Review of Keynesian Economics, Vol. 10 No. 4, Winter 2022, pp. 513–532

The peso problem and dollar hegemony under inflation targeting

Juan Alberto Vázquez-Muñoz*
Benemérita Universidad Autónoma de Puebla, Mexico

Ignacio Perrotini-Hernández**
Universidad Nacional Autónoma de México, Mexico City, Mexico

This article examines the influence of US monetary policy on Mexico's exchange rate (peso/dollar) and monetary policy. It shows that the recent reduced volatility of Mexico's exchange rate is a consequence of defensive policies undertaken by Mexico's central bank to avoid sudden capital reversals and speculative attacks, usually associated with destabilizing speculative behavior. To test that hypothesis, the paper examines the effect of the accumulation of international reserves and exchange-rate variations on the Mexico–US interest-rate gap. The authors' findings confirm that international reserves permit the central bank to maneuver the exchange rate and its inflation target. Furthermore, the paper provides an estimated Taylor rule for Mexico, including the US interest rate. The estimation reveals that Mexico's monetary policy is not independent of US monetary policy. Mexico faces a liquidity trap at a higher interest rate than the United States. Whereas the United States faces a trap at the zero lower bound, Mexico encounters monetary policy ineffectiveness at an interest rate of 3.5 percent.

Keywords: *exchange rates, interest rates, Mexico, monetary policy, central banks*

JEL codes: *E420, E430, E52, E580*

1 INTRODUCTION

This article analyses the influence of the Mexico–US interest-rate gap and the accumulation of international reserves on the exchange rate (peso/dollar) and the Bank of Mexico's inflation-targeting monetary policy framework. We argue that the interest rate of the Federal Reserve of the United States exerts a strong influence on the monetary policy of the Bank of Mexico.

We also claim that the relative stability of the exchange rate of the Mexican peso derives from the rapid accumulation of international reserves the Bank of Mexico has undertaken with the aim of avoiding sudden capital stops and confronting destabilizing speculative attacks. We test our hypothesis using empirical evidence from Mexico and the United States to gauge the effect of the accumulation of international reserves and exchange-rate variations on the interest-rate gap. Our results show that those precautionary accumulations of international reserves operate as an additional regular monetary policy instrument that allows the central bank certain degrees of freedom to control the exchange rate and the inflation rate.

* Email: juan.vazquez@correo.buap.mx.
** *Corresponding author*: Email: iph@unam.mx.

Journal compilation © 2022 Edward Elgar Publishing Ltd
The Lypiatts, 15 Lansdown Road, Cheltenham, Glos GL50 2JA, UK
and The William Pratt House, 9 Dewey Court, Northampton MA 01060-3815, USA

We estimate an alternative Taylor rule for Mexico including the US rate of interest, which delivers important clues. First, Mexico's monetary policy depends on the US monetary policy. Second, Mexico faces a liquidity-trap level of the interest rate much higher than the United States. Whereas the United States faces a zero lower bound level, Mexico encounters ineffectiveness of its monetary policy at a positive interest rate of 3.5 percent. The results derived from our empirical studies lead us to conclude that the Bank of Mexico's monetary policy position is pro-cyclical. Those asymmetries speak to the hegemonic role of the dollar and the subordinate position of the peso.

The main contribution of the present article to the literature is twofold. First, it analyses the influence of the accumulation of international reserves on the interest-rate gap and the dynamics of the exchange rate. Second, it provides an estimation of an alternative Taylor rule showing the influence of the US interest rate on Mexico's monetary policy and the pro-cyclical character of the Bank of Mexico's monetary policy. Those issues are frequently overlooked in the literature. For instance, Galindo and Ros (2008) and Ros (2015) are concerned with the central-bank propensity to appreciate the exchange rate with the aim of achieving an inflation target, a policy which is viewed as the cause of slow growth and stagnation in Mexico and other emerging economies; Médici et al. (2021) criticize that view, arguing that there is no reason to believe that a competitive exchange rate can accelerate the growth rate of an economy facing structural constraints.

The paper is structured as follows: the Section 2 briefly discusses Milton Friedman's and John M. Keynes's ideas regarding the relative merits of fixed versus flexible exchange-rate regimes and the best way to attain internal and external stabilization. Section 3 presents an empirical analysis of current-account disequilibrium, currency fluctuations, and the net financial position of the Mexican economy. Section 4 explains the accumulation of international reserves, the interest-rate gap, and exchange-rate expectations. Sections 5 and 6 contain econometric estimations of the effects of the international reserves on the interest-rate gap and the alternative Taylor rule, respectively. Section 7 concludes, with some reflections on the main contributions of the article and a brief reference to the future of the dollar hegemony.

2 FRIEDMAN AND KEYNES ON EXCHANGE-RATE DYNAMICS

Friedman (1953, pp. 182–186) made 'the case for flexible exchange rates' along with free currency convertibility and perfect capital mobility in open markets on the presumption that this setting is economic-welfare-enhancing. He criticized Bretton Woods' fixed exchange-rates arrangement, arguing that it is inconsistent with multilateral trade and internal monetary stability. He maintained that rigid exchange rates and capital controls neither ensure balance-of-payments equilibrium nor boost stabilization of expectations, whereas agents under floating exchange rates can 'protect themselves hedging in a futures market' (ibid., p. 174).

Friedman wholeheartedly believed that a system of unfettered floating exchange rates harmonizes monetary and fiscal policy and dispenses with the inflation/deflation bias resulting from central-bank discretionary management. Since both the exchange rate and the balance of payments are monetary phenomena,[1] if 'any one country

1. In his view, exchange rates and current-account disequilibria are just symptoms of monetary disequilibria.

inflates' (deflates), its exchange rate will depreciate (appreciate), hurting its own real income in the first place (ibid., p. 199). Thus, government interventions are ineffective.

Friedman also claimed that, contrary to hard and/or crawling pegs, a flexible exchange-rate regime allows a central bank the maximum degree of freedom to pursue an independent monetary policy consistent with both internal stability and balance-of-payments equilibrium (ibid., p. 200). Hence his contention that exchange-rate speculation is always stabilizing. Friedman's tenets rely on the assumptions that the real interest parity condition,[2] the neutrality of money hypothesis, and, therefore, the purchasing power parity (PPP) hypothesis hold. His paradigm describes an ergodic economy where domestic saving and foreign exchange are certainly substitutable; prices, interest rates, and exchange rates tend to converge to equilibrium values determined by 'fundamentals.' In sum, a freely floating exchange-rate regime accompanied by perfect capital mobility is the best antidote to sudden stops of capital flows, a phenomenon that has plagued Mexico's and other Latin American countries' recent financial history (Calvo 1998; Calvo and Mendoza 2000).

In this connection, it is safe to say that the Bank of Mexico's current monetary policy framework of inflation targeting includes most (if not all) of the essential ingredients of Friedman's case for flexible exchange rates.[3] Similarly, and paradoxically, nowadays many heterodox economists (Frenkel and Ros 2006; Galindo and Ros 2008; Wray 2015; Bresser-Pereira 2016) share Friedman's belief that a floating exchange-rate regime is the key to solving the pressing problem of economic stagnation. Unfortunately, as Palley (2020, p. 481) contends, a flexible regime 'has its own adverse financial and inflation complications,' for 'if the balance of payments constraint is structural' it is ineffective (see also Vernengo 2006).

Keynes (1936 [1964], pp. 262 and 266), in turn, maintained that it is fallacious to think of the capitalist economy as a self-adjusting system, for a belief that flexible wages and prices and competitive exchange rates epitomize a 'method of securing full employment' is groundless. Such policies are likely to impart deleterious effects, for instance a redistribution of real income against wage-earners (real devaluations depress real wages), financial fragility,[4] reduced effective demand, output contraction, and higher unemployment rates (Keynes 1936 [1964], p. 264; Palley 2018).

In the 1920s, amidst the crisis of the pound sterling and the initial ascent of the dollar to the status of the world economy's new hegemonic currency, Keynes (1923) was concerned with the trade-off between the stability of internal prices and that of the exchange rate. Whilst Keynes did not abandon the quantity theory of money altogether, he challenged it, contending that money is not neutral (at least) in the short term so that inflation and deflation tend to impinge on production, employment, saving and investment levels, economic growth, and wages (Vicarelli 1984). The PPP doctrine is also valid only under extremely unrealistic conditions, and hence it is not a sound theory of the determinants of the exchange rate (Keynes 1923 [2013], p. 71 labeled it 'jejune' doctrine). Debunking of the PPP hypothesis also led Keynes to reject

2. Capital flows are said to be infinitely elastic vis-à-vis interest-rate differentials; Friedman's rendition of exchange-rate behavior relies on a basic confusion between the stabilizing properties of arbitrage and those (not necessarily stabilizing) of speculation (Davidson 1999, p. 15; Lavoie 2014, pp. 478–480).

3. The *Annual Report on Exchange Arrangements and Exchange Restrictions 2021* of the International Monetary Fund (IMF 2022) classified Mexico as a free-floating country.

4. A higher national debt burden and, given elastic exchange rate expectations, increasing monetary, nominal exchange rate and financial instability (Serrano et al. 2021).

the uncovered interest parity (UIP) as an appropriate explanation of exchange-rate dynamics. He was probably the first to discover what are now known as UIP and PPP 'failures' (Sarno 2005; Serrano et al. 2021).

Keynes (1923 [2013], p. 103) claimed that the interest-rate differential (covered interest arbitrage) paid on financial assets 'lent or deposited for short periods of time in the money markets of the two centres under comparison' is 'the most fundamental cause' of the difference between the spot and the forward rates in financial markets. Keynes (1930) further elaborated his analysis of exchange- and interest-rate dynamics by highlighting the role of financial asset markets and later, in *The General Theory* (1936), enriched it with a framework including a theory of liquidity preference, the principle of effective demand, and the determination of output to explain the causes of unemployment and stagnating slow growth.

Most instructive for this paper's purpose, and for studying the riddles of today's international monetary hegemony, is a prescient remark Keynes (1923) made while examining the implications, for the majority of nations, of a few central banks – most importantly the United States' Federal Reserve – controlling the world's gold reserves in the 1920s. He foresaw the emergence of a new asymmetric monetary and financial arrangement with key currencies – the dollar, primarily – at the apex and peripheral currencies with lower liquidity and dependent monetary policies at the subservient bottom of the system.

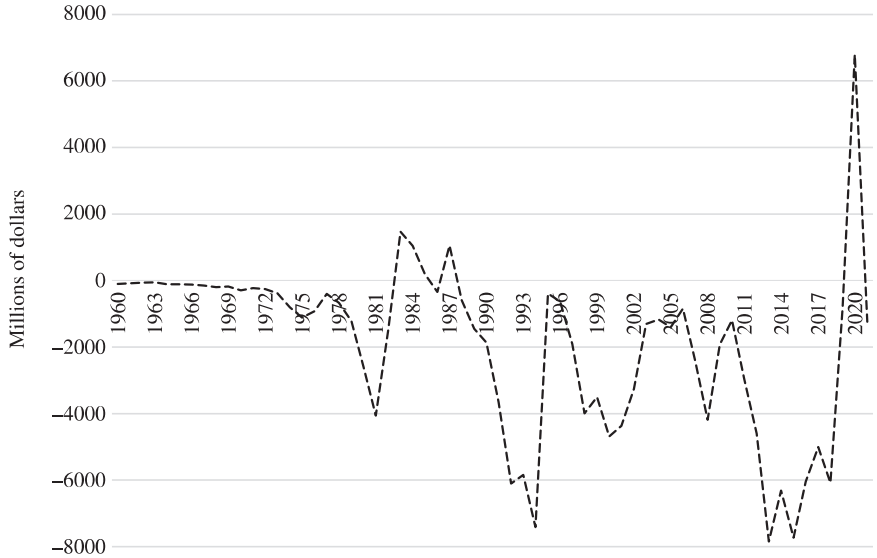
Keynes's conception of money as chiefly a unit of account and a store of value, in contrast to Friedman's medium of exchange definition, is relevant *a propos* understanding today's international asymmetric monetary 'nonsystem' (Williamson 1976), the unraveling effects of dollar hegemony on peripheral countries' monetary policy capability, and for dealing with the uneven cost distribution of balance-of-payments adjustments between debtors and creditors.

3 CURRENT ACCOUNT, NOMINAL EXCHANGE RATE, AND EXTERNAL NET FINANCIAL POSITION

The main sources of accumulation of international reserves are the current account (CA), foreign capital inflows, and foreign debt. A current-account surplus (deficit) tends to increase (decrease) the demand for international reserves. The exchange-rate regime may be significant; a flexible (fixed) exchange-rate setting should reduce (expand) the demand for international reserves.

Mexico presents an apparently curious situation. During the period 1960–1994, a fixed exchange-rate regime prevailed and Mexico alternated with CA equilibrium during 1960–1973, a deficit in 1974–1981 (financed through increasing foreign debt leading to the debt crisis of 1982), a surplus in 1982–1988 obtained by means of a drastic recession, and a sizable deficit in 1989–1994 triggered by trade and financial liberalization.

A flexible exchange-rate arrangement replaced the old regime after the Tequila crisis of 1995 and an inflation-targeting monetary policy framework was adopted in 2001. The new macroeconomic policy has delivered poor results (see Figure 1). The cumulative CA deficit of the fixed regime was equal to –$39.1 billion, whereas that of the flexible regime plus inflation-targeting period (1996–2021) was –$64 billion. Irrespective of the exchange-rate scheme, the declining trend of the CA does not account for the accumulation of international reserves over the whole period. Furthermore, it takes a severe crisis to correct increasing CA imbalances. That speaks to the structural constraints of the balance of payments and to the so-called 'peso problem' being not exclusively



Source: Authors' elaboration with data from the Sistema de Información Económica database (SIE) of the Bank of Mexico (BM).

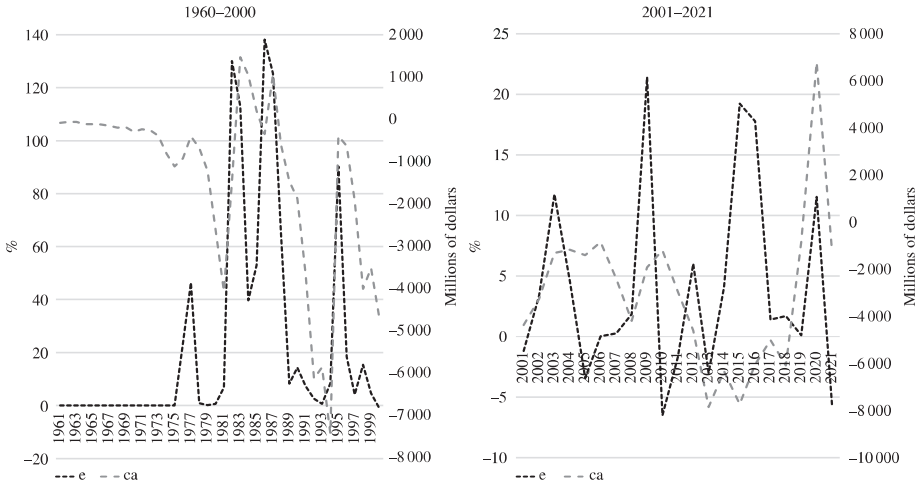
Figure 1 Current-account balance (annual data), 1960–2021

related to a fixed exchange rate, and it can very well arise in a flexible exchange-rate setting. The peso problem is best understood as the combination of dollar hegemony and the structural constraints plaguing the Mexican economy.

It is noteworthy that during the period of the fixed exchange-rate regime there was a strong positive correlation between the annual rate of depreciation of the nominal exchange and the CA balance: nominal and real devaluations caused CA surpluses in crisis times (see Figure 2, left panel). However, the same is not true of the era of inflation targeting, when annual nominal and real currency depreciations have not brought about CA surpluses (see Figure 2, right panel), except for the remarkable 2020 pandemic-related crisis. The deindustrialization of the Mexican economy induced by the export-led growth *cum* inflation-targeting model is to blame for this deteriorated behavior of the CA.

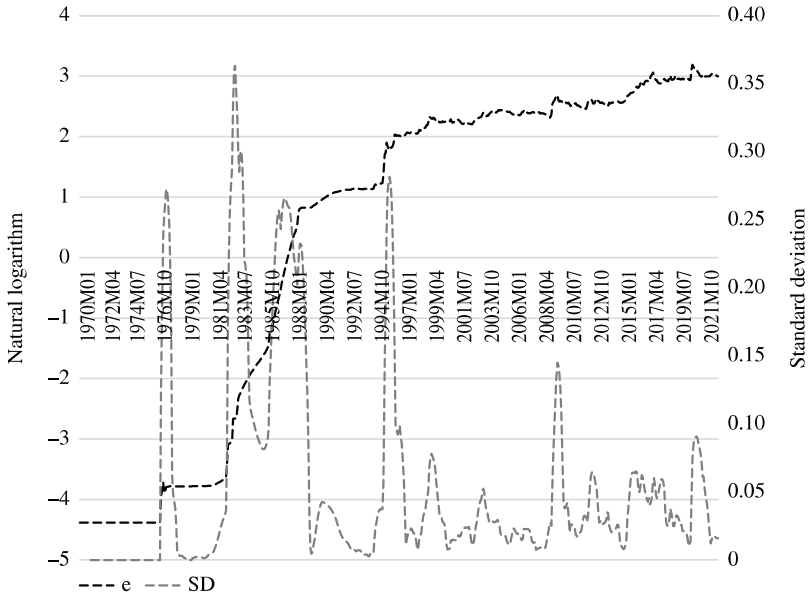
Figure 3 shows the significant reduction of volatility of the peso/dollar exchange rate as the Mexican economy shifted from a fixed exchange-rate regime to an inflation-targeting monetary policy *cum* flexible exchange rate. During 1970–1994 the cumulative depreciation of the nominal exchange rate was 26 901 percent compared to 501 percent over the period 1995–2021.[5] Speculative attacks against the Mexican peso continued over the latter period, but at a much lower pace. Is this a sign of fading of the peso problem? What accounts for the reduced volatility of the Mexican currency? For that, we must turn to the role of accumulation of international reserves, but beforehand let us briefly look at Mexico's external net financial position shown in Figure 4.

5. The annual average rate of depreciation for those years with devaluations higher than 10 percent within the period 1970–1994 was 74.77 percent, compared to 25.70 percent for years with similar devaluation rates in the period 1995–2021.



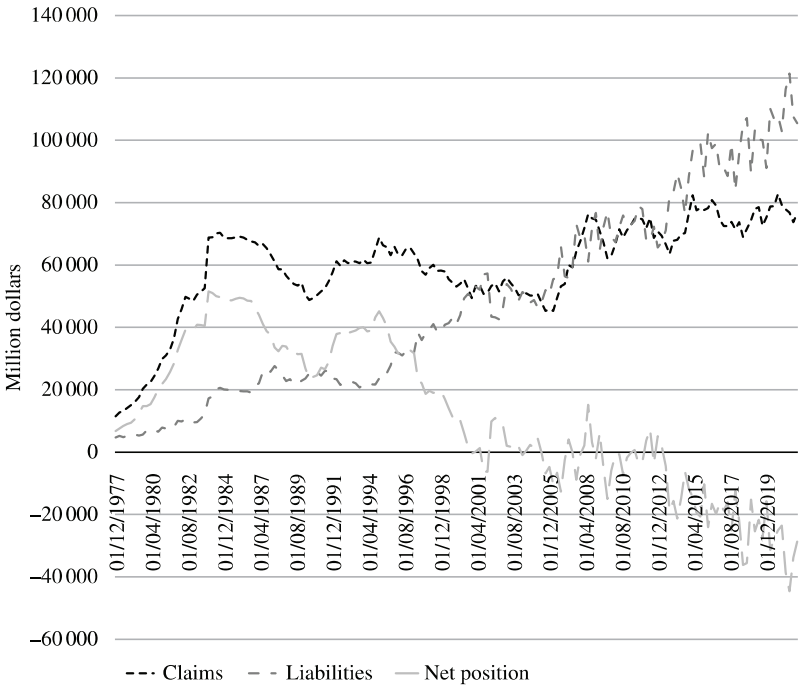
Source: Authors' elaboration with data from the SIE database of the BM.

Figure 2 Annual nominal exchange-rate depreciation and current-account balance (annual data)



Note: The volatility of the nominal exchange rate was calculated as the standard deviation of the nominal exchange rate measured in natural logarithms during the period considered between the relevant month indicated in the figure and the previous 11 months.
Source: Authors' elaboration with data from the Banco de Información Económica (BIE) database of Mexico's National Institute of Statistics and Geography (INEGI).

Figure 3 Nominal exchange rate, level, and volatility (monthly data), 1970M1–2022M5



Source: Authors' elaboration with data from the debt securities statistics database of the Bank of International Settlements.

Figure 4 Local positions in current dollars (outstanding at the end of each quarter), 1977Q4–2021Q4

The concomitant result of Mexico's continued CA deficits, resulting from increasing financial openness and greater flexibility of the exchange rate, has been a significant worsening of its international net financial position. The dollar-denominated claims of all the sectors of the Mexican economy grew faster than their liabilities during 1977–1999; claims and liabilities converged thereafter, reaching an equilibrium during 2001–2013. The position turned negative after that and has worsened with each crisis throughout the inflation-targeting period. Mexico's current net financial position is negative.[6]

4 ACCUMULATION OF INTERNATIONAL RESERVES, THE INTEREST-RATE GAP, AND EXPECTED DEPRECIATION

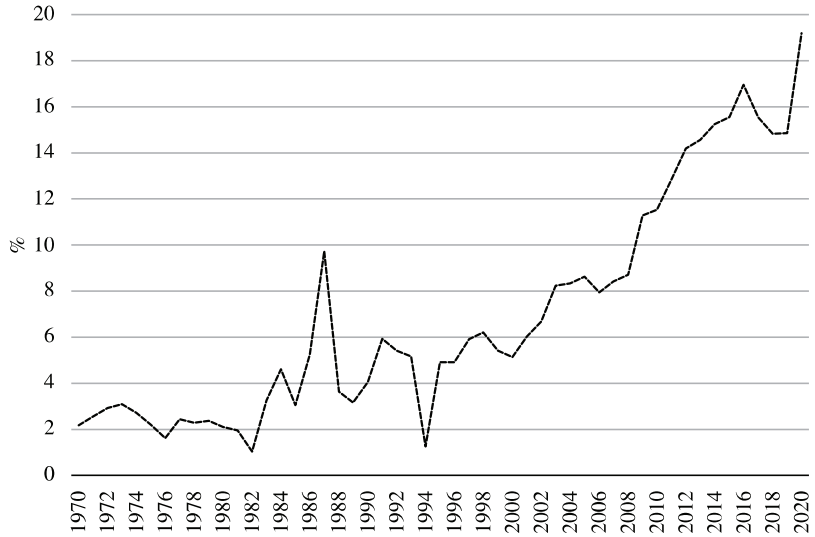
Mexico has experienced several episodes of sudden reversals of capital involving liquidity, banking and exchange-rate crises, costly output contractions, high unemployment,

6. It is worth noting that the banking sector is the main contributor to Mexico's negative net local position, its liabilities having increased after the 1995 financial crisis, while its claims exhibited a cyclical behavior around a stable mean between the last quarter of 1983 and 2021.

and welfare loss. The 1995 financial crisis is perhaps the most important experience of recent times because it produced a structural change in the government's policy towards foreign debt, inflation, exchange rate, and international-reserve management.

We have seen that volatility of the peso/dollar exchange rate greatly diminished in the aftermath of the 1995 financial crisis. However, the abandonment of the fixed exchange-rate regime as an anchor for inflation and the transition to a floating exchange rate did not provide a sufficiently effective cushion against speculative currency attacks and sudden stops of capital inflows. Given the relative weakness of the domestic financial system, the government engaged in an accelerated accumulation of precautionary international reserves as an additional barrier to rein in exchange-rate instability arising from the asymmetric relationship between a peripheral currency and a key currency, the true source of the peso problem. Figure 5 illustrates the rising trend of international reserves as a percentage of gross national income (GNI). It suggests that precautionary international reserves play a much greater stabilizing role in today's environment of inflation targeting *cum* floating exchange rate than in the context of the fixed exchange rate of the 1970s and 1980s.

The fact that an emerging-market economy is subject to exogenous monetary and financial hegemony strengthens the need for short-term means to cope with financial fragility entrenched in the structure of the balance of payments. Consequently, the monetary authorities are compelled to accumulate precautionary international reserves



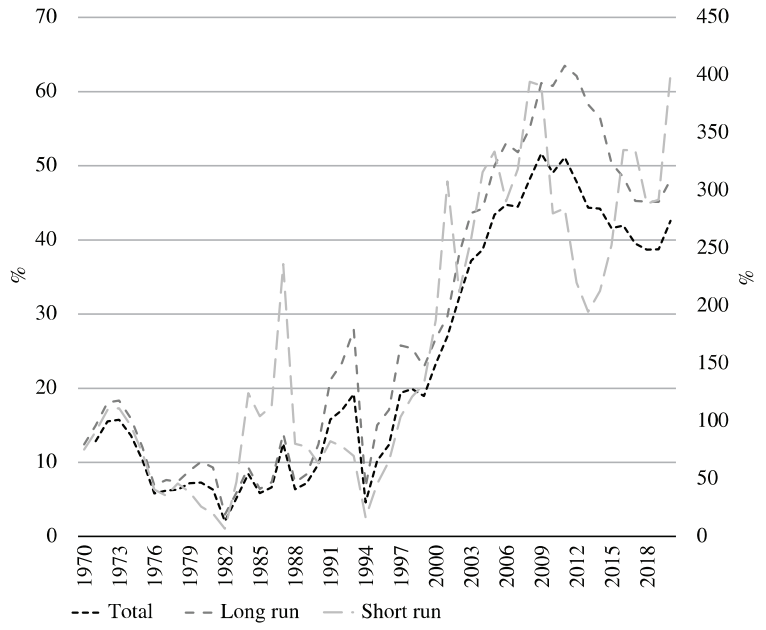
Note: Total reserves comprise holdings of monetary gold, special drawing rights, reserves of IMF members held by the IMF, and holdings of foreign exchange under the control of monetary authorities. The gold component of these reserves is valued at year-end (31 December) London prices. GNI is the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad.
Source: Authors' elaboration with data from the International Debt Statistics database of the World Bank.

Figure 5 International reserves as a percentage of gross national income (annual data), 1970–2020

to cover unexpected risks of speculative attacks and sudden capital stops, absent addressing the deep origins of the problem rooted in the asymmetric nature of the international monetary system. In this connection, Figure 6 shows Mexico's increasing accumulation of international reserves as a ratio of total long-run and short-run external debt during 1970–2020. First, the fastest rate of international-reserve accumulation occurred during the period of inflation targeting *cum* flexible exchange rate. Second, the case of short-run external debt calls for special attention as it jumps in times of turbulence and crisis. Third, this pattern exposes *de facto* what Keynes (1923; 1936) criticized, namely the detrimental effect of an asymmetric international monetary system.

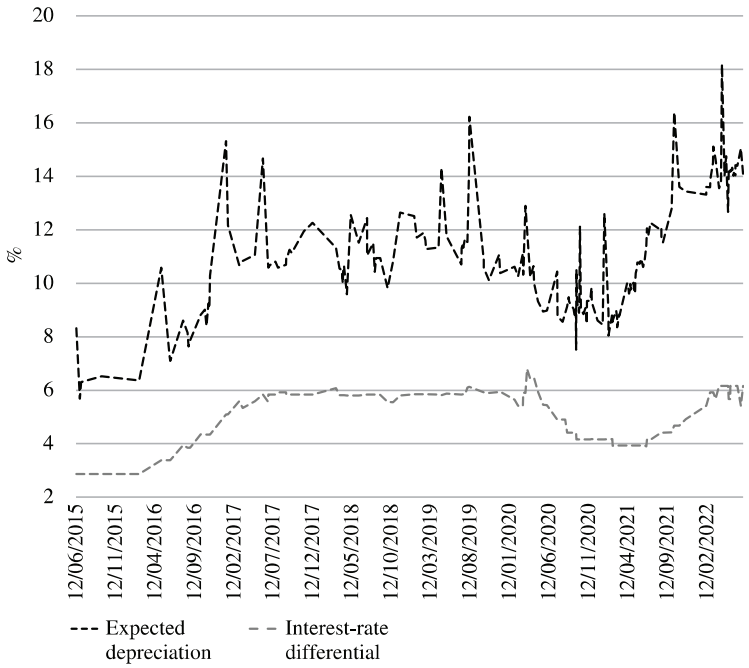
Accumulating international reserves requires an attractive (higher) rate of return to draw in capital. Consequently, the Bank of Mexico must set an interest rate higher than that of the United States if it is to capture portfolio capital inflows. That bilateral interest-rate gap is affected by the potential speculative attacks against the peso. Balanced against that, international-reserve accumulation as a percentage of total external debt prevents such speculative attacks. Therefore, an increase in the domestic interest rate allows the Bank of Mexico to reduce the gap. On the other hand, if the nominal exchange rate increases, the Bank of Mexico must increase the interest-rate gap.

Figure 7 shows that the expected variation of the nominal exchange rate follows the Mexico–US interest-rate gap, with expected variations of the nominal exchange rate being higher than the interest-rate gap. Absent accumulation of international reserves, the volatility of the exchange rate would be larger.



Source: Authors' elaboration with data from the International Debt Statistics database of the World Bank.

Figure 6 International reserves as a percentage of total, long-run, and short-run external debt (annual data), 1970–2020



Note: Expected depreciation was calculated as the percentage difference between the spot value of the exchange rate and its future value for a two-to-three-year range.
Source: Authors' elaboration with data from the SIE database of the BM, the BIE of the INEGI, and the Federal Reserve Economic Data (FRED) database of the Federal Reserve of St. Louis.

Figure 7 Uncovered interest parity hypothesis (daily data), June 2015–July 2022

5 ESTIMATING THE INFLUENCE OF INTERNATIONAL RESERVES ON THE INTEREST-RATE GAP

It can be argued that Mexico's monetary policy is not autonomous from the United States' monetary policy. Not merely because we assume that there must be a positive Mexico–US interest-rate gap, but because this gap depends on Mexico's financial fragility measured as the international reserves as a percentage of external debt.

To test for the existence of the relations stipulated in the previous paragraph, the following equation is estimated:

$$gi_t = \beta_0 + \beta_1 RD_t + \beta_2 e_t + u_{1t}, \tag{1}$$

where β_i are the parameters to be estimated, *gi* is the Mexico–US interest-rate gap, *RD* is Mexico's international reserves as a percentage of total external debt, *e* is the nominal exchange rate, u_1 is an error term, and *t* is a time index. All variables are expressed in natural logarithms terms.

Sources and data are as follows: the Mexican interest rate is the annual average of (i) the monthly interest rate of the Treasury Certificates at 91 days (CETES) from January 1978 to August 1982 and from August 1983 to January 1985; (ii) the monthly interest rate of the Treasury Certificates at 28 days from September 1982 to July

1983 and from February 1985 to January 2008; and (iii) the daily Bank of Mexico's target interest rate from February 2008 to December 2020. The data are provided by the Sistema de Información Económica database of the Bank of Mexico. The United States interest rate is the annual average of the monthly federal funds effective rate, obtained from the Federal Reserve Economic Data database of the Federal Reserve of St. Louis. International reserves as a percentage of total external debt were taken from the International Debt Statistics database of the World Bank. Lastly, the nominal exchange rate is the annual average of: (i) the monthly average of the settlement-date exchange rate from January 1978 to October 1991; and (ii) the determination-date exchange rate from November 1991 to December 2020, obtained from the Sistema de Información Económica database of the Bank of Mexico.

As a first step, we examine for a unit root in the series to be used in the estimation of equation (1). Table 1 reports our results. It shows *gi* and *RD* are stationary series while *e* is an integrated series of order one. So, we can use the bounds-testing approach cointegration methodology (Pesaran et al. 2001) to estimate equation (1).[7]

According to our results shown in Table 2, the estimated elasticity of *gi* with respect to *RD* is equal to –1; it shows the major importance of the accumulation of international reserves for Mexican monetary policy relative to United States monetary policy. On the other hand, the elasticity of *gi* with respect to *e* is equal to 0.21. Therefore, when *e* tends to depreciate, *gi* increases; and when *e* appreciates, *gi* decreases. As can be seen in Figure 8, although our fitted *gi* tends to be lower than the actual one, its general behavior is very consistent with the latter. Moreover, our results show that a higher *gi* prevailed during the period 1978–1999 compared to the period 2000–2020. That is explained by the lower international reserves accumulated as a percentage of total external debt (see Figure 6), the fixed exchange regime and the monetary policy framework in operation at the time, and the relatively low significance of financial liberalization during the former period.

Table 1 Unit-root test for the series used in the estimation of equation (1)

Series	Period	Augmented Dickey–Fuller test (*t*-statistics)	Phillips–Perron test (adj. *t*-statistics)
gi	1979–2020	–3.50***	–3.49***
RD	1979–2020	–3.65**	–3.65**
e	1979–2020	–1.40	–1.40
d(e)	1979–2020	–3.86*	–3.32**

Notes: *, **, and *** are statistically significant at 1 percent, 5 percent, and 10 percent levels. All variables are measured in natural logarithm terms. $d(\cdot)$ stands for the first difference operator. All level tests were done assuming the existence of intercept and trend, while the first difference test was done assuming only the existence of intercept. The number of lags used for the ADF tests were chosen in accordance with the Schwarz information criterion, whilst the number of bandwidths used for the PP tests were chosen according to the Newey–West criterion.

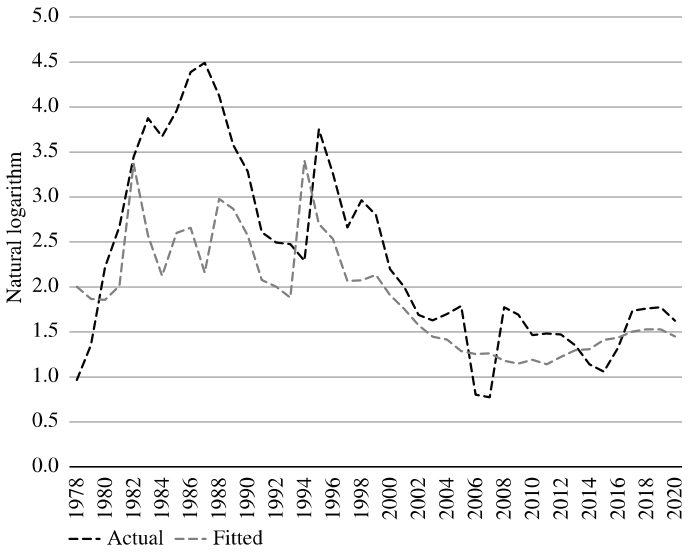
Source: Authors' elaboration with data from the SIE database of the BM and the FRED database of the Federal Reserve of St. Louis.

7. This approach is applicable regardless of whether the underlying regressors are purely I(0), purely I(1), mutually cointegrated, or any combination of these characteristics. This is, indubitably, a considerable advantage given the low power of the unit-root test and the relatively small size of our data.

Table 2 Estimation of the Mexico–US interest-rate gap (equation (1))

Period	1978–2020
Dependent variable	*gi*
RD	−1.06*
	(0.13)
e	0.21*
	(0.07)
Constant	4.76*
	(0.38)
Model type	Restricted constant, no trend
ARDL model	(2, 4, 3)
F-bounds test	
F-statistic	8.80*
Adjustment coefficient	
u_{1t-1}	−0.97*
	(0.15)
Jarque–Bera test	3.01
LM test (*F*-statistic, 1 lag)	0.36
White test (*F*-statistic)	0.41
Ramsey RESET (*t*-statistic, one fitted term)	0.46

Notes: * is statistically significant at the 1 percent level (standard errors in parentheses). All variables are measured in natural logarithm terms. White test does not include cross terms. ARDL model indicates the number of lags of the dependent and independent variables. A complete report of the estimation is available on request from the authors.
Source: Authors' elaboration using data from the SIE database of the BM and the FRED database of the Federal Reserve of St. Louis.



Source: Authors' elaboration with data from the SIE database of the BM and the FRED database of the Federal Reserve of St. Louis.

Figure 8 Actual and fitted Mexico–US interest-rate gap (annual data), 1978–2020

6 ESTIMATING AN ALTERNATIVE TAYLOR RULE

The significant accumulation of international reserves as a percentage of total external debt and the influence of the nominal exchange rate on the Mexico–US interest-rate gap also reflect the strong dependency of Mexico's monetary policy on the United States' monetary policy. Regarding this dependency, we are only interested in the flexible exchange-rate period (that is, from the first quarter of 1995 to the first quarter of 2022). According to economic theory, a flexible exchange rate neutralizes changes in the foreign interest rate but in the case of Mexico this cannot be accepted, as admitted by the Bank of Mexico (see Banco de México 2020).

While it is true that *gi* has diminished due to the accumulation of international reserves as a percentage of total external debt, the Mexican interest rate has still been affected by the Federal Reserve's monetary policy decisions. The Taylor rule followed by the Bank of Mexico is commonly estimated without including the US interest rate. We believe the Bank of Mexico is concerned about both its own domestic inflation and the United States' interest rate, and we postulate that the actual Taylor rule implicitly followed by the Bank of Mexico is as follows:

$$i_{Mt} = \alpha_0 + \alpha_1(\pi_t - \pi^\circ{}_t) + \alpha_2 i_{USt} + \alpha_3 {i_{US}}^2{}_t + u_{2t}, \tag{2}$$

where α_i are the parameters to be estimated, i_M is Mexico's interest rate, π is the annual inflation rate, π° is the Bank of Mexico's annual inflation rate target, i_{US} is the United States interest rate, u_2 is an error term, and t is a time index.

We assume a quadratic relation between Mexico's interest rate and the United States interest rate. Moreover, considering the reduction of the Mexico–United States interest-rate gap since 1999, we assume a structural break at the third quarter of 2001. We also assume that from the first quarter of 1995 to the second quarter of 2001 the quadratic term of equation (2) was positive, whilst from the third quarter of 2001 to the first quarter of 2022 it was negative.

Sources and data are as follows: the Mexican interest rate is the quarterly average of (i) the monthly interest rate of the Treasury Certificates at 28 days from the first quarter of 1995 to the first quarter of 2008; and (ii) the daily Bank of Mexico's target interest rate from the second quarter of 2008 to the first quarter of 2022. The source of all the information is the Sistema de Información Económica database of the Bank of Mexico. The rate of inflation was elaborated as the annual growth rate of the quarterly average of the monthly Consumer Price Index reported by INEGI in its Banco de Información Económica database. The United States interest rate is the quarterly average of the monthly federal funds effective rate, given by the Federal Reserve Economic Data database of the Federal Reserve of St. Louis.

As a first step, we examine for a unit root in the series to be used in the estimation of equation (2). Table 3 reports our results. As can be seen, $(\pi - \pi^\circ)$ is a stationary series and the rest are integrated series of order one. Therefore, we can use the bounds-testing approach cointegration methodology to estimate equation (2).[8]

According to the results shown in Table 4, the Bank of Mexico increases (decreases) the interest rate when the inflation rate is higher (lower) than its target; however, it is also found that from the first quarter of 1995 to the second quarter of 2001, the Bank of Mexico augmented its interest rate in an increasingly quadratic way with respect to that of the United States, while from the third quarter of 2001

8. See footnote 7.

Table 3 Unit-root test for the series used in the estimation of equation (2)

Series	Period	Augmented Dickey–Fuller test (*t*-statistics)	Period	Phillips–Perron test (adj. *t*-statistics)
i_M	1998Q2–2022Q1	−2.44	1995Q2–2022Q1	−3.72**
$d(i_M)$	1998Q3–2022Q1	−2.07**	1995Q3–2022Q1	−13.72*
$\pi - \pi^{\circ}$	1995Q2–2022Q1	−2.25**	1995Q2–2022Q1	−2.58**
i_{US}	1995Q4–2022Q1	−3.67**	1995Q2–2022Q1	−2.44
$d(i_{US})$	1995Q3–2022Q1	−4.84*	1995Q3–2022Q1	−4.95*
${i_{US}}^2$	1995Q3–2022Q1	−4.18*	1995Q2–2022Q1	−2.64
$d({i_{US}}^2)$	1995Q3–2022Q1	−4.46*	1995Q3–2022Q1	−4.44*

Notes: * and ** are statistically significant at the 1 percent and 5 percent level. $d(\cdot)$ stands for the first difference operator. All level tests were done assuming the existence of intercept and trend, while the first difference test was done assuming no intercept and no trend. The number of lags used for the ADF tests were chosen in accordance with the Schwarz information criterion, whilst the number of bandwidths used for the PP tests were chosen according to the Newey–West criterion.
Source: Authors' elaboration with data from the SIE database of the BM, the BIE database of the INEGI, and the FRED database of the Federal Reserve of St. Louis.

Table 4 Estimation of the alternative Mexican Taylor rule (equation (2))

Period	1995Q1–2022Q1
Dependent variable	i_M
$\pi - \pi^{\circ}$	0.46*
	(0.05)
i_{US}^2	0.37*
	(0.01)
$i_{US} \cdot D0122$	2.45*
	(0.25)
$i_{US}^2 \cdot D0122$	−0.70*
	(0.06)
Constant	3.51*
	(0.18)
Model type	Restricted constant, no trend
ARDL model	(2, 4, 4, 1, 4)
F-bounds test	
F-statistic	114.12*
Adjustment coefficient	
u_{1t-1}	−0.45*
	(0.02)
Jarque–Bera test	0.92
LM test (*F*-statistic, 1 lag)	0.88
White test (*F*-statistic)	0.71
Ramsey RESET (*t*-statistic, one fitted term)	1.03

Notes: * is statistically significant at the 1 percent level (standard errors in parentheses). *D*0122 is a dummy variable with a value equal to 1 from the third quarter of 2001 to the first quarter of 2022 and 0 otherwise. White test does not include cross terms. ARDL model indicates the number of lags of the dependent and independent variables. A complete report of the estimation, including the fixed regressor, is available on request from the authors.

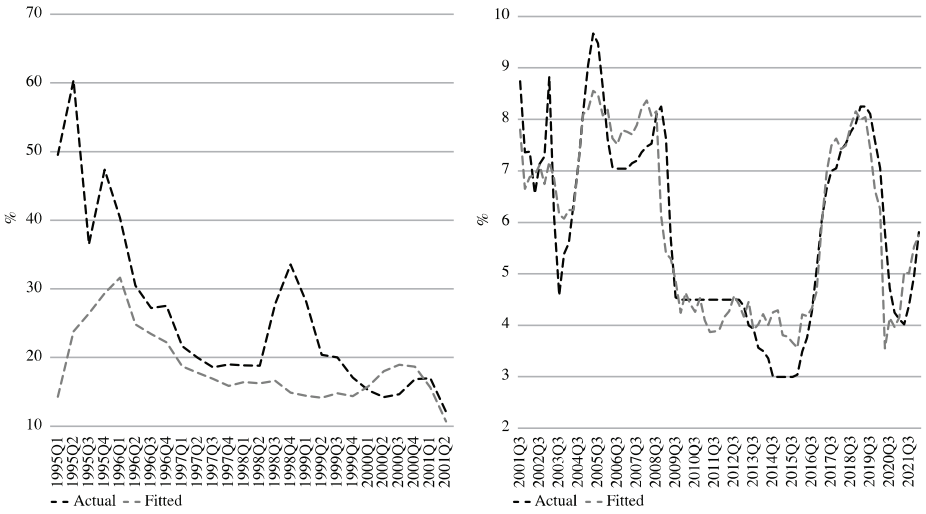
Source: Authors' elaboration using data from the SIE database of the BM, the BIE database of the INEGI, and the FRED database of the Federal Reserve of St. Louis.

to the first quarter of 2022 the effect was still quadratic but decreasing. As can be seen in Figure 9, from the first quarter of 1995 to the second quarter of 2001, our fitted Mexican interest rate tends to be lower than the actual interest rate, but the former converges to the latter towards the end of the sub-period; from the third quarter of 2001 to the first quarter of 2022 our fitted Mexican interest rate is very similar to the actual interest rate.

One consequence of the influence of the United States' interest rate on Mexico's interest rate is that Mexico confronts an interest-rate floor at a higher level of the interest rate. For the United States the liquidity-trap level of the interest rate is at a nominal interest rate equal to zero (the zero lower bound), but for Mexico it is at a nominal interest rate equal to 3.5 percentage points. Consequently, as can be seen in Figure 10, while the United States' real interest rate was negative for a long period, Mexico's interest rate has been higher and usually positive.

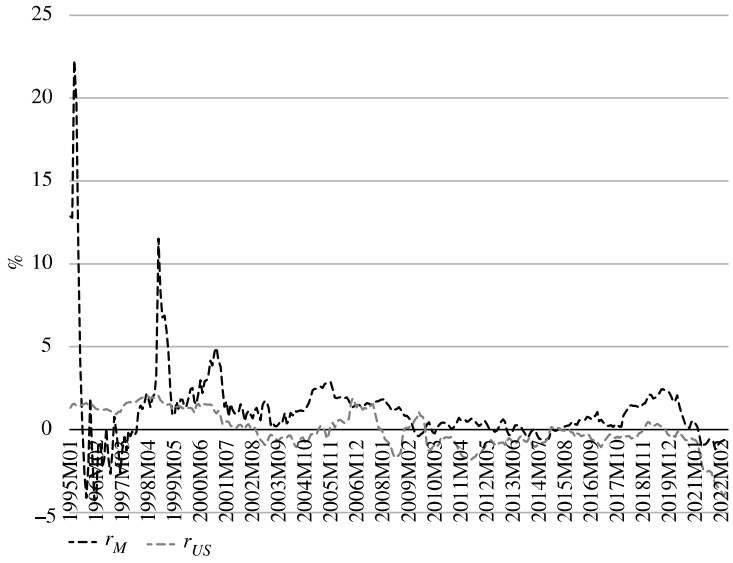
Some final implications resulting from the influence of the United States' monetary policy on Mexico's monetary policy are:

1. Although Mexican policy is widely thought to be counter-cyclical, in fact it has been pro-cyclical, which is at variance with both the intent of Taylor's rule (Taylor 1993) and the Federal Reserve's policy stance.



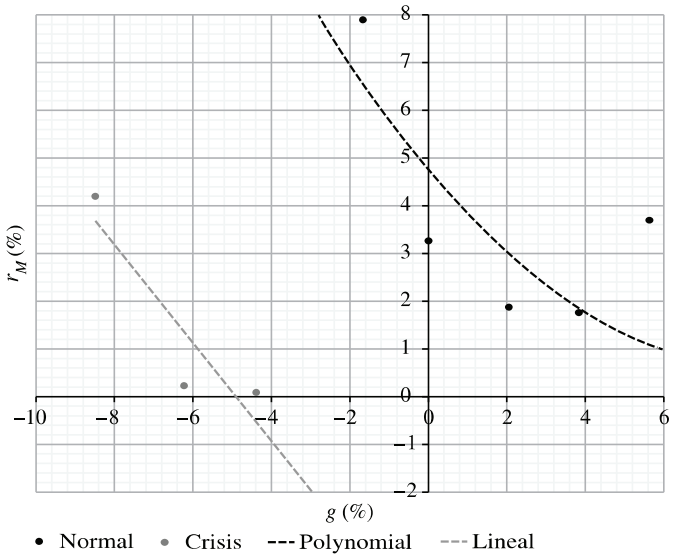
Source: Authors' elaboration with data from the SIE database of the BM, the BIE database of the INEGI, and the FRED database of the Federal Reserve of St. Louis.

Figure 9 Actual and fitted Mexican interest rates (quarterly data), 1995Q1–2022Q1



Source: Authors' elaboration with data from the SIE database of the BM, the BIE database of the INEGI, and the FRED database of the Federal Reserve of St. Louis.

Figure 10 Mexico's and the United States' real interest rates (monthly data), 1995M1–2022M5



Note: Lineal and polynomial convey the ordinary least squares (OLS) estimation between r_M and g for normal and crisis periods respectively. The outlier values observed in 2020Q2 and 2021Q2 are not considered.
Source: Authors' elaboration with data from the SIE database of the BM and of the BIE database of the INEGI.

Figure 11 Annual growth rate and real interest rate (quarterly data: average for each two percentage points segments of the growth rate), 1995Q1–2022Q1

2. Mexico's interest and inflation rates increase during recession periods, and vice versa. Figure 11 shows that Mexico's economic crises are phases of stagflation.
3. Fiscal policy has been ruled out since the foreign-debt crisis of 1982, much before the advent of the inflation-targeting monetary policy framework. Such fiscal conservatism makes no economic sense: considering that the Bank of Mexico's inflation target is 3 percent and that a liquidity-trap position is reached at an interest rate equal to 3.5 percent, the corresponding liquidity-trap real interest rate is equal to 0.5 percent (a level at which monetary policy becomes ineffective). Therefore, in that scenario, the low real cost of public debt implies that there is enough fiscal policy space.

7 FINAL REMARKS

In this article, taking inspiration from Keynes (1923; 1936), we have focused on the influence of both the dollar and the US monetary policy on Mexico's exchange rate and monetary policy. It was argued that the role of the dollar as the key or hegemonic currency introduces asymmetries in the international monetary system which greatly influence the exchange-rate dynamics of peripheral currencies, and also curb the ability of emerging-market economies to independently use their monetary policy tools and set goals. Those features apply to Mexico.

We have provided evidence of some of the consequences of the dollar hegemony for the Mexican economy. The lower volatility of the exchange rate of the Mexican peso, observed in recent decades, is a consequence of defensive policies – chiefly, the accumulation of international reserves – undertaken by the central bank to discourage and address sudden capital reversals and speculative attacks arising from speculative behavior in conditions of financial fragility.

Our hypothesis was tested with statistical evidence; we conducted empirical estimations to measure the effect of the accumulation of international reserves and exchange-rate variations on the Mexico–US interest-rate gap. Our main findings confirm that those 'precautionary' acquisitions of reserves represent an additional monetary policy channel that, on the one hand, gives the central bank room to maneuver both the exchange rate and its inflation target, and, on the other, bolsters the hegemony of the dollar.

Furthermore, we estimated an alternative Taylor rule for Mexico including the US rate of interest; our estimation gave us some noteworthy clues. First and foremost, Mexico's monetary policy is not autonomous from US monetary policy; second, Mexico faces a liquidity-trap level of the interest rate much higher than the United States: while the United States faces a zero lower bound level, Mexico encounters ineffectiveness of its monetary policy at a positive interest rate of 3.5 percent.

Clearly, with hindsight, the flexible exchange-rate regime introduced in the post-Bretton Woods era and in operation up to the present time, aggravated the balance of payments disequilibria and the monetary instability it was supposed to resolve. This 'nonsystem' allowed the United States to become the only country truly free to manage (appreciate or depreciate) its exchange rate according to its own domestic macroeconomic goals. This change bolstered the dollar hegemony over international liquidity (De Paula et al. 2017; Prates 2020).

Now, as for the crucial question regarding the future of dollar hegemony, it is an open question. The ongoing conversation is that the dominant position of the dollar will decline. The IMF (Arslanalp et al. 2022) reports that central banks' portfolio diversification is the main cause for the relative decline of the dollar's share in the world's market for international reserves. What will be the evolution of the dollar? It is a moot question. There have also been calls for a new international monetary and financial order since the collapse of Bretton Woods. It would be futile to simply substitute a new key currency, be it the euro or the renminbi or whatever currency for that matter, for the current hegemonic currency, the dollar, because that dethroning of the dollar would simply mean a *gattopardo* monetary reform. In this connection, Keynes instructed, back in the 1940s, that the post-war reconstruction of the international monetary and financial system should avoid granting the international reserve right on any particular currency (Harrod 1951).

Insofar as the dollar will remain the key currency at least for the foreseeable future, problems of liquidity and assets with a differential liquidity premium will also remain with us. In this connection, it is worth wrapping up by quoting Keynes (1936 [1964], p. 155): 'Of the maxims of orthodox finance none, surely, is more anti-social than the fetish of liquidity.'

REFERENCES

Arslanalp, S., B. Eichengreen, and C. Simpson-Bell (2022), 'The stealth erosion of dollar dominance: active diversifiers and the rise of nontraditional reserve currencies,' IMF WP/22/58, Washington, DC: International Monetary Fund.

Banco de México (2020), 'Reporte de estabilidad financiera,' Banco de México, available at: {BB59C14C-03BE-58EE-6E0F-7D3EB65D52D5}.pdf (banxico.org.mx).
Bresser-Pereira, L.C. (2016), 'Reflecting on New Developmentalism and Classical Developmentalism,' *Review of Keynesian Economics*, 4(3), 331–352.
Calvo, G.A. (1998), 'Capital flows and capital-market crises: the simple economics of sudden stops,' *Journal of Applied Economics*, 1(1), 35–54.
Calvo, G. and E. Mendoza (2000), 'Contagion, globalization, and the volatility of capital flows,' in S. Edwards (ed.), *Capital Flows and the Emerging Economies: Theory, Evidence, and Controversies*, Chicago: University of Chicago Press, pp. 15–41.
Davidson, P. (1999), 'Global employment and open economy macroeconomics,' in J. Deprez and J.T. Harvey (eds), *Foundations of International Economics*, London and New York: Routledge, pp. 9–34.
De Paula, L.F., B. Fritz, and D.M. Prates (2017), 'Keynes at the periphery: currency hierarchy and challenges for economic policy in emerging economies,' *Journal of Post Keynesian Economics*, 40(2), 183–202, available at: https://doi.org/10.1080/01603477.2016.1252267.
Frenkel, R. and J. Ros (2006), 'Unemployment and the real exchange rate in Latin America,' *World Development*, 34(4), 631–646.
Friedman, M. (1953), 'The case for flexible exchange rates,' in M. Friedman, *Essays in Positive Economics*, Chicago: The University of Chicago Press, pp. 157–203.
Galindo, L.M. and J. Ros (2008), 'Alternatives to inflation targeting in Mexico,' *International Review of Applied Economics*, 22(2), 201–214.
Harrod, R.F. (1951), *The Life of John Maynard Keynes*, London: Macmillan.
IMF (International Monetary Fund) (2022), *Annual Report on Exchange Arrangements and Exchange Restrictions 2021*, Washington, DC: IMF.
Keynes, J.M. (1923 [2013]), *A Tract on Monetary Reform*, Cambridge, UK: Cambridge University Press.
Keynes, J.M. (1930), *A Treatise on Money*, vols I and II, London: Macmillan.
Keynes, J.M. (1936 [1964]), *The General Theory of Employment, Interest and Money*, New York: Harcourt Brace Jovanovich.
Lavoie, M. (2014), *Post-Keynesian Economics: New Foundations*, Cheltenham, UK and Northampton, MA: Edward Elgar Publishing.
Médici, F., A. Mario, and A. Fiorito (2021), 'Questioning the effect of the real exchange rate on growth: new evidence from Mexico,' *Review of Keynesian Economics*, 9(2), 253–269.
Palley, T. (2018), 'Recovering Keynesian Phillips curve theory: hysteresis of ideas and the natural rate of unemployment,' *Review of Keynesian Economics*, 6(4), 473–492.
Palley, T. (2020), 'What's wrong with Modern Money Theory: macro and political economic restraints on deficit-financed fiscal policy,' *Review of Keynesian Economics*, 8(4), 472–493.
Pesaran, M.H., Y. Shin, and R.J. Smith (2001), 'Bound Testing Approaches to the analysis of level relationships,' *Journal of Applied Econometrics*, 16(3), 289–326.
Prates, D. (2020), 'Beyond Modern Money Theory: a Post-Keynesian approach to the currency hierarchy, monetary sovereignty, and policy space,' *Review of Keynesian Economics*, 8(4), 494–511.
Ros, J. (2015), *¿Cómo salir de la trampa del lento crecimiento y alta desigualdad?*, El Colegio de México y Universidad Nacional Autónoma de México.
Sarno, L. (2005), 'Viewpoint: towards a solution to the puzzles in exchange rate economics: where do we stand?,' *Canadian Journal of Economics* (*Review Canadienne d'économique*), 38(3), 673–708.
Serrano, F., R. Summa, and G. Aidar (2021), 'Exogenous interest rate and exchange rate dynamics under elastic expectations,' *Investigación Económica*, 80(318), 3–31.
Taylor, J.B. (1993), 'Discretion versus policy rules in practice,' *Carnegie-Rochester Conference Series on Public Policy*, 39, 195–214.
Vernengo, M. (2006), 'Technology, finance, and dependency: Latin American radical political economy in retrospect,' *Review of Radical Political Economics*, 38(4) 551–568.

Vicarelli, F. (1984), *Keynes, the Instability of Capitalism*, Philadelphia: University of Pennsylvania Press.
Williamson, J. (1976), 'The benefits and costs of an international nonsystem,' in E.M. Bernstein et al. (eds), *Reflections on Jamaica*, Essays in International Finance 115, International Finance Section, Princeton, NJ: Princeton University Press, pp. 54–59.
Wray, L.R. (2015), *Modern Money Theory: A Primer on Macroeconomics for Sovereign Monetary Systems*, 2nd edn, Basingstoke, UK: Palgrave Macmillan.