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Bhavesh Garg
Indian Institute of Technology Ropar, India, bhaveshgarg89@gmail.com

K. P. Prabheesh
Indian Institute of Technology Hyderabad, India

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IS INDONESIA'S CURRENT ACCOUNT BALANCE OPTIMAL? EVIDENCE FROM AN INTERTEMPORAL APPROACH

Bhavesh Garg* and K.P. Prabheesh**

*Corresponding author. Department of Humanities & Social Sciences, Indian Institute of Technology Ropar, India. Email: bhaveshgarg89@gmail.com
**Department of Liberal Arts, Indian Institute of Technology Hyderabad, India.

ABSTRACT

This study investigates whether Indonesia's Current Account (CA) balance is intertemporally solvent. We provide fresh evidence on Indonesia's CA deficit solvency by considering post-crisis period data and conducting sub-sample analysis. Our findings suggest that Indonesia's CA is not solvent. We notice evidence of excess lending prior to the global financial crisis of 2008 and excess borrowing in the post-crisis period. Policymakers need to focus on the composition of capital flows and management of volatile capital flows since discouraging foreign capital inflows may serve as a deterrent to economic growth.

Keywords: Current account; Cointegration; Consumption-smoothing; Intertemporal solvency; Present value model.
JEL Classifications: E21; F30; F32; F42.

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I. INTRODUCTION

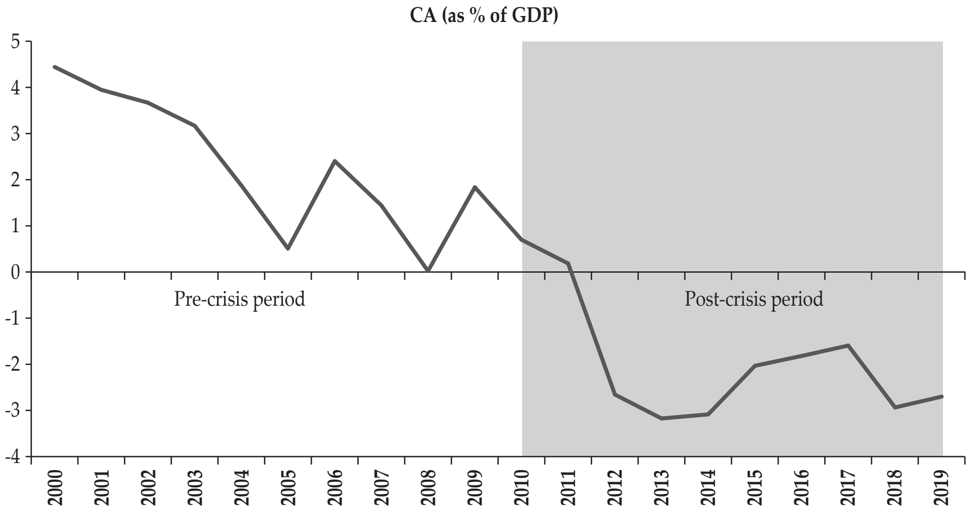
Large and persistent Current Account (CA) deficits can be a foundation for external sector vulnerability and a constraint for growth in emerging economies (Blanchard and Milesi-Ferretti, 2009, 2012). Usually, CA deficits of an open economy are financed by capital inflows from abroad; therefore, a persistent CA deficit builds up net foreign liabilities that needs to be paid at some time in future. However, if capital inflows required to finance deficits are not channeled to productive use, then a country may not be able to secure the necessary financing to ensure intertemporal solvency of its CA balance. Further, if these capital flows are volatile and prone to sudden stops, such as portfolio flows, then reversal of capital flows may lead to excessive pressure on the exchange rate and external position of a country (Garg and Prabheesh, 2017; Padhan and Prabheesh, 2020). Most notable episode of capital flow reversals leading to a financial crisis is Asian Financial Crisis of 1997-98. Thus, a persistent CA deficit may lead to an external sector crisis if capital flows are not managed and secured. However, CA deficits are not always undesirable for an emerging economy since a CA deficit would imply availability of capital at low borrowing cost, which may lead to a credit boom in the borrowing country and fulfill the domestic investment demands that are not met by savings in the domestic economy (Blanchard and Milesi-Ferretti, 2012; Caballero *et al*., 2015). Thus, a CA deficit may have an expansionary impact on economic growth via capital inflows (Blanchard and Milesi-Ferretti, 2009; Blanchard *et al*., 2016).

This paper is motivated by Indonesia's rising CA deficits since the Global Financial Crisis (GFC) in 2008. We chose Indonesia because it has appeared consistently among the top deficit emerging market economies since the GFC (IMF, 2021). Indonesia's CA dynamics have changed along with a shift in the pattern of deficit and surplus economies worldwide (IMF, 2014, 2019). The Indonesian economy followed a mercantilist approach after the East Asian Crisis of 1997-98, which resulted in consistent CA surpluses thereafter. This approach was followed by various emerging economies of Asia, which led to the global saving glut and a peak in global imbalances in 2006 (Ahearne, 2007). Dooley *et al*., (2003) described this evolution of global CA imbalances as the Bretton Woods System II wherein the US still remains the core while Asia stands as the periphery. However, after the GFC and subsequent corrections in global imbalances, Indonesia changed from being a net lender to a net borrower of capital (see, Figure 1)[1]. Hence, we analyze whether Indonesia's CA is equal to the optimal CA calculated through an intertemporal optimization model. Through this analysis, we draw implications for its intertemporally solvency. In particular, we test if capital flows to Indonesia are optimal to ensure the solvency of its CA deficits.

[1] Further, S. and Matondang (2016) discuss that many emerging economies in Asia experienced appreciation of their domestic currency due to the large influx of capital inflows.

Figure 1.
Trends in Indonesia's CA to GDP in the Pre-crisis and Post-crisis Period.

Source: IMF (2021)



Our empirical approach to address the above question is as follows. First, we employ the Present Value Model of the Current Account (PVMCA) approach to estimate an optimal CA path. Second, we examine the deviation of actual from optimal CA path using different parameters. Third, we conduct three set of estimations by testing the hypothesis with a full sample (2000Q1 – 2019Q4), a pre-crisis sample period (2000Q1 – 2009Q1) and a post-crisis sample period (2009Q2 – 2019Q4). Our main empirical findings are as follows. First, we find that the intertemporal budget constraint is not valid in all three sub-samples, and hence the CA balance in Indonesia is not solvent. Second, we find that the optimal CA has smaller variance as compared to the actual CA. Finally, we find evidence of excess savings in the pre-crisis sample period and excess borrowing in the post-crisis sample period.

Regarding the empirical literature on the CA solvency in small open economies, the results are mixed at best. The majority of research was initially conducted on developed economies (Sheffrin and Woo, 1990; Otto, 1992; Milbourne and Otto, 1992; Ghosh, 1995; Makrydaskis, 1999; Guest and McDonald, 1998; Cashin and McDermott, 1998, 2002; Bergin and Sheffrin, 2000; Otto, 2003; Kim *et al*., 2006; Kano, 2008). Out of these studies, Ghosh (1995) developed a benchmark model of consumption-smoothing while Bergin and Sheffrin (2000) later augmented Ghosh's (1995) benchmark model by incorporating non-tradable sector and exchange rates.

On emerging economies, the empirical literature is scanty. Initial attempts were made by Ghosh and Ostry (1995) to estimate a consumption-smoothing model. They found that the intertemporal solvency condition was satisfied for most of the emerging countries. Then, Callen and Cashin (1999) accounted for the asymmetry in capital flows and tested the condition in the case of India. They found the condition to be consistent for the full sample but not for the pre-liberalization sample period. Their findings further implied the importance of the availability of capital for optimal consumption-smoothing. In another study, Adedeji (2001) further augmented the PVM by introducing the role of terms of trade. He found the condition to be valid in the case of Nigeria.

There have been few more studies conducted in the case of emerging economies that have either found validity or violation of the intertemporal solvency condition. Landeau (2002) found that the CA balance in Chile is solvent over the period 1960-1999. Similar results were found by Darku (2010) in the case of Ghana over the period 1960-2002. In the case of India, Khundrakpam and Ranjan (2009) utilized a similar model to Callen and Cashin (1999) and Garg and Prabheesh (2018) and found that the solvency condition is met. On the other hand, few studies found that the solvency criterion is violated. Ogus and Sohrabji (2008) found that the Turkish CA is not solvent over the period 1992-2004. However, the model showed improvement in the solvency condition in the post-2001 crisis period. Similarly, Moccero (2008) found that the intertemporal solvency condition is violated in the case of Argentina. In a recent study, Narayan and Srianathakumar (2020) considered a group of developing and developed countries and found mixed evidence wherein countries such as France, the US, and the Philippines failed the intertemporal solvency condition test.

Overall, we can conclude that the PVMCA in emerging economies have produced mixed results at best. With regards to the Indonesian context, only one study (see Ismail *et al*., 2013) has tested for intertemporal solvency of the CA. They utilized the annual data from 1960-2004 and the estimated optimal CA fails to track the actual CA path. Further, they found evidence of excess borrowing before the Asian Financial Crisis and excess saving in the post-1998 period.

Our study departs from Ismail *et al*. (2013) in three ways. First, Bergin and Sheffrin (2000) argue that employing annual data in PVMCA tend to under reject the intertemporal budget constraint. Thus, we employ quarterly data to minimize the bias. Second, intertemporal models implicitly assume that a country can borrow and lend internationally, implying that a country must have liberalized capital flows. However, Ismail et al. (2013) mainly considers the period before Indonesia's financial liberalization. As a remedy, we employ a sample from 2000 onwards and consider three samples – full sample from 2000Q1 to 2019Q4, pre-crisis sample from 2000Q1 to 2009Q1 and post-crisis sample from 2009Q2 to 2019Q4. Third, we provide fresh evidence on Indonesia's CA deficits solvency since the group of deficit and surplus countries have changes in the post-crisis era and Indonesia has structurally shifted from a surplus country before the crisis to a persistent deficit country after the crisis (Garg and Prabheesh, 2021).

II. METHODOLOGY

We employ the intertemporal approach to the CA which is considered as the benchmark theoretical approach in examining CA behaviour. The approach was initially developed by Sachs (1981, 1982) and later by Obstfeld and Rogoff (1995). The premise is that the CA balance, whether surplus or deficit, is a result of the rational expectations of representative agents who are forward-looking in nature. Thus, these agents will always try to smooth their consumption in case of any future random variations in their income. In this case, the smoothing takes place either by borrowing or lending (Garg and Prabheesh, 2018). In other words, if there is a variation in the current income then to maintain a stable consumption level, saving will adjust accordingly. That is, if income reduces then saving will fall and vice-versa, to smooth the consumption. This phenomenon is applicable to the aggregate economy. When aggregated to the whole economy, it implies that when net output of a small open economy decreases the economy will finance its extra consumption either by dissaving or borrowing capital from abroad. Thus, the resulting CA balance will decline. Hence, if the economic agents are optimally saving and investing then the country's CA balance will also be optimal and intertemporally solvent.

To test the intertemporal solvency and estimate the optimal CA level, empirical literature has utilized the PVMCA. This model implies that the CA will form an optimal forecast of any future changes in income, as the adjustment will be reflected in the saving and borrowing behavior. This approach was developed by adopting the "saving for a rainy day" hypothesis of Campbell (1987) and Campbell and Shiller (1987).

Following Ghosh (1995), we assume a small open economy populated by an infinitely-lived representative economic agent. The agent has access to foreign capital markets for lending and borrowing:

$$U_t = \sum_{t=0}^{\infty} \beta^t \mathrm{E}_t[u(C_t)] \qquad 0 < \beta < 1 \tag{1}$$

where β is the subjective discount factor that measures the rate of time preference in the economy, $u(.)$ is the instantaneous utility function. The intertemporal budget constraint is expressed as:

$$\begin{aligned} CA_t &= B_{t+1} - B_t = Y_t + rB_t - C_t - I_t - G_t \\ B_{t+1} &= (1+r)B_t + Y_t - C_t - I_t - G_t \end{aligned} \tag{2}$$

where CA is current account, B is the initial level of foreign assets/borrowing, Y denotes GDP, C represents private consumption, I is investment, and G is government consumption for the economy. The world interest rate r is fixed and given exogenously.

The optimal consumption path is derived by imposing the transversality condition and maximizing equation (1) subject to the constraint in equation (2):

$$C_t^* = (r/\theta)\left[B_t + \frac{1}{(1+r)} E_t\left\{\sum_{t=0}^{\infty} (1+r)^{-i} NO_{t+i}\right\}\right] \tag{3}$$

where $NO_t = Y_t + rB_t - I_t - G_t$ is the net output and $\theta = \frac{(\beta(1+r)r)}{((\beta(1+r)^2 - 1)}$ is the consumption tilting parameter. The parameter reveals whether agents are impatient or not with regards to their consumption. If the value of β is greater than 1/(1+r), then the world interest rate is insufficient for the agent to postpone their consumption and thus $\theta > 1$. In this case, CA will be in deficits. On the contrary, if $\theta < 1$, then interest rates are sufficiently high for an agent to postpone or tilt their consumption towards the future, and thus a surplus. However, in case of $\theta = 1$, there is no consumption tilting. Thus, the optimal consumption-smoothing component of the CA is derived as:

$$ca_t^* \equiv no_t - \theta c_t^* \tag{4}$$

where ca_t^*, no_t and c_t^* are the natural logarithms of optimal consumption-smoothing CA, NO_t and C_t^*, respectively. Substituting equation (3) into (4) gives:

$$ca_t^* = -\sum_{t=0}^{\infty}\left(\frac{1}{1+r}\right)^i E_t \Delta no_{t+i} \tag{5}$$

The eq. (5) is the testable hypothesis of PVMCA wherein the optimal CA is equal to the expected present discounted sum of future random shocks to net output.

A. Empirical Strategy

As a first step, we estimate the consumption tilting parameter. Then, we purge it from the actual consumption series to obtain the actual consumption smoothing CA series (ca_t^{sm}). Following Ghosh (1995) and Otto (2003), we calculate the tilting parameter by regressing *no* on *c*:

$$ca_t^{sm} = no_t - \theta c_t \tag{6}$$

Next, the tilting component is subtracted from the actual consumption and unrestricted VAR consisting of Δno and ca_t^{sm} is estimated. The VAR(1) can be written as[2]:

$$\begin{bmatrix} \Delta no_t \\ ca_t^{sm} \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} \Delta no_{t-1} \\ ca_{t-1}^{sm} \end{bmatrix} + \begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix} \tag{7}$$

Or, it can be written as:

$$X_t = AX_{t-1} + e_t \tag{8}$$

where $X_t \equiv \begin{bmatrix} \Delta no_t & ca_t^{sm} \end{bmatrix}$ and A is the transition matrix.

[2] VAR(1) can be easily generalized for a higher order VAR(p).

By taking *k*-step ahead expectations:

$$E(X_{t+k}) = \Psi^k X_t \tag{9}$$

so that $E_t \Delta NO_{t+k} = [1 \quad 0] A^k X_t$

Then, the vector [1 0] is used to generate the forecasts of Δno. Thus, the infinite sum in eq. (5) can be written as:

$$ca_t^* = -\sum_{k=1}^{\infty} \beta^k [1 \quad 0] A^k X_t \tag{10}$$

or

$$ca_t^* = -\beta [1 \quad 0] A (I - \beta A)^{-1} X_t \tag{11}$$

where I is a 2×2 identity matrix. Since ca_t^* is the optimal CA and its estimate is consistent with the restrictions of the PVMCA, thus, we can express equation (5) in VAR form as:

$$\begin{aligned} ca_t^* &= [1 \quad 0] \left[A * \frac{1}{1+r} \right] \left[I - \frac{A}{(1+r)} \right]^{-1} \begin{bmatrix} \Delta no_t \\ ca_t^{sm} \end{bmatrix} \\ &= [\Gamma_{\Delta no} \quad \Gamma_{ca^{sm}}] \begin{bmatrix} \Delta no_t \\ ca_t^{sm} \end{bmatrix} \end{aligned} \tag{12}$$

To examine the intertemporal solvency of Indonesia's CA, we gathered quarterly data ranging from 2000Q1 to 2019Q4. The details on data description and sources are presented in Table 1. All data are converted into real terms using consumer price index and seasonally adjusted. We converted all variables into per-capita figures using population data. While the PVMCA developed in Ghosh (1995) does not take natural logarithms, we do so in our analysis for appropriate comparisons between samples. Finally, we used the US 90 days T-bill rate as a proxy for world interest rates and calculated the value of β. Finally, we demeaned the series on Δno and ca^{sm} since we were concerned with analyzing the dynamic properties of the model.

Table 1.
Data Description and Sources

This table presents the variable, its description in terms of unit of measurement and frequency, and sources. Our sample consists of quarterly observations from 2000Q1 to 2019Q4.

Variable	Variable Description	Sources
GDP	Quarterly estimates of Gross Domestic Product (in Indonesian Rupiah)	OECD database
C	Quarterly estimates of Private Final Consumption Expenditure (in Indonesian Rupiah)	OECD database
I	Quarterly estimates of Gross Capital Formation (in Indonesian Rupiah)	OECD database
G	Quarterly estimates of Government Final Consumption Expenditure (in Indonesian Rupiah)	OECD database
Population	Year estimates of population	OECD database
*r**	US 90 days T-bill rate (per annum)	FRED database
CPI	Consumer Price Index – All items (2015=100)	OECD database

We chose the sample from 2000-2019 for two reasons. First, our sample covers the period wherein capital flows are mobile and thus it satisfies an implicit assumption of lending and borrowing in PVMCA. Second, our sample allows us to conduct a sub-sample analysis of pre-GFC and post-GFC period. For this reasons, we conduct three set of analysis – one with the whole sample of 2000Q1 to 2019Q4, one with the pre-crisis period of 2001Q1 to 2009Q1, and another one with the post-crisis period of 2009Q2 to 2019Q4.

III. EMPIRICAL RESULTS

A. Calculation of Consumption-tilting Parameter

As a first step, we estimated the consumption-tilting parameter. Then, we purged it from the actual CA to derive the consumption-smoothing component of the CA. The tilting component is the parameter obtained by regressing *no* on *c*. Thus, we first investigated the stationarity of *no* and *c* in all three samples by implementing Phillips and Perron (1988) test and the Kwiatkowski *et al*. (1992) test[3]. Table 2 reports the unit root test results. The findings confirm that *no* and *c* are stationary at first difference, I(1), in all three samples and hence a cointegration approach is appropriate to estimate the tilting component[4].

[3] We also utilized Narayan and Popp (2010) structural break test to check whether the unit root properties are not affected due to breaks in the series. This test has better power properties and detected breaks more accurately (Narayan and Popp, 2013). In cases of no, the estimated *t*-statistics for the M1 and M2 models are -0.335 and -3.706, respectively. Similarly, in case of *c*, the *t*-statistics for the M1 and M2 models are -3.054 and -3.766, respectively. Thus, the estimated *t*-statistics values are below the 10% critical values for both models (Narayan and Popp, 2010). Hence, we conclude that both *no* and *c* contains unit root and the breaks are occurring around the GFC period.

[4] We conducted unit root test for ca_t^{sm} and found it to be stationary at levels.

Table 2.
Results of Unit Root Tests.

This table reports the unit root test results based on PP and KPSS tests. The null hypothesis for PP test is non-stationary while for KPSS test it is stationary. Therefore, a rejection of the null hypothesis in KPSS test implies nonstationary. * and ** represent 1% and 5% significance levels respectively. The full sample consists of quarterly observations from 2000Q1 to 2019Q4, pre-crisis sample ranges from 2000Q1 to 2009Q1, and post-crisis sample ranges from 2009Q2 to 2019Q4. Here, *c* and *no* denotes the consumption and net output, respectively.

	PP		KPSS	
	Level	First Difference	Level	First Difference
Full Sample				
c	-1.132	-11.760*	1.245*	0.179
no	-0.216	-10.448*	1.233*	0.098
Pre-crisis				
c	-0.900	-2.949**	0.688**	0.203
no	-1.193	-6.886*	0.641**	0.099
Post-crisis				
c	-1.781	-7.770*	0.821*	0.302
no	-0.572	-10.309*	0.822*	0.069

Next, we applied ARDL bound testing approach due to its advantages in small samples (Narayan, 2005). For robustness, we implemented DOLS procedure. The results for the test of a significant cointegrating relationship between *no* and *c* are reported in Table 3. For the full sample, 2000Q1 – 2019Q4, the estimated *F*-statistics is significant at the 1% level, implying that there is evidence of a significant cointegrating relationship between *no* and *c* and the value of the tilting parameter is 0.824, i.e. θ<1 (see column 2, Table 3). With regards to sub-samples, both the pre-crisis sample and post-crisis sample period exhibit significant long-run relationships from bound test results. These findings are in line with the pretesting of PVMCA wherein both *no* and *c* move in the same direction. However, the value of titling parameter is larger in post-crisis period as compared to pre-crisis period. Nonetheless, the value of θ<1 in all three samples indicate that the consumption is tilted towards the present, as reflected in Indonesia's CA deficits (see column 3, Table 3). Then, we conducted diagnostic checking of residuals such as test of autocorrelation, normality, and heteroscedasticity. We find that, in all three samples, the value of *F*-statistics implies that we are unable to reject the null of no autocorrelation. Similarly, Jarque-Bera statistics show that the errors are normal, and there is no presence of heteroscedasticity. see column 4-6, Table 3). Hence, we conclude that the models are well behaved.

Table 3.
Results of Cointegration Tests Between *no* and *c*

This table reports cointegration test results from ARDL and DOLS procedure. The critical values for *F*-statistics in ARDL bound tests are taken from Narayan (2005). * and ** represent 1% and 5% significance level, respectively. s.e. denotes standard errors while the values in the square brackets are probability values. For the test of autocorrelation and heteroscedasticity, *F*-statistics are reported and for the test of normality Jarque-Bera statistic is reported.

Samples	ARDL					DOLS		
	F-statistic	θ (s.e.)	Residual Diagnostics			θ (s.e.)	JB_{Norm} [Prob.]	Wald Test H_0: θ = 1
			F_{Auto} [Prob.]	JB_{Norm} [Prob.]	F_{ARCH} [Prob.]			
Full sample	8.783*	0.824* (0.037)	0.123 [0.883]	0.261 [0.877]	1.210 [0.274]	0.887* (0.158)	0.509 [0.775]	54.744*
Pre-crisis	5.142**	0.370* (0.033)	0.328 [0.723]	0.773 [0.679]	1.011 [0.448]	0.383* (0.032)	0.618 [0.733]	363.694*
Post-crisis	5.881**	0.827* (0.065)	0.915 [0.409]	1.083 [0.581]	1.796 [0.187]	0.888* (0.036)	1.637 [0.440]	9.476*

Then, we checked if the results from ARDL are robust by applying the DOLS procedure. The value of titling component is quite similar to the values we obtained in the ARDL procedure (see column 7, Table 3) and the residuals are normal and there is no autocorrelation. Then, we conducted a test of coefficient restrictions to investigate if the calculated value of θ is equal to one. Thus, we tested the hypothesis H_0:θ=1 against the alternative of H_1: $\theta \neq 1$. The results from the Wald test imply that the value of θ is significantly different from zero (see column 9, Table 3).

We obtained the consumption-smoothing component of the actual CA, ca_t^{sm}, in eq. (6) by removing the tilting parameter.

Full sample : $ca_t^{sm}=no_t-0.824c_t$
Pre-crisis : $ca_t^{sm}=no_t-0.370c_t$
Post-crisis : $ca_t^{sm}=no_t-0.827c_t$

If the net output and consumption are cointegrated then removal of the tilting parameter from the ca_t^{sm} makes the latter stationary.

B. Unrestricted VAR and Granger-causality Tests

We estimated an unrestricted VAR containing demeaned Δno_t and ca_t^{sm} for two reasons. First, we use the VAR coefficient to estimate the companion matrix in eq. (8) which then is used to calculate the weights on Δno_t and ca_t^{sm} in eq. (13). Second, we test whether the CA is able to predict future random shocks in net output (see eq. (14)). Table 4 summarizes the results.

Table 4.
VAR Coefficients and Granger-causality Test

This table is divided into two panels, A and B. Panel A reports the coefficients of VAR(1) model between Δno_t and ca_t^{sm} while Panel B shows the Granger-causality results between Δno_t and ca_t^{sm}. The full sample consists of quarterly observations from 2000Q1 to 2019Q4, pre-crisis sample ranges from 2000Q1 to 2009Q1, and post-crisis sample ranges from 2009Q2 to 2019Q4. The values in the parenthesis in panel A are *t*-statistics. Finally, * denotes statistical significant at the 1% level.

Panel A: Unrestricted VAR Model of Δno_t and ca_t^{sm}						
	Full-sample		**Pre-crisis**		**Post-crisis**	
	Δno_t	ca_t^{sm}	Δno_t	ca_t^{sm}	Δno_t	ca_t^{sm}
Δno_{t-1}	-0.065	0.100	0.065	-0.089	-0.224	-0.179
	(-0.542)	(0.854)	(0.398)	(-0.537)	(-1.382)	(-1.124)
ca_{t-1}^{sm}	-0.346	0.431	-0.571	0.574	-0.108	0.778
	(-2.972)	(3.795)	(-3.628)	(3.566)	(-0.982)	(7.185)
Panel B: Granger-causality Tests						
	Full-sample		**Pre-crisis**		**Post-crisis**	
Null Hypothesis	***F*-statistic**	**Prob.**	***F*-statistic**	**Prob.**	***F*-statistic**	**Prob.**
ca_t^{sm} does not cause Δno_t	8.721*	0.004	12.778*	0.001	1.521	0.225
Δno_t does not cause ca_t^{sm}	0.723	0.397	0.288	0.594	0.662	0.421

Before estimating an unrestricted VAR model, we tested for the optimal lag length and a VAR(1) model is chosen. Further, we checked for residual diagnostics and find that the errors do not exhibit autocorrelation and are normally distributed. Then, we tested for Granger-causality between Δno_t and ca_t^{sm} since the PVMCA implies that the CA is optimal if Granger-causes subsequent net output. We find that there is a significant causality from ca_t^{sm} to Δno_t in case of full-sample and pre-crisis sample however there are no causal relations between ca_t^{sm} and Δno_t in post-crisis period sample. Overall, the granger-causality test results imply that the results are consistent with present value model predictions for full-sample and pre-crisis period.

Next, we estimated optimal CA, ca_t^*, by taking a linear combination of the weights on Δno_t and ca_t^{sm}. These weights on Δno_t and ca_t^{sm} are point estimates and nonlinear functions of the calculated VAR coefficients (Otto, 2003). We find that the estimated weights on Δno_t and ca_t^{sm} for the full sample are 0.11 and 0.53, respectively. The weights for the pre-crisis and post-crisis period s are -0.10 and 0.10 for Δno_t and 0.39 and 0.48 for ca_t^{sm}, respectively. Since the causality tests does not tell us much about the fit of the model, we checked for the equivalence more formally through correlation coefficient tests, variance equality test and fit of the model. Specifically, we checked if the optimal ca_t^* is identical to the actual ca_t^{sm}.

Figure 2.
The Actual and Estimated Optimal Consumption-smoothing CA (Full Sample: 2000Q1 – 2019Q4)

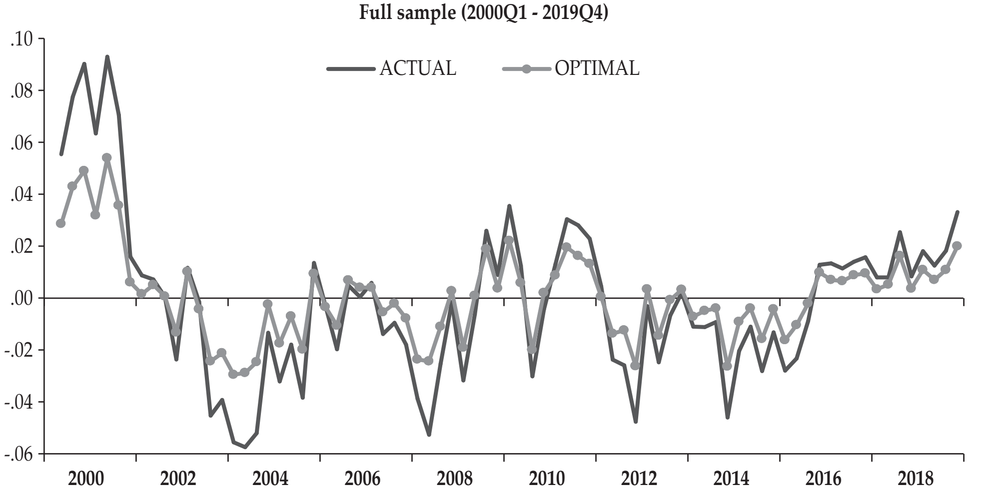


Figure 3.
The Actual and Estimated Optimal Consumption-smoothing CA (Pre-crisis Period: 2000Q1 – 2009Q1)

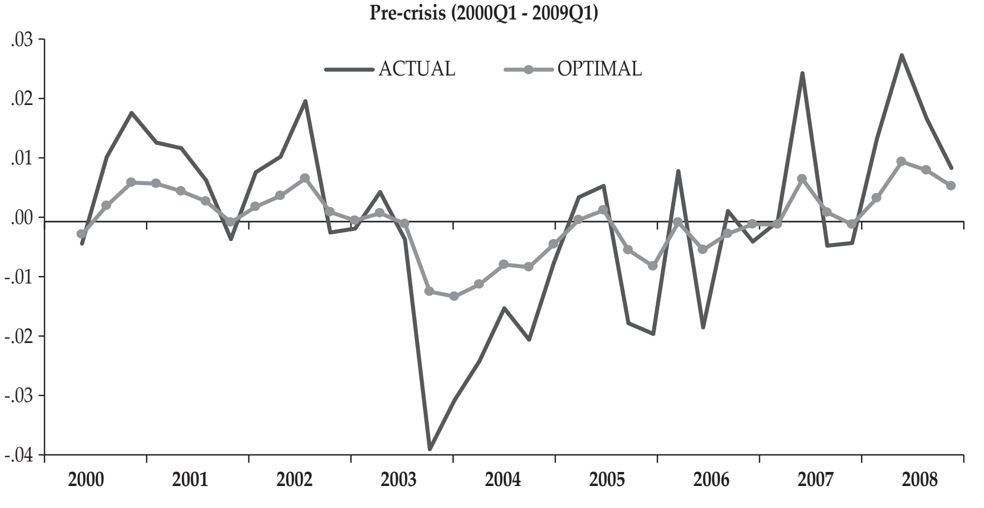
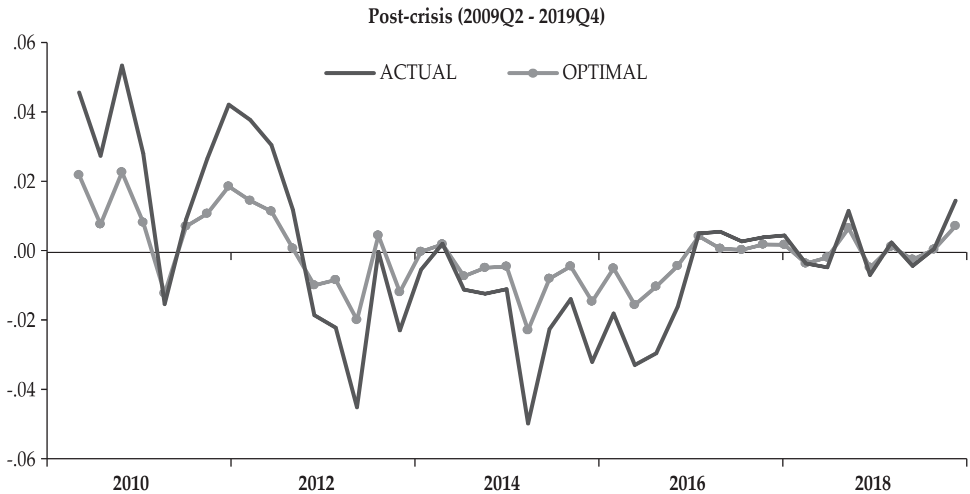


Figure 4.
The Actual and Estimated Optimal Consumption-smoothing CA (Post-crisis Period: 2009Q2 – 2019Q4)



With reference to checking if the optimal CA can trace the actual CA, we looked at the two series graphically. Figure 2 depicts the dynamic path of actual CA and estimated optimal CA for the full sample; Figures 3 and 4 illustrates for the pre- and post-crisis period, respectively. From Figures 2-4, we can conclude that there are significant deviations between the optimal CA and actual CA, and the former does not track the latter reasonably well. However, the sub-sample analysis show that the model works relatively better in the period before the GFC as compared to post-crisis period. However, the graphical analysis is not a formal test to examine the validity of the PVMCA. The results of variance equality tests, correlation tests, and fit of the model are reported in Table 5.

Table 5.
Test of the Present Value Model

The values associated with equality of variances tests are *F*-statistics. The values in parentheses are probability values. Fit of the model is calculated by taking an average of the sum of squares of the deviation of the actual from the optimal CA and then taking a square root of the value. A smaller value indicates a better fit in this case. The full sample consists of quarterly observations from 2000Q1 to 2019Q4, pre-crisis sample ranges from 2000Q1 to 2009Q1, and post-crisis sample ranges from 2009Q2 to 2019Q4.

	Full Sample	Pre-crisis	Post-crisis
$Var(ca^{sm})/Var(ca^{*})$	3.358 (0.000)	7.172 (0.000)	5.307 (0.000)
$Corr(ca^{sm},ca^{*})$	0.986	0.950	0.968
Fit of the model	0.009	0.010	0.012

The fit of the model indicates that the full-sample exhibits a better fit as compared to the two sub-samples. Among the sub-samples, pre-crisis period indicates a slightly better fit as compared to post-crisis period. However, the variance equality test results show that the variance of actual CA is significantly greater than the variance of optimal CA in all three samples. It implies that the consumption-smoothing is not optimal in case of Indonesia during the sample period. Even though the correlation coefficient shows very high comovement between the actual and optimal CA, the rejection of the null hypothesis of variance equality also suggest inequality of the two series. These findings imply that the estimated optimal CA does not closely follow the movements in the actual CA as there are significant deviations from each other and hence the CA balance is insolvent. It means that CA is not an outcome of forward-looking agents; however, the sub-sample analysis exhibit evidence of excess lending in the pre-crisis period whereas there is excess borrowing in the post-crisis period.

IV. CONCLUSIONS

Indonesia's CA has undergone a significant shift in the post-GFC era as compared to the period before and after the Asian Financial Crisis of 1997-98. Indonesia has experienced a CA surplus due to its mercantilist approach; however, after the GFC in 2008, there was capital outflow from EMEs, which put pressure on the CA balance. Consequently, Indonesia shifted from a CA surplus country in the pre-crisis period to a CA deficit country after the crisis. Hence, this paper explores whether Indonesia's CA is intertemporally solvent or not. If the calculated optimal CA tracks the movements in actual CA closely, then agents are forward-looking and have rational expectations, which implies that the CA balance is solvent. Equality of actual and optimal CA also implies optimal lending/borrowing by the country.

We employed quarterly data from 2000Q1 – 2019Q4 in our full sample analysis. We further conducted the tests of present value models by decomposing the full sample into two sub-samples – 2000Q1 to 2009Q1 characterizing the pre-crisis sample, and 2009Q2 to 2019Q4 for the post-crisis sample. We find that the CA balance is able to improve the predictability of future variations in net output in full sample and pre-global financial crisis period, but not in post-crisis period. The results from variance equality and correlation tests further suggest that Indonesia's CA is not solvent in all three samples. Hence, the capital flows are also not optimal. Further, we find evidence of excess lending before the GFC and excess borrowing after that. Policymakers need to focus on the composition of capital flows that are utilized in financing these deficits in the last one decade. Identifying the more volatile capital flows and managing them would ensure intertemporal solvency otherwise there would be excessive pressure on exchange rate and foreign exchange reserves which could develop into a balance of payments crisis. Nonetheless, policymakers should not discourage capital inflows in general since these flows can have expansionary impact on domestic output in emerging economies and a CA deficit can assist in attaining a higher growth trajectory if capital flows are liberalized pragmatically.

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