ALCANCE

EVIDENCE FOR THE INTERTEMPORAL CURRENT ACCOUNT IN BRAZIL AND ANALYSIS OF THE DISTANCE BETWEEN THEORETICAL AND OBSERVED CURRENT ACCOUNT[1]

EVIDÊNCIAS PARA A CONTA CORRENTE INTERTEMPORAL NO BRASIL E ANÁLISE DO DISTANCIMENTO ENTRE TEÓRICA E OBSERVADA

EVIDENCIA DE LA CUENTA CORRIENTE INTERTEMPORAL EN BRASIL Y ANÁLISIS DE LA DISTANCIA ENTRE TEÓRICO Y OBSERVADO

JÚLIA GOES DA SILVA CARMO
Doctor
Federal University of Juiz de Fora - Brazil
ORCID: 0000-0002-0187-2447
julia.goes@ufjf.edu.br

WILSON LUIZ ROTATORI CORRÊA
Doctor
Federal University of Juiz de Fora - Brazil
ORCID: 0000-0002-5517-6447
Federal University of Juiz de Fora
wilson.rotatori@ufjf.edu.br

ADMIR ANTONIO BETARELLI JUNIOR
Doctor
Federal University of Juiz de Fora - Brazil
ORCID: /0000-0003-0002-7599
admir.betarelli@ufjf.edu.br

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ABSTRACT

Studies on the intertemporal behavior of the Brazilian current account show that the model is not sufficient to explain the movements observed, and is not compatible with the theoretical hypothesis of consumption smoothing over time, through the acquisition and sale of assets in the international financial market. Using the methodology proposed by Huang (2010), we investigate the inclusion of the variables world real interest rate and terms of trade in the basic model for the Brazilian case between 1970 and 2010. Even though the results are favorable to the inclusion of those variables, the theoretical current account does not fully adjust to the observed one, a possible result to be found in the literature on the subject. In an attempt to advance in this point of analysis, the VAR method is combined with the QCA to complement the analysis and gain evidence of what might have contributed to the widening of the gap between the observed and theoretical current accounts from 1980 to 2002. Despite the time lag of the data under study, the methodological strategy of combining the methods allows for specific interactions between variables that are not part of the model, but that are indicated as possible explanations for the result obtained. The specific and consistent configurations obtained provide evidence that the distancing between accounts occurred in a scenario of greater exchange, by the private sector, of differentiated assets for future production.

Keywords: intertemporal current account. capital mobility. VAR. QCA.

RESUMO

Estudos sobre o comportamento intertemporal da conta corrente brasileira demonstram que o modelo não é suficiente para explicar os movimentos observados, não sendo compatível com a hipótese teórica de suavização do consumo ao longo do tempo, por meio de aquisição e venda de ativos no mercado financeiro internacional. Utilizando a metodologia proposta por Huang (2010), investiga-se se a inclusão das variáveis taxa real de juros mundial e termos de troca ao modelo básico, para o caso brasileiro entre 1970 e 2010. Ainda que os resultados sejam favoráveis à inclusão daquelas variáveis, a conta corrente teórica não se ajusta totalmente à observada, resultado possível de se deparar na literatura em torno do tema. Na tentativa de avançar neste ponto da análise, o método VAR é combinado com o QCA com o objetivo de complementar a análise para ter evidências do que poderia ter contribuído para o distanciamento entre as contas correntes observada e teórica, entre 1980-2002. A despeito da defasagem temporal dos dados em estudo, a estratégia metodológica de combinação dos métodos permite obter interações específicas entre variáveis que não compõem o modelo, mas são apontadas como possíveis explicações para o resultado obtido. As configurações específicas e consistentes obtidas fornecem indícios de que o distanciamento entre as contas ocorreu em cenário de maior troca, pelo setor privado, de ativos diferenciados para a produção futura.

Palavras-chave: conta corrente intertemporal. mobilidade do capital. VAR. QCA.

RESUMEN

Los estudios sobre el comportamiento intertemporal de la cuenta corriente brasileña muestran que el modelo no es suficiente para explicar los movimientos observados, y no es compatible con la hipótesis teórica de suavizar el consumo en el tiempo, a través de la adquisición y venta de activos en el mercado financiero internacional. Utilizando la metodología propuesta por Huang (2010), investigamos si la inclusión de la tasa de interés del mundo real y las variables de los términos de intercambio en el modelo básico, para el caso brasileño entre 1970 y 2010. Si bien los resultados son favorables a la inclusión de En esas variables, la cuenta corriente teórica no se ajusta completamente a la observada, resultado posible que se encuentra en la literatura sobre el tema. En un intento de avanzar en este punto del análisis, se combina el método VAR con el QCA con el fin de complementar el análisis para tener evidencia de lo que pudo haber contribuido a la brecha entre las cuentas corrientes observadas y teóricas, entre 1980-2002. A pesar del desfase temporal de los datos en estudio, la estrategia metodológica de combinar los métodos permite interacciones específicas entre variables que no componen el modelo, pero que se señalan como posibles explicaciones del resultado obtenido. Las configuraciones específicas y consistentes obtenidas evidencian que la brecha entre cuentas se dio en un escenario de mayor intercambio, por parte del sector privado, de activos diferenciados para la producción futura.

Palabras clave: cuenta corriente intertemporal. movilidad de capital. VAR. QCA.

1 INTRODUCTION

In the economic literature, capital mobility between countries is marked by the seminal article by Feldstein & Horioka (1980), who, based on the theoretical hypothesis of perfect mobility, argue that a high correlation between savings and investment would be evidence of low international capital mobility. Regardless of that relationship, Ghosh (1995) argues that there is some degree of capital mobility reflected in the current account movement. Under the hypothesis of intertemporal exchanges, formulated along the lines of the permanent income hypothesis, the current account would be a channel for smoothing consumption. With rational expectations, the representative agent moves the current account by adjusting its optimal consumption in the face of shocks. The volatility of the observed current account compared to the theoretical one under perfect capital mobility would be able to indicate the degree of international mobility of capital. This theoretical interpretation is discussed in the literature, such as in Cashin & McDermott (1998), Agénor et al (1999), Hussien & Mello Jr. (1999), Bergin & Sheffrin (2000), Ismail & Baharumshah (2008), Ogus & Sohrabji (2008), Garg & Prabheesh (2018), Singh (2019), among others. Huang (2010) assumes that fluctuations in the terms of trade can also act as inducers of smoothing current account movement, so that not considering them would possibly lead to attributing the current account movement to other factors, such as capital mobility.

For the Brazilian economy between 1947 and 1997, Senna & Issler (2000) followed the basic model of Ghosh (1995) and obtained a different result from that of Ghosh & Ostry (1997), despite using a similar methodology, due to greater methodological rigor, as the authors pointed out. Although the model's testable hypotheses are not entirely favorable, those authors found excess rather than perfect capital mobility, pointing to the existence of significant speculative capital in circulation in that period. Silva & Andrade (2006) resumed the study by Senna & Issler (2000) by adding a quarterly sample between 1991 and 2004 and an annual sample from 1947 to 2003. The authors also tested the orthogonality hypothesis (for rational expectation) and decomposed the variance for the transitory shock test. The results admit the hypothesis of orthogonality for annual data, but not the hypothesis that transitory shocks in net product affect the current account, which may be evidence of excessive spending or external restriction, according to them. Furthermore, they point to the smoothing behavior of the current account for quarterly data from 1990 onwards.

Given the performance of the basic intertemporal model, Silva & Andrade (2007) discuss excessive mobility and this relative inadequacy for small open economies, such as Brazil, if the smoothing component of the current account would also serve as an instrument to react to expected variations in world interest rates and in the exchange rate. With data for the 1947-2003 period, the results show that the inclusion of those variables does not sufficiently improve the model's fit, but the model used cannot be rejected for the period if one considers the elasticity of substitution equal to 0,59 for the Brazilian case. On the other hand, Santos & Cerqueira (2017), for the 1999 to 2007 period at quarterly frequency, point out that interest rate movements did not affect the Brazilian's intertemporal consumption decisions. Carrasco-Gutierre & Oliveira (2013), using the intertemporal current account model, corroborate stylized facts in the literature; however, there are testable hypotheses of the model that could not be confirmed. With such studies, the search for factors that could contribute to such a result is motivating for the research. On the other hand, Oliveira, Hellery & Carrasco-Gutierrez (2015) and Silva (2016) find evidence favorable to the inclusion of habit formation in consumption to understand the dynamics of the current account.

These results concerning the behavior of the current account are similar in some of the empirical literature on the intertemporal approach, that is, results are not completely satisfactory to explain the real movements of the observed intertemporal current account. The flow of capital has possibly increased to the point that it overlaps with what is needed to smooth the current account, leading to the conclusion that the movements of the theoretical current account associated with the underlying theoretical assumptions of the model (smoothing consumption, perfect capital mobility and formation of rational expectations) would not explain the performance of the observed current account. Among the factors highlighted as potential candidates to explain the low performance of the model, there are the following: i) significant movement of speculative capital (Ghosh, 1995; Senna & Issler, 2000); ii) restrictions on access to the international financial market, with imperfect capital mobility (Silva & Andrade, 2007); iii) government consumption. However, even though the proposed models incorporate other variables for the study of the Brazilian case, the methodology used in the case of this study shows the gap between the theoretical current account and the observed one, especially from the 1980s to the early 2000s. Obstfeld (2010, 2012) argues that, even though the gross flow of international assets has increased significantly and influenced the current global financial structure, current account imbalances should be considered by economic policymakers. However, the author warns about the need to observe this raw flow regarding these formulators. In Obstfeld

(2004), the author has already proposed a measure of the flow of assets and shows how it evolved for emerging and developed countries, and a measure of the size of the international trade in assets that could also have contributed to elucidating the unsatisfactory results of the model.

Thus, this article aims to verify the degree of mobility of Brazilian capital and provide evidence on possible factors that may be related to the behavior of the current account. To do so, the methodological strategy is to obtain the estimation of the intertemporal current account model, following Huang (2010), through the Vector Autoregressive (VAR) estimation combined with subsequent qualitative analysis through Qualitative Comparative Analysis (QCA). At this point, despite the time lag of the data under study, the purpose is to contribute to the discussion by testing factors that could lead to the incompatibility between the theoretical model and the current account carried out for the 1970-2010 period. The QCA was proposed by Ragin (1987), based on Boolean theory and algebra, to develop studies in social sciences, but it has been expanding its use with interesting results. Schneider & Wagemann (2010) and Marx, Rihoux & Ragin (2013) list five reasons for using the QCA: data summary; verification of the analytical coherence of a given set of cases with the identification of anomalies; the evaluation of existing theories; the elaboration of new theories; the evaluation of new ideas, propositions, or conjectures not yet incorporated into an existing theory.

For this work, the motivation to use this technique is in line with the possibility of examining the factors that would lead to the gap between the Brazilian current accounts between 1980 and 2002. After all, the QCA allows us to obtain information on the data, contributing to verify whether a specific set of factors present a consistent configuration for the observed result. With this scope, the article is divided into 4 sections, in addition to this Introduction. Section 2 presents the model, and then, Section 3 deals with the research methodology and description of the data to carry out the tests and application. The results will be shown in section 4, and finally, the final considerations are gathered in section 5.

2 INTERTEMPORAL CURRENT ACCOUNT MODEL

The intertemporal current account model assumes a small country that produces a tradable good and consumes the production of others. The consumer, who forms rational expectations, has the utility function of his/her life given by:

$$\mathrm{U_t} = \mathrm{E_t}\{\sum_{s=t}^{\infty} \beta^{s-t} \mathrm{u}(\mathrm{C_s^*})\} \quad (1)$$

where $\mathrm{E_t}\{.\}$ is the operator of conditional expectation on the information available in t; β is a subjective discount factor; s and t are time indicators in the range $[1, \infty]$; $\mathrm{u}(.)$ is the utility of the individual that responds to consumption in s $(\mathrm{C_s^*})$, whose function is:

$$u(C_{m,s}; C_{x,s}) = \frac{1}{1-1/\sigma}\left(C_{m,s}^{\alpha} \cdot C_{x,s}^{1-\alpha}\right)^{1-1/\sigma} \quad (2)$$

The parameter σ is the intertemporal elasticity of substitution that represents the sensitivity of consumption to the interest rate, wherein $\sigma > 0$ and $\sigma \neq 1$. On the other hand, α is the proportion of consumption assigned to imported products and assumes a value between $]0,1[$. Given this composition of consumption, one expects that the price index (P^*) ensures that $C_t = C_{m,t} + P_t C_{x,t} = P^* C_t^*$. As the country participates in the international financial market, by buying and selling assets, the consumer is faced with a budget constraint:

$$B_{t+1} = (1 + r_{t+1})[B_t + P_t NO_t - C_t] \quad (3)$$

B is the stock of net assets; r is the world real interest rate; NO is the net product; P is the relative price by the terms of trade; and C is the consumption in terms of the price of imported goods. Therefore, the problem of maximizing an individual's lifetime utility is:

$$Max\ U_t = E_t\left\{\sum_{s=t}^{\infty} \beta^{s-t} u(C_s^*)\right\}$$
$$s.t.\ B_{t+1} = (1 + r_{t+1})\left[B_t + P_t NO_t - \left(C_{m,t} + P_t C_{x,t}\right)\right] \quad (4)$$

and it has the Euler Equation as a solution:

$$E_t\left[\beta^{\sigma}(1 + r_{t+1})^{\sigma}\left(\frac{C_t}{C_{t+1}}\right)\left(\frac{P_t}{P_{t+1}}\right)^{(\sigma-1)(1-\alpha)}\right] = 1 \quad (5)$$

which loglinearized is:

$$E_t \Delta c_{t+1} = \mu + \sigma E(1 + r_{t+1}) - (\sigma - 1)(1 - \alpha) E \Delta p_{t+1} \quad (6)$$

Equation 6 shows that consumption responds to expected changes in the international interest rate and terms of trade. However, knowing the dynamics of the consumption smoothing current account is necessary to obtain the loglinearized intertemporal budget constraint. This is obtained iteratively from the restriction of the individual's maximization problem, and it considers the transversality equation given by $\lim_{T\to\infty}\left[\left(\frac{1}{1+r}\right)^{T} B_{t+T+1}\right] = 0$. If $R_{t+i} = 1/\prod_{j=1}^{i}(1 + r_{t+j})$, the intertemporal budget constraint is:

$$E_t\{\sum_{i=0}^{\infty} R_{t+i} C_{t+i}\} = E_t\{\sum_{i=0}^{\infty} R_{t+i} P_{t+i} NO_{t+i}\} + B_t \quad (7)$$

The loglinearization of Equation 7 follows the strategy of Huang & Lin (1993) and Bergin & Sheffrin (2000), considering $\Gamma_t = \phi_t + B_t$, obtained in three phases, detailed in Huang & Lin (1993), Huang (2010):

$$p_t + no_t - \frac{1}{\Omega} c_t + \left(\frac{1-\Omega}{\Omega}\right) b_t = -\sum_{j=1}^{\infty} \rho^j \left[\frac{1}{\Omega}\Delta c_{t+j} - \left(\frac{1-\Omega}{\Omega}\right) r_{t+j} - \Delta p_{t+j} - \Delta no_{t+j}\right] \quad (8)$$

From Equations 7 and 8, obtaining the equation of current account fluctuations is possible:

$$ca_t = p_t + no_t - \frac{1}{\Omega} c_t + \left(\frac{1-\Omega}{\Omega}\right) b_t$$
$$= -E_t \sum_{j=1}^{\infty} \rho^j \left\{\Delta no_{t+j} + \frac{1-\Omega-\sigma}{\Omega} r_{t+j} + \left[\left(1 - \frac{(1-\alpha)(1-\sigma)}{\Omega}\right)\Delta p_{t+j}\right]\right\} \quad (9)$$

Equation 9 includes the analysis of intertemporal exchange made possible by the individual's choice between present and future consumption and should not be understood as the flow accounted for in the account Current Transactions of the Balance of Payments. The equation intrinsic to the model is the individual's optimal consumption path and it respects the intertemporal constraint faced. Ghosh (1995) recognizes that current account fluctuation can be influenced in two ways: i) in response to the world interest rate relative to the subjective discount rate (consumption-tilting); and ii) in response to shocks in output, government spending and investment, stabilizing consumption over time (consumption-smoothing). For this work, the understanding of consumption-smoothing is the interest. Therefore, the current account represents a consumption smoothing component, and it is understood that this current account is constructed by Equation 9 and not by the difference between net product and consumption.

By Equation 9, $\mathrm{ca_t}$ anticipates future changes in net output, world interest rate and terms of trade. Given the perfect mobility of capital, the individual saves if future expectation is of a bad result, so temporary increases in the net product (Δno_t) or terms of trade (Δp_t) raise the current account[2]. The world real interest rate, on the other hand, influences the current account through two channels: the intertemporal substitution effect and the income effect. The parameter σ is responsible for the first effect, so that there will be an increase in the smoothing current account, through the reduction of present consumption, if there is an expectation of an increase in the real interest rate. The other channel is the wealth effect measured by $1-\Omega$, which is positive if $B_t > 0$, affecting ca_t in the opposite direction to world real interest expectations. For Brazil, the real debtor, ($B_t < 0$), $1-\Omega < 0$, which reverses the direction of the income effect.

To find a general equation that captures even the imperfection of the international mobility of capital, Huang (2010), as in Shibata & Shintani (1998), developed Equation 9 including a liquidity restriction term by which the mobility of capital is analyzed. Considering the existence of an intermediate mobility level (λ), in which λ and $1-\lambda$ are weight consumption, then:

$$c_t = \lambda c_t^p + (1-\lambda)c_t^i = \Omega\left(p_t + no_t + \frac{1-\Omega}{\Omega} b_t + \lambda E_t\left\{\sum_{j=1}^{\infty} \rho^j x_{t=1}\right\}\right) \quad (10)$$

So, the smoothing current account of that country will be:

$$ca_t = -\lambda E_t\left\{\sum_{j=1}^{\infty} \rho^j x_{t+j}\right\} \quad (11)$$

An important interpretation of Equation 11 is that λ is in the range $]0,1[$, and it measures the degree of mobility of international capital. The greater this parameter, the greater the country's participation in the world market, and the current account is used by the individual to smooth his/her consumption over time. It only matters the postponement or anticipation of consumption using the international asset market, with unrestricted access.

3 METHODOLOGICAL STRATEGY

3.1 Autoregressive Vector (Var)

Following Campbell (1987), Equation 11 can be rewritten:

$$ca_t = -E_t \sum_{j=1}^{\infty} \rho^j (\lambda \Delta no_{t+i} + \eta r_{t+i} + \theta \Delta p_{t+i}) \quad (12)$$

Considering the vector $Y_t = [ca_t \Delta no_t r_t \Delta p_t]'$, the Autoregressive Vector (VAR) methodology will us allow to know the best forecast for the variables and build the smoothing current account theoretical series. In the format of a VAR:

[2] For this analysis to be effective, Ω is expected to be close to 1 so that $1-[(1-\alpha)(1-\sigma)/\Omega]$ is positive. For Brazil, net borrower country, ($\mathrm{B_t} < 0$) the value is $\Omega > 1$, but the relationship is kept.

$$\begin{bmatrix} ca_t \\ \Delta no_t \\ r_t \\ \Delta p_t \end{bmatrix} = \begin{bmatrix} a_{11}(L)\ a_{12}(L)\ a_{13}(L) a_{14}(L) \\ a_{21}(L)\ a_{22}(L)\ a_{23}(L)\ a_{24}(L) \\ a_{31}(L)\ a_{32}(L)\ a_{33}(L)\ a_{34}(L) \\ a_{41}(L)\ a_{42}(L)\ a_{43}(L)\ a_{44}(L) \end{bmatrix} \begin{bmatrix} ca_{t-1} \\ \Delta no_{t-1} \\ r_{t-1} \\ \Delta p_{t-1} \end{bmatrix} + \begin{bmatrix} e_{1t} \\ e_{2t} \\ e_{3t} \\ e_{4t} \end{bmatrix}$$

Wherein $a_{ij}(L)$ is the polynomial in the lag operator L and e_{it} are the prediction errors. To VAR(1): $Y_t = AY_{t-1} + e_t$. A is the companion matrix of order $pn \times pn$, where n is the number of variables in the vector, p is the order of the VAR, and e_t is the vector $(pn \times 1)$. For any time ahead of t,the optimal prediction of Y_{t+i}, given the set of information up to t (H_t), will be: $E_t[Y_{t+i}/H_t] = A^i Y_t$. Where $0 < \rho < 1$, Equation 12 is rewritten:

$$ca_t^* = -(\gamma_2\lambda + \gamma_3\eta + \gamma_4\theta)\rho A(I - \rho A)^{-1} Y_t = -kY_t \quad (13)$$

where γ_j is the vector $1 \times np$ with all elements equal to zero, except for the jth, which is equal to 1. Equation 13 represents the theoretical smoothing current account (ca_t^*) that reveals the agent's future expectation around the variables, where $k = (\gamma_2\lambda + \gamma_3\eta + \gamma_4\theta)\rho A(I - \rho A)^{-1}$ is a line vector (of order $1 \times np$) that captures the predictions regarding the variables of the vector Y_t. Disregarding the error, ca_t^* can be equal to ca_t if $-k_{1\,xnp} = [1\ 0\ ...\ 0]$. From this equality, np constraints to the theoretical model are generated and can be tested.

This study intends to analyze the effect of including the terms of trade and the world real interest rate in the model; so we start from a simple to a complete model. Therefore, 3 models are estimated, and for each one the vector Y_t is:

$$Model\ 1 - Y_t = [ca_t\ \Delta no_t]$$
$$Model\ 2 - Y_t = [ca_t\ \Delta no_t\ r_t]$$
$$Model\ 3 - Y_t = [ca_t\ \Delta no_t r_t\ \Delta p_t]$$

So, with the current series and the theoretical one[3], it is possible to test against the model and obtain its variances in order to have clues about the international capital mobility.

3.2 Qualitative Comparative Analysis (QCA)

After obtaining the theoretical current account and comparing it with the current one obtained by the first equality of Equation 9, the methodological strategy of seeking evidence about the difference between them is adopted. If the country smooths its consumption over time, both series for the current account must be the same. However, the literature has shown that there is no perfect adherence between them, bringing the following questions: Why does the theoretical current account remain far from the observed one for the case under study? To help answer the question, the QCA method is used to find the configurations that would lead to a specific result. Thus, considering the distance between the current and the theoretical current account, it is of interest to know which combinations of factors have most contributed to this result, to help elucidate the issue.

In order to follow good practices indicated for the use of the technique, presented in Schneider & Wagemann (2010) and based on the scope of this work, the following concepts compatible with the QCA analysis terminology are defined: i) condition – each factor of interest, and that should not be confused with an independent variable; ii) result – is the phenomenon investigated, which in this case is the difference between the theoretical and the observed current account and should not be confused with a dependent variable; and iii) solution formula – is the result found for the QCA and is not confused with the terms used for a regression that is an equation.

[3] Whenever it is a theoretical current account, it is referred to the result of the best forecast of agents, given by Equation 13, and when it is a constructed current account, real or observed, it refers to that obtained by Equation 9. In both cases, it is the smoothing component of the checking account.

The comparative and qualitative analysis of results (QCA) has been increasingly used by areas of knowledge such as psychology, political and social sciences, quite possibly due to strategic advances (Marx, Rihoux & Ragin, 2013). The method uses Boolean logic to examine the combinations of conditions (configuration) sufficient and/or necessary to obtain a given result. In other words, the interaction between combinations explains the result; or the occurrence of a Y result is evaluated using the conditional probability $\mathrm{P(Y/A.B)}$, where $\mathrm{A.B}$ is a specific setting. By calibrating the values in between $[0,1]$, other fuzzy sets are generated, and the best configurations will be created with a number of cases with scores greater than 0.5 in each configuration. This calibration represents an ordinal scale whose value 1 shows inclusion in the set, zero shows not inclusion in the set, and 0.5 indicates that the object is neither completely inside nor outside the set.

As an example, to rank the government size condition, if the generated value is equal to 1, we can say that in that year, the government size was significantly large and, therefore, that year is included in the set. Unlike a given year being ranked with a value of 0, in this case, the year is completely out of the set. If the value assigned is 0.5, it is a "cross-over point", that is, it is a point of ambiguity, and it cannot be said that the observation belongs or not to the set. Another work option is to generate crisp sets in which values 0 or 1 will be assigned to the observations of each set. When 0 is assigned, it indicates the non-inclusion of the observation in the set and will occur whenever the value is less than the average of the set. 1 will be assigned, otherwise, when the observation value is greater than the mean of the set.

The choice of conditions to be analyzed by the QCA is based on factors in general highlighted by authors as possible factors that lead the intertemporal current account model not to represent current account fluctuations, which are: i) Grubel-Lloyd Index proposed by Obstfeld (2004); ii) size of the international asset market; iii) size of government measured by consumption as a ratio of GDP (Gross domestic product). As it is intended to have empirical evidence for how such hypotheses could contribute to the theoretical current account being above the observed, the selected result is the difference between them. The choice of this result is based on the unsatisfactory result for the VAR forecast for the intertemporal current account model. By applying the model of Huang (2010), which found satisfactory results for England, it was expected to find good results for the Brazilian case, mainly because it is a smaller economy than England, and the intertemporal model is based on a small economy.

The reference of 0.75 is established as the sufficiency condition so that the generated configuration results in a difference in the current account, that is, all conditions that present an inclusion ratio (consistency score) greater than 0.75 are considered sufficient for the distancing of the theoretical intertemporal current account. Therefore, it is understood that this method as a research approach will allow us to have evidence about configurations present in the distance between theoretical and observed variables between 1970 and 2010. The expectation is to have evidence of which configuration of factors resulted in the departure of the theoretical current account in relation to the observed one.

3.3 Description Of Data

The construction of the database for the Brazilian economy in the period from 1970 to 2010 took place using the variables summarized in Table 1. The series GL, GLrs, VC, CG are external to the intertemporal current account model presented and will be the proxies of factors listed as possibly responsible for the unsatisfactory performance of the model. The result of the portfolio investment account of the Balance of Payments as a proportion of GDP was included as a variable, however, it was not included in the analysis due to non-compliance of normality multivariate.

Table 1.
Database information

Name	Description	Description	Source
Δno_t	Net product variation per capita	GDP deducted from gross capital formation and government consumption.	World Bank
r_t	International real interest rate	Weighted average of G-7 real interest.	World Bank
Δp_t	Terms of trade variation	-	IPEA
b_t	Net external liability per capita	Gross value external position.	Lane, Milesi-Ferreti (2007)
c_t	Consumption per capita	-	World Bank
ca_t	Observed current account	Constructed by Equation 9.	-

(To be continued)

(Conclusion)

Dif	Difference between the theoretical and the observed current account	-	-
GL	Grubel-Lloyd Index	International trade index of swapping assets, built from the source.	Obstfeld (2004)
$GLsr$	Grubel-Lloyd Index	Index without reserve, built from source.	Obstfeld (2004)
VC	Size of international trade in assets	Financial openness index – International asset trading built from Source.	Obstfeld (2004)
CG	Government consumption	-	World Bank

SOURCE: Own elaboration.

In analogy to the Grubel-Lloyd index[4], proposed for bilateral trade in similar but differentiated products, Obstfeld (2004) proposes: $GL = 1 - \frac{|A-L|}{A+L}$, where A is gross foreign assets and L is liabilities. The closer the index is to 1, the greater the bilateral asset trade, or the "diversification" trade, such as the mutual exchange of differentiated assets for future production. That is, with the index equal to 1, an ideal situation for a country with no assets or net external debt, which, therefore, maintains equilibrium over time. In the case of 0, all liabilities are net liabilities, which the author called pure development finance. According to the author, Index close to 0 implies that the country has engaged in greater volumes of intertemporal trade related to pure asset swaps for other assets, such as the export of currently available goods in exchange for the promise of future goods, or the opposite, giving origin to an imbalance in the current account (Obstfeld, 2012, p. 12).

According to the author, the intertemporal models of the current account are insufficient to describe the dynamics of net foreign assets, since there are currently huge flows of diversification in two-way intranational financial operations. A variant of the proposed index is to deduct international reserves, to represent the international market for differentiated private sector assets, so this will also be analyzed. As a proxy for access to the international asset market, or volume of trade in assets, as a measure of openness financial, also proposed in Obstfeld (2004, 2012), there is: $VC = \frac{A+L}{2Y}$, where Y is the GDP. For the three indices proposed by the author, emerging countries generally stay behind higher-income countries, as they exchange more swap assets, and present less total financial openness. As for government presence, it will be measured by government consumption as a proportion of GDP. To illustrate these conditions of interest, its behavior in the period under study is shown in Figure 1. In all cases, we observed changes from the 1990s onwards, which may be related to the distancing of the current account from the theoretical one in previous periods.

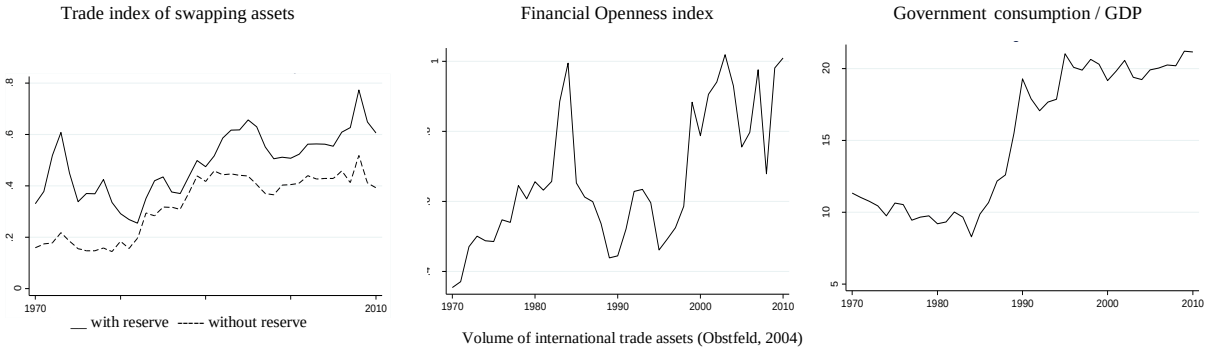

Figure 1. Conditions selected for analysis.
SOURCE: Own elaboration.

[4] In this work, whenever there is a reference to the Grubel-Lloyd Index, it is the international trade index of swapping assets proposed by Obstfeld (2004).

4 RESULTS

4.2 Evidence About Volatility Current Account

The results for the Unit Root Test by the Augmented Dickey Fuller, Phillips-Perron, KPSS methods are shown in Appendix A. In general, the results show that the variables at the level no_t, p_t, c_t, b_t have Unit Root but are stationary at first difference. For the current account and interest rate series, part of the statistics obtained leads to rejecting the Unit Root, and for the current account this occurs only at 10% significance for the Augmented Dickey Fuller test, and the stationarity hypothesis is not rejected for the KPSS test.

To obtain ca_t^* through VAR estimation, it is necessary to determine the values of λ, η and θ. The value of λ is equal to 1, considering perfect capital mobility. The values for η and θ depend on the definition of the parameters ρ, Ω, σ and α, and the values of the first two have already been defined. The parameter σ, intertemporal elasticity of substitution, is 0.59, obtained in the study by Issler and Pesqueira (2000). The coefficient of participation of imported goods in the total consumption of tradable goods (α) is calculated based on the conceptualization of Campa and Goldberg (2006), and for the Brazilian case it has an average value of 0.04699. Then, $\eta = -0.621$ and $\theta = 0.639$ are obtained. For Model, 1 a VAR (3) is estimated and for Models 2 and 3 a VAR(2), which satisfies the condition of stability and non-autocorrelation of the residuals.

An implication arising from the model is that the current account causes, in Granger's sense, variations in the net product, that is, the current account anticipates fluctuations in the net product. It can be seen through the causality test that, for none of the Models, the test admits causality, being unfavorable evidence for the smoothing behavior of the current account. The same result was observed by Senna & Issler (2000) and Silva & Andrade (2006). Another pertinent test is the Test on the restrictions imposed on each of the Models, for which the statistic found rejects the hypothesis of validity of the restrictions, at 5% significance[5].

After adjusting the VAR order and defining the necessary parameters, the theoretical smoothing current account is obtained for each of the 3 proposed models. Figure 2 shows the behavior of the theoretical series (dashed line) obtained for each of the Models, together with the observed series obtained by Equation 9 (continuous line).

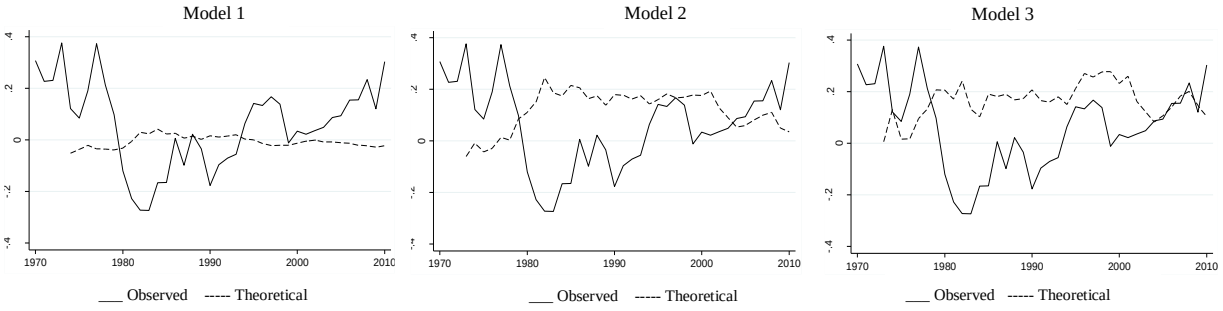

Figure 2. Observed and theoretical series of Models 1, 2 and 3 in the natural logarithm unit.
Source: Own elaboration, from STATA\SE 12.

By the Graph of Model 1 in Figure 2, ca_t^* is not very compatible with the movements of ca_t. However, with a little more volatility, the theoretical series obtained for Models 2 and 3 have a trajectory relatively closer to the observed series. It is understood that, in a visual analysis, expanding the simpler model, including real international interest rate and terms of trade, increases the volatility of the theoretical smoothing current account, as the information of these variables becomes part of the formation of expectations of agents. However, the inclusion of variables cannot accurately reflect the movements observed in the period.

[5] For Model 1, the test statistic for the model constraints is $\chi^2(6) = 71.77$; for Model 2 it is $\chi^2(6) = 93.47$; and for Model 3 it is $\chi^2(8) = 99.83$; in all three cases, the p-value is close to 0.000. For Granger's Causality test the statistics are 3.7598; 3.3511 and 2.7036 leading to the rejection of the significance of the current account in the net product equation.

Although the Graph of Model 3 maintains the detached trajectory of the observed series in relation to the theoretical series, it seems to be even closer to the observed one when compared to Model 2 at certain points, especially in the 1970s, a period marked by two oil shocks that influenced the country's import capacity, shocks possibly captured by the terms of trade. Also, from 2002 onwards, this variable seems to contribute a lot to explain the smoothing current account movement. From that year to 2005, there was a deterioration in the terms of trade, and the proximity of the series gives indications that the agent reacted to this movement. Since the expectation of shocks is what matters for the intertemporal model, the inclusion of terms of trade seems to affect intertemporal consumption decisions.

Another point that can be seen in the observation of Figure 2 is the inability of the theoretical models to describe the deficit observed in the smoothing component of the current account between 1980 and early 2000s. This period is marked by an unfavorable environment for the formation of expectations: exit of the country from the international scene, high international interest rates and debt crisis. It can be inferred that Models 2 and 3 cannot predict the deficit, or the current account deficit was not compatible with the expected smoothing behavior. As of 1994, the observed smoothing current account becomes positive, possibly influenced by an improvement in the expectations in relation to the previous decade. The surpluses observed after 1994 were lower than theoretically necessary to smooth consumption, mostly for Models 2 and 3.

The analysis of the level of international capital mobility occurs by comparing the variances of the smoothing current account and the theoretical one, as proposed by Ghosh (1995). Table 2 presents the variances found for the period from 1970 to 2010. Columns and lines 'Theoretical 1', 'Theoretical 2' and 'Theoretical 3' respectively represent the variance and covariance of the Theoretical current account of Models 1, 2 and 3. The column and row 'Observed' represent the variance/covariance of the series built from Equation 9, and the column 'Ratio' shows the ratio of the observed and theoretical variances.

Table 2.
Variance and Covariance 1970 to 2010

	Observed	Theoretical 1	Theoretical 2	Theoretical 3	Ratio
Observed	0.02753				-
Theoretical 1	-0.00241	0.000493			55.80
Theoretical 2	-0.00730	0.001213	0.006122		4.50
Theoretical 3	-0.00210	0.000175	0.003455	0.0046956	5.86

Note: Ratio = observed variance / theoretical variance.
Source: Own elaboration, from STATA\SE 12.

In the last column of Table 2, the ratios found are greater than 1, which shows that, to approximate theoretical and current accounts, $\lambda > 1$ would be necessary, that is, there is an excess of capital mobility. For the 3 Models, although higher than one, it can be seen that the ratio is lower than that found for the basic model. The covariance between the observed and theoretical series is negative for the three models, a possible consequence of the long period in which the theory predicted a surplus and the smoothing Brazilian current account persisted in deficits.

It is important to return to the questions raised after observing Figure 2: failure of the model to reflect the 1980s and early 2000s; the best visual approximation of the theoretical series to what was observed from the beginning of the 1990s onwards; and the coincidence of the launch of the Plano Real with the resumption of the observed surplus. From that, it is considered appropriate that the reasons for the variances be analyzed in three subperiods: from 1970 to 1989, from 1990 to 2010 and from 1994 to 2010. The objective is to have evidence whether from 1990, or from 1994, the theoretical variance is closer to that observed and whether this changes the analysis of excess mobility. Table 3 presents the variances found for the subperiods.

In the three subperiods considered, the variance ratio is greater than 1 for any of the Models. However, it is noted that, regardless of the period, the variables included in the model contribute to approximate the theoretical variance of their observed counterpart, reinforcing that the effects of interest rate and terms of trade are relevant to explain the movement of the current account and should not be considered the liquid product only. The comparison of the ratios between the periods shows that there was a reduction in excess capital mobility in recent years for Models 2 and 3.

To help the analysis, Appendix B presents the results of the Ratio of Variance test, which confronts the Null Hypothesis that the ratio is equal to 1 against the Alternatives that the Ratio is greater than, different from and less than 1. For the Model 3, the study of subperiods shows that the ratio between observed and theory variances is greater than 1 regardless of the period. However, the test of reason does not allow rejecting the null hypothesis in favor of any of the alternatives for the 1994-2010 subperiod. Therefore, it is statistically possible to admit that the ratio between the variances is equal to 1, which sets aside the assertion about excess mobility from 1994 onwards. Considering all the hypotheses assumed for the construction of Model 3, the ratio test between the variances allows us to say that the Brazilian current account worked as a smoother consumption in the 1994-2010 period[6].

Table 3.
Variance and Covariance of current account series

			Period from 1970 to 1989		
	Observed	**Theoretical 1**	**Theoretical 2**	**Theoretical 3**	**Ratio**
Observed	0.04395				-
Theoretical 1	-0.00397	0.00091			48.353
Theoretical 2	-0.01425	0.00250	0.01024		4.293
Theoretical 3	-0.00618	0.00064	0.00447	0.00504	8.719
			Period from 1990 to 2010		
	Observed	**Theoretical 1**	**Theoretical 2**	**Theoretical 3**	**Ratio**
Observed	0.01292				-
Theoretical 1	-0.00128	0.000204			63.258
Theoretical 2	-0.00325	0.000332	0.002701		4.7823
Theoretical 3	0.00069	-0.000123	0.002511	0.00363	3.5610
			Period from 1994 to 2010		
	Observed	**Theoretical 1**	**Theoretical 2**	**Theoretical 3**	**Ratio**
Observed	0.00644				-
Theoretical 1	-0.00037	0.00009			75.719
Theoretical 2	0.00181	-0.00012	0.00283		2.273
Theoretical 3	0.00108	-0.00011	0.00321	0.00443	1.452

Note: Ratio = observed variance / theoretical variance.
Source: Own elaboration, from STATA\SE 12.

This result possibly reflects the policies that made up the Real Plan, which provided greater participation of imported goods in the Brazilian economy, increasing competition among tradable goods. Also, foreign savings were increasingly accessible, which favored the use of the current account to smooth consumption against forecasts of change in the economy's output. In addition, the formation of expectations could be improved, compared to what happened in the decade prior to the Plan.

4.3 QUALITATIVE COMPARATIVE ANALYSIS (QCA)

As shown, the theoretical current account proved to be above the observed current account for most of the period, providing evidence of the weak performance of the theoretical model in explaining intertemporal current account fluctuations. Therefore, the purpose of the QCA analysis is to find configurations of conditions not included in the intertemporal model, but which possibly help to elucidate the following question: What has contributed to fact that the theoretical current account remained above the observed current account, mainly between 1980-2002? The QCA method allows us to test the configurations that contributed to the distance between both current accounts without, however, establishing causal relationships. The conditions of interest to be tested are those originated by the sets Grubel-Lloyd index (A), Grubel-Lloyd index without including reserves (B), variation in the volume of international trade in assets (C),

[6]The same results regarding capital mobility for Model 3, in the proposed periods, are observed when constructing the theoretical current account with the value of imports to tradable goods between 0.047 and 0.5.

and government consumption as a proportion of GDP (E), and the result to be analyzed for each configuration is the difference between the theoretical and observed current account (F)[7].

The solution formulas indicate, in the period of analysis, that there are consistent configurations for the combinations of conditions of interest. For the result of difference between current and theoretical accounts, however, in order to have a better economic interpretation of what the configurations can offer, an analysis was made only with the Grubel-Lloyd index and another one only with the Grubel-Lloyd index without including the reserves, keeping the others. Bearing in mind the interest in verifying the solutions for the period in which the difference is positive, the best configurations will be linked to the period from 1980 to 2002, when the theoretical current account was necessarily above the observed one. For the generated fuzzy sets, regarding the configurations with Grubel-Lloyd index, one consistent configuration was found, and two were found with no reserve, all shown in Table 4.

Table 4.
Consistent settings for the occurrence of positive difference

	G-L Index	**G-L Index without reserve**	
	1	**1**	**2**
Grubel-Lloyd Index	a	n.a.	n.a.
Grubel-Lloyd Index without reserve	n.a.	B	B
Positive change in the financial openness index	C	c	C
Percentage change in government consumption	e	e	e
Consistency	0.867	0.886	0.864
Rawcoverage	0.472	0.353	0.468
Uniquecoverage	0.472	0.353	0.468
Solutioncoverage	0.472	0.528	
Solutionconsistency	0.867	0.814	

Note: Uppercase letter indicates presence while lowercase indicates absence. Not applicable: n.a.
Source: Own elaboration, from STATA\SE 12.

For the result of the difference between theoretical and observed current account – considering the Grubel-Lloyd index (A), variation in the volume of international trade in assets (C), and government consumption as a proportion of GDP (E) – a consistent combination was observed. This configuration points to lower values for the level of pure swap assets together with positive variation in the volume of the international asset market, and the absence of significant variation or increase in government spending in relation to GDP tends to distance theoretical current account and current. The consistency and coverage are 0.867 and 0.472 respectively, the value of the former being relatively significant and in favor of the configuration found. The low value of the index coincides with what Obstfeld (2004) highlighted, as it shows that a large exchange of swap assets tends to contribute to the difference between the current accounts. But it can be said for this specific sample and for the case in which this fact occurs concurrently with greater access to the financial market and low variation in the volume consumed by the government.

For the result of difference between theoretical and observed current account – now considering the Grubel-Lloyd index settings without reserve (B), the variation in the volume of international trade in assets (C), and government consumption as a proportion of GDP (E) – two configurations were found, according to the last two columns of Table 4. The two consistent configurations can be reduced to a consistent solution: a significant Grubel-Lloyd index without reservation together with no variation in government consumption, regardless of the variation in the size of the international trade in assets, leads to the occurrence of a difference between the theoretical and the observed current account. For these data, such verification allows us to state that fewer exchanges of pure swap assets by the private sector, that is, the higher the Grubel-Lloyd index, together with low variation in government consumption, tend to lead to a distance between theoretical and observed current account.

[7] The Stata 12 program for the method implementation requires that the sets that will have tested configurations be named by capital letters, for this reason, the variables were renamed by the letters. For the implementation of the technique, like the VAR(2) forecasts, the period is from 1973 to 2010.

For the generated crisp sets, a consistent solution was found only for the combinations that include the Grubel-Lloyd index without reserve. However, this will not be discussed or presented here, as consistency and coverage are too low to be considered relevant. After all, consistency indicates how much the causal combination found leads to the result under study, and coverage measures how much of the result is explained by the referred configuration considered. There is no criterion established in the literature as a threshold for these measures; however, due to parsimony, it was decided to consider the combinations that present a consistency greater than 0.8.

Thus, for the QCA analysis, lower Grubel-Lloyd index values, given the combination highlighted above, present a result as proposed in Obstfeld (2004). After all, according to the author, index values close to 1 show that the country maintains intertemporal balance. However, if we look at the index without considering reserves, it shows that the increase in asset diversification, or for fewer transactions of pure swap assets, regardless of the increase (or not) of financial openness, if combined with the smaller variation in government consumption in proportion of GDP, leads to a departure from the theoretical current account. It is worth highlighting the statement by Obstfeld (2012, p. 473) that official reserves constitute an important component of gross foreign assets for emerging countries, which in this work is reflected in the change in the result when this component is removed. It is also noteworthy that the index obtained is considered low, being on average, for the period 1970-2010, only 0.495 and 0.341 with and without reserves, respectively. Whereas, in Obstfeld (2004), the averages of the countries with higher income are 0.84 for both. Therefore, higher values of the index lead to a distance between the theoretical and observed current accounts, and they do not present a contradiction, as they are only relatively larger.

5 CONCLUSION

This study makes it possible to have evidence on the level of mobility of international capital in Brazil between 1970 and 2010, reviewing the results already carried out for Brazil in view of the methodology proposed in Huang (2010). Although the estimated model was not able to accurately track the debit moments in the consumption smoothing component of the Brazilian current account, it is possible to verify that the inclusion of the terms of trade and international real interest rate is relevant for the formation of expectations of individuals. The VAR methodology also allowed for evidence of excess capital mobility in the period; however, the implicit λ reduced and the current account worked as a consumption smoother from 1994, possibly due to the dynamics of the Real Plan, instituted to stabilize and promote opening of the economy. Therefore, these results would favor the use of terms of trade in the model.

Even with the inclusion of the proposed variables, the model is not sufficient to explain the current account fluctuations observed in the period. Thus, the QCA analysis provided evidence for Obstfeld's (2004) point that the current international financial structure with a large gross flow of assets can make the intertemporal current account model insufficient, but not unnecessary, to explain the observed fluctuations. Therefore, the index proposed by that author as a measure of pure swap assets, associated with low or no variation in government spending, becomes a significant combination to obtain the distance between theoretical and current accounts as a result, especially in the period of 1980 to 2002. It should be noted that none of the configurations should be considered in isolation to deal with the result of the difference, as the QCA is based on the interaction between them to obtain a possible result.

As for the factors presented as possible explanations for the unsatisfactory performance of the intertemporal current account model, configurations of sets external to the model were sought to verify if combined they could give evidence of the gap between theoretical and current accounts. As for the participation of government consumption, in all consistent combinations, it is expected to have low variation in government consumption. Furthermore, for the case of analyzing the private trade of pure swap assets, the result does not necessarily depend on the increase or not of financial openness. As for the movement of these assets, including the reserve, there is a need to observe an increase in financial openness.

It is worth highlighting the limitations of the present study, including the restriction and time lag of the data for the construction of the models, justified by the purpose of presenting the QCA as a tool combined with the compression of possible occurrences that led to a gap between theoretical and empirical results for the intertemporal current account. The indication is that the theoretical hypothesis of intertemporal smoothing of the current account for the period motivated the application of the CSF as a method that allows for the evaluation of relevant conditions observed in a specific period. In relation to the model built as Huang (2010), it should be noted that the analysis of the results for Brazil must consider theoretical limitations such as the ease of access to the international financial market to move consumption in the face of shocks observed in GDP, interest rate and exchange rate. Thus, such hypotheses require treating the analyses in a way that goes beyond the period and conditions established in this study.

Thus, having achieved the objective proposed in this article, but without exhausting this topic, new questions can be raised to advance this line of research. The method implemented here is concerned with analyzing the data in this sample, not with proposing to establish a causal relationship, which opens a line of advance in the discussion. The government's participation in the economy, in this work, was measured by the consumption/GDP ratio but other measures can be suggested to better represent this agent in the economy. With the index proposed by Obstfeld (2004, 2012), there are signs that the intertemporal model could not account for current account movements, which enables the continuity in showing how it is possible to improve it.

Regarding the QCA methodology, the conditions selected to verify the poor performance of the model can be improved, or others can be chosen to obtain evidence. In addition, the use of the analysis tool can be expanded to show managers the possible effects of certain conditions so that individuals do not use the checking account to smooth their consumption over time. As an ally in the evaluation of this theoretical case, the use and development of the method can contribute to improve the evaluation of managers for the behavior of variables under specific conditions observed in a period. Thus, it is important to promote the use of QCA in research in Brazil, where the study is incipient, as reported by Betarelli Junior & Ferreira (2018), or unusual, as stated by Souza Filho, Martins & Macedo (2018).

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APPENDIX A – Unit Root Test

Test	no_t	p_t	c_t	b_t	r_t	Δno_t	Δp_t	Δc_t	Δb_t	ca_t
Augmented Dickey Fuller - lag(3)	-1.340	-2.333	-1.897	-2.77*	-2.632*	-2.994**	-3.099**	-3.367**	-2.868*	-2.491*
Phillips-Perron- lag(3)	-5.981	-7.960	-7.689	-6.621	-16.4**	-25.9***	-40.4***	-31.7***	-54.2***	-9.13
Kpss- lag(3)	0.759*	0.197	0.696**	0.622**	0.276	0.281	0.22	0.257	0.119	0.198

Note: Let H_0 be the hypothesis of the existence of a Unit Root, it is understood that: *** Reject at 1% significance; **Reject H_0 at 5% significance;*Reject H_0 at 10% significance. The tests consider the alternative hypothesis of a generating process with a trendless intercept. For KPSS H_0 is: a stationary variable at level; and H1a hypothesis is a unit root. The Ng-Perron and DickeyFuller GLS test by the Eviews 5 program was also used and the results are compatible.
Source: Own elaboration, from STATA\SE 12.

APPENDIX B – Ratio of Variance Test

Tested null hypothesis: $var(ca_t)/var(ca_t^*) = 1$

	1970 - 2010 Period		
Alternative Hypothesis Tested	Model 1	Model 2	Model 3
$var(ca_t)/var(ca_t^*) > 1$	Pr(F > f) = 0.00	Pr(F>f) = 0.00	Pr(F>f) = 0.00
$var(ca_t)/var(ca_t^*) \neq 1$	2*Pr(F> f) = 0.00	2*Pr(F> f) = 0.00	2*Pr(F> f) = 0.00
$var(ca_t)/var(ca_t^*) < 1$	Pr(F < f) = 1.00	Pr(F < f) = 1.00	Pr(F < f) = 1.00
	1970 - 1989 Period		
Alternative Hypothesis Tested	Model 1	Model 2	Model 3
$var(ca_t)/var(ca_t^*) > 1$	Pr(F > f) = 0.00	Pr(F>f) = 0.0025	Pr(F>f) = 0.00
$var(ca_t)/var(ca_t^*) \neq 1$	2*Pr(F> f) = 0.00	2*Pr(F> f) = 0.0049	2*Pr(F> f) = 0.0001
$var(ca_t)/var(ca_t^*) < 1$	Pr(F < f) = 1.00	Pr(F < f) = 0.9975	Pr(F < f) = 1.00
	1990 - 2010 Period		
Alternative Hypothesis Tested	Model 1	Model 2	Model 3
$var(ca_t)/var(ca_t^*) > 1$	Pr(F > f) = 0.00	Pr(F > f) = 0.0005	Pr(F >f) = 0.0033
$var(ca_t)/var(ca_t^*) \neq 1$	2*Pr(F> f) = 0.00	2*Pr(F> f) = 0.0010	2*Pr(F> f) = 0.0065
$var(ca_t)/var(ca_t^*) < 1$	Pr(F < f) = 1.00	Pr(F <f) = 0.9995	Pr(F< f) = 0.9967
	1994 - 2010 Period		
Alternative Hypothesis Tested	Model 1	Model 2	Model 3
$var(ca_t)/var(ca_t^*) > 1$	Pr(F > f) = 0.00	Pr(F > f) = 0.0553	Pr(F >f) = 0.2321
$var(ca_t)/var(ca_t^*) \neq 1$	2*Pr(F > f) = 0.00	2*Pr(F > f) = 0.1107	2*Pr(F > f) = 0.4642
$var(ca_t)/var(ca_t^*) < 1$	Pr(F < f) = 1.00	Pr(F <f) = 0.9447	Pr(F < f) = 0.7679

Note: $var(ca_t)/var(ca_t^*)$ is the ratio = observed variance / theoretical variance obtained by the indicated model. The term Pr (F > f) represents the probability that the test statistic found is above the tabulated reference statistic, and it is not possible to admit the null hypothesis if the p-value is below the significance level of 5%. The test follows an F distribution with $(\mathrm{N}-1)$, $(\mathrm{N}'-1)$ degrees of freedom, with N being the observed current account sample size and N' the theoretical current account sample size.
Source: Own elaboration, from STATA\SE 12.