BBVA Research

N° 18/07

WORKING PAPER

Natural interest rates in the U.S., Canada and Mexico

Kan Chen / Nathaniel Karp

BBVA Research

Natural Interest Rates in the U.S., Canada and Mexico*

Kan Chen
BBVA Research
kan.chen@bbva.com

Nathaniel Karp
BBVA Research
nathaniel.karp@bbva.com

Abstract

The natural interest rate, or r-star, has been a critical determinant of monetary policy normalization in the U.S. and other countries. With the U.S. Federal Reserve expected to continue raising interest rates, central banks in other countries will have to balance the spillover effects with their own internal dynamics. In countries with close ties to the U.S. economy, the influence could be more profound. This is the case of Canada and Mexico, two small-open economies that are highly integrated to the U.S. through international trade and capital markets. In this paper, we first apply the methodology developed by Holston et al. (2017) to estimate r-stars for the U.S., Canada and Mexico. We then decompose the natural interest rate into growth and non-growth components and discuss the channels through which different factors could affect the natural interest rate. Finally, we use our estimates to show that Canada and Mexico should hold distinct priorities for their decision making on the trilemma of international finance. Our analysis suggests that Canada′s central bank could afford to allow monetary policy autonomy to be a secondary goal, while the interest rate setting by Mexico′s central bank should remain highly independent to boost the return on capital through the non-growth component.

Key words: Natural interest rate, Trilemma, Monetary Policy, Canada, Mexico

JEL classification: E42, E60, G15

* The views expressed are solely those of the authors and do not necessarily reflect those of BBVA Research, or anyone else in BBVA. The authors thank the participants of the 85th International Atlantic Economic Conference for helpful comments.

1. Introduction

Like the U.S. Federal Reserve (Fed), many central banks around the world will attempt to normalize monetary policy after an extended period of low interest rates. These countries will have to balance the spillover effect from Fed's normalization with their internal dynamics. For countries with close ties to the U.S. economy, the influence could be more profound. This is the case of Canada and Mexico, which are two traditional small-open economies, mostly price-takers in the international markets, and highly integrated to the U.S. through international trade and capital markets.

The cornerstone of the Federal Reserve's short-term interest rate normalization process is the natural interest rate or r-star, which acts as the benchmark for full normalization and has repeatedly emerged in discussions on the expected path of monetary policy. In particular, many policy recommendations are based on the central bank's commitment to the interest rate relative to the natural rate of interest. For example, Carlstrom et al. (2015) suggest that a temporary interest rate peg below the natural rate of interest would help the economy escape the zero lower bound (ZLB).

While economists have hardly reached an agreement on how to calculate r-star, the estimation strategy proposed by Laubach and Williams (2003) has been widely discussed and accepted to be an effective method to compute the natural interest rate. Their model links output, interest rate and inflation with two equations: The IS curve equation connects the interest rate and output gap, while the Phillips curve equation links the output gap to inflation. This stylized model provides a straightforward illustration of the dynamics of important economic variables for most economies.

Moreover, the methodology has a novel feature in which the natural interest rate can be decomposed into growth and non-growth components. The growth component is the growth rate of potential output while the non-growth component captures the aggregate effects of other factors such as the scarcity of safe assets (Caballero et al., 2017), income inequality (Summers, 2014), and the global saving "glut" (Bernanke, 2011). The separation into the growth and non-growth components helps shed light on the dynamics of natural interest rates.

While there is a vast literature on estimating the natural rate of interest for the U.S., much less research has been conducted in a cross-country narrative. For example, Hamilton et al. (2016) and Holston et al. (2017) are two recent studies that compare the natural interest rates of the U.S. to those of other advanced economies. However, these studies focus on finding out factors that shape the natural interest rate in developed countries and do not look into the case of developing countries.

Our paper tries to fill this gap by estimating the natural interest rate of an emerging market economy – Mexico. On the one hand, after more than three decades of economic and financial reforms, Mexico has become highly integrated into the global market and is inevitably affected by the international factors that have impacted other developed countries. On the other hand, Mexico still holds some typical properties of developing countries, such as limited depth of the

financial sector and a relatively young population. By examining the case of Mexico, we can better understand the channels through which natural interest rates in emerging economies are affected.

Furthermore, we extend our research on the trilemma faced by policymakers of open economies. The trilemma states that one country cannot have all three conditions of monetary independence, fixed exchange rate, and completely free financial markets simultaneously. Therefore, the government has to evaluate the trade-offs and prioritize policy objectives. However, foreign exchange rates and global interest rates affect developed and developing open economies like Canada and Mexico in different ways. Therefore, by understanding the determinants of the natural interest rate and the trilemma faced by these economies, we can shed light on how to improve the decision-making process of monetary policy, financial openness, and exchange rate flexibility. Our analysis utilizes the trilemma indexes developed by Aizenman, Chinn, and Ito (2008) to illustrate how the natural interest rate for Mexico and Canada can be affected by different policy priorities. For Mexico, we show that independent monetary policy and high capital mobility will encourage domestic investment, which in turn would boost potential GDP growth and natural interest rates. Moreover, Mexico should maintain a flexible exchange rate regime, as the fear of capital flight under a tightly controlled currency could significantly lower the return on capital. For Canada, we show that a stable foreign exchange rate will increase potential output growth and therefore raise the natural interest rate. Given that Canada also has a fully open financial market, the monetary authorities should put a high weight on global factors, particularly interest rates, in their decision-making process.

In the remainder of the paper, Section 2 briefly outlines the data and methodology for the estimates of natural interest rates for Canada, Mexico, and the United States. Section 3 shows in-depth discussions of our empirical results, including the parameter estimates and the series of r-star including the growth and non-growth components. In Section 4, we extend our empirical investigation by examining the relationship between the natural interest rate and the open economy trilemma, and we highlight different policy priorities for an advanced economy (Canada) and an emerging market economy (Mexico). Section 5 presents our main conclusions.

2. Methodology and data

2.1. The empirical model

Our empirical model is based on Holston et al. (2017). It essentially estimates a system of two equations:

$$\tilde{y}_t = a_{y,1}\tilde{y}_{t-1} + a_{y,2}\tilde{y}_{t-2} + \frac{a_r}{2}\sum_{j=1,2}\left(r_{t-j} - r^*_{t-j}\right) + \epsilon_{1,t} \quad (1)$$

$$\pi_t = b_\pi \pi_{t-1} + b_y \tilde{y}_{t-1} + \epsilon_{2,t} \quad (2)$$

where $\tilde{y}_t$ denotes the output gap, which is defined as the difference between log-real (y_t) and log-potential (y^*_t) output ($\tilde{y}_t = y_t - y^*_t$), r^*_t denotes the natural interest rate, π_t denotes the consumer price inflation, and r_t denotes the real interest rate. The ex-ante short-term real interest rate is calculated as the nominal federal funds rate subtracting the expected inflation rate, which is a four-quarter moving average of past inflation values. The stochastic terms $\epsilon_{1,t}$ and $\epsilon_{2,t}$ denote transitory shocks to the output gap and inflation. These are derived from two key building blocks of New Keynesian models. Equation (1) is based on the dynamic IS curve, where the output gap is affected by its previous values and lagged real interest rate gap. Equation (2) is based on the New Keynesian Phillips curve, where the inflation rate depends on past values of inflation and output gap.[1]

Theoretically, the natural interest rate is affected by the growth rate of potential output and other non-growth factors. Therefore, the natural interest rate can be decomposed into two components:

$$r^*_t = g_t + z_t, \quad (3)$$

where g_t is the growth rate of potential output, and z_t is the aggregate change of non-growth factors, such as uncertainty, individuals' preferences over risks and liquidity, life expectancy, and prices of capital goods.

Following Holston et al. (2017), we further specify the dynamics of y^*_t, g_t, and z_t as:

$$y^*_t = y^*_{t-1} + g_{t-1} + \epsilon_{4,t} \quad (4)$$

$$g_t = g_{t-1} + \epsilon_{5,t} \quad (5)$$

$$z_t = z_{t-1} + \epsilon_{6,t}\ . \quad (6)$$

That is, the log potential output follows a random-walk process with a drift, g. Moreover, the drift term, g_t, and the non-growth factor, z_t, also follow a random-walk process.

1: See Holston, Laubach, and Williams (2017) for further discussion on the intuition of the equations in the context of an open economy.

2.2. Data

Our data sample includes quarterly real GDP, and monthly inflation and short-term nominal interest rate for Canada, Mexico, and the United States. Monthly data were averaged to obtain quarterly variables. Table 1 summarizes the series that we used for our estimation, where y denotes output, π denotes inflation, and i denotes a safe overnight nominal interest rate. We obtained our data from Haver Analytics.

Table 1 Data description

Variable	Definition	Publisher
Canada 1962:I – 2017: III		
y	real GDP	Statistics Canada
π	CPI less food and energy	Statistics Canada
i	bank rate	Bank of Canada
Mexico 1978:I – 2017: III		
y	real GDP	Instituto Nacional de Estadística Geografía e informática
π	CPI less food and energy	Instituto Nacional de Estadística Geografía e informática
i	overnight rate	Banco de México
United States 1959:I – 2017: III		
y	real GDP	Bureau of Economic Analysis
π	PCE less food and energy	Bureau of Economic Analysis
i	federal funds rate	Board of Governors

3. Empirical results

3.1. Parameter estimates

We report our estimates of the parameters for the three economies in Table 2. On the one hand, the results for Canada and the United States are consistent with Holston et al. (2017) regarding the persistence of the output gap, ($a_1 + a_2$), being close to 1. Also, the slope coefficients, a_r and b_y, and standard errors, σ_1, σ_2, and σ_4, are significant and consistent with the literature.

On the other hand, the estimates for Mexico have several distinct patterns from the two advanced economies in the region. First, from the IS curve (equation 1) coefficients, we can see that the output gap for Mexico is less persistent than the ones for Canada and the United States. The sum of a_1 and a_2 is only 0.87, which is significantly lower than 0.96 for Canada and 0.94 for the United States. Moreover, the standard error of the innovation term for Mexico is also more than twice as large as the other two. These results highlight some of the most familiar challenges that central banks in emerging markets have to deal with, such as higher volatility of the business cycle and the need of more aggressive monetary policy easing to boost investment.

Second, the New Keynesian Phillips curve (equation 2), reveals a high standard error of the innovation term for inflation and a much steeper slope than for Canada and the United States. Comparing the estimates for b_y the slope coefficient of 0.81 for Mexico highlights substantial price sensitivity to changes in aggregate demand. These results confirm higher inflation costs when trying to bring down unemployment and lower credibility of the authorities regarding their commitment to achieving price stability.

Table 2. Parameter estimates

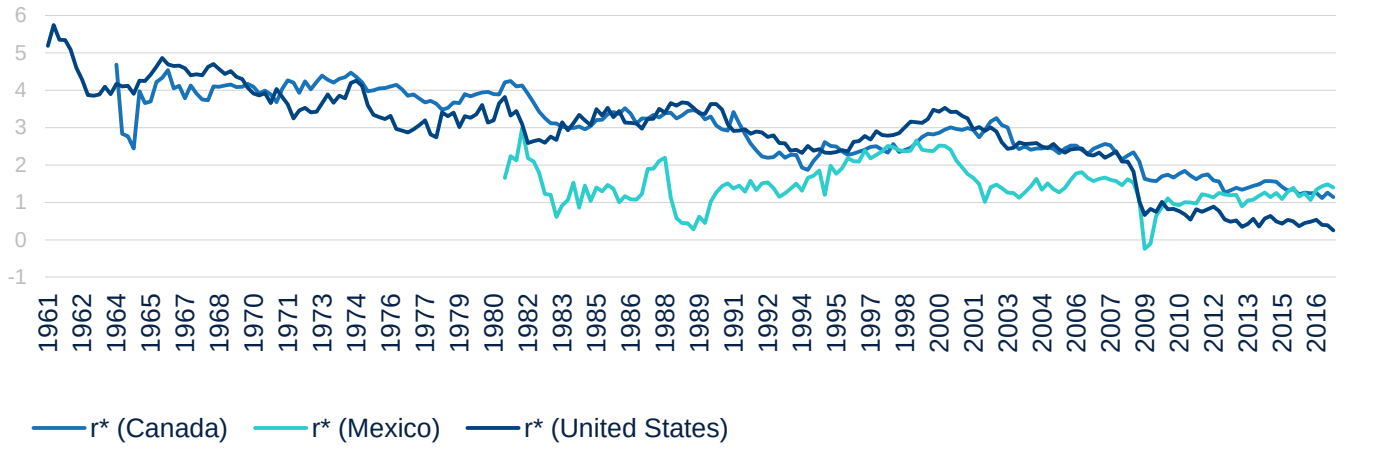
Parameter	Canada	Mexico	United States
a_1	1.606	1.399	1.532
	(15.811)	*(12.335)*	*(14.836)*
a_2	-0.644	-0.530	-0.590
	(6.356)	*(3.825)*	*(5.636)*
$a_1 + a_2$	0.963	0.869	0.942
a_r	-0.072	-0.013	-0.070
	(3.070)	*(1.348)*	*(4.060)*
b_π	0.580	0.854	0.667
	(13.430)	*(19.198)*	*(15.897)*
b_y	0.049	0.811	0.077
	(2.321)	*(1.528)*	*(3.101)*
σ_1	0.363	0.845	0.355
	(4.057)	*(4.097)*	*(3.933)*
σ_2	1.398	11.007	0.793
	(36.809)	*(35.664)*	*(29.990)*
σ_4	0.598	0.824	0.571
	(10.168)	(4.027)	(10.085)

(T values in parentheses)

3.2. The natural interest rate estimates

Based on our parameter estimates, we further obtain the latent variable of the natural interest rates for Canada, Mexico, and the United States. We plot the series in Figure 1.

Figure 1 Natural interest rates (r*) for Canada, Mexico, and the United States



Source: BBVA Research

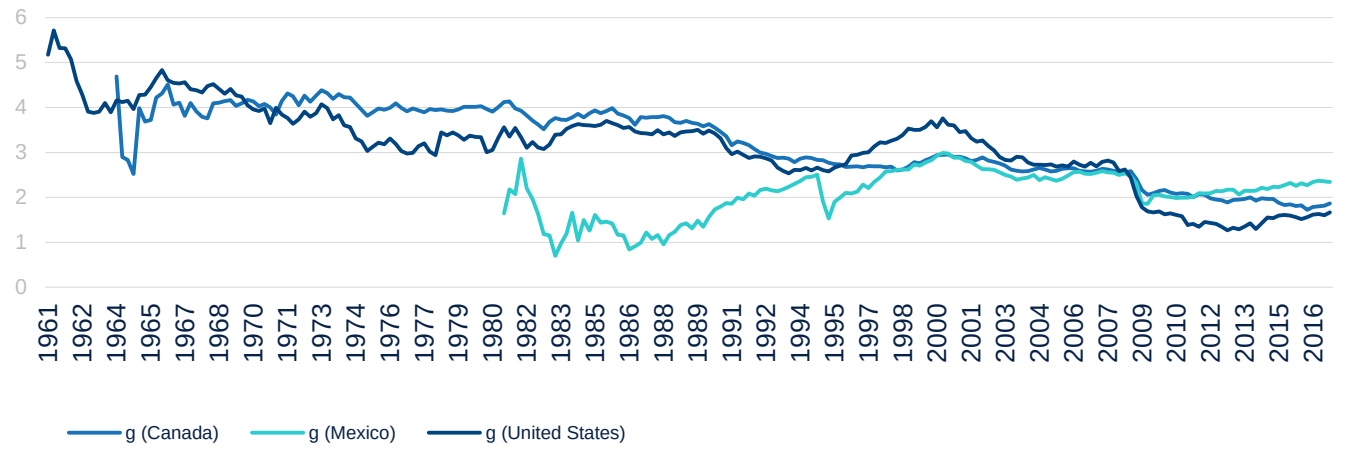
First, from Figure 1, we can see that Mexico's r-star is significantly more volatile than in the United States and Canada. This is consistent with the argument of Aguiar and Gopinath (2007) that "the cycle is the trend" for emerging market economies. That is, transitory shocks in emerging market economies are much larger than in advanced economies. Therefore, it is often challenging to separate cycles and trends in the business cycle. Nonetheless, it is worth noting Mexico's increasing r-star stability since the early 90s following the structural economic transformation that included higher integration to the global economy, a flexible exchange rate, central bank autonomy, and fiscal responsibility.

Second, the dynamics of natural interest rates vary significantly after 2008's global financial crisis. For Canada, the scale of the drop is much smaller than for the United States. However, the declining trend for these two countries shows that both economies are likely affected by similar structural factors such as the slowdown in productivity, aging of the labor force and insufficient investment. Mexico's natural interest rate exhibits an even more substantial decrease. However, after a swift rebound, Mexico's r-star returned to its pre-crisis level, and for the first time, it surpassed both the United States and Canada's. This suggests that the forces that are pulling down natural interest rates in the United States and Canada are not as strong in Mexico.

3.3. Growth and non-growth components of r*

As equation (3) suggests, we can decompose the natural interest rate (r_t^*) into two parts: the growth component (g_t) and the non-growth component (z_t). The intuition behind such decomposition is straightforward. First, the natural interest rate should reflect the return to capital investment, which will be captured by the growth component. Second, the natural interest rate should also indicate market characteristics, such as preferences over risks and liquidity conditions. Such characteristics will be captured by the non-growth component. Therefore, the decomposition will shed light on our understanding of the driving factors behind natural interest rates in this cross-country study.

Figure 2 Growth components (g) for Canada, Mexico, and the United States



Source: BBVA Research

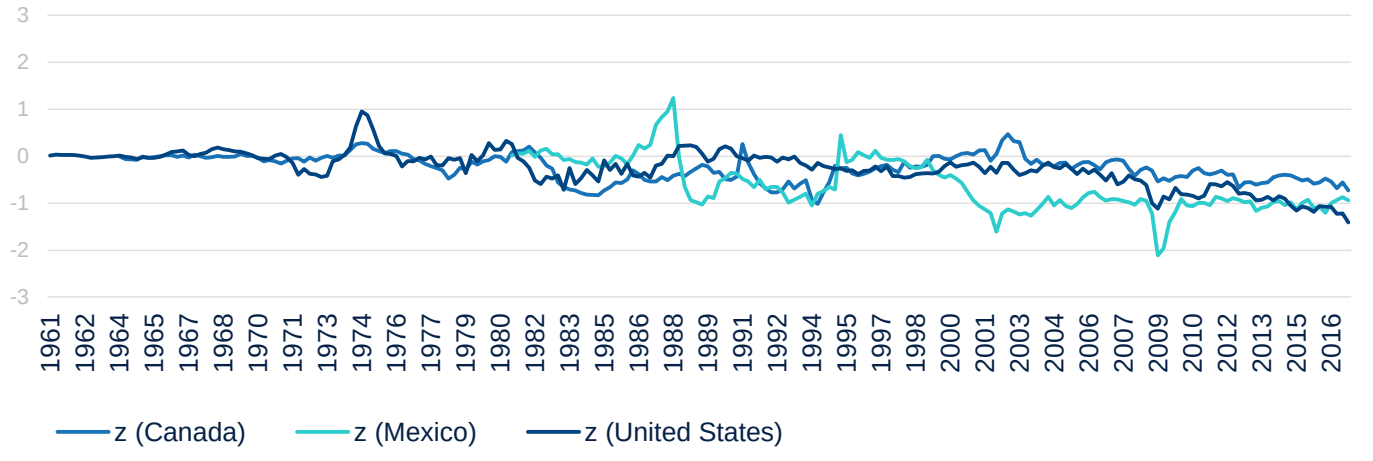
Figure 2 illustrates the growth component for the three North American economies. For the United States, the rate of potential output growth peaked around 2000 and suffered a significant decline after the Great Recession. The gradual rebound in the past three years is consistent with alternative estimations that assume that the potential output growth rate will accelerate in the next decade. Similarly, Canada's declining secular trend since the 1980s is expected to turn around in the next couple of years. For example, the United States' Congressional Budget Office projects potential output growth of 1.9 percent by 2022 compared to 1.5 percent in 2017. Likewise, the Bank of Canada projects potential output growth to increase from 1.3 percent in 2017 to 1.6 percent by 2020.[2]

According to our estimation, after a steep drop during the global financial crisis, Mexico's potential output growth embarked on a steady upward trend improving from 2.1 percent in 2012 to 2.4 percent in 2017. This reflected strong consumption, particularly in the services sector, supported by both robust credit availability and employment gains in the formal sector. The improvement in economic fundamentals explains the steady upward trend in r-star since 2013.

[2]: See for example CBO's An Update to the Budget and Economic Outlook: 2017 to 2027 (https://www.cbo.gov/system/files/115th-congress-2017-2018/reports/52801-june2017outlook.pdf) and Bank of Canada's Monetary Policy Report - April 2017 (http://www.bankofcanada.ca/2017/04/mpr-2017-04-12/).

The estimates of the non-growth components depict a different narrative (Figure 3). While the z series for Mexico is negative for most of the sample period, as is the case in the United States and Canada, Mexico's z is far more volatile and negative than in the two other countries. This might be the result of higher vulnerability to international capital flows that characterize an emerging market economy. In fact, the surge in Mexico's non-growth component in both the second half of the 1980s and after the Tequila crisis reflects strong capital inflows following the sharp decline in the value of the currency. In the 2000s, the investment reversal and industrial rebalancing amid greater competition from China and other emerging markets explain the negative rates of the non-growth component that lasted for an extended period. After 2006, excluding the global financial crisis, Mexico's z factor remained relatively stable, even after increased uncertainty following the U.S. 2016 presidential election. In part, this reflects the rebalancing towards safe domestic assets under more stable macroeconomic conditions. It is worth noting that the high volatility in z explains the patterns of the natural interest rate despite a stable potential output growth rate. In sum, while financial stability should remain a top priority for policymakers, it is equally important to stay attractive to investors.

Figure 3 Non-growth components (z) for Canada, Mexico, and the United States



Source: BBVA Research

4. International macroeconomics trilemma: Policy implications for Mexico and Canada

As two small-open economies that have close connections to the United States economy, Canada and Mexico's policymaking is affected by the spillovers from the Federal Reserve's monetary policy actions. Moreover, the discussion of their policy decisions is further complicated by the trilemma of international macroeconomics.

The trilemma, or the impossible trinity, is popularized by Mundell (1963). It states that one country cannot have a fixed exchange rate, free capital mobility and monetary policy independence, all at the same time. A country with a fixed value of their currency and completely independent interest rate setting cannot allow capital to flow across the border freely. On the other hand, if the exchange rate is fixed and cross-border capital flow is free, the interest rate will always be at the global level to eliminate arbitrage. Moreover, the combination of free capital mobility and complete monetary policy autonomy would require a flexible exchange rate regime to avoid drains of foreign reserves.

Aizenman et al. (2008) have developed three indexes for exchange rate stability, monetary independence, and the openness of capital markets for 181 countries from 1970 through 2014. Their indexes quantify the degree of the three dimensions explained above, and provide us a convenient measure for the policy decisions by each government. The indexes include the Monetary Independence (MI) index, which is derived from the correlation of a country's interest rate with foreign interest rates, the Exchange Rate Stability (ERS) index, which is based on the volatility of a country's exchange rates, and the Financial Openness/Integration (KAOPEN) index, which is a de jure measure of each country's openness to foreign capital based on their specific law terms. All three measures are normalized with a range from 0 to 1, with zero meaning the lowest monetary policy independence, no control over exchange rate fluctuations, and closed financial markets.

In our empirical investigation, we run regressions of r-star, g, and z for Canada and Mexico on the trilemma indexes controlling for the United States, and we present the regression results in Table 3.

Table 3 Results for trilemma regressions

	Mexico			Canada		
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	r^*	g	z	r^*	g	z
r^*_{US}	0.437***			0.725***		
	(0.0660)			(0.0886)		
g_{US}		0.231**			0.729***	
		(0.0966)			(0.110)	
z_{US}			0.826**			0.380***
			(0.314)			(0.134)
FX stability	-0.785***	-0.451*	-0.372	0.666	1.474**	-0.438
	(0.237)	(0.250)	(0.355)	(0.691)	(0.638)	(0.357)
Monetary independence	0.489*	-0.204	0.979**	0.192	0.257	-0.171
	(0.259)	(0.290)	(0.371)	(0.549)	(0.504)	(0.311)
Openness to capital	1.363***	1.831***	-0.612*			
	(0.239)	(0.263)	(0.327)			
Constant	-0.272	0.713*	-0.318	0.627*	0.317	0.0847
	(0.280)	(0.358)	(0.352)	(0.350)	(0.368)	(0.208)
Observations	**34**	**34**	**34**	**45**	**45**	**45**
R-squared	**0.709**	**0.674**	**0.411**	**0.747**	**0.72**	**0.18**

Standard errors in parentheses, *** p<0.01 ** p<0.05 * p<0.10.

The regression analysis shows that for Mexico's natural interest, the r-star of the United States has a significant positive impact. This is consistent with the empirical literature that spillovers from the Fed will affect interest rates in Mexico and other emerging markets. Moreover, we can see that controlling the foreign exchange rate has a negative effect on the natural interest rate of Mexico. The Mexican peso crisis and the East Asia financial crisis have shown that limiting foreign exchange rate fluctuations to market conditions could put massive pressure on interest rates and capital reserves. When the arbitrage opportunity is exploited by international investors, a foreign exchange rate not determined by market forces will not sustain, and usually, a financial crisis with currency meltdown will follow. Therefore, for emerging market economies like Mexico, a fixed exchange rate regime will negatively affect the natural interest rate.

Moreover, our regression results also show that financial openness is a positive factor for the natural interest rate. To further understand the mechanism behind the positive effect, we can see from column (2), that the level of openness to capital has a significant positive impact on potential output. This confirms the substantial effect of foreign investment on economic performance for Mexico. On the other hand, from column (3), we can see that financial openness also has a negative effect on the non-growth factor. However, this negative impact is neither as significant nor as large as the positive effect on the growth factor. Still, this underlies the side effects of high financial openness when, for example, sudden stops of international capital destabilize the domestic financial system.

The regressions on the natural interest rate of Mexico highlight the priorities for policymakers. Regarding the international macroeconomics trilemma, the authorities should put less control over the exchange rate and increase

financial openness. Moreover, given that monetary independence has a positive effect on the natural interest rate through the non-growth factor, the central bank should set the policy rate consistent with domestic conditions of price stability and growth, and avoid the temptation of “following the Fed.”

In the case of Canada, the open financial market index equals 1 (the highest possible value) throughout the whole sample period. Therefore, we leave out the financial openness index from the regression. Given the utterly open financial market, the trilemma reduces to a dilemma. The natural interest rate of Canada is profoundly affected by the interest rate in the United States. As an advanced economy without currency crises, we can see from column (5), that foreign exchange rate stability has a marginally positive effect on potential output. In addition, monetary independence is insignificant in all of the three regressions. Therefore, since the foreign exchange rate is the most significant factor for potential output, the policy priority for Canada would be to maintain a stable exchange rate, and be flexible in allowing their monetary policy to follow the Fed’s.

5. Conclusions

The central banks of Canada and Mexico exemplify the dilemma that monetary authorities will face over the next years as the Federal Reserve continues normalizing monetary policy. On the one hand, advanced economies such as Canada that have open financial markets should focus on maintaining a stable foreign exchange rate and allow their policy rates to track the United States. Considering that the natural interest rate and its components in the United States are lower than Canada's, and that inflation in both countries is similar, there is little risk of overtightening monetary conditions and derailing the expansion by following this strategy.

On the other hand, emerging markets like Mexico with floating foreign exchange rates should maintain an independent interest rate setting based on domestic economic conditions. In principle, it would seem that monetary policy would call for higher interest rates given that the natural interest rate and inflation are higher than in the United States. Otherwise, an overheated economy would result in price instability, which would require aggressive monetary policy actions thereby exacerbating the volatility of the business cycle. However, in the short-run, the path of monetary policy is more likely to be determined by the non-growth factor.

6. References

Aguiar, M., Gopinath, G., 2007. Emerging Market Business Cycles: The Cycle Is the Trend. *Journal of Political Economy* 115, 69–102.

Aizenman, J., Chinn, M.D., Ito, H., 2008. Assessing the Emerging Global Financial Architecture: Measuring the Trilemma's Configurations over Time (Working Paper No. 14533). National Bureau of Economic Research.

Andrew Agopsowicz, Bassirou Gueye, Natalia Kyui, Youngmin Park, Mohanad Salameh, Ben Tomlin, 2017. April 2017 Annual Reassessment of Potential Output Growth in Canada.

Barro, R.J., Fernández-Villaverde, J., Levintal, O., Mollerus, A., 2014. Safe Assets (Working Paper No. 20652). National Bureau of Economic Research.

Bernanke, B.S., 2011. International Capital Flows and the Returns to Safe assets in the United States 2003-2007. *Financial Stability Review* 13–26.

Bernanke, B.S., 2005. The Global Saving Glut and the U.S. Current Account Deficit (No. 77), Speech. Board of Governors of the Federal Reserve System (U.S.).

Caballero, R.J., Farhi, E., Gourinchas, P.-O., 2017. The Safe Assets Shortage Conundrum. *Journal of Economic Perspectives* 31, 29–46.

Carlstrom, C.T., Fuerst, T.S., Paustian, M., 2015. Inflation and Output in New Keynesian Models with a Transient Interest Rate Peg. *Journal of Monetary Economics* 76, 230–243.

Congressional Budget Office, 2017. An Update to the Budget and Economic Outlook: 2017 to 2027. Congressional Budget Office.

Galesi, A., Nuño, G., Thomas, C., 2017. The Natural Interest Rate: Concept, Determinants and Implications for Monetary Policy. *Economic Bulletin*.

Gordon, R.J., 2016. Perspectives on The Rise and Fall of American Growth. *American Economic Review* 106, 72–76.

Hamilton, J.D., Harris, E.S., Hatzius, J., West, K.D., 2016. The Equilibrium Real Funds Rate: Past, Present, and Future. *IMF Econ Rev* 64, 660–707.

Holston, K., Laubach, T., Williams, J.C., 2017. Measuring the natural rate of interest: International trends and determinants. *Journal of International Economics*, 39th Annual NBER International Seminar on Macroeconomics 108, S59–S75.

Kiley, M.T., 2015. What Can the Data Tell Us About the Equilibrium Real Interest Rate? (SSRN Scholarly Paper No. ID 2665710). Social Science Research Network, Rochester, NY.

Laubach, T., Williams, J.C., 2003. Measuring the Natural Rate of Interest. *The Review of Economics and Statistics* 85, 1063–1070.

Mundell, R.A., 1963. Capital Mobility and Stabilization Policy Under Fixed and Flexible Exchange Rates. *Canadian Journal of Economics and Political Science/Revue canadienne de economiques et science politique* 29, 475–485.

Obstfeld, M., Shambaugh, J.C., Taylor, A.M., 2005. The Trilemma in History: Tradeoffs Among Exchange Rates, Monetary Policies, and Capital Mobility. *The Review of Economics and Statistics* 87, 423–438.

Rey, H., 2015. Dilemma not Trilemma: The global Financial Cycle and Monetary Policy Independence (Working Paper No. 21162). National Bureau of Economic Research.

Summers, L.H., 2014. U.S. Economic Prospects: Secular Stagnation, Hysteresis, and the Zero Lower Bound. *Bus Econ* 49, 65–73.

BBVA Research

Working Papers

2018

18/07 **Kan Chen and Nathaniel Karp:** Natural interest rates in the U.S., Canada and Mexico

18/06 **Angel de la Fuente:** Las finanzas autonómicas en 2017 y entre 2003 y 2017.

18/05 **Noelia Cámara, Enestor Dos Santos, Francisco Grippa, Javier Sebastian, Fernando Soto y Cristina Varela:** Monedas digitales emitidas por bancos centrales: Una valoración de su adopción en América Latina.

18/04 **Angel de la Fuente y Rafael Doménech:** El nivel educativo de la población en España y sus regiones: actualización hasta 2016.

18/03 **Diego Bodas, Juan R. García López, Juan Murillo Arias, Matías Pacce, Tomasa Rodrigo López, Pep Ruiz de Aguirre, Camilo Ulloa, Juan de Dios Romero Palop and Heribert Valero Lapaz:** Measuring Retail Trade Using Card Transactional Data.

18/02 **Máximo Camacho and Fernando Soto:** Consumer confidence's boom and bust in Latin America.

18/01 **Ana I. Segovia Domingo and Álvaro Martín Enríquez:** Digital Identity: the current state of affairs.

2017

17/24 **Joaquín Iglesias, Álvaro Ortiz and Tomasa Rodrigo:** How Do the Emerging Markets Central Bank Talk? A Big Data Approach to the Central Bank of Turkey.

17/23 **Ángel de la Fuente:** Series largas de algunos agregados económicos y demográficos regionales: Actualización de RegData hasta 2016.

17/22 **Ángel de la Fuente:** Series enlazadas de algunos agregados económicos regionales, 1955-2014. Parte II: Otras variables de empleo, rentas del trabajo y paro.

17/21 **Ángel de la Fuente:** La evolución de la financiación de las comunidades autónomas de régimen común, 2002-2015.

17/20 **Maximo Camacho, Matias Pacce and Camilo Ulloa:** Business cycle phases in Spain.

17/19 **Ángel de la Fuente:** La liquidación de 2015 del sistema de financiación de las comunidades autónomas de régimen común.

17/18 **Víctor Adame y David Tuesta:** The labyrinth of the informal economy: measurement strategies and impacts.

17/17 **Víctor Adame y David Tuesta:** El laberinto de la economía informal: estrategias de medición e impactos.

17/16 **Liliana Rojas-Suárez y Lucía Pacheco:** Índice de prácticas regulatorias para la inclusión financiera en Latinoamérica: Facilitadores, Promotores y Obstaculizadores.

17/15 **Liliana Rojas-Suárez y Lucía Pacheco:** An Index of Regulatory Practices for Financial Inclusion in Latin America: Enablers, Promoters and Preventers.

17/14 **Ángel de la Fuente:** Las finanzas autonómicas en 2016 y entre 2003 y 2016.

17/13 **Carlos Casanova, Joaquín Iglesias, Álvaro Ortiz, Tomasa Rodrigo y Le Xia:** Tracking Chinese Vulnerability in Real Time Using Big Data.

17/12 **José E. Boscá, Rafael Doménech, Javier Ferri y José R. García:** Los Desplazamientos de la Curva de Beveridge en España y sus Efectos Macroeconómicos.

17/11 **Rafael Doménech y José Manuel González-Páramo:** Budgetary stability and structural reforms in Spain: lessons from the recession and options for the future.

17/10 **Ángel de la Fuente:** Series enlazadas de algunos agregados económicos regionales, 1955-2014. Parte I: Metodología, VAB, PIB y puestos de trabajo.

17/09 **José Félix Izquierdo:** Modelos para los flujos de nuevo crédito en España.

17/08 **José María Álvarez, Cristina Deblas, José Félix Izquierdo, Ana Rubio y Jaime Zurita:** The impact of European banking consolidation on credit prices.

17/07 **Víctor Adame García, Javier Alonso Meseguer, Luisa Pérez Ortiz, David Tuesta:** Infrastructure and economic growth from a meta-analysis approach: do all roads lead to Rome?

17/06 **Víctor Adame García, Javier Alonso Meseguer, Luisa Pérez Ortiz, David Tuesta:** Infraestructuras y crecimiento: un ejercicio de meta-análisis.

17/05 **Olga Cerqueira Gouveia, Enestor Dos Santos, Santiago Fernández de Lis, Alejandro Neut y Javier Sebastián:** Monedas digitales emitidas por los bancos centrales: adopción y repercusiones.

17/04 **Olga Cerqueira Gouveia, Enestor Dos Santos, Santiago Fernández de Lis, Alejandro Neut and Javier Sebastián:** Central Bank Digital Currencies: assessing implementation possibilities and impacts.

17/03 **Juan Antolín Díaz and Juan F. Rubio-Ramírez:** Narrative Sign Restrictions for SVARs.

17/02 **Luis Fernández Lafuerza and Gonzalo de Cadenas:** The Network View: applications to international trade and bank exposures.

17/01 **José Félix Izquierdo, Santiago Muñoz, Ana Rubio and Camilo Ulloa:** Impact of capital regulation on SMEs credit.

Click here to Access the Working Paper published

Spanish

and English

Contact details:
BBVA Research
Azul Street, 4
La Vela Building - 4th and 5th floors
28050 Madrid (Spain)
Tel.: +34 91 374 60 00 and +34 91 537 70 00
Fax: +34 91 374 30 25
bbvaresearch@bbva.com
www.bbvaresearch.com