Indian Journal of Finance and Economics
Vol. 3, No. 1, **2022** : pp. 91-102

URL : www.arfjournals.com
https://DOI: 10.47509 /IJFE.2022.v03i01.07

ARF INDIA
Academic Open Access Publishing
www. arfjournals. com

THE EFFECT OF EXCHANGE RATE UNCERTAINTY ON DOMESTIC INVESTMENT IN ETHIOPIA

Naser Yenus Nuru[1] and Hiluf Techane Gidey[1]

[1]*Adigrat University, Ethiopia. E-mail: nyenus23@gmail.com; hiluf450@gmail.com*

Received : 11 April 2022; Revised : 22 May 2022; Accepted : 30 May 2022; Published : 30 June 2022

Abstract: There is no yet clear theoretical and empirical consensus on the relationship between exchange rate uncertainty and domestic investment. The main purpose of this study, therefore, is to examine the effect of real effective exchange rate uncertainty on domestic investment for the Ethiopian economy over the sample period 1992Q1- 2016Q1. To address this objective, Jordà's (2005) local projection method is employed and generalized impulse response functions are generated in this study. The impulse response functions exhibit that one standard deviation shock in exchange rate uncertainty stimulates domestic investment for the Ethiopian economy. In response to one standard deviation shock in exchange rate uncertainty, domestic investment increases to around 4 percent at the second quarter. This may indicate the existence of risk neutral or insensitive domestic investors to exchange rate uncertainty in Ethiopia. As to the effects of other control variables, domestic investment also increases in response to real income and real effective exchange rate shocks. The effect of inflation shock on domestic investment is positive and statistically significant up to the eighth quarter, and negative and significant afterwards.

Keywords: domestic investment, exchange rate uncertainty, Ethiopia, local projection

1. INTRODUCTION

One of the major policy amendments made by various countries in the world economy is an abandonment of fixed exchange rates for floating exchange rate systems mainly after the end of Gold standard system in 1971. Afterwards, exchange rate uncertainty emanated from this policy becomes an alarming economic incidence (Ozcelebi, 2018). Exchange rate uncertainty, due to its strong connection to risk and uncertainty, grow as the grand source concern of macroeconomic issues and macroeconomic policymakers.

To cite this article:

Naser Yenus Nuru and Hiluf Techane Gidey, 2022; The Effect of Exchange Rate Uncertainty on Domestic Investment in Ethiopia. *Indian Journal of Finance and Economics*, Vol. 3, No. 1, pp. 91-102. https://DOI: 10.47509 /IJFE.2022.v03i01.07

The Ethiopian birr, under a fixed exchange rate regime in which the national or central bank has a responsibility to manage and announce the exchange rate policy, was pegged to a major currency commonly the US dollar) from its beginning in 1945 until the early 1990s. After the fall of Derg regime in 1992, the transitional government implemented an exchange rate policy which is more close to managed floating in which there is a government intervention whenever necessary to stabilize the foreign exchange market (Nega, 2015). According to the National Bank of Ethiopia (NBE), the exchange rate has no predetermined path and thus it is allowed to fluctuate from day to day, with authorities occasionally intervening in the foreign exchange market through buying and selling currencies (Haile, 2019).

Like most low income countries' exchange rate, Ethiopian exchange rate displayed uncertainties after the major policy reforms on exchange rate and liberalized international relations in 1992 (see Figure 1).

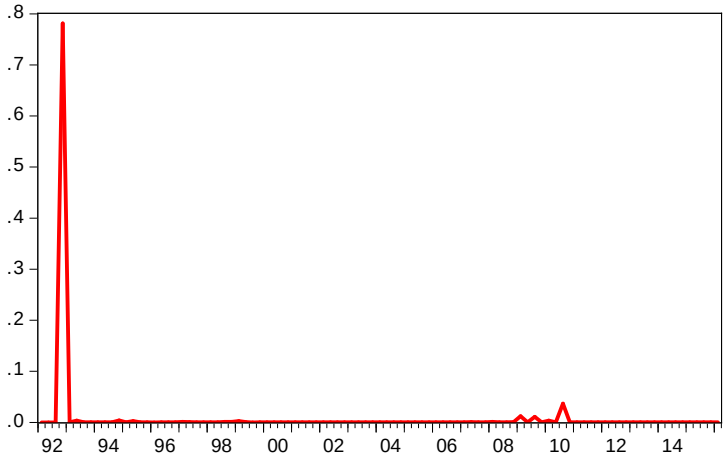

Figure 1: Ethiopia's real effective exchange rate uncertainty

The real exchange rate when managed carefully, however, can be a useful policy instrument to support the goals of structural change and export promotion. Volatility of exchange rate affects policymakers as well as investors (Aye *et al.*, 2015; Aye and Harris, 2019). Hence, volatility of Ethiopian exchange rate may affect growth instruments like trade balance and domestic investment of the country.

Although the effects of exchange rate uncertainty on the economic variables such as economic growth, trade, export, and foreign direct investment have been investigated broadly in the existing literature, the researches examining the impact of exchange rate uncertainty on the

domestic investment have been limited. The existing studies suggest mixed and inconclusive evidence on the relationship between uncertainty and investment. Hartman (1972) and Able (1983) argue that heightened uncertainty about the price of output gives rise to higher investment and, in turn, enhances economic activity under the assumptions of risk-neutral competitive firms and constant returns to scale production function. Their assumptions ensure convexity of the marginal profitability of capital in output price and input costs. On the other hand, a larger body of literature provides explanation for the response of investment to uncertainty by focusing on the real option feature of investment. Making an analogy between an investment opportunity and a stock option in a financial market, Dixit and Pindyck (1994) argue that if investment is irreversible, uncertainty raises the value of accumulating cash and waits for new developments that would dispel uncertainty. Heightened uncertainty is likely to increase the value of this "wait and see" option and thus reduce investment spending temporarily.

The available empirical studies also exhibit both positive and negative effects of exchange rate uncertainty on domestic investment. While some studies such as those by Iyke *et al*. (2017) and Canbaloglu and Gurgun (2018) revealed that exchange rate uncertainty has a positive impact on domestic investment, other studies (Safdari and Soleymani 2011; Serven 2002; Diallo 2015) found that real effective exchange rate uncertainty has a significant negative impact on domestic investment.

All in all, the impact of exchange rate uncertainty on domestic investment is not clear cut both in the theoretical and empirical literature. Besides, the existing studies mainly focus on cross-country analysis. The only existing study for Ethiopia by Fufa *et al.* (2018) forecasted the volatility of Ethiopian ETB/Euro exchange rate rather than its effect on macroeconomic variables such as domestic investment and hence, this paper investigates the effect of exchange rate uncertainty on domestic investment at country level, Ethiopia, filling the existing knowledge gap in the literature.

This paper is organized as follows. The literature review is presented in section 2. The data and methodology is presented in section 3. Results are presented and discussed in section 4. In section 5, conclusions are presented.

2. REVIEW OF RELATED LITERATURE

2.1. Theoretical Literature

Theoretically, the linkage between fluctuations in exchange rate and investment consists both direct and opposite effects. Most theoretical studies

argue that exchange rate uncertainty results in a positive or negative effect on domestic investment after it causes price uncertainty. On the one hand, studies by Hartman (1972) and Abel (1983) argue that competitive risk neutral firms invest more in order to avoid uncertainty in the future; hence high price uncertainty leads to higher levels of investment. In contrast to the above argument, Pindyck (1991), however, argues that investment is irreversible and increased uncertainty slows down the investment process by risk neutral firms.

Dixit and Pindyck (1994), using their theory of optimal inertia, come up with another important aspect to be considered, that investments can be postponed. Information about the future can bring favorable or unfavorable script. In both cases, optimum decision is possible by postponing the investment project. In the case of a favorable script, the postponement avoids the low revenue operation period and investment under uncertain environment. In the adverse script, the waiting period can have a long duration and the investment project may not be executed and lowers investment. Darby *et al.* (1999) later develop a theoretical model based on Dixit and Pindyck (1994) and their theoretical model tries to solve some related dilemmas of investment execution states. First, the model introduces the threshold at which exchange rate uncertainty could have adverse effects on investment. Second, the model pinpoints the real situations in which investment actually is killed by uncertainty. Their model clearly identifies conditions under which exchange rate uncertainty could have negative or positive effects on domestic investment. The condition is basically reduced to opportunity cost of postponing against the present value. If opportunity cost of postponing is lower than the present value or the scrapping price by firms, producers will be eager to postpone rather than to invest. On the other hand, the postponing effect may disappear if uncertainty is rather low.

2.2. Empirical literature

Positive and negative effects of exchange volatility were also found from empirical studies conducted by different scholars in different countries in different time. Iyke *et al.* (2017), for instance, found that current level of uncertainty enhances investment in the short run in Ghana over the period 1980–2015 while lagged levels of uncertainty dampens investment. In the long run, however, exchange rate uncertainty has a positive impact on domestic investment. Canbaloglu and Gurgun (2018) examined the effect of exchange rate uncertainty on domestic investment for 25 emerging markets and developing economies (EMDEs) and the effect is found to be positive and significant in these economies.

On the other side, Safdari and Soleymani (2011), Serven (2002) and Diallo (2015) disclosed a negative effect of exchange rate uncertainty on investment. Safdari and Soleymani (2011) examined the relationship between uncertainty of exchange rate and domestic investment using generalized autoregressive conditional heteroskedasticity (GARCH) (1,1) approach for six countries, and they obtained a negative relation between uncertainty of exchange rate and domestic investment. Serven (2002), using large cross country time series data and GARCH based measure of real exchange uncertainty, exhibited a negative and highly significant effect of real exchange rate uncertainty on private investment. Diallo (2015) also examined the link between real exchange rate uncertainty and domestic investment for 51 developing countries (23 low-income and 28 middle-income countries) and illustrated that real effective exchange rate uncertainty has a strong negative impact on investment in these countries.

Maepa (2016) also studied the effect of exchange uncertainty on different types of investment in South Africa from 1970 to 2014. The study revealed that a negative long-run relationship between exchange rate uncertainty and private domestic investment. It also showed weak and negative long run relationship effect of exchange rate uncertainty on foreign direct investment and portfolio investments in South Africa. However, the short-run interaction was found to be small and not significant enough to cause disruptions to the exchange rate and to the inflow of investments into the country.

De Oliveira (2014) compared the relationship between different exchange rate regimes and investment scenarios and showed that crawling peg exchange rate regime has advantages over the other regimes. The regime stability implies that less currency fluctuations are necessary to stimulate investment. Aizenman (1992) also concluded that fixed exchange rate regime characterized by low uncertainty of exchange rates is more conducive to foreign direct investment relative to a flexible exchange rate which includes uncertainties of exchange rates. This conclusion applies for real uncertainty of exchange rates that are positively correlated with level of investments and nominal shocks in exchange rate associated with negative impact on investment.

Bahmani-Oskooee and Hajilee (2013) assessed the short-run and long-run effects of exchange rate uncertainty on domestic investment in 36 countries using bounds test approach and the result indicates that exchange rate uncertainty has a significant short-run effect on domestic investment in 27 countries.

From the preceding empirical review, we can deduce the following two points. First, there is no consensus on the effect of exchange rate uncertainty

on domestic investment. Second, most of the studies are done on a cross-country basis. Hence, this paper examines the effect of exchange rate uncertainty on domestic investment at a country level, Ethiopia and thereby adding to the gap in the literature.

3. DATA AND METHODOLOGY

3.1. Data Type and Source

We use quarterly data that extends from the period 1992Q1 to 2016Q1. The beginning year of the sample represents the introduction of the managed floating exchange rate regime after the formal ending of the fixed exchange rate regime in Ethiopia. It should be noted, however, that the length of the period is determined purely by data availability. The variables of interest in our estimated model are domestic investment as dependent variable and real effective exchange rate uncertainty as main independent variable. Following Aye and Harris (2019), the realized real effective exchange uncertainty is calculated as:

$$REXVOL_t = r_{t,i}^2 \tag{1}$$

where r_t is the quarterly return (natural logarithm of the first difference i.e. $lnr_t - lnr_{t-1}$). is the quarterly realized volatility of the real effective exchange rate. The major advantage of the realized volatility is that it is model-free, and hence void of measurement or specification errors. By inference, it does not suffer the generated regressor problem associated with two-step estimation procedures (Pagan 1984).

And other control variables such as real gross domestic product (RGDP), real effective exchange rate, and inflation (first difference of consumer price index in our case) are included in the study. The data are obtained from National Bank of Ethiopia.

We apply the logarithm to all series except for realized exchange rate uncertainty and employ the standard unit-root methodology, i.e., the augmented Dickey-Fuller and Phillips-Perron tests. Hence, we specify the number of augmentation lags to account for serial correlation in the Dickey-Fuller regressions, for which we employ the Schwarz information criterion (SIC). Table 1 shows the results for the unit root tests. The values indicate that the series are non-stationary by accepting the null hypothesis of the existence of a unit root except for real effective exchange rate uncertainty and inflation. The non-stationary variables, however, are found to be stationary after first difference except real GDP and domestic investment which is integrated of order 2 based on ADF test.

Table 1: Unit-root tests

	ADF			*Phillips-Perron*						
	Lags (SIC)	*t-statistic*	*p-value (I(0))*	*Lags (SIC)*	*t-statistic*	*p-value (I(1))*	*t-statistic*	*p-value (I(0))*	*t-statistic*	*p-value (I(1))*
Exchange rate uncertainty	0	-9.821561	0.0000	-	-	-	-9.821561	0.0000	-	-
Domestic investment	9	2.157896	0.9999	11	1.723086	0.9789	7.439266	1.0000	-2.532195	0.0117
Real GDP	1	1.385303	1.0000	0	-0.354470	0.9114	3.832173	1.0000	-0.354470	0.9114
Inflation	0	-9.208016	0.0000	-	-	-	-9.218676	0.0000	-	-
Exchange rate	2	-0.853488	0.9562	1	-5.536284	0.0000	-0.672104	0.9719	-9.918081	0.0000

H_o: Series has a unit root

3.2. Methodology

To examine the effect of real effective exchange rate uncertainty on domestic investment in Ethiopia, Jordà's (2005) local projection (LP) method is used. The LP method requires running a sequence of predictive regressions of a variable of interest on a structural shock for different prediction horizons. The impulse response is then obtained from the sequence of regression coefficients of the structural shock (Aye and Harris, 2019). Therefore, the method can produce the response of domestic investment to real effective exchange rate uncertainty at different horizons. As clearly explained in Auerbach and Gorodnichenko (2013), Ramey and Zubairy (2018) and Aye and Harris (2019), this method has some advantages compared to VAR impulse responses. First, the estimation relies on robust standard errors and is simple to implement. Second, it is robust to misspecification of the data generating process. Third, joint or point-wise analytic inference is simple. Fourth, it can more easily accommodate non-linearities. Last but not least, impulse responses from LP are consistent and asymptotically normal.

According to Hamilton (1994) and Koop *et al.* (1996), impulse responses function, the difference between two forecasts, is a drive in a dynamic system used to scale the impact of shocks on expected or future value of economic variables at time horizon. According to Koop *et al.* (1996), the generalized impulse response function of y_t at horizon h is defined as follows:

$$IR(t,h,\delta,\Omega_{t-1}) = E(y_{t+h} \mid v_t = \delta, \Omega_{t-1}) - E(y_{t+h} \mid v_t = 0, \Omega_{t-1});\ h = 0,1 \ldots H \qquad (2)$$

Where, δ is an $n\times1$ vector representing shocks, 0 is an $n\times1$ vector matrix of zeros v_t is an $n\times1$ vector of additive random shocks, Ω_{t-1} is the information block of value of the variables up to t–1, and $E(.\mid)$ is a mean predictor. Jordà (2005) proposed to recover the multiplier from the set of regression coefficients β_j^h associated with the following set of h-step-ahead predictive regressions:

$$y_{t+h} - y_{t-1} = \alpha^h + \sum_{i=1}^{I} \gamma_i^h y_{t-i} + \sum_{j=1}^{J} \beta_j^h x_{t-j} + \sum_{m=1}^{M} \vartheta_k^h z_{t-m} + v_{t+h|t-1}; h \qquad (3)$$

Domestic investment, the endogenous variable interest, is represented by y_t; x_t is the shocks from exchange rate uncertainty, with mean zero and variance δ_x^2; and z_t represents the vector of control variables which may include shocks other than exchange rate uncertainty shock (x_t). And v_{t+h} is a prediction error term with variance δ_x^2. The coefficient β_j^h provides us response function that shows the impact of exchange rate uncertainty shock on domestic investment at horizon $h = 0 \ldots .H$, keeping all other variables constant.

4. RESULTS AND DISCUSSION

We start our analysis by first presenting the descriptive statistics of the variables of interest. Table 2 shows the statistical behavior of our variables over the period of 1992Q1 up to 2016Q1 at their non-transformed original data. Accordingly, real GDP has the highest mean, median, maximum, minimum and standard deviation, while real effective exchange rate uncertainty has the lowest value. All of the variables are normally skewed. While inflation is negatively skewed, the remaining variables are positively skewed. Looking at the Kurtosis of our variables, except real effective exchange rate uncertainty, domestic investment and inflation, the remaining variables have a value less than three indicating a normal distribution.

Table 2: Results of descriptive statistics

	Real effective exchange rate volatility	*Domestic investment*	*Real GDP*	*Inflation*	*Real effective exchange rate*
Mean	0.008963	9.46E+10	3.39E+11	0.020694	10.44177
Median	9.47E-05	2.29E+10	2.47E+11	0.021132	8.627900
Maximum	0.781257	5.63E+11	8.30E+11	0.172171	21.36410
Minimum	0.000000	1.88E+09	1.31E+11	-0.229264	2.070000
Standard deviation	0.079335	1.45E+11	1.95E+11	0.048895	5.055166
Skewness	9.658078	1.851019	0.985267	-0.757057	0.834897
Kurtosis	94.51415	5.280424	2.752758	10.44242	2.484473
Jarque-Bera	35356.31	76.40942	15.94086	233.1323	12.34318
Probability	0.000000	0.000000	0.000346	0.000000	0.002088
Sum	0.869366	9.18E+12	3.29E+13	2.007364	1012.851
Sum Sq. Dev.	0.604232	2.03E+24	3.66E+24	0.229513	2453.252
Obsevations	97	97	97	97	97

To examine the effects of shocks including exchange rate uncertainty shock on domestic investment, generalized impulse response functions over 12 horizons are provided in Figure 2. To begin with our main variable of interest, it is observed that exchange rate uncertainty has a positive significant effect on domestic investment over the whole period considered. Domestic investment increases by about 4 percent in the second quarter in response to one standard deviation shock in exchange rate uncertainty. Our result confirms to the theoretical argument of Hartman (1972) and Abel (1983) who argue exchange rate uncertainty causes price uncertainty and the competitive risk neutral firms invest more in order to avoid uncertainty in the future; hence high price uncertainty leads to higher levels of investment. This result is also consistent to the empirical findings of Iyke *et*

al. (2017) and Canbaloglu and Gurgun (2018) who find a positive effect of exchange uncertainty on domestic investment.

As to the effects of other control variables, domestic investment also increases in response to real income and real effective exchange rate shocks. The boost in domestic investment due to a real income shock is in line with the theory that positive growth in the real income should create optimism among investors regarding the economy, thereby, leading to a boom in domestic investment. The effect of inflation shock on domestic investment

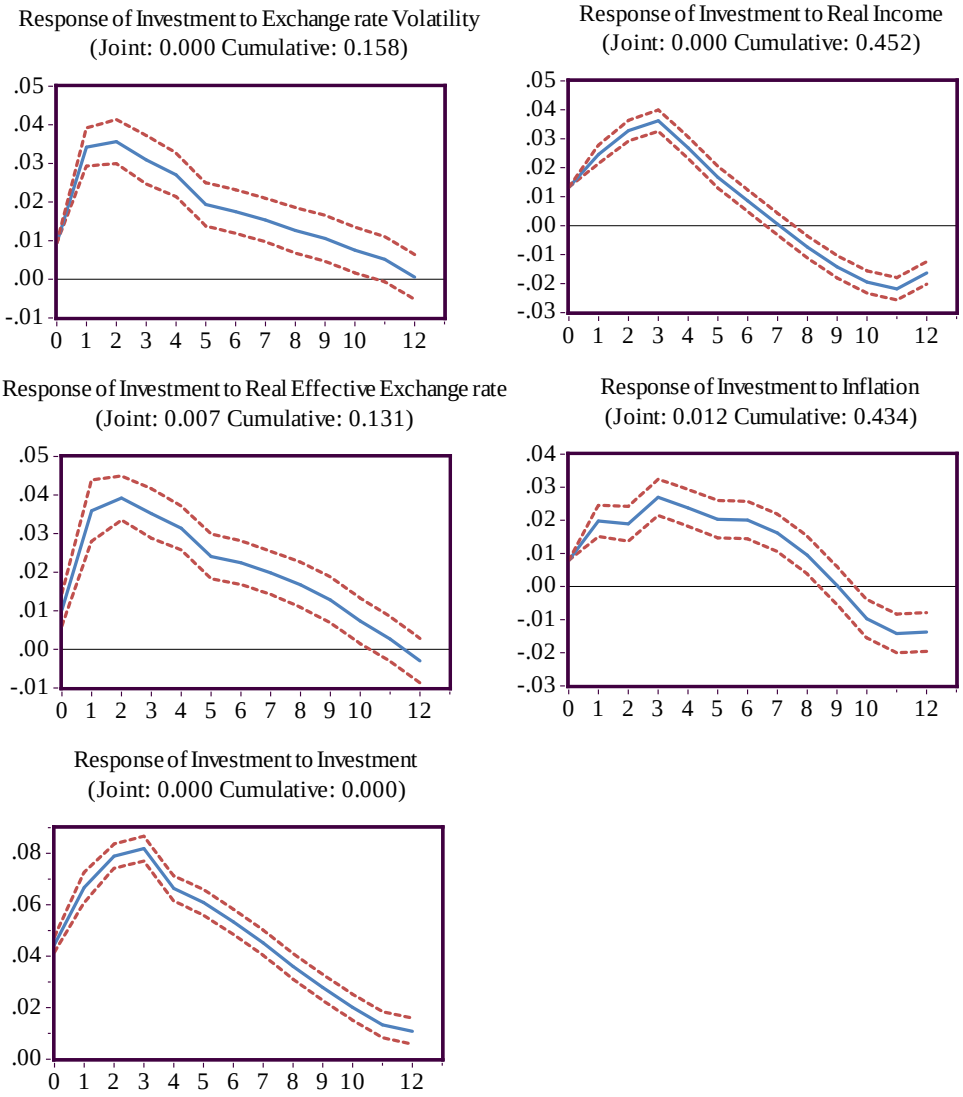

Figure 2: Impulse responses to generalized one standard deviation shocks with 68 per cent conditional confidence bands

is positive and statistically significant up to the eighth quarter, and negative and significant afterwards. Lastly, investment shock is persistent.

5. CONCLUSION AND FUTURE RESEARCH

This study examines the effect of exchange rate uncertainty on domestic investment in Ethiopia using Jordà's (2005) local projection method for the sample period 1992Q1 to 2016Q1. Following Koop *et al.* (1996), generalized impulse response functions are generated to see the effect of the variable of interest on the dependent variable. The result of the model shows that exchange rate uncertainty affects domestic investment positively and significantly over the whole horizon considered. In response to one standard deviation shock in exchange rate uncertainty, domestic investment increases to around 4 percent at the second quarter. This may be due to the fact that competitive risk neutral firms invest more in order to avoid uncertainty in the future; hence high price uncertainty leads to higher levels of investment. This result may also imply that the current managed floating exchange rate regime in the country does not create much uncertainty and thereby do not pose a problem in stimulating domestic investment in the economy.

Domestic investment also increases in response to real GDP and real effective exchange rate shocks. The effect of inflation shock on domestic investment is positive and statistically significant up to the eighth quarter, and negative and significant afterwards. It will be interesting to see the reaction to high and low exchange rate uncertainty shocks as more data become available over time and we leave this for future research.

References

Abel, AB., 1983; Optimal investment under uncertainty. *American Economic Review*, 73(3), 228-233.

Aizenman, J., 1992; Exchange rate flexibility, uncertainty, and the patterns of domestic and foreign direct investment. NBER Working Papers Series No. 3953.

Auerbach, A.J., and Y. Gorodnichenko, 2013; Fiscal multipliers in recession and expansion. In Fiscal Policy after the Financial Crisis, ed. A. Alesina and F. Giavazzi, 63-98. Chicago: University of Chicago Press.

Aye, C., Gupta, R., Moyo, S., and Pillay, N., 2015; The impact of exchange rate uncertainty on exports in South Africa. *Journal of International Commerce, Economics and Policy*, 6(1), 1550004.

Aye C., and L. Harris, 2019; The effect of real exchange rate volatility on income distribution in South Africa. WIDER Working Paper 2019/29.

Bahmani-Oskooee M., and Hajilee M., 2013; Exchange rate volatility and its impact on domestic investment. *Research in Economics*, 67(1), 1-12.

Canbaloglu B., and Gurgun, G., 2018; The impact of exchange rate uncertainty on domestic investment: Panel evidence from emerging markets and developing

economies. IntechOpen, Open Access books, Financial Management from an Emerging Market Perspective. *http://dx.doi.org/10.5772/intechopen.71195.*

Darby, J., Hallet, A. H., Ireland, J., and Piscitelli, L., 1999; The impact of exchange rate uncertainty on the level of investment. *The Economic Journal*, 109(454), 55-67.

De Oliveira C. A., 2014; Investment and exchange rate uncertainty under different regimes. *Estud. Econ., São Paulo*, 44(3), 553-577.

Diallo, I., 2015; Exchange rate uncertainty and investment: A panel data cointegration approach. *Expert Journal of Economics*, 3(2), 127-135.

Dixit, A., and ND R. S. Pindyck, 1994; Investment under uncertainty. Princeton: Princeton University Press.

Fufa, D., and Zeleke, B.L., 2018; Forecasting the volatility of Ethiopian Birr/Euro exchange rate using Garch-Type models, *Annals of Data Science*, 5, 529-547.

Haile, F., 2019; The exchange rate: Why it matters for structural transformation and growth in Ethiopia? Policy Research Working Paper 8868.

Hamilton, J.D., 1994; Time Series Analysis. Princeton: Princeton University Press.

Hartman, R., 1972; The effects of price and cost uncertainty on investment. *Journal of Economic Theory*, 5(2), 258-266.

Iyke, N. B., and H. Sin-Yu, 2017; Exchange rate uncertainty and domestic investment in Ghana. MPRA Paper No. 80474.

Jordà, Ò., 2005; Estimation and inference of impulse responses by local projections. *American Economic Review,* 95(1), 161–82.

Koop, G.M., H. Pesaran, and S. Potter, 1996; Impulse response analysis in nonlinear multivariate models. *Journal of Econometrics*, 74(1), 119–47.

Maepa, M. M., 2016; The effects of exchange rate uncertainty on South African investments. ERSA working paper 609.

Nega M. K., 2015; Assessment on real effective exchange rate and external sector development of Ethiopia. *Economics*, 4(4), 64-70.

Ozcelebi, O., 2018; Analysis of the role of exchange rate volatility in monetary policy conduction in OECD countries: Empirical evidence from Panel-VAR models. IntechOpen, Book chapter p. 84-97. *http://dx.doi.org/10.5772/intechopen.74405.*

Pagan, A., 1984, Econometric issues in the analysis of regressions with generated regressors. *International Economic Review*, 25(1), 221–47.

Pindyck, R.S., 1991; Irreversibility, uncertainty, and investment. *Journal of Economic Literature*, 29(3), 1110–48.

Ramey, V.A., and S. Zubairy, 2014; Government spending multipliers in good times and in bad: Evidence from U.S. historical data, NBER Working Paper, no. 20719.

Safdari M., and Soleymani M., 2011; Exchange rate uncertainty and investment in some of Middle East and North African countries. *Global Economy and Finance Journal*, 4(2), 60-73.

Serven L., 2002; Real exchange rate uncertainty and private investment in developing countries. Policy Research Working Paper 2823.