PROYECTO DE INVESTIGACIÓN INTERNOS SIN FINANCIAMIENTO O AUTOGESTIONADOS

ANEXO 2 – DETALLES DE LA PROPUESTA

Investigación Básica ☐ Investigación Aplicada ☒

DEPARTAMENTO(S) Y/O INSTITUTO(S):
1. Departamento de Economía Cuantitativa
2.

LINEA(S) DE INVESTIGACIÓN:
1. Política Económica
2.

DISCIPLINA CIENTÍFICA ***(Marque X, solamente una opción)***	
Ciencias Naturales y Exactas;	
Ingeniería y Tecnologías;	
Ciencias Médicas;	
Ciencias Agrícolas;	
Ciencias Sociales;	
Humanidades	X

OBJETIVO SOCIOECONÓMICO ***(Marque X, solamente una opción)***	
Exploración y explotación del medio terrestre;	
Ambiente;	
Exploración y Explotación del espacio;	
Transporte, telecomunicaciones y otras infraestructuras;	
Energía;	
Producción y tecnología industrial;	
Salud;	
Agricultura;	
Educación;	
Cultura, ocio, religión y medios de comunicación;	
Sistemas políticos y sociales, estructuras y procesos;	X
Defensa;	
Avance general del conocimiento: I+D financiada con los Fondos Generales de Universidades (FGU);	
Avance general del conocimiento: I+D financiados con otras fuentes.	

1 **Proyecto de Investigación**

Título:
Liquidity risk stress thresholds in the face of macroeconomic and financial performance – A non-linear approach for South American countries.

Resumen del proyecto (máximo 200 palabras)

South American countries have experienced liquidity crisis at the end of the 80s and 90s as a consequence of bank instability and the increase of external debt. In spite of the fact that in recent years the foreign reserves have grown slowly in most of SA countries, there are countries such as Argentina and Venezuela that have declined their reserve levels significantly. (See, IMF (2000), Caballo and Fernandéz-Arias (2013),Talvi (2014) and Ocampo (2014)).

In view of the fact that the latest financial crises led to an increase in the exposure to liquidity risk, the amount of liquid assets (cash flow and short-term investments) decreased, while liquid liabilities increased (short-term deposits and short-term debts). We propose to build a system of stress which identifies and monitors risk thresholds. These ones will allow the identification of the impacts caused by liquidity problems, which will contribute to the formulation of effective macro-prudential policies in the region.

This paper aims to determine risk thresholds to monitor liquidity through non-linear models. These ones will identify the liquidity effects on macroeconomic and financial performance considering stress scenarios through a high or low inflation regime and the crisis or non-crisis regime, using the smooth transition regression model (STAR) and the threshold vector autoregressive model (TVAR) in 10 South American countries for the period between 1978 and 2014.

Palabras clave (4-6):
Liquidity risk, Non-linear models , Stress test , Risk thresholds

2 Objetivos, relevancia, productos y resultados esperados de esta propuesta de investigación

2.1 Objetivos

2.1.1 Objetivo General

To determine liquidity risk stress thresholds in the face of macroeconomic and financial performance for South American countries according to the high or low inflation regime and the crisis or non-crisis regime.

2.1.2 Objetivos Específicos

a. To review theoretical and empirical literature in order to analyze liquidity risk effects on macroeconomic and financial performance.
b. To build a database composed of indicators that evaluate the relationship of liquidity risk and macroeconomic and financial indicators of 10 South American countries between 1978 and 2014.
c. To estimate threshold models using the Smooth Transition Regression model (STAR) and Threshold Vector Autoregressive model (TVAR) methods.
d. To analyze the results for each country considering the impacts of high or low inflation regime and the crisis or non-crisis regime.
e. To describe the conclusions and discuss possible implications according to the monetary policy of each country.

2.2 Detalle de los resultados esperados (con relación a los objetivos)

a. According to the literature review most emerging countries increase their reserves or levels of liquidity when there is inflationary pressure and the occurrence of a financial crisis rises (See, Pina (2015)). Some empirical studies find that the increase in liquidity is reflected during periods preceding a crisis in order to mitigate negative impacts and could improve growth performances in the post-crisis period, but this will depend on the macro-financial performance of each country (See, Dominguez et al. (2012) Catão and Milesi-Ferreti (2014), Alberola et al. (2015) and Bussière et al. (2015)).
b. Database covers 10 South American countries, namely; Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay and Venezuela in the 1978-2014 period. Most variables used are available at the Central Banks of each country, the World Development Indicators Database by the World Bank and International Financial Statistics (IFS) by the International Monetary Fund (IMF).
c. The STAR and TVAR threshold models are non-linear methods, which allow to determine simultaneously the thresholds of two regimes of inflation and the crisis or non-crisis regime proposed.
d. The results confirm that there is a nonlinear relationship between some liquidity risk measures variables and some macroeconomic and financial indicators, in view of the fact that the risk thresholds obtained are significant. Our findings are consistent and similar to other empirical studies, which have identified thresholds of high and low inflation regime or the crisis or non-crisis regime in some emerging economies.

e. Our study contributes to the debate on monitoring liquidity risk through stress scenarios, which identify risk thresholds. These ones improve each country's macro-prudential policies and make early decisions considering the impact of inflationary regimes and the performance of macroeconomic and financial indicators in periods of crisis and non-crisis experienced by the economies of the South American region.

3 Relevancia de la propuesta de investigación y su relación con la(s) líneas de investigación

The aim of this study is to determine the impact of macroeconomic and financial performance, which can be affected by liquidity measures considering the high or low inflation regime and periods of crisis and non-crisis regime. This will be of great use for the Central Banks of the above-mentioned South American countries, since monetary monitoring through stress testing is fundamental to a country's economic policy decisions. In addition, these stress scenarios combined with other analyses of the real and financial sector can be used as monitoring systems in order to guarantee the stability of the economy as a whole and its financial system. Therefore, this system of monitoring through stress thresholds that we propose, will allow the identification of the impacts caused by liquidity problems, which will contribute as a tool for the regulation and correct execution of macro-prudential policies.

4 Productos esperados (marcar con una "X" al menos uno de los productos no señalados)

Tipo de Producto:	Marcar con una "X"
a. Disertación a la Comunidad Politécnica (obligatorio);	X
b. Presentación de un artículo en formato de la Revista Politécnica (obligatorio)	X
c. Proyecto de Titulación;	
d. Aplicación tecnológica construida o implementada;	
e. Patente presentada;	
f. Perfil de proyecto de mayor impacto científico, técnico, pedagógico o de innovación.	
g. Publicaciones científicas indexada en SCIMAGO-SCOPUS/WoS/SCIELO/Latindex Catálogo o un artículo en congreso indexado en SCOPUS.	X

5 Descripción y metodología y diseño del proyecto

5.1 Descripción, metodología y diseño del proyecto (Máximo dos carillas)

Since the financial crises of the 1990s, there have been reforms for supervision and risk management through the Basel Committee on Banking Supervision (BCBS) with the aim of mitigating the possibility of banking crises and the country debt overhang. However, some South American countries have experienced liquidity crisis at the end of the 80s and 90s as

a consequence of bank instability and the increase of external debt. In spite of the fact that in recent years the foreign reserves have grown slowly in most of the SA countries, there are countries such as Argentina and Venezuela that have declined their reserve levels significantly. (See, IMF (2000), Caballo and Fernandéz-Arias (2013),Talvi (2014) and Ocampo (2014)).

According to Caballo and Fernandéz-Arias (2013) liquidity crisis could be attenuated by the provision of external liquidity through international credit lines. In spite of the existence of these short-term international sources of funding, South American economies have faced restrictions on access to these credits, due to speculation caused by economic and political uncertainties, currency depreciation, rising inflation and external debt, falling prices of bonds and commodities, among other factors. In addition, these credit lines have been limited during the crisis and post-crisis periods of developed countries. (See, Esseres (2013) and Pham (2018)).

In the same context, Catão and Milesi-Ferreti (2014) and Alberola et al. (2015) find that foreign reserves reduce the likelihood of crisis and manifest that if a country has higher levels of foreign reserves, this could act as a buffer during financial stress. In the case of South American countries, the provision of external liquidity strategy depends on the level of short- term indebtedness, payment of imports and protection for an outflow of capital (See, Luna (2015))).

Under these scenarios, it seems necessary to monitor the liquidity risk through stress threshold considering the liquidity effects on macroeconomic and financial performance. Hence, the main question that arises in this research project is *what are the stress thresholds to monitor liquidity risk in the face of macroeconomic and financial shocks, considering the high or low inflation regime and the crisis or non-crisis regime of 10 South American countries?*

In order to answer this question, it is important to consider that liquidity is directly related to monetary aggregates and the financial system, so it must be evaluated how it affects both macroeconomic and financial sectors. Therefore, the main contribution of this study is to build a stress system, which identifies the liquidity effects on macroeconomic and financial performance considering stress scenarios through high or low inflation regime and the crisis or non-crisis regime through models of autoregressive thresholds of 10 South American countries for the period between 1978 and 2014.

Unlike other studies that have evaluated the impacts of liquidity through the accumulation of the reserves according to the behavior of GDP growth in periods of crisis through linear models (See, Dominguez et al. (2012), Dominguez (2012) and Alberola et al. (2015)), our study proposes to use non-linear models to determine thresholds considering different liquidity measures, in order to identify ranges of values where the behavior predicted by the model varies according to the high or low inflation regime and the crisis or non-crisis regime.

Our threshold models evaluate the following liquidity measures as exogenous variables: broad money to total reserves ratio, short-term debt (% of total reserves), foreign reserves, banking reserves, Liquidity Coverage Ratio (LCR) of the banking system, and total reserves

(% total external debt). These measures identify the monetary impact of the short-term and the bank liquidity coverage.

On the other hand, we consider the following macroeconomic and financial variables as the endogenous variables: GDP growth, real exchange rate, external debt (% of GDP), domestic credit (% of GDP) and trade balance (% of GDP).

The methodology that we are going to use is the smooth transition regression model (STAR) and verify the robustness of the model using the threshold vector autoregressive model (TVAR).

The STAR approach determines a non-linear relationship between variables of interest and capture their dynamics. Formally, it is given by the following equation.

$$y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_0 X_t + F(\xi_t, \gamma, c)\left[\beta_0 + \sum_{i+1}^{p} \beta_i X_t\right] + \varepsilon_t$$

Where y_t are each dependent variables proposed, while X_t are each measure of liquidity mentioned above. $F(\xi_t, \gamma, c)$ is a transition function bounded between 0 and 1 which controls the switch between regimes; $\gamma > 0$ is the slope coefficient that determines the smoothness of the transition; c is the threshold parameter between the two regimes; and, ξ_t is the transition variable.

Several authors have employed this approach to identify the nonlinearities on macroeconomic and financial variables. Switzer and Picard (2016) studied the relationship between business cycles and stock market liquidity to conclude that liquidity is not necessarily a prominent pointer of future economic condition. McMillan (2001) used the STAR model when studying the interaction between stock returns and the business cycle. Ocal and Osborn (2000) examined the non-linearity between the consumption and industrial production in the United Kingdom, as well as Granger and Terasvirta (1993) related to the non-linearity between gross national product growth and leading indicators in the United States.

The purpose of using the STAR model on our research is to determine the non-linearity that can appear on liquidity fundamentals when facing macroeconomic and financial shocks, in order to evaluate their monetary impacts. On the one hand, we will determine the liquidity risk stress thresholds in order to evaluate the liquidity fundamentals according to the crisis or non-crisis regime. On the other hand, we will determine the impact of macroeconomic and financial shocks considering both the high or low inflation regime, because South American countries have been highly exposed to depreciation or devaluation pressures and, therefore, have experienced different inflation regimes.

To verify the robustness of the model, we will use the TVAR model. This type of approach analyzes the interaction between the variables separating the data into two regimes. An aggregate feature of the TVAR model is the nonlinear impulse response function that it gives. Mathematically, it can be expressed by the equation below.

$$y_t = \alpha_0(L)i_{t-1} + \beta_0(L)X_t + [\alpha_1(L)i_{t-1} + \beta_1(L)X_t]I(\pi_{ct} > r) + \varepsilon_t$$

where X_t is a vector of exogenous variables including liquidity shocks; $\alpha(L)$ and $\beta(L)$ are lag polynomials; π_{ct} is a measure of inflationary conditions; r represents the threshold critical value; I is and indicator function that takes 0 or 1.

This system of monitoring through stress thresholds allows the identification of the impacts caused by liquidity problems, which will contribute to the formulation of effective macro prudential policies in the region.

The remainder of this study is organized as a paper, which is structured as follows. The first section is the introduction. In section 2 we analyze the liquidity effects on macro-financial performance by a literature review. Section 3 explains the empirical strategy. Section 4 describes the data. Section 5 presents the results obtained and discusses the channels of macro-financial contagion. Finally, conclusions are presented in section 6.

References

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6 Infraestructura, equipos y fondos adicionales.

6.1 Infraestructura y equipos

- *Indicar la infraestructura y equipos **disponibles** para la ejecución del proyecto, con la ubicación actual de los mismos*

Infraestructura	Equipos	
	Nombre del Equipo	**Ubicación del Equipo**
Departamento Economía Cuantitativa	Impresora	Departamento de Economía Cuantitativa

6.2 Breve justificación del equipo requerido

La impresora va ser utilizada para imprimir la literatura y todos los documentos necesarios que sustentaran la elaboración del proyecto de investigación.

6.3 Fondos Adicionales

- *Otros fondos de otros organismos (si los hubiere)*

ESCUELA POLITÉCNICA NACIONAL

Proyecto de Investigación Interno Sin Financiamiento o Autogestionado

ANEXO 3 - CRONOGRAMA DE ACTIVIDADES DEL PROYECTO

Investigación y Proyección Social

Título del Proyecto: **Liquidity risk stress thresholds in the face of macroeconomic and financial performance – A non-linear approach for South American countries.**

AÑO 1

Nº	Actividad	Mes 1				Mes 2				Mes 3				Mes 4				Mes 5				Mes 6				Mes 7				Mes 8				Mes 9				Mes 10				Mes 11				Mes 12			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	**To review theoretical and empirical literature in order to analyze liquidity risk effects on macroeconomic and financial performance.**																																																
1,1	To read and analyze theoretical literature	■	■	■	■	■	■	■	■																																								
1,2	To read and analyze empirical literature	■	■	■	■	■	■	■	■																																								
2	**To build a database composed of indicators that evaluate the relationship of liquidity risk and macroeconomic and financial indicators of 10 South American countries between 1978 and 2014.**																																																
2,1	To recollect the indicators from each country's Central Banks database, the World Bank's World Development Indicators Database and the International Financial Statistics (IFS) of the International Monetary Fund (IMF).									■	■	■	■	■	■	■																																	
2,2	To calculate the variables in the periods or countries that do not have the complete indicators.									■	■	■	■	■	■	■																																	
3	**To estimate threshold models using the Smooth Transition Regression model (STAR) and Threshold Vector Autoregressive model (TVAR) methods.**																																																
3,1	To build the proposed models applying the corresponding codes using the software R.																■	■	■	■	■	■	■	■	■																								
3,2	To estimate the main proposed models and of robustness models.																■	■	■	■	■	■	■	■	■																								
4	**To analyze the results for each country considering the impacts of high or low inflation regime and the crisis or non-crisis regime.**																																																
4,1	To interpret the results of the main models for each country considering the two types of regimes proposed.																									■	■	■	■	■	■	■	■																
4,2	To interpret the results of the robtuness models for each country considering the two types of regimes proposed.																									■	■	■	■	■	■	■	■																
5	**To elaborate the conclusion and discussion**																																	■	■	■	■												
6	**To elaborate the introduction**																																					■	■	■	■								
7	**To make the corrections of the paper**																																									■	■	■	■				
8	**To present the paper to a workshop**																																													■	■	■	■
9	**To submit the paper to a journal**																																													■	■	■	■