



Exchange rate volatility and its impact on domestic investment



Mohsen Bahmani-Oskooee^{a,*}, Massomeh Hajilee^{b,1}

^a University of Wisconsin-Milwaukee, 3210 N. Maryland Avenue, Milwaukee, WI 53211, United States

^b University of Houston-Victoria, United States

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ABSTRACT

The relationship between exchange rate uncertainty and domestic investment has attracted some attention in macro literature. Previous studies that investigated the relation concentrated on firm level data with mixed results. In this paper we argue that the relationship applies equally at the aggregate. We assess the short-run and long-run effects of exchange rate volatility on domestic investment in each of the 36 countries in our sample using time-series data. The application of the bounds testing approach indicates that exchange rate volatility has significant short-run effects on domestic investment in 27 countries. The short-run effects are translated into the long-run only in 12 countries.

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1. Introduction

Since the advent of current float in 1973, the literature on the impact of exchange rate volatility or exchange rate uncertainty on different macroeconomic variables including domestic investment has gained special attention. Theoretically, this relationship has been addressed in various ways and has resulted in a large body of literature with the conclusion that exchange rate uncertainty can have a positive or negative impact on the investment. Most studies argue that exchange rate volatility results in price volatility. Price volatility, in turn, could have positive or negative effects on domestic investment. Hartman (1972) and Able (1983, 1984, 1985) are examples of studies who argued that high price uncertainty might lead to higher levels of investment by competitive risk-neutral firms who try to invest more in order to avoid uncertainty in the future. In contrast, the introduction of the irreversible investment literature by Pindyck (1988) and Bertola (1998) shows that increased uncertainty slows down the investment process by risk-neutral firms. Pindyck (1991) extends his analysis and reaches the same conclusion which is based on the assumption that the cost of declining capital stock exceeds the adjustment cost in markets with imperfect information. The same is argued by Craine (1989) and Zeira (1989) who also try to explain the negative effect using two factors of risk aversion and incomplete markets.

In an effort to determine whether investors prefer to wait rather than to invest in the presence of uncertainty Dixit and Pindyck (1994) try to evaluate the option value of an investment project which is the value of waiting for investment. Using “a theory of optimal inertia”, they argue that, firms that refuse to invest when the current rate of return are far in excess of the cost of capital will be waiting. Darby et al. (1999) later develop a theoretical model based on Dixit and

* Corresponding author.

E-mail address: bahmani@uwm.edu (M. Bahmani-Oskooee).

¹ Mohsen Bahmani-Oskooee is a Wilmeth Professor and a Distinguished Professor at the University of Wisconsin-Milwaukee. Massomeh Hajilee is an Assistant Professor of Economics at the University of Houston-Victoria. They would like to thank two anonymous referees for valuable comments. The usual disclaimer applies.

Pindyck (1994). The theoretical model they develop tries to answer three related questions. First, the model introduces the threshold at which exchange rate uncertainty could have adverse effects on investment. Second, the model identifies conditions under which uncertainty actually reduces investment. Finally, the model also includes a measure of exchange rate misalignments and shows that in addition to exchange rate uncertainty, exchange rate misalignments can affect investment. Their model clearly identifies conditions under which exchange rate volatility could have negative or positive effects on domestic investment. The condition is basically reduced to opportunity cost of waiting versus the present value. If opportunity cost of waiting is lower than the present value or the scrapping price by firms, producers will be inclined to wait rather than to invest. On the other hand, the waiting effect may disappear if uncertainty is rather low. Although the theoretical model was developed at firm level, they test its predictions by estimating an aggregate investment function for France, Germany, Italy, U.K, and the U.S. for which the real cost of capital is constructed using the implicit business sector investment and output deflators and a long term interest rate. They find that indeed, suppressing volatility and exchange rate misalignment for all five countries will increase investment. The most powerful effects of misalignment occur in Italy and lesser effects are present in French, UK and US models. In the case of German model, no significant effects of misalignment could be identified. As for the effects of exchange rate volatility, they found that it has negative significant long-run impact in the United States, Germany and France with elasticities of -0.21 , -0.19 and -0.13 respectively, but only a temporary effect in the UK and Italy.

Sarkar (2000) uses the real option model of McDonald and Siegel (1986) and Dixit and Pindyck (1994) and shows the non-monotonic relationship between investment and uncertainty. To estimate the effect of uncertainty on investment, he employs the probability of achieving an optimal investment within a pre specified time. An increase in the probability measure with the volatility of the project, is inferred as a sign of a positive relationship between uncertainty–investment relationships. On the other hand, a decrease in the probability measure associated with the volatility of a project signifies a negative relationship between investment and uncertainty. Wong (2007) modifies the real options approach of Sarkar (2000) by using the effect of uncertainty on investment timing rather than on the probability measure. By looking at the effect of uncertainty on investment timing in a real option model, he shows that for relatively safe projects, greater uncertainty shortens the expected exercise time and thus increases the investment level in high growth projects. Note that this conclusion is different from the negative investment–uncertainty relationship mentioned above.

Given the above literature, we revisit the impact of exchange rate uncertainty on domestic investment by including a measure of exchange rate uncertainty in a standard investment function. By using recent advances in econometrics, we distinguish the short-run effects from the long-run effects. This is perhaps the most comprehensive study on the topic since the model is estimated for 36 countries. To that end, Section 2 introduces the model and the method. Section 3 reports the empirical results. Section 4 is dedicated for our concluding remarks and finally, data definition and sources appear in an Appendix.

2. The model and method

The investment function employed in this paper basically follows the literature and includes a measure of income, interest rate, and the exchange rate itself (e.g., Bahmani-Oskooee and Hajilee (2010)). We extend this basic model by adding a measure of exchange rate volatility as another determinant of domestic investment. Thus, a log-linear specification of the model takes the following form:

$$\ln I_{it} = \beta_0 + \beta_1 \ln Y_t + \beta_2 \ln r_t + \beta_3 \ln RE_t + \beta_4 \text{VAR}_t + \varepsilon_{i,t} \quad (1)$$

where I is the real domestic investment; Y is the real income, r is the nominal interest rate; RE is the real effective exchange rate, and VAR is a measure of variability of RE . It is expected that an estimate of β_1 to be positive. The main reason is that at a high level of income, investors become more optimistic about the future course of the economy and invest more. An estimate of β_2 is expected to be negative since an increase in the interest rate raises borrowing costs. Changes in the exchange rate could have a positive or negative impact on domestic investment. When Alexander (1952) introduced the absorption approach, he argued that since wages do not adjust fully to inflationary effects of currency depreciation, real income is shifted from workers to producers in the form of profit. Increased profit, in turn, could give incentive to producers to invest more. On the other hand, since depreciation raises the cost of imported inputs, profits could be hurt. Depending on which effect is stronger, domestic investment could be affected in either direction. Indeed, the empirical results provided by Bahmani-Oskooee and Hajilee (2010) showed that in some countries the effect is positive and in some, negative. As for the effects of exchange rate volatility, based on the arguments provided in the introductory section we would expect an estimate of β_4 to be negative or positive.²

Most studies that assess the impact of exchange rate volatility on macro variables argue the impact to be a short-run phenomenon. In an attempt to distinguish the short-run effects from the long-run effects, following the literature we re-write Eq. (1) in an error-correction modeling format. Pesaran et al. (2001) propose a method that yields the short-run and the long-run effects in one step. Following their approach of bounds testing, the error-correction representation takes

² Other studies that have assessed the effects of exchange rate changes on investment are: Campa and Goldberg (1995, 1999) and Blecker (2007).

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