while the right-hand-side scale shows the available data for the level of official international reserves. The available data suggest a negative relationship between movements in the nominal exchange rate and levels in international reserves. This apparent correlation is more consistent with a managed float rather than a pure float. Intervention data are discussed later.

In a letter to then governor, Graham Towers, dated 2 October 1950, the minister of finance, D. C. Abbott, authorized intervention to bring the 'premium' down to at least 3 per cent. In advising the governor, the minister wrote: 'you must use your judgment as to the timing and extent of such sales' (Abbott 1950).[5] Bank officials clearly recognized that, in the absence

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[3] Of course, the devaluation contributed to creating the conditions for rising capital inflows. An appendix (not shown) plots the data from Powrie (1964). Powrie (1964) presents quarterly data on capital flows during the 1953–61 period and these show that, in 1956 and 1957, for example, capital flows surged to well over 100 million Canadian dollars, subsequently rising to nearly 200 million through 1961. Previously, inflows and outflows tended to fluctuate in a range of ±25–50 million.

[4] The purported transitional, or temporary, nature of the policy may partly explain why criticism of the float from abroad was relatively muted (Cornell 1951–5). Domestically, however, expectations that Canada would soon return to a pegged exchange rate were not shared. (Cornell 1951–5, LR 76–522, p. 23).

[5] The 'premium' refers to the percentage differential between the Canadian and US currencies. Hence, for example, if 0.96 CAD purchases 1.00 US the premium is approximately 4.2 per cent. Interestingly, the same concept of limiting exchange rate
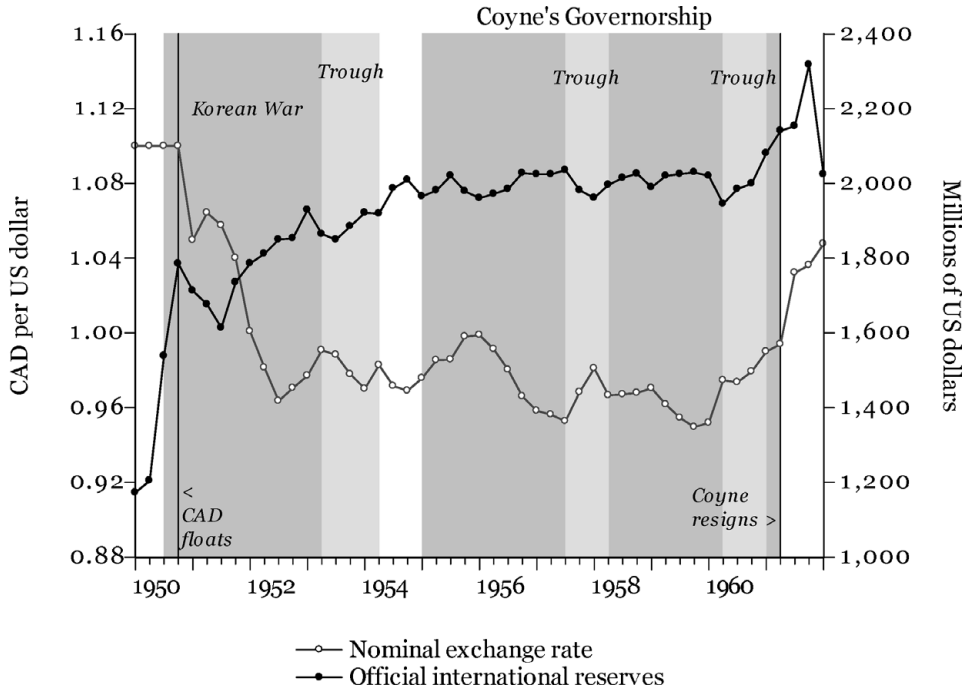
Figure 1.   *Nominal exchange rates and international reserves, 1950–62*

Note: Nominal exchange rate is the Canadian dollar price of 1 US dollar. Data from the Bank of Canada, CANSIM II series v37426, and *Banking and Monetary Statistics* (Washington, DC: Board of Governors of the Federal Reserve System, 1976), table 15.24. Data for 1950 is the 'official' exchange rate. International reserves are in millions of US dollars from CANSIM II series v122396.

of capital controls and a floating exchange, US and Canadian interest rates would be linked via current and expected exchange rate changes.[6]

The period after 1957 marks a dramatic change in the Bank of Canada's monetary policy. The Bank begins to tighten monetary policy even in what, in retrospect, appears to be a recession. This leads to an appreciation of the dollar, followed by a depreciation, as monetary policy eventually begins to loosen. The result also shows up as a sharp depreciation of the dollar until Canada goes back to the pegged exchange rate at 1.08 CAD to the

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fluctuations resurfaces in the 1961 budget when the finance minister publicly announced the government's intention to move the dollar, this time to some unspecified discount vis-à-vis the US dollar (see Yeager 1976, p. 556; Wonnacott 1965, pp. 201, 259).

[6] In a historical study that compared US–Canada interest rate differentials, Bouey and Starrs (1963) clearly made the relevant connection. 'It is recognized, of course, that the effect of the differential on the volume of foreign-pay borrowing may at any given time be influenced by the combination of the current level of the exchange rate and expectations regarding future movements of the exchange rate' (ibid., p. 3).

US dollar (or 92.5 US cents to the Canadian dollar) in May 1962 (not shown in Figure 1). 'There seems to be general agreement that removal of the premium on the Canadian dollar would be desirable ...' (Coyne 1961, JEC 94–7, vol. 1, p. 1). This suggests that, beginning around 1958, market forces were generating an exchange rate that was deemed more acceptable in the opinion of the Bank (and the government). Indeed, it is only by early 1962 that 'the decision was made to support the Canadian dollar ...' (ibid., p. 253) According to the available archival evidence, the Bank of Canada does not appear to actively intervene in the foreign exchange market after 1957 until shortly before Canada returns to the Bretton Woods fold. This is also confirmed by a confidential memo, dated 2 June 1961 and, presumably, written by Coyne that suggests government inaction on several fronts, including exchange rate policy.[7] Indeed, the period 1958–61 is one of intense controversy with accusations, in both the academic literature and in the press, of Bank of Canada incompetence, inappropriate government meddling in the affairs of monetary policy, or both. Siklos (2008, also see references therein), Bordo *et al.* (2007) and Helleiner (2006) revisit this era in Canadian economic history and there is some consensus that the years 1958–62 are significantly different from the years that preceded this period.[8]

What is unclear is the extent to which the Bank understood the distinction between sterilized and non-sterilized interventions. Cornell (1951–5, pp. 3–4), for example, suggests potential difficulties in achieving complete sterilization even though the Bank resorted to changes in the primary reserve requirement for the banking system, as well as introducing a secondary reserve requirement forcing the banks to hold short-term Treasury bills. There is no explicit discussion of the sterilization question in any archival documents examined, nor in any of the Bank of Canada's Annual Reports.

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[7] Memoranda, papers and many other documents at the time do not always indicate authorship. When authorship can be established, the author's name is cited along with the archival source. Otherwise the 'author' is listed according to the location of the document (e.g. either Rasminsky's or Coyne's papers).

[8] McKinnon and Oates (1966, p. 60n) argue that: 'Virtually all of the students of Canada's history with a flexible exchange rate conclude that the difficulties of 1958–1962 were not the fault of the system, but instead grew out of a series of unfortunate or perhaps disastrous policy decisions in Ottawa.' The culprit may well have been a misunderstanding of the role of monetary policy under a flexible exchange rate which was likely one of the catalysts for Mundell's (1961) seminal contribution (see, however, below). Other factors no doubt include the decision to float the central bank's lending rate as this created the opportunity for 'hot' money to flow into Canada (e.g. Plumptre 1970). Also, elections in 1957 and 1958, and the end of the resource boom following the end of the Korean War, also likely contributed to a creating significantly different economic conditions (e.g. see Binhammer 1964).

3. Exchange rate policy and foreign exchange market intervention in Canada

3.1. *The Bank of Canada's view*

How did the Bank of Canada interpret exchange rate policy and, in particular, the concept of a floating exchange rate? As early as 1949 the Bank was contemplating life without exchange controls and a floating exchange rate.[9] Indeed, Coyne (1949, LR 76–115-13–1), then deputy-governor, wrote a secret memo outlining how a flexible exchange rate might insulate the Canadian economy from the impact of, say, a US recession.[10] He goes on to point out that, unlike a fixed exchange rate system, a devaluation is announced by policymakers. Setting aside the political dimension of such a decision, an aspect considered by Coyne but not explored in any detail, he also adds that: 'It will be very difficult, however, for the authorities in charge of a fixed rate to recognize the appropriate time for such a move' (Coyne 1949, LR 76–115-13–1). Coyne envisages an exchange rate system whereby it 'would be undesirable for the authorities to take any great degree of responsibility for the movement of the exchange rate' (Coyne 1949, LR 76–115-13–4). However, neither Coyne nor other Bank officials interpreted a floating exchange rate as tantamount to complete laissez-faire in foreign exchange markets. He adds: 'Bank of Canada action could be determined solely by the view taken of the desirable level of reserves which should be maintained' (Coyne 1949, LR 76–115-13–4). Several archival documents, written especially through the mid 1950s, allude to the necessity of permitting the exchange rate to freely fluctuate so long as it is constrained to vary within a band or within some tolerance limits (e.g. Rasminsky 1946–51).[11] It seems clear that the exchange rate system as envisaged by Coyne broadly resembles what would eventually be called the target zone exchange rate system proposed by Krugman (1991).

 Figure 2 plots the nominal exchange rate, the bank rate, and Bank of Canada interventions in the spot market for the 1951–7 period when

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[9] It is often alleged that Friedman played an important role in persuading Canadian policymakers to adopt a floating regime. Helleiner (2006, p. 94) argues that Friedman overstates his influence. Nothing in the archival documents surrounding the events around the 1950 decision to float the dollar suggests any significant influence from Friedman's views.

[10] In modern parlance we would say from foreign 'shocks'. Of course, this kind of terminology was not in use at the time. Helleiner (2006, p. 85) traces the memorandum to January 1949 but cannot confirm attribution. The version cited here, identical to the dated but unauthorized version, is written by Coyne but has no date. For convenience, I use the 1949 publication date.

[11] The 1949 memo written by Coyne refers to tolerance limits of approximately $\pm 1/4\%$.
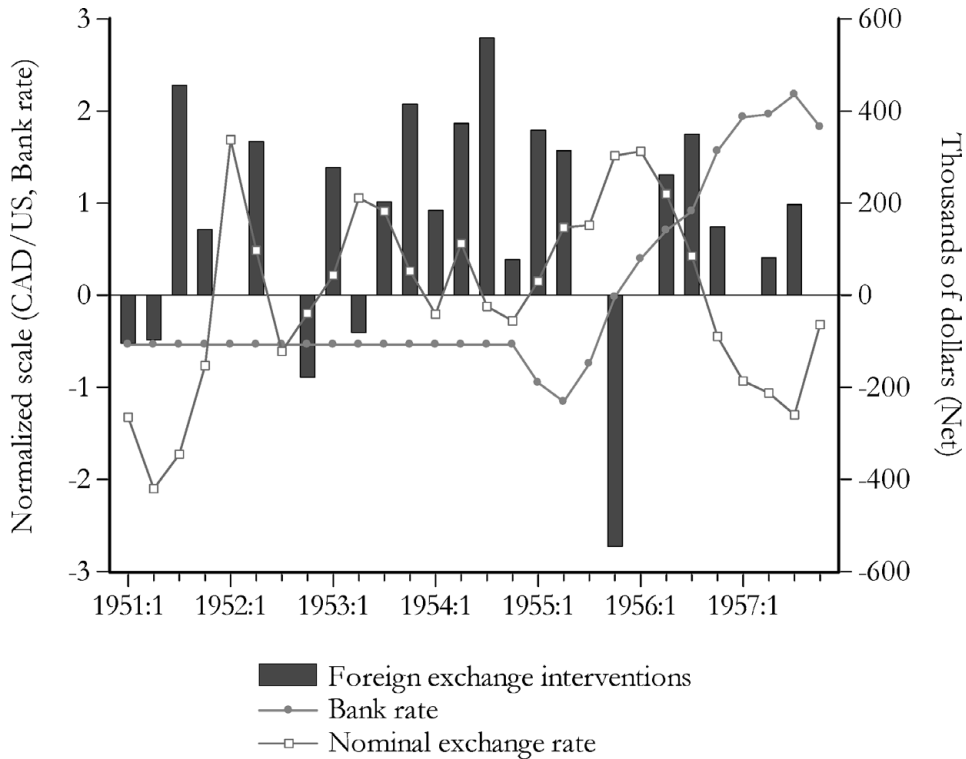
Figure 2.   *Foreign exchange intervention, 1951–7*

Note: Intervention data collected from Bank of Canada archives. The data were converted to the quarterly frequency via averaging. An identical plot, which shows the actual days when the Bank of Canada intervened, is relegated to an appendix (not shown). Net means purchases (+) less sales (−) of US dollars. Data are in thousands of US dollars. See Figure 1 for definition and source of nominal exchange rate. Bank rate is from CANSIMII series v39078.

the central bank actively bought and sold US dollars.[12] Foreign exchange interventions, measured in thousands of US dollars, are persistent and are, more often than not, positive, which means that the Bank was typically a net buyer of US dollars. Hence, on the whole, pressure on the Canadian dollar was in the direction of appreciation which intervention was seeking to offset through an increase in the supply of Canadian dollars, a clear sign of 'leaning against the wind'.

[12] The behaviour of US−Canada interest rate differentials during this period is discussed later. Policymakers may also have been led to believe that a floating exchange rate would be stable because of the experience with the float in the period 1914–39 (Cornell (Rasminsky 1952–5, p. 5)). In spite of the apparent stability of the exchange rate during the 1950s, Mussa (1986) reports that exchange rate volatility during the 1950 Q1 − 1961 Q2 period was significantly higher than during the Bretton Woods pegged regime of 1961 Q3 − 1970 Q1.

3.2. *Previous interpretations of Bank of Canada exchange rate policy in the 1950s*

The relevant literature can be divided into two parts: studies that are primarily interested in the macroeconomic effects (i.e. on output, the unemployment rate, the balance of payments, etc.) of a floating exchange rate system while a separate literature essentially focuses on the role of intervention versus speculation in foreign exchange markets as an explanation for the low level of volatility in the Canadian dollar under the float. In what follows, the focus will be on the second strand of the literature. Canada's experience during the 1950s may well have been the inspiration for advocates of the float, and their belief in its stabilizing effects on the nominal exchange rate (Friedman 1953; Johnson 1970). Consequently, there is an extensive literature on the subject and what follows represents only a highly selective survey.

Bordo *et al.* (2007) dismiss foreign exchange intervention during this period as being inconsequential. They also claim that the literature 'has concluded that official intervention did not play a significant role in stabilizing the nominal exchange rate'. They justify their conclusion in part on the grounds that intervention amounts were relatively small. The effectiveness of foreign exchange intervention, however, is not only a function of its size but also stems from its ability to influence expectations or in prompting agents to engage in portfolio reallocation. This explains, in part, the continued reliance to this day on intervention in foreign exchange markets even though capital mobility is high, transactions costs are low, and purchases or sales of foreign exchange by central banks are likely proportionately even smaller in size relative to the volume of transactions in foreign exchange markets (see Sarno and Taylor 2001) than in the 1950s. Bordo *et al.* (2007) also contend that the floating exchange rate helped induce stability in key macro variables and that policymakers did not understand how monetary policy performs under a floating exchange rate with a high degree of capital mobility. They reach this conclusion based on a series of counterfactuals based on a New Keynesian type model. Their model is entirely forward-looking, a feature that is neither discussed nor defended. While there is little doubt that monetary policy was, to a limited extent, forward-looking, it could not have been entirely far-sighted. Moreover, their interpretation about the level of understanding of the implications of a monetary policy under a float is questionable, although policy mistakes were clearly made.[13]

Earlier studies of Canadian exchange rate policy in the 1950s consider whether speculation could explain the stability of the exchange rate. Other

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[13] According to Siklos (2008), policy errors were likely made after 1957 and, hence, have no direct bearing on the results of this article.

than perhaps McLeod (1965),[14] the literature finds that speculators either did contribute to stabilizing the exchange rate, or that it is difficult to find evidence that speculation had the potential to destabilize the currency. Studies in this vein include Ingram (1960), Powrie (1964), Poole (1967) and Arndt (1968).

Turning to studies that explore the impact of intervention by the Bank of Canada in foreign exchange markets, the practice has usually been to rely on data on official foreign exchange reserves data, either at the monthly or quarterly frequencies. Importance was also attached to the 'psychological' role of the exchange rate at parity with the US dollar. Indeed, the usual reference to the 'premium' or 'discount' of the Canadian dollar vis-à-vis its US counterpart is symbolic of the importance that markets and policymakers apparently placed on a par value with the US currency (e.g. also see Wonnacott 1960, p. 95). As a result, several authors made a distinction between interventions meant to ensure that the exchange rate wandered around some 'normal' rate[15] as opposed to interventions whose objective was to limit exchange rate volatility. While there was a lively debate about whether the government or the Bank of Canada could influence 'trends' in the nominal exchange rate (e.g. see Eastman and Stykolt 1956), there seems to be more of a consensus that foreign exchange intervention could contribute to reducing the volatility in the nominal exchange rate (e.g. Pippenger 1967; Mellish and Hawkins 1968; Pippenger and Phillips 1973).[16]

To summarize, there is no universal agreement on the impact of foreign exchange intervention during the 1950s. Yeager (1976) and Wonnacott (1965), for example, conclude that intervention was ineffective only in the sense of not permanently influencing exchange rate levels. There is, instead, greater agreement that intervention accomplished its principal aim of limiting exchange rate variability. What is particularly striking, however, is that the existing literature does not resort to any intervention data, relying instead on proxies or indirect evidence of its impact on the exchange rate. The next section presents evidence which overcomes this deficiency.

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[14] Meltzer (1967) describes McLeod (1965) as 'a polemic, couched in the language of economic analysis' (p. 96). He goes on to add that 'the crude data in his Appendix give no support to the assertions that speculators have a destabilizing effect' (p. 97).

[15] Eastman and Stykolt (1956, p. 221) defines the 'normal' rate as follows: 'the rate that would prevail during the normal period in the absence of fluctuations caused solely by the accident of timing of transactions, and by transactions induced by these fluctuations. That period is normal for which buyers and sellers of exchange forecast the rate.'

[16] Mellish and Hawkins (1961) is a pamphlet divided into two sections. Mellish concludes that intervention was a stabilizing force, at least until 1961. Hawkins argues that the coincidence of US and Canadian business cycles helps explain nominal exchange rate stability. This argument is rejected by, among others, Penner (1969) and does not appear consistent with the results in Bordo *et al.* (2007), or Siklos (2008).

4. Foreign exchange intervention in Canada, 1951–7: data and empirical results

4.1. Data and stylized facts about intervention

Data used in the empirical analysis below are sampled at the daily, weekly and quarterly frequencies. Daily exchange rate data, defined as the Canadian dollar price of one US dollar were obtained from the Bank of Canada. Interest rate data in the form of the yield on 90-day Treasury bills are available at the weekly frequency beginning on 29 January 1953.[17] The bank rate, which represents the penalty rate charged on loans made to so-called chartered banks, is also available at the weekly frequency.

Although there are suggestions that select foreign exchange reserve data are also available at a sampling frequency higher than the monthly frequency, I could find no such time series.[18] Therefore, a weekly time series is also constructed by simply assuming that the average level of reserves is constant within the month.[19] Intervention data were obtained from the Bank of Canada Archives.[20] Readers are asked to consult, for example, Wonnacott (1965) for detailed explanations concerning the operations of the Exchange Fund Account managed by the Bank of Canada acting on behalf of the government to implement foreign exchange interventions. Table 1 provides summary statistics about the frequency and intensity of interventions. Column (1) reveals that interventions occurred infrequently while the intensity of interventions, proxied here as the ratio of interventions to the stock of reserves, was small. However, this figure understates somewhat the effective size of interventions since, as shown in column (3), there were several days when the Bank of Canada simultaneously purchased and sold US dollars in the foreign exchange market. Recall that the purpose of the intervention regime was to ensure that the premium or discount vis-à-vis the US dollar remained within some (unspecified) range.

Although a market for forward exchange existed at the time, I was unable to construct a consistent time series.[21] Forward transactions were usually arranged between chartered banks and their customers. Instead, I rely on

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[17] Prior to that date the T-bill auction was held biweekly. For details about developments and other institutional aspects of Canada's financial system during the 1950s, see, for example, McIvor (1958), and Neufeld (1972).

[18] Correspondence with the Bank of Canada, as well as archival research, confirms this to be correct. However, Davutyan and Pippenger (1989) claim using daily estimates of official international reserves.

[19] Alternative conversions from the monthly to the weekly frequency did not change any of the conclusions discussed below.

[20] Additional information from the same source was found for the year 1957 showing, at irregular daily intervals, changes in the Ministry of Finance's and the Bank of Canada's positions in the spot market. As it is unclear whether this was the result of active intervention in the foreign exchange market, these data were not used.

[21] As is well known, forward exchange rates forecast future spot rates quite poorly.

Table 1. *The frequency and intensity of foreign exchange intervention:*
summary statistics

Year	(1) Number of days	(2) Intensity	(3) Simultaneous activity
1951	15	.08 (.03)	2
1952	9	.02 (.02)	2
1953	15	.01 (.02)	3
1954	21	.02 (.03)	3
1955	31	.01 (.05)	9
1956	12	.01 (.02)	1
1957	3	.03 (.01)	0

Note: Column (1) indicates the total number of days in a particular year the Bank of Canada intervened in the foreign exchange market. Column (2) is the average size of interventions (in US dollars) during the calendar year, as a percentage of the stock of foreign exchange reserves (also in US dollars). The standard deviation is in parenthesis. Figures are rounded up to the nearest decimal. Column (3) shows the total number of days in a particular year where the Bank of Canada both purchased and sold US dollars in the foreign exchange market on the same day.

the US−Canada interest rate differential since capital was highly mobile between the two countries. The short-term interest rate in Canada begins to exceed the comparable US rate around the end of 1953 until essentially the end of the sample period considered. Similarly, the discount rates in both countries show, with few exceptions, Canadian rates as having exceeded the US rate throughout the period (not shown).[22] There is no apparent correlation between changes in official reserves and the Canada−US interest rate differential. In contrast, intervention reached its most intense level the wider the gap between US and Canadian interest rates.

4.2. Empirical evidence on intervention and the exchange rate

Figure 3 assumes that the Bank of Canada adopted a target zone policy to limit exchange rate movements. Relying on the simple method suggested by Svensson (1992), we can estimate an expected rate of appreciation assuming interest rate parity holds. Under this scenario, the expected rate of appreciation is determined by the interest rate differential between the two countries' nominal interest rates. Alternatively, since an expected exchange rate series is not available, we can instead use the actual exchange rate one quarter ahead to obtain an estimate of the expected rate of appreciation. The resulting estimates are then compared to estimates that arbitrarily assume

[22] Data available beginning in 1953 also show that Canadian long-term interest rates exceeded US long-term rates by a sizeable margin (on average 55 basis points with a standard deviation of 24 basis points over the period 1953–7). The relevant data are plotted in an appendix (not shown). Also, see Siklos (2008).
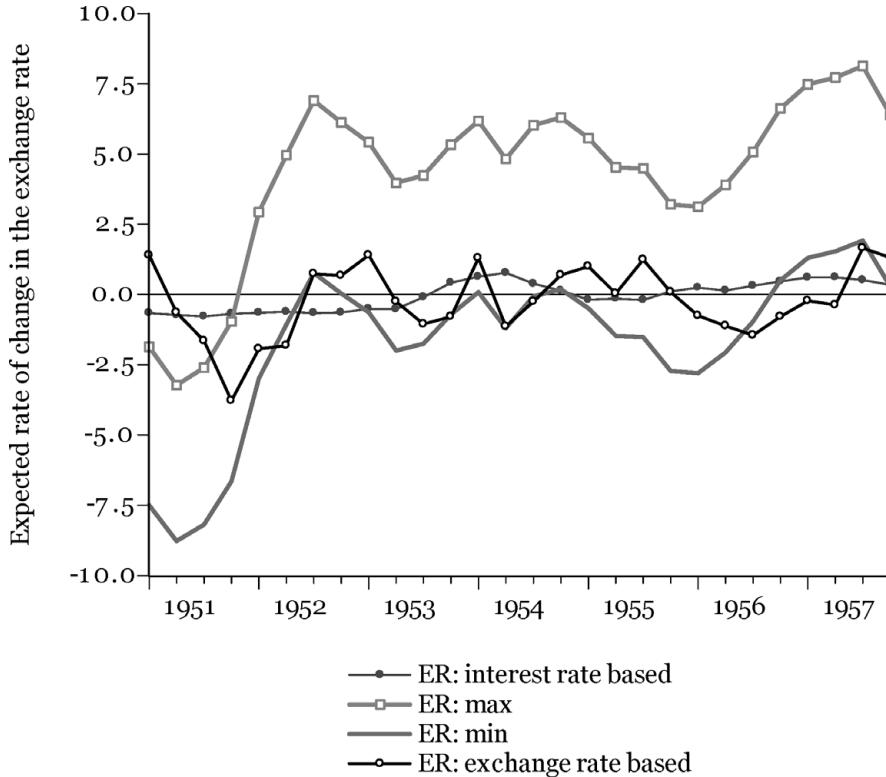
Figure 3. *Expected rates of depreciation*

Note: ER is the expected rate of appreciation (−)/ depreciation (+) under different scenarios evaluated as $d_t = ({_t e_{t+1}}/e_t) - 1$, $[(1 + i_t)/(1 + i_t^*)] - 1$, where e is the nominal exchange rate (CAD/US), and i, i^* are, respectively, domestic and foreign nominal interest rates. To obtain the *max* and *min* values it was assumed that the Bank of Canada adopted a ±3% target zone exchange rate corridor.

a ±3% fluctuation band at the quarterly frequency. This assumption seems reasonable based on the archival documents previously cited. The plot is striking for the data suggest not only that exchange rate appreciations were, for the most part, close to the hypothesized lower bound but that the regime was also largely a credible one. This represents a little bit of evidence that may help to explain the relative stability of the exchange rate in the 1951–7 period.

This apparent asymmetry in the intervention practices of the Bank of Canada, that is, the tendency to lean against an appreciation of the Canadian dollar, is also apparent from Table 2 which estimates, for daily data, a version of a simple intervention model that links intervention to exchange rate movements and a decision rule used by the central bank to limit the size of appreciations or depreciations in the exchange rate (e.g. also see Murray

Table 2. *Intervention model*

Dependent variable: net purchases (+)/sales (−) of US dollars
Sample: daily, 2 January 1951 – 31 December 1957

Independent variables	Coefficient	(t-values)	[p-value]
Constant	0.13	(3.65)	[.00]
Δe	−3.50	(−8.43)	[.00]
D^{MAX}	0.18	(0.68)	[.50]
D^{MIN}	−0.48	(−1.87)	[.06]
Summary statistics			
$\overline{R}^2$	.053		
F	35.20 (.00)		
Observations	1826		

Note: Intervention data in millions of US dollars, Δe is 100 times the log first difference of the nominal exchange rate (CAD per US dollar). D^{MAX} and D^{MIN} are the intervention ranges referred to in the text (see n. 14). The equation was estimated via least squares.

et al. 1997). The basic specification is written

$$INT_t = \beta_0 + \beta_1 \Delta e_t + \beta_2 D_t^{MAX} + \beta_3 D_t^{MIN} + \varepsilon_t \qquad (2)$$

where INT_t represents either net purchases (+) or sales of US dollars (−), Δe is the rate of change in the exchange rate, and D^{MAX} and D^{MIN} are two dummy variables equal to one when changes in the nominal exchange rate exceed some unannounced intervention threshold of $+\frac{1}{4}\%$ on a daily basis.[23] The constant term is positive, and statistically significant, an indication that, on average, the Bank of Canada was purchasing US dollars, and this is consistent with the summary statistics in Table 1, and the evidence presented in Figure 2. The slope coefficient estimates for β_1 reveal that, on average, an appreciating dollar (i.e., $\Delta e_t < 0$) led to net purchases of US dollars. Note, however, that this effect is enhanced when nominal exchanges rate changes exceed the lower (hypothetical) intervention limit (i.e. $\hat{\beta}_3$ is statistically significant while $\hat{\beta}_2$ is not) thereby providing some empirical evidence of the asymmetric intervention phenomenon described earlier. The evidence, so far, points to a fear of appreciation on the part of policymakers and, hence, to a managed float as opposed to a pure float.[24]

[23] The choice of intervention bounds, while not entirely arbitrary (see the discussion in Section 3.1), cannot be precisely established based on internal documents consulted at the Bank of Canada, as discussed previously.

[24] The results based on equation (2) are meant to be illustrative for at least two reasons. First, the specification ignores the role of volatility as a possible additional objective of the managed floating regime (see, however, below). Second, there exists the possibility that the relationship between INT and Δe is an endogenous one. Although an instrumental variables approach could be used there is the usual problem, exacerbated at the daily frequency, of finding adequate instruments. Two stage least squares estimates of (2) with

4.3. *Intervention and exchange rate volatility*

Intervention is intended not only to possibly influence exchange rate levels but, perhaps equally important, may contribute to moderating exchange rate volatility. Therefore, Table 3 presents estimates of various conditional volatility models, again at the daily frequency. As several preliminary estimates of the workhorse GARCH (1, 1) model for all the samples considered yielded estimates of the ARCH and GARCH terms that were not statistically different from one, all the estimates shown are based on an IGARCH (1, 1) model.[25] The mean portion of the equation yields, after some experimentation, an AR(2) model. Hence, an AR(2) – IGARCH(1, 1) model appears to best describe the 1950s data. Column (1) adds the intervention series (in absolute value) in both the mean and variance equations thereby permitting intervention to influence both moments.

Column (2) is the same specification as in column (1) except that I now add a news variable. Since the nominal exchange rate might also react to verbal announcements, and not simply to actual interventions in the foreign exchange market, I compiled a series of news dummy variables. Two sets of dummies were constructed from a search of the *Globe and Mail* newspaper from 1951 until the end of 1961.[26] Using the keywords 'exchange rate' or 'monetary policy', both the front-page headlines and the op ed pages were searched for relevant articles that commented either on the state of the exchange rate or the perceived stance of monetary policy. For example, a headline on the front page of the 13 March 1952 *Globe and Mail* announces 'Canadian dollar highest since '30s', while an op ed column on 22 February 1954, entitled 'The problem is economic', argues that economic problems faced in Canada are not due to the relatively high value of the Canadian dollar but to other factors (e.g. taxes and duties). The 'exchange rate' and 'monetary policy' dummies were further disaggregated according to whether the news appeared on the front page or in the op ed sections of the *Globe and Mail*. A total of 52 exchange rate and monetary policy announcements were identified. The variable that enters here consists of news items about the exchange rate (ER news) covered on the front page of the *Globe and Mail*. Other news effects variables previously described proved not to be significant when included in both the mean and variance equations (results not shown) while the ER news variable did not significantly

all the variables lagged one period (except the constant of course) did not change the conclusions (not shown). Ideally, dealing with the simultaneity problem requires that we know the intervention rule of the Bank of Canada beyond what has so far been hypothesized. Of course, this information is unobserved.

[25] The GARCH (1, 1) model remains perhaps the most popular conditional volatility model in the finance literature. See, for example, Enders (2004, chapter 3).

[26] When a headline or op ed column is published on a weekend or a holiday the dummy is set to one on the following weekday.

Table 3. *AR(2) – IGARCH (1, 1) Estimates for three exchange rate regimes*

Dependent variable: 100 times log difference of the Nominal Exchange Rate
Sample: daily, various samples
Coefficient estimates: (t-value, p-value)

	(1) 4 Jan 1951 – 31 Dec 1952	(2) 4 Jan 1951 – 31 Dec 1957	(3) 5 Jan 1989 – 29 Dec 1995	(4) 6 Jan 2000 – 29 Dec 2006
Mean equation				
Constant	−0.005 (−3.52, .00)	−0.005 (−3.30, .00)	−0.011 (−1.78, .08)	−0.01 (−0.58, .56)
INT_t	−0.004 (−2.54, .01)	−0.004 (−2.58, .01)	0.034 (0.77, .44)	N/A
ER news	–	−0.70 (−3.94, .00)	–	–
AR (1)	0.16 (6.61, .00)	0.16 (6.58, .00)	0.02 (0.77, .44)	0.01 (0.52, 0.60)
AR (2)	−0.06 (−2.40, .02)	−0.05 (−2.34, .02)	−0.04 (−1.48, .14)	−0.03 (−1.06, .29)
Variance equation				
ARCH	0.173 (15.94, .00)	0.17 (16.09, .00)	0.09 (7.05, .00)	0.03 (5.16, .00)
GARCH	0.827 (76.21, .00)	0.83 (76.05, .00)	0.91 (71.73, .00)	0.97 (187.71, .00)
INT_t	0.001 (4.64, .00)	0.001 (4.66, .00)	0.01 (2.60, .01)	N/A
Summary equation				
$\bar{R}^2$	0.035	0.037	0.0002	0.0005
F	11.94 (.00)	11.12 (.00)	0.056 (.99)	–
Observations	1824	1824	1822	1822

Note: Estimated via maximum likelihood assuming student's t-distribution.

influence conditional volatilities. The results indicate a moderate amount of persistence in exchange rate changes (viz. as seen from the AR (1) and AR (2) coefficients) while the sign of Δe indicates, as noted earlier, a tendency for the pressure on the exchange rate to appreciate. As before, interventions in both the mean and variance equations are statistically significant. However, it is noteworthy that intervention contributes to raising volatility and this may partly explain the decision to effectively cease intervention in foreign exchange markets until the early 1960s in anticipation of the return to Bretton Woods. Indeed, if we consider two other notable episodes in Canadian monetary history, namely the intervention era of the early 1990s (see Murray *et al.* 1997), and the 'pure' float since just before the adoption of inflation targets (in 2001), we see some striking parallels as well as differences. Columns (3) and (4) of Table 3 estimate AR(2)-IGARCH(1, 1) models for the 1989–95 and 2000–6 periods. The former sample includes an intervention variable[27] in both the mean and variance equations while no such variable is relevant for the 2000–6 sample.[28] Consistent with the views of the Bank of Canada, intervention was not only meant to temper appreciations in the currency but it also influenced its volatility. Instead, intervention actually increased exchange rate volatility and this feature of the data[29] may partly explain the decision to abandon foreign exchange intervention, except in extreme situations. Nevertheless, it is also the case that exchange rate changes behave as a random walk in both samples considered,[30] unlike the 1950s era. Presumably, the growing sophistication and global nature of foreign exchange trading is partly responsible for this outcome. Nevertheless, the fact that the exchange rate does not behave as a martingale during the 1950s is consistent with the notion that exchange rate movements contain some structure, and this can only be yet another indication of a form of 'leaning against the wind'.[31]

Finally, Figure 4 plots, on a normalized scale, the conditional volatilities of the three samples considered. It is clear that the era of the 'pure' float yields by far the highest volatility estimates while the two eras of foreign exchange intervention yield conditional volatilities that are more alike. Nevertheless, the conditional volatilities for the 1950s remain relatively low. Therefore, the

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[27] Data on intervention in the spot market was originally obtained from John Murray at the Bank of Canada. Michael King sent an update of the daily information data. I am grateful to both for their help.

[28] The Bank of Canada intervened in 2000 but not in the spot exchange market. Rather there was a coordinated intervention with the US Fed, the European Central Bank and the Bank of England.

[29] Although the Bank of Canada may have failed to reduce exchange rate volatility it may have succeeded in reducing uncertainty about exchange rate movements. See Rogers and Siklos (2003).

[30] A variety of ARIMA models for the mean equation were estimated and none of the estimated parameters were statistically significant (results not shown).

[31] Davutyan and Pippenger (1989) reach a similar conclusion using official reserves data.
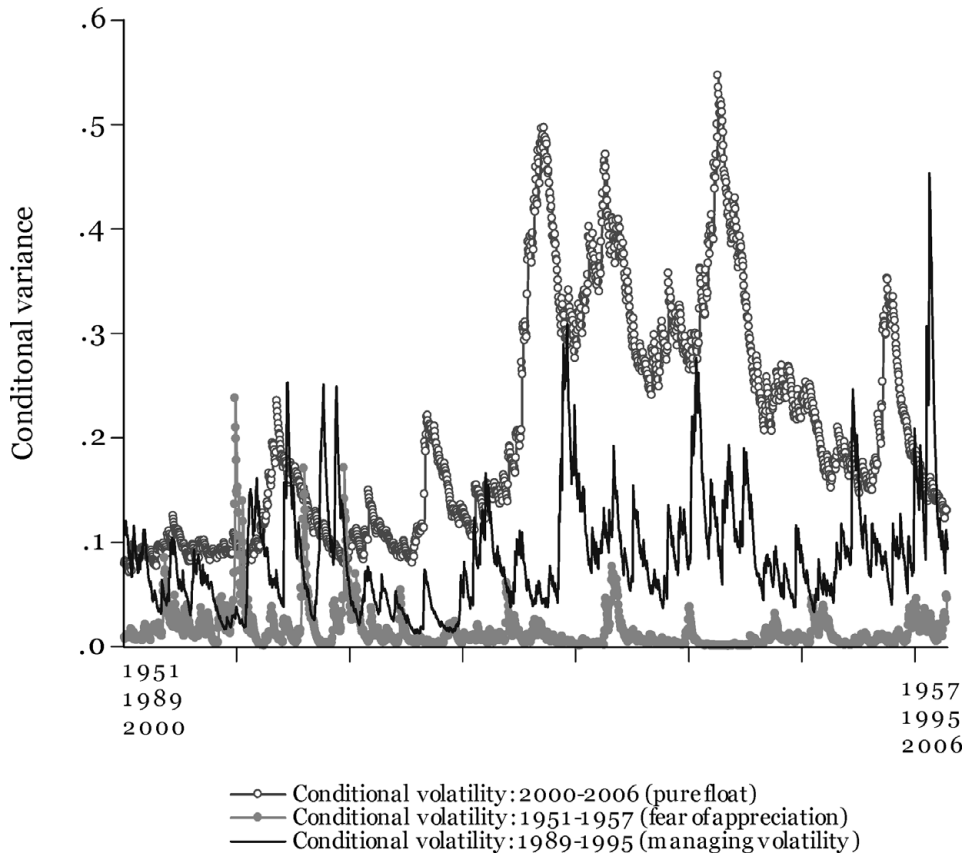
Figure 4.   *Conditional volatility estimates under three different foreign exchange regimes*

Note: Conditional variances from an AR(2) – IGARCH (1, 1) estimated for the three samples shown. Data are daily and samples (1951–7, 2000–6, 1989–95) overlap as shown on the horizontal axis.

managed float induced a more stable exchange rate than either a pure float or a policy meant to mitigate exchange rate volatility alone.

4.4. A counterfactual experiment

Since the economy of the 1980s and the 2000s are clearly different from the environment facing policymakers during the 1950s, an alternative approach consists in devising a counterfactual experiment that asks what the behavior of the exchange rate in the 1951–7 period would look like if there had been a pure float. We know that, between 1958 and 1961, the Bank of Canada and the Ministry of Finance took a 'hands off' approach in the foreign exchange market. Indeed, the run-up in the exchange rate after 1958 is

Table 4. *Counterfactual experiment: What if the Canadian dollar floated in 1951–7?*

	Pure float 1 Jan 1958 – 29 Dec 1961	Fear of floating 5 Jan 1951 – 29 Dec 1957
Mean equation		
Constant	−0.003 (−1.145, .25)	−0.003
AR(1)	0.056 (1.819, .07)	0.056
INT_t	N/A	−0.0002 (−0.143, .89)
Conditional volatility		
Constant	−0.458 (−5.942, .00)	−0.458
$\lvert \varepsilon_t \rvert \sqrt{\sigma_{t-1}^2}$	0.374 (8.527, .00)	0.374
$\ln \sigma_{t-1}^2$	0.957 (73.938, .00)	0.957
INT_t	N/A	0.067 (6.055, .00)

Note: Also, see notes to Table 3. The model here is an AR(1)-EGARCH(1,1). In the fear of floating sample the mean and conditional variance coefficients, except for INT, were constrained to be the same as in the pure float sample. This is why there are no standard errors next to the conditional variance terms in the second column, with the exception of the INT variable whose impact, of course, must be estimated.

clearly visible in Figure 1. We can, therefore, presume that this period was indeed consistent with the textbook floating exchange rate regime. Table 4 reports estimates of an AR(1)-EGARCH(1,1) model which appears to best describe the mean and conditional volatility of the exchange rate during the 1958–61 period.[32] Column (1) shows that the exchange rate was considerably less persistent during this period than in the 1951–7 fear of floating period discussed above. This, by itself, is suggestive of evidence of a more managed float in the earlier sample. The asymmetry term (the second coefficient in the variance equation) is highly significant which reflects the impact of the sharp downward movement in the exchange rate level during this period (see Figure 1). The counterfactual experiment consists in asking what the impact of foreign exchange intervention would have been if the model and coefficients estimated for the 1958–61 sample also describe the evolution of the exchange rate, and its volatility, in the period of interest, that is, for the 1951–7 period. As shown in column (2) of Table 4 we find that intervention would have not affected the mean equation while conditional volatility would have increased precisely, as one would expect if intervention is unexpected as is the case under a pure float. Hence, we have still more evidence that the 1951–7 period is not of the pure float variety but comes closest to a managed floating exchange rate regime.

[32] News variables were not statistically significant when added to the mean and variance equations (results not shown). One isolated event, however, may have had a temporary impact on the conditional volatilities, namely when the Canadian dollar breached parity and fell below the US dollar on 29 December 1961. However, the inclusion of a one-time dummy was not robust to different specifications of the model and is, therefore, excluded.

5. Conclusions

The bulk of the evidence suggests that foreign exchange intervention during the 1950s had a significant influence on both the mean and conditional variance of exchange rate changes. Comparisons with later episodes of intervention and a 'pure' float also suggest that intervention during the 1950s was a significant factor in the relative stability of exchange rates during the 1950s. Unlike earlier studies of the era that rely on official foreign exchange reserves data, this article employs heretofore unused intervention data in the spot market during the 1951–7 period, to make the case that Canada operated under a managed float. A counterfactual experiment also reinforces the main contention of this study. This is not to say that intervention was the only 'story' of 1950s monetary policy. Nevertheless, it is clear, unlike the earlier literature which has tended to describe the 1950s in Canada as a floating exchange rate regime of the pure textbook variety, that a significant amount of 'fear of appreciation' contributed to explaining movements and the volatility of the Canadian dollar during the 1951–7 period.

In reflecting on the exchange rate policy of the government and the Bank of Canada during the 1950s, it is interesting to note that, just as the decision to float in 1950 was partly influenced by the favourable experience with a flexible exchange rate before World War II, the decision to adopt a managed float once again in 1970 was also prompted by the experience of the 1950s. Between 1970 and 1995, foreign exchange intervention occurred frequently, prompted by pressure on the exchange rate, and triggered once the Canadian dollar exceeded a narrow intervention band. However, as was the case in the 1950s, the timing of interventions, as well as the width of the non-intervention band, was kept secret from financial markets and the public (see Murray *et al.* 1997). Since that time the Bank of Canada has moved to a regime with more transparency and flexibility when, following the adoption of inflation targets in 1991, the Bank retained the right to intervene in foreign exchange markets but refrained from doing so, except on one occasion (Rogers and Siklos 2003).[33] A future return to a more actively managed exchange rate system, while unlikely, is not, however, out of the question.

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[33] This occurred in September 2000 when, along with the US, the UK and the ECB, the Bank intervened to support the fledgling euro currency. Also, see Fatum and King (2005).

Figures not shown in the main body of the article are available in a separate appendix. The data used in the article will also be made available at www.wlu.ca/sbe/psiklos

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