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Interest Rate, Exchange Rate, Terms of Trade and Current Account Dynamics: Empirical Evidence from Pakistan

ABSTRACT

Since the early 1980s, the intertemporal approach to the current account (ICA) has acquired much attention and has become a standard instrument for determining the current account situation. The current study analyzes the ICA's consistency and relevance for Pakistan. To achieve this goal, we employ the present value model of the current account for the period 1960 to 2016. The empirical findings highlight the statistical consistency of the prediction of the intertemporal model in Pakistan. Furthermore, when supplemented with external sector variables such as the stochastic global interest rate, real exchange rate, and terms of trade, the present value model does a reasonable job of illuminating Pakistan's historical current account movements.

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1. INTRODUCTION

One of the fundamental aims of open economy macroeconomics is the theoretical and empirical investigation of the current account balance (CAB), and a significant number of research endeavors have been undertaken in this field using various methodologies. The modeling and the ramifications of the Current Account Deficit (CAD) have evolved, particularly in the post-World War II era (Edwards, 2001). The post-World War II period observed debates and strategies regarding CAB derived from the traditional approaches to balance of payments proposed by the Keynesian and the Monetarists and the intertemporal approach to the current account (ICA).

A thorough investigation of the conventional Keynesian and Monetarist approaches reveals that both of these focus on a macroeconomic framework based on trade and current account balances. Even though these approaches provide helpful guidance for macroeconomic policies, they are deficient in incorporating the microeconomic foundations and optimizing the behavior of the forward-looking economic agents in the analysis. The ICA adequately tackles such shortcomings of these approaches. Like the Mundell–Fleming model, this approach presupposes perfect capital mobility and high economic interdependence among nations. The rise of this approach in the early 1980s paved the way for the advancement of the models in two critical ways: by providing microeconomic foundations for analyzing the behavior of economic agents; and by utilizing the intertemporal optimization theory to scrutinize an array of interconnected macroeconomic challenges relating to international trade flows, CAB, external debt sustainability and the equilibrium exchange rates, particularly in a forward-looking framework (Singh, 2007).

In essence, the ICA is a restatement of the permanent income hypothesis (PIH) (Friedman, 1957; Hall, 1978). When an economy experiences a difference between its current and permanent income levels, an incentive for the economic agents to get engaged in lending and borrowing activities at the world capital market to accommodate the temporary variations emerges. An expectation of a temporary gain in future income drives economic agents to raise their current consumption spending, increasing the CAD. Conversely, a decline in anticipated future income is expected to condense the magnitude of the CAD. Applying a present value link between CAB and changes in net output, referred to as the basic present value model of the current account (PVMCA), is a well-known method for empirically testing the ICA. Later, advances in the relevant literature, on the other hand, established a more refined version of the PVMCA that took into account the effects of predicted relative prices – real interest rate (RIR), a real exchange rate (RER), and terms of trade (TOT). The PVMCA is based on the methodology of two critical empirical studies, namely, Campbell (1987) and Campbell and Shiller (1987), which facilitate in deriving the optimum current account value of an optimizing agent by employing the VAR technique.

With few exceptions1, Pakistan's economy has been plagued by recurrent external sector deficits since the 1960s. Various factors have historically contributed to the deterioration of external accounts. However, the low rates of domestic saving, recurrent budget, trade deficits, and exchange rate fluctuations remained the significant factors in dampening the external sector position of Pakistan. Pakistan's chronic CAD, along with mounting foreign debt and volatile private consumption, necessitates an inquiry into the dynamics of the CAB. This is noteworthy because economic theory says that governments should smooth consumption by using the tool of the CAB (Sachs et al., 1981).

Thus, the primary purpose of the present research is to analyze the dynamics of the CAB in Pakistan using the intertemporal model, which includes time-varying world real interest rate (RIR), the real exchange rate (RER), and terms of trade (TOT). The contribution of this study is apparent from two aspects. It is the first

[1] Historically, Pakistan experienced current account surplus only in few fiscal years i.e. 1960-61, 1983-84, 2001-02, 2002-03 and 2003-04.

attempt in Pakistan and other developing nations in South Asia to estimate an intertemporal model that integrates the world RIR, the RER, and the TOT. Secondly, the study not only follows the existing literature in using consumption-based interest rate (CIR), which comprises the world RIR, the RER, and the TOT, but it also investigates the isolated effects of three components of CIR within the PVMCA methodology to determine their relative contribution in generating fluctuations in the CAB of Pakistan.

The research is planned into five sections. Following the brief introduction, a critical review of the literature on the ICA's validity in various nations is presented in section 2. Section 3 discusses the theoretical model, construction of variables, data sources, and estimation technique. The results and discussion are given in section 4. Finally, section 5 presents the concluding remarks and some policy recommendations.

2. LITERATURE SURVEY

Using the framework of the ICA, a large body of research has been produced over the last three decades to scrutinize the dynamics of the CAB across various sets of countries. To this end, the PVMCA surfaces are a standard tool in the researchers' hands to test the ICA's consistency with the real-world data. To date, the relevant literature fails to yield decisive empirical evidence in support of the PVMCA framework. For instance, several studies show the inability of the basic PVMCA for various countries (Sheffrin & Woo, 1990; Otto, 1992; Milbourne & Otto, 1992; Makrydakis, 1999; Ogus & Niloufer, 2006; Goh, 2007; Khundrakpam & Ranjan, 2008; and Machi, 2013) while contrary evidence is recorded by Ghosh and Ostry (1995) and Agénor et al. (1999) among others. Bergin and Sheffrin (2000) pioneering work introduce refinements in the PVMCA by incorporating the role of stochastic RIR and the RER. They succeed in showing the better performance of their model than the basic PVMCA and contend that the effect of external shocks is transmitted to the CAB, in the case of small open economies, through the channels of the world RIR and the RER. According to Gruber (2004), fusing habit formation in a basic PVMCA enhances its better match with CA data. Nonetheless, Kano (2009) demonstrates that habit formation is similar to the world RIR as its influence on consumer behavior. Hence, the PVMCA with the world RIR can be an alternative to its habit formation counterpart. Similarly, according to Nason and Rogers (2006), excluding the stochastic world RIR is a crucial factor behind the poor performance of the basic PVMCA.

The Bergin and Sheffrin's model created a great appeal, and numerous empirical endeavors have demonstrated its better performance vis-à-vis the basic PVMCA (for instance, Adedeji, 2001; Landeau, 2002; Saksonovs, 2006; Darku, 2008; Campa & Gavilan, 2011; Mukhtar & Khan, 2011). To extend the framework laid out by Bergin and Sheffrin (2000), and Adedeji (2001) includes expected change in the TOT to estimate the model empirically. Their study aimed to determine the relative performance of four versions of the PVMCA using data for Nigeria from1960 to 1997. The results identified that the model augmented with the TOT and the time-varying world RIR and the RER does not perform better relative to the version of the PVMCA that incorporates changes in the world RIR and the RER only. However, it outperforms a basic PVMCA that ignores the transmission mechanisms through which an external shock affects the CAB.

Similarly, Bouakez and Kano (2008) have undertaken a critical study to inspect the actual CAB explaining the ability of the PVMCA model augmented with a TOT variable. Incorporating this variable tries to test the Harberger-Laursen-Metzler (HLM) effect, which asserts a favorable impact of a temporary rise in the TOT on the CAB. The study tests the PVMCA by utilizing the quarterly data from four advanced economies, namely, Australia, Canada, and the United Kingdom (1972Q1 to 2001Q4, 1962Q2 to 2001Q2, 1971Q1 to 2001Q4, respectively). By and large, the study's findings recommend the insignificant influence of shocks pertaining to the TOT in instigating CA fluctuations.

Ghosh and Ostry (1995) provided the pioneering work examining the ICA about Pakistan. The authors used data from 1960 to 1991 to show that the ICA is incompatible with the country's data. Mukhtar and Khan (2011) examine Pakistan's CA trends using annual time series data from 1960 to 2009. They discover that the basic intertemporal model continues to be ineffective in explaining Pakistan's overall CA vacillations. The Bergin and Sheffrin type model, on the other hand, does an excellent job of describing the CA's behavior. Apart from these two studies, we cannot locate any further research relevant to Pakistan that focuses on investigating CA dynamics within the ICA framework.

Because of the integration of the stochastic world RIR and the RER, the Bergin and Sheffrin model is deemed substantially more practicable. In any event, an alternative fundamental international relative price, namely, the TOT, is missing from the Bergin and Sheffrin investigation, which is appropriately acknowledged as one of the critical transmission routes of external shocks by the relevant literature. The primary goal of the present study is to test whether the TOT plays any significant role in improving the fit of the Bergin-Sheffrin model with Pakistan's data. Bouakez and Kano (2008) disregard the use of CIR by Bergin and Sheffrin in their analysis. They contend that this series in the research depends on the structural parameters. So, it is better to get more reliable results by explicitly disentangling the effects of the world RIR from the effects originating from the RER movements.

The primary goal of this study is to examine the dynamics of the CAB in Pakistan using an intertemporal model that incorporates time-varying world real interest rates (RIR), real exchange rates (RER), and terms of trade (TOT). The basic research question at hand is to determine the ICA's ability to predict the behaviour of Pakistan's CA balance in order to derive appropriate policy options for better managing the external balance. To this end, the study will assess the validity of the ICA in Pakistan using a modified version of the Bergin-Sheffrin model. Furthermore, in order to get more concrete results, the study will not only work with consumption-based interest rate (CIR), which comprises the world RIR, the RER, and the TOT, but it will also gauge the separate effects of three components of CIR within the PVMCA methodology to identify their relative importance in engendering fluctuations in Pakistan's CAB. This type of strategy has never been employed in any study based on the ICA related to a developing country, including Pakistan.

3. ANALYTICAL FRAMEWORK

3.1. The Model

This section presents a modified version of Bergin and Sheffrin (2000) PVMCA, incorporating the stochastic TOT. We borrow our PVMCA from Adedeji (2001). This model is constructed on the assumption that the consumption bundle of a representative household, which lives in a small open economy, consists of both tradable and non-tradable goods. It implies that the representative household can consume exportable, importable, and non-tradable. The household's expected lifetime utility can be expressed as:

$$E_t U = E_t \sum_{s=t}^{\infty} \beta^{s-t} \frac{C_s^{*(1-\sigma)}}{1-\sigma} \quad (1)$$

β refers to the subjective discount factor, σ indicates the relative risk aversion coefficient (or the reciprocal of the intertemporal elasticity of substitution), and an index of the total consumption is represented C^*. Finally, the functional form for C^* is assumed to be a Cobb-Douglas:

$$C^* = C_N^{\alpha} C_M^{1-\alpha}, \qquad 0 < \alpha < 1 \quad (2)$$

Where, C_N is the consumption of non-traded goods, C_M refers to the consumption bundle of imported goods. Moreover, the term α symbolizes the share of traded goods in the total consumption index. Net holdings of foreign assets (i.e., international bonds) evolve according to the budget constraint:

$$A_{s+1} - A_s = Y_{Xs} + r_s A_s - P_s Y_{Ns} - Q_s C_{Ms} - P_s C_{Ns} - I_s - G_s \qquad (3)$$

Where Y_x represents exportable' output, Y_N shows the production of non-tradable, P indicates the price of non-tradable for exportable, and Q refers to the relative price of importable concerning exportable. So, both P and Q are interpreted as the RER and the TOT, respectively. A, I, and G represent net foreign assets of a country, total investment, and government expenditures, respectively. All the selected variables are stated in terms of exportable goods. As a result, total expenditures, as measured in units of exportable C_S, is equal to $Q_s C_{Ms} + P_s C_{Ns}$ and total output, Y_S, equates to $Y_{Xs} + P_s Y_{Ns}$.

To solve the agent's problem, as an initial step, the consumption-based price index P^*, is explained as the minimum quantity of consumption spending required to purchase one unit of C^*, given P and Q. The agent's intertemporal problem is solved to derive P^*, maximizing $C_{Ns}^{\alpha} C_{Ms}^{1-\alpha}$ subject to $C_s = Q_s C_{Ms} + P_s C_{Ns}$. The derivation of P^*yields:

$$P_s^* = \frac{P_s^{\alpha} Q_s^{1-\alpha}}{\alpha^{\alpha}(1-\alpha)^{(1-\alpha)}} \qquad (4)$$

We next proceed to reformulate the optimization problem of an economic agent in terms of the single compound good C^*. In addition, the budget constraint for one period (3) is explained by employing the definitions of total output and total expenditures and by incorporating the fact that $P_s^* C_s^* = C_s$. The outcome is:

$$P_s^* C_s^* = Y_s + (1 + r_s)A_s - A_{s+1} - I_s - G_s \qquad (5)$$

The intertemporal problem then faced by the economic agent is to optimize (1) conditional to (5). An appropriate mathematical exercise results in the following first-order condition:

$$E_t \left[\beta(1 + r_{t+1}) \left(\frac{P_t^*}{P_{t+1}^*} \right) \left(\frac{C_t^*}{C_{t+1}^*} \right)^{\sigma} \right] = 1 \qquad (6)$$

Substitution for C^* and P^* from (2) and (4) we get:

$$E_t \left[\beta(1 + r_{t+1}) \left(\frac{C_t}{C_{t+1}} \right)^{\sigma} \left(\frac{P_t^{\alpha} Q_t^{(1-\alpha)}}{P_{t+1}^{\alpha} Q_{t+1}^{(1-\alpha)}} \right)^{(1-\sigma)} \right] = 1 \qquad (7)$$

Failure to get an overt solution of Euler equation (7) leads us to an approximation of this expression. In this regard, the joint log normality for all variables results in the following specification of (7):[2]

$$E_t \left[ln\beta + r_{t+1} - \sigma \Delta C_{t+1} + (1-\sigma) ln P_t^{\alpha} Q_t^{(1-\alpha)} - (1-\sigma) ln P_{t+1}^{\alpha} Q_{t+1}^{(1-\alpha)} \right] + \frac{1}{2} Var(lnX) = 0 \qquad (8)$$

where $X = \beta(1 + r_{t+1}) \left(\frac{C_t}{C_{t+1}} \right)^{\sigma} \left(\frac{P_t^{\alpha} Q_t^{(1-\alpha)}}{P_{t+1}^{\alpha} Q_{t+1}^{(1-\alpha)}} \right)^{(1-\sigma)}$, $\Delta C_{t+1} = lnC_{t+1} - lnC_t$, and the approximation $\ln(1 + r_{t+1}) \approx r_{t+1}$ has been utilized. Furthermore, we have assumed that variances and covariances between all variables remain constant, expression (8) turns as:

[2] If X is log-normally distributed with the property that $E_t(x) = E_t(\log x) + \frac{1}{2} Var(\log x)$

$$E_t\Delta C_{t+1} = E_t[\gamma r_{t+1} - \alpha(\gamma-1)\Delta p_{t+1} - (1-\alpha)(\gamma-1)\Delta q_{t+1}] + Constant \qquad (9)^3$$

Where, $\Delta p_{t+1} = lnP_{t+1} - lnP_t$, $\Delta q_{t+1} = ln\,Q_{t+1} - lnQ_t$, and $\gamma = \frac{1}{\sigma}$ (the elasticity of intertemporal substitution). Thus, we can rewrite (9) for showing the evolution of optimal consumption profile as:

$$E_t c_{t+1} = \gamma E_t r^c_{t+1} \qquad (10)$$

where, r^c is the consumption-based interest rate expressed as:

$$r^c_t = r_t - \left[\alpha\left(\frac{\gamma-1}{\gamma}\right)\right]\Delta P_t - \left[(1-\alpha)\left(\frac{\gamma-1}{\gamma}\right)\right]\Delta q_t \qquad (11)$$

Now an important task is to derive the required econometric form of the modified PVMCA for testing its implications. In this case, we linearize the intertemporal budget constraint around the steady-state, where the net foreign assets are set equal to zero as an essential requirement of the model. A long derivation task ends at:

$$\widehat{CA}_t = -E_t[\textstyle\sum_{s=t+1}^{\infty}\beta^s\,(\Delta no_s - \gamma r^c_s] \qquad (12)^3$$

The expression (12) demonstrates the influence of both domestic and external shocks on the CAB. A rise in the CAB accompanies a fall in expected net output, while the expected CIR will condense the CAB. It implies that domestic and foreign factors will affect the CAB differently. For empirical examination of (12), we set the following framework:

$$\begin{bmatrix}\Delta no_t \\ CA_t \\ r^c_t\end{bmatrix} = \begin{bmatrix}\phi_{11} & \phi_{12} & \phi_{13} \\ \phi_{21} & \phi_{22} & \phi_{23} \\ \phi_{31} & \phi_{32} & \phi_{33}\end{bmatrix}\begin{bmatrix}\Delta no_{t-1} \\ CA_{t-1} \\ r^c_{t-1}\end{bmatrix} + \begin{bmatrix}\varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t}\end{bmatrix} \qquad (13)$$

Using (13) and the other conditions that $E_t(X_{t+j}) = \Omega^j X$, $E(\varepsilon_{1t}) = E(\varepsilon_{2t}) = E(\varepsilon_{3t}) = 0$ and Ω is the 3×3 matrix of coefficients ϕ_{ij}. The restrictions on (12) can be stated as:

$$hy_t = -\textstyle\sum_{s=t+1}^{\infty}\beta^{s-t}\,(g_1 - \gamma g_2)\Omega^{s-t}y_t \qquad (14)$$

Where, $y_t = (\Delta no_t \quad CA_t \quad r^c_t)'$, $g_1 = [1 \quad 0 \quad 0]$, $g_2 = [0 \quad 0 \quad 1]$, and $h = [0 \quad 1 \quad 0]$. For a given y_t, the right-hand side of (14) can be expressed as:

$$\widehat{CA}_t = ky_t \qquad (15)$$

Where $k = -(g_1 - \gamma g_2)\beta\Omega(1-\beta\Omega)^{-1} = [\Phi_{\Delta no} \quad \Phi_{CA} \quad \Phi_{r^c}] = [0 \quad 1 \quad 0]$. The expression (15) sets a statistical restriction of the modified PVMCA within the VAR framework, i.e., and actual CAB is analogous to its PVMCA's predicted counterpart ($\widehat{CA}_t = CA_t$) employing the Wald test. Apart from this formal test, following Adedeji (2001), the validity of the modified PVMCA will also be judged from some informal tests derived from (12). Briefly, these tests are: (i) the predicted CAB series of the model (or optimal CAB) appears stationary at the levels, i.e., I(0); (ii) fluctuations in the net output and CIR are Granger caused by the CA series;(iii) equality exists between the actual CAB and the model's predicted CAB; and (iv) if both the series are similar, the stationarity of the one series also indicates the stationarity of the other series.

[3] The lower case letters indicates the logs of the upper case counterparts

In light of Bouakez and Kano's (2008) concerns about the use of CIR, we must investigate the separate roles of the world RIR, the RER, and the TOT in determining Pakistan's CAB behavior. Therefore, following Bouakez and Kano (2008) and the procedure presented above, the optimal CAB can be expressed as:

$$\widehat{CA}_t^* = -E_t[\sum_{s=t+1}^{\infty} \beta^s (\Delta no_s - \gamma r_s + \alpha(\gamma-1)\Delta p_s + (1-\alpha)g_4(\gamma-1)\Delta q_s)] \qquad (16)$$

For estimating (16), the VAR model consists of five variables, and the constraints imposed on the model are expressed as:

$$hy_t = -\sum_{s=t+1}^{\infty} \beta^{s-t} (g_1 - \gamma g_2 - (1-\alpha)(1-\gamma)g_3 - \alpha(1-\gamma)g_4)\Omega^{s-t} y_t \qquad (17)$$

where $h = [0 \quad 1 \quad 0 \quad 0 \quad 0]$, $g_1 = [1 \quad 0 \quad 0 \quad 0 \quad 0]$, $g_2 = [0 \quad 0 \quad 1 \quad 0 \quad 0]$, $g_3 = [0 \quad 0 \quad 0 \quad 1 \quad 0]$, and $g_4 = [0 \quad 0 \quad 0 \quad 0 \quad 1]$.

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For a given y_t, the expression on the right-hand side of (17) can be stated as:

$$\widehat{CA}_t^* = ky_t \qquad (18)$$

Hence, the vector of the parameter $k = -(g_1 - \gamma g_2 - (1-\alpha)(1-\gamma)g_3 - \alpha(1-\gamma)g_4)\beta\Omega(1-\beta\Omega)^{-1}$.

3.2. Data Sources and Explanation of Variables

This study utilizes annual time series data from 1960 to 2016 for Pakistan to accomplish the empirical objectives. Data on the selected variables, namely, consumption spending, public sector spending, investment spending (comprises of the gross fixed capital formation and variations in inventories), GDP, and CAB are accessed from International Financial Statistics published by the International Monetary Fund, Pakistan Economic Surveys (various issues) published by the Government of Pakistan, and World Development Indicators by the World Bank.

We deviate from the common tradition in the relevant empirical research regarding the construction of the CAB series4 by subtracting private consumption, public sector spending, and investment expenditures from the national income (gross national product). We computed the net output series by deducting the public sector expenditure and private investment spending from GDP. The world RIR is calculated from the weighted averages of the real interest rates of G-7 countries. As foreign trade of Pakistan is denominated in the US dollar, the current study uses the RER by taking the US dollar as a benchmark currency. The TOT variable is constructed by following the standard practice, i.e., taking the ratio of the export prices to the import prices. Finally, all the selected variables are used in the real per capita form.

The value of elasticity of intertemporal substitution γ varies between 0 and 1[5]. We have followed Ostry and Reinhart (1992) and Darku (2008) using the value γ = 0.45. About the value of the share of traded goods in the total consumption index α, like Bergin and Sheffrin (2000), we select the value of this index 0.5.

[4] We deviate from the traditional approach of constructing current account series from gross national product less private consumption expenditure less private investment less government consumption spending because of a visible mismatch between the current account series given in balance of payment data of Pakistan and current account series constructed by following the method suggested in intertemporal model that is traditional way of constructing current account series. Therefore, it is quite plausible to use current account series given in BoP data of Pakistan. See, for instance, Ghosh and Ostry (1995), Bergin and Sheffrin (2000), Adedeji (2001), Darku (2008) and Mukhtar and Khan (2010), among others.

[5] See, for example, Hall (1988), Ostry and Reinhart (1992), Kydland and Zarazaga (2003), Bergin and Sheffrin (2000), Adedeji (2001), Landeau (2002), Uribe (2002) and Darku (2008).

Finally, for the value of the discount factor β, first, we obtain the mean of the world RIR, $\bar{r}$ using the formula $1/(1+\bar{r})$, we compute the value of β, which is equal to approximately 0.96.

4. RESULTS AND DISCUSSION

4.1. Unit Root Test

Considering that testing stationarity of variables is a prerequisite for applying a VAR model, the study has used the Dickey-Fuller Generalized Least Squares (DF-GLS) unit root test for selected time series. Table 1 depicts that all the four variables, i.e., actual CAB, optimal CAB, change in net output, and CIR are stationary at a level that implies they are $I(0)$. The findings of the stationarity test concerning the actual and optimal CA series lend favorable support in applying the PVMCA to Pakistan's data. In the next step, a VAR model of order one is selected as proposed by the AIC and the SBC lag selection criteria to carry out the empirical exercise.

Table 1: Results of Unit Root Test

Variable	Level	Mackinnon Critical Values for Rejection of Hypothesis of a Unit Root			Decision
		1 %	5 %	10 %	
Δno_t	-4.56	-3.76	-3.18	-2.88	*I* (0)
CA_t	-3.98	-3.76	-3.18	-2.88	*I* (0)
$\widehat{CA}_t$	-6.38	-3.76	-3.18	-2.88	*I (0)*
r_t^c	-6.38	-3.76	-3.18	-2.88	*I* (0)

4.2. VAR Estimates and Tests of Restrictions of the Modified PVMCA

Table 2 presents the estimated coefficients of three equations within the VAR model and different modified PVMCA tests. The Granger causality test in (Panel B of Table 2) indicates unidirectional causality between the CAB and variations in the net output, and it is running from the former to the latter. However, no causal pattern is found between the CAB, and the CIR. Hence, the outcome of this informal test yields partial support to the modified PVMCA. Next, the parameters of the VAR model, presented in Table 2, are used to derive a series for the optimal CAB, and then a graphical comparison amongst the actual and the optimal CA series is structured. A visual inspection of the plots of both series is displayed in figure 1, revealing that the model fits reasonably well with the data. Moreover, by including the stochastic world RIR, the RER, and the TOT in the model, an improvement is observed in the modified PVMCA to predict the general trend of the actual CAB in Pakistan. Nevertheless, it is also evident that the actual CAB demonstrates relatively more instability than its optimal counterpart, which is a usual occurrence when a consumption smoothing model is used for analyzing the case of a small open economy (Adler, 2002).

We have employed another informal test of the intertemporal model, which is carried out by taking the ratio of two CA balances, namely, the proportion of optimal CAB's variance to the variance of its actual counterpart. The PVMCA and the assumption of high capital mobility support a value of unity for this ratio (Ghosh & Ostry, 1995; Agénor et al., 1999). From panel C of Table 2(column 2), it is evident that this ratio is less than unity, i.e., 0.744, indicating a moderate level of capital mobility to Pakistan through the selected period of the study. It also casts doubt on the validity of the ICA for Pakistan's data. Our final informal test of the intertemporal model is based on the correlation coefficient value between the two CA series. We obtained the value of the correlation coefficient as 0.815 (panel C of Table 2, column 2), suggesting that the modified PVMCA has a reasonably good power to describe the behavior of CAB of Pakistan during the sample period. Figure 1 displays a close association between the two series.

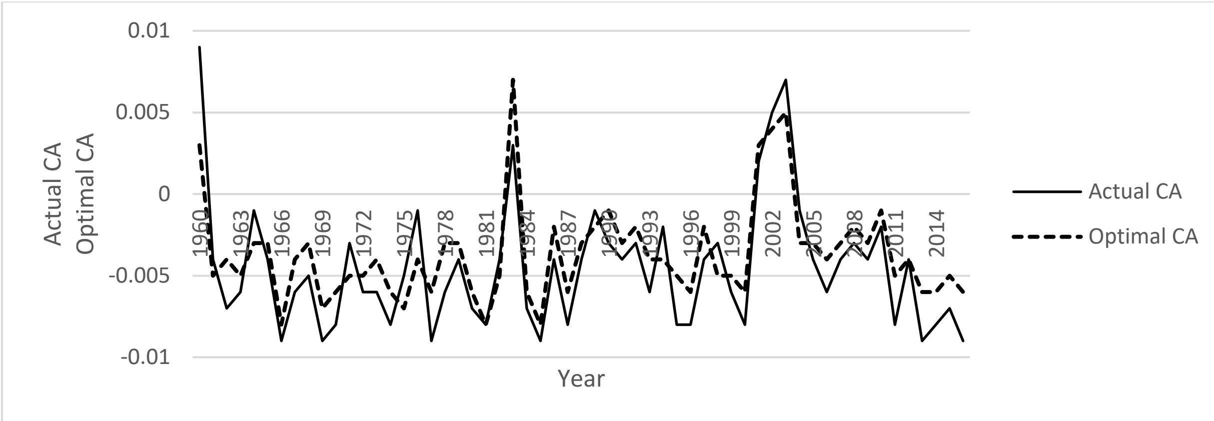

Figure 1: Plots of Actual and Optimal Current Account Balances

The next step is to go over the results of the formal tests used in the study, presented in Table 2 (Panel C, column 1). The k vector coefficients on change in net output, CIR, and CAB are –0.124, –0.028, and 0.547, respectively. Individually, the values of all three coefficients are statistically indistinguishable from 0, 1, and 0, which corresponds to their theoretical values in the modified PVMCA. This finding forms our expectation regarding the strength of our estimated model to pass through the stringent statistical restriction implied by the expression (12) in section 3.1. The outcome of the Wald test reflects that, as a whole, the restriction of the modified PVMCA is not rejected by Pakistan's data. It implies that including the world RIR, the RER, and the TOT significantly improves the intertemporal model's ability to explain CA behavior in Pakistan. The results for different diagnostic tests, namely, serial correlation, functional form, heteroscedasticity, and normality, in Table 2, reveal that the residuals conform to the Gaussian assumptions.

Table 2: VAR Estimates and Tests of Restrictions of the Modified PVMCA

Panel A: VAR Estimates							
Dependent Variable	Regressor			Diagnostic Tests: χ^2 (*P*-values are in the parentheses)			
	Δno_{t-1}	CA_{t-1}	r^c_{t-1}	S.Correlation	F.Form	Heteroscedasticity	Normality
Δno_t	0.175	-0.518***	-0.057	0.379	0.089	0.541	0.726
	(0.169)	(0.143)	(0.042)	(0.581)	(0.911)	(0.439)	(0.339)
CA_t	-0.172	0.665***	-0.039	0.684	0.097	0.999	1.077
	(0.154)	(0.101)	(0.222)	(0.348)	(0.899)	(0.311)	(0.301)
r^c_t	-0.719	0.038	0.318**	1.114	0.278	0.674	0.888
	(0.631)	(0.039)	(0.148)	(0.273)	(0.667)	(0.354)	(0.317)

Panel B: Granger Causality Test: F statistic (*P*-values are in the parenthesis)		
CA does not Granger Cause Δno	8.517	(0.004)
Δno does not Granger Cause CA	1.145	(0.376)
CA does not Granger Cause r^c_t	0.359	(0.552)
r^c_t does not Granger Cause CA	1.348	(0.251)

Pane C: Tests of Restrictions			**Pane C: Ratio of Variance and Correlation Coefficeint**
Δno_t	-0.124	(0.212)	$var(\widehat{CA})/var(CA)$ = 0.744
CA_t	0.547	(0.413)	$Corr(CA, \widehat{CA})$ = 0.815
r^c_t	-0.028	(0.214)	
χ^2 = 3.317; *P*-value = 0.357			

Notes: As all the three variables used in the model are stated as deviations from their respective means, the VAR model is estimated without a constant term. The values in parentheses represent the standard errors. *** and ** indicate significant at 1% and 5% significance levels, respectively.

4.3. Estimates of Basic PVMCA and Bergin and Sheffrin's Model

It seems imperative to present the findings of two other versions of the intertemporal model, known as the basic PVMCA[6] and Bergin and Sheffrin's model. The results of different versions of the intertemporal model can be compared to establish the relative implications of domestic and external shocks in causing variations in the CAB of Pakistan. The overall findings indicate the strong rejection of the basic PVMCA by data under formal (statistical) and informal tests (see Table 3 and figure 2). One of the primary reasons for the weak performance of this model may be its restrictive nature, so it is expanded to incorporate the influence of exogenous shocks in changing the CAB. When Bergin and Sheffrin's model is applied, we find a tremendous improvement in the intertemporal model's performance in fitting the CAB data of Pakistan. According to informal and formal tests, the extended PVMCA not only successfully captures the pattern of most of the actual current account swings, but its constraints are also not statistically rejected by the current account data (see Table 4 and figure 3). Hence, this result points towards the important role of the stochastic world RIR and the RER in inducing variations in the country's CAB. A comparison among the three versions of the intertemporal model indicates that no doubt the performance of the model, which includes external shocks, namely, the world RIR, the RER, and the TOT is far better than that of the basic PVMCA on the ground of both the formal and informal tests. Nonetheless, through informal tests, it appears that this empirical model, in relative terms, does not perform better than the model proposed by Bergin and Sheffrin (2001), which excludes the TOT variations. Hence, our findings suggest fewer effective contributions of the TOT shocks regarding the oscillations in the CAB of Pakistan.

Table 3: VAR Estimates and Tests of Restrictions of the Basic PVMCA

Dependent Variable	**Regressor** Δno_{t-1}	**Regressor** CA_{t-1}	**Diagnostic Tests: χ^2 (*p* values are in the parentheses)** S.Correlation	F.Form	Hetero.	Normality
Δno_t	0.109	-0.384***	1.266	0.009	0.072	0.664
	(0.221)	(0.095)	(0.250)	(0.989)	(0.923)	(0.417)
CA_t	0.011	0.414***	0.804	1.517	0.053	0.446
	(0.027)	(0.049)	(0.319)	(0.238)	(0.962)	(0.792)
Granger Causality Test: F statistic (P-values are in the parenthesis)						
CA does not Granger Cause Δno				9.448 (0.009)		
Δno does not Granger Cause CA				1.667 (0.342)		
Tests of Restrictions						
Δno_t	-0.163	(0.139)		$var(\widehat{CA})/var(CA)$ = 0.607		
CA_t	0.415***	(0.105)		$Corr(CA, \widehat{CA})$ = 0.513		
	χ^2 = 26.855; *P*-value = 0.000					

Notes: The variables entering the model are expressed as deviations from their means, so the VAR model is estimated without a constant term. The numbers in the parentheses are the standard errors. *** indicate significant at 1% level.

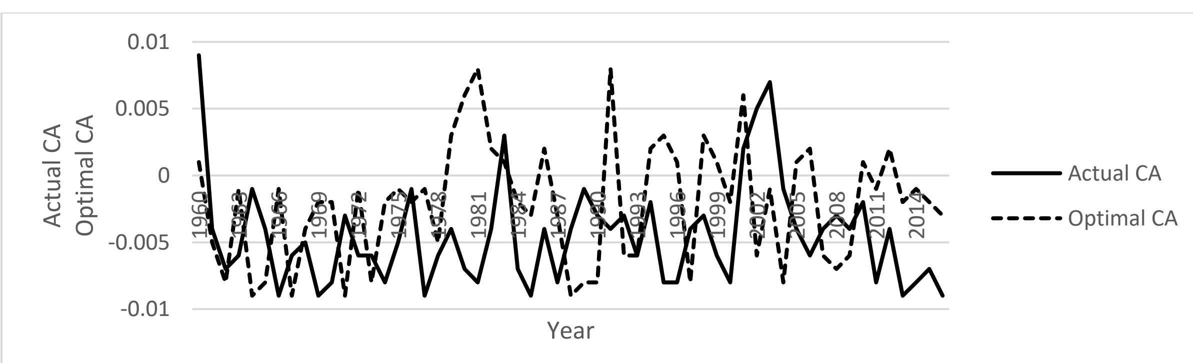

Figure 2: Plots of Actual and Optimal Current Account Balances

[6] Assuming constant world interest rate of 4% we have estimated the optimal current account series under the basic PVMCA.

Table 4: VAR Estimates and Tests of Restrictions of the Bergin and Sheffrin Model

Dependent Variable	Regressor			Diagnostic Tests: χ^2 (*P*-values are in the parentheses)			
	Δno_{t-1}	CA_{t-1}	r^c_{t-1}	S.Correlation	F.Form	Heteroscedasticity	Normality
Δno_t	0.345	-0.167***	-0.029	1.366	0.114	0.049	0.656
	(0.297)	(0.027)	(0.108)	(0.253)	(0.684)	(0.938)	(0.387)
CA_t	-0.995	0.736***	-0.182	0.559	0.902	1.399	0.602
	(0.749)	(0.101)	(0.146)	(0.428)	(0.303)	(0.241)	(0.396)
r^c_t	-0.201	-0.086	0.612**	0.611	0.101	0.739	0.492
	(0.189)	(0.097)	(0.245)	(0.384)	(0.864)	(0.317)	(0.468)
Granger Causality Test: F statistic (*p* values are in the parenthesis)							
CA does not Granger Cause Δno						18.294 (0.000)	
Δno does not Granger Cause CA						1.158 (0.382)	
CA does not Granger Cause r^c_t						1.187 (0.374)	
r^c_t does not Granger Cause CA						1.057 (0.425)	
Tests of Restrictions							
Δno_t	-0.028 (0.097)				$var(\widehat{CA})/var(CA)$ = 0.931		
CA_t	0.449*** (0.011)				$Corr(CA, \widehat{CA})$ = 0.966		
r^c_t	0.028 (0.031)						
	χ^2 = 2.984; *P*-Value = 0.447						

Notes: As all the three variables entering the model are expressed as deviations from their means, the VAR model is estimated without a constant term. The numbers in parentheses are standard errors. *** and ** indicate significant at 1% and 5% levels, respectively.

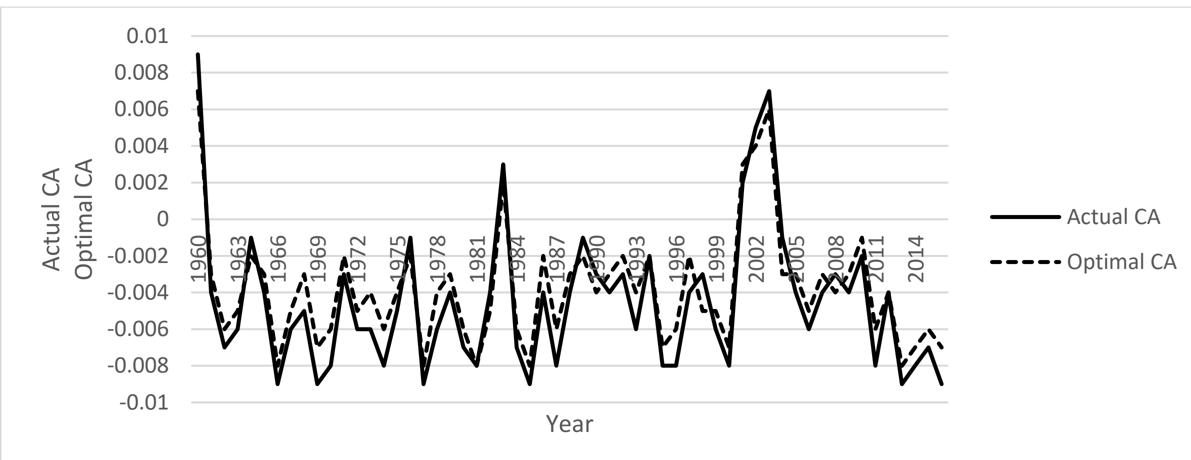

Figure 3: Plots of Actual and Optimal Current Account Balances

The use of CIR, which embraces the world RIR, RER, and TOT, is criticized by Bouakez and Kano (2008). Problems with the application of this variable are: firstly, its construction depends upon the values of the structural parameters, namely, the elasticity of intertemporal substitution (γ) and the share of traded goods in the total consumption index (α); secondly, it fails to reflect the different effects of the world RIR, the RER, and the TOT. Therefore, to test for the robustness of our empirical endeavor for the PVMCA, we also estimate a model separating the effects of all the three international relative prices from one another.

As a first step, for testing the modified intertemporal model, the CAB and the world RIR should appear as stationary at levels, whereas the net output, the RER, and the TOT should appear as integrated of order 1 (stationary in their first differences). Table 5 reports the findings of the stationarity tests for each selected time series using the DF-GLS test. It can be observed from the table that CA_t and r_t are integrated of order zero (stationary at levels) and no_t , p_t and q_t are stationary at their first differences as expected. So, their first difference form is taken for empirical analysis. The optimal CA series also appears stationary at level, which constitutes favorable evidence for the modified PVMCA. Further, we have employed the AIC and the SBC tests of lag length criteria to determine the VAR model's order. Both of which suggest one period lag as optimal.

Table 5: Results of Unit Root Test

Variables	Level	Mackinnon Critical Values for Rejection of Hypothesis of a Unit Root			Decision
		1 %	5 %	10 %	
Δno_t	-4.56	-3.76	-3.18	-2.88	I (0)
CA_t	-3.98	-3.76	-3.18	-2.88	I (0)
$\widehat{CA}_t^*$	-4.22	-3.76	-3.18	-2.88	I (0)
r_t	-3.94	-3.76	-3.18	-2.88	I (0)
Δp_t	-8.06	-3.76	-3.18	-2.88	I (0)
Δq_t	-6.61	-3.76	-3.18	-2.88	I (0)

Concerning the results of the formal and informal tests, we focus on Table 6[7]. For the Granger causality test, we can observe that the unidirectional causality exists, which runs from the CAB to the change in net output and towards change in the RER. However, we have found evidence for the absence of any causal relationship of the CAB with the world RIR and the change in the TOT. Hence, these findings advocate that the modified model gets partial support. The proportion of the variances of two current accounts (the predicted CA variance to the actual CA variance appears as 0.691(column 2, Table 6), which is slightly lower than the model where the CIR is used (see Table 2 above). It refers to the fact that the extent of the fluctuations in the actual CA series relatively increases in Pakistan when we decompose the CIR into different components in a model. The correlation coefficient value is 0.727(column 2, Table 6), while it was 0.815 previously.

As far as the formal test is concerned, Table 6 reports that the k vector coefficients of variation in net output, the CA, the world RIR, change in the RER, and variations in the TOT are –0.179, 0.635, 0.044, 0.847, and 0.126, respectively instead of their respective theoretical values of 0, 1, 0, 0 and 0 (column 1, Table 6). The null hypothesis of no difference between the estimated and theoretical values cannot be rejected for all variables except for TOT, which indicates that the role of this variable is against the expectation of the intertemporal model. This finding suggests that the external sector shocks are mainly transmitted to Pakistan's economy through the world RIR and the RER channels, with the TOT channel playing no significant role in inducing any fluctuation in the CAB in response to external shocks. Hence, the well-known HLM effect does not get any support from Pakistan's data within the framework of the ICA.

Nonetheless, the Wald test result displayed in Table 4 uncovers that we fail to reject the statistical restriction implied by the modified PVMCA as given in the expressions (17) and (18) in section 3.1. This outcome corroborates our earlier finding where we have used CIR for capturing the effects of the stochastic world RIR, the RER, and the TOT as given in Table 2. Hence, it appears that the use of CIR or its segments does not affect the consistency of the modified PVMCA with Pakistan's data.

The above analysis points out convincingly towards the non-existence of the HLM effect (that constitutes a significant association between the TOT and the CA) in Pakistan over the selected time of this study. Thus, the TOT shocks are not quantitatively imperative for stimulating the CA fluctuations in the country. This outcome is analogous for the majority of the countries for which this (HLM) effect has been empirically scrutinized within the intertemporal approach's framework. For instance, employing the modified methodology for the intertemporal approach given by Glick and Rogoff (1995) and Iscan (2000) fails to find substantial evidence for the significant influence of the TOT on the CAB of the G-7 countries.

[7] For VAR model estimates and diagnostic tests see table A1in appendix.

Similarly, Adedeji (2001) documents the insignificant effect of the TOT in creating any movements in the Nigerian CAB by using an intertemporal model wherein the stochastic variations in the world RIR, the RER, and the TOT are simultaneously introduced. In a study, Bouakez and Kano (2008) cannot find any significant relation between the TOT and the CAB for Australia and Canada, contrary to the HLM effect. Nonetheless, they report favorable outcomes for the effect of HLM on the United Kingdom. Interestingly, on empirical grounds, studies by Khan et al. (1992) and Otto (2003) provide evidence against the prevalence of the HLM effect in Pakistan by using different methodologies, which corroborates the findings of the modified intertemporal model in the present study.

Table 6: Granger Causality and Tests of Restrictions of the Modified PVMCA

Granger Causality Test: F statistic (*p* values are in the parenthesis)		
CA does not Granger Cause Δno	8.517	(0.004)
Δno does not Granger Cause CA	1.145	(0.376)
CA does not Granger Cause r	0.551	(0.461)
r does not Granger Cause CA	0.871	(0.355)
CA does not Granger Cause Δp	4.820	(0.049)
Δp does not Granger Cause CA	0.171	(0.251)
CA does not Granger Cause Δq	0.212	(0.251)
Δq does not Granger Cause CA	0.069	(0.792)

Tests of Restrictions			**The ratio of CA and Correlation Coefficient**
Δno_t	-0.179	(0.371)	$var(\widehat{CA})/var(CA)$ = 0.691
CA_t	0.635	(0.515)	$Corr(CA, \widehat{CA})$ = 0.727
r_t	0.044	(0.182)	
Δp_t	0.847	(0.966)	
Δq_t	0.126***	(0.042)	
χ^2 = 3.891; *P*-Value = 0.316			

Notes: The numbers in parentheses are standard errors. *** indicates significant at 1% level.

Table 7: Decomposition of Variance for the Current Account Series[8]

	Percentage of variance due to							
Period	Standard Error	World Real Interest Rate	Terms of Trade	Real Exchange Rate	Net Output	Current Account	Substitution Effect	Income Effect
1	0.08	0.88	0.09	1.14	1.60	96.28	2.11	97.88
2	0.47	0.99	0.65	3.82	11.59	82.94	5.46	93.53
4	1.77	4.07	1.81	4.02	16.23	73.85	9.90	90.08
6	2.34	5.36	1.85	6.91	14.19	71.68	14.12	85.87
8	1.99	8.13	1.78	6.74	13.17	70.17	16.65	83.34
10	2.32	9.22	1.67	6.08	12.99	70.03	16.97	83.02

At this point, it appears to be appropriate to show the CA's variance decomposition to quantify the relative contribution of the income effect and the substitution effect in illuminating the CA's variance. Table 5 presents the variance decomposition of the current account series. The influence of the world RIR, the RER, and the TOT innovations are pooled to form the substitution effect, while the effects of CAB and net output innovations are assembled to yield the income effect.

For the Cholesky decomposition, the following recursive ordering is used to do the variance decomposition analysis: firstly, because the intertemporal model is constructed for a small open economy, the world RIR, the TOT, and the RER are ordered ahead of the remaining variables; secondly, all the external variables

[8] In keeping view the objective of the study only the variance decomposition analysis for the current account series is presented.

namely, the world RIR, the TOT, the RER, and internal sector indicator, i.e., net output are preset concerning the CAB, as evidenced by the modified PVMCA's theoretical formulation. Thus, the CA series is ranked the last; thirdly, there is a lack of a clear argumentation regarding the predetermination of one variable for the other, specifically, when the relative ordering of real exchange rate and net output is to be determined, thus the study considers both the orderings.

The decomposition is taken in percentage form at different horizons. As we find virtually no difference in the results of whether the RER is ordered before or after the net output, Table 7 only reports the outcome of the decomposition where we place the RER ahead of the net output. It is evident from Table 7 that net output and CA's innovations remain a dominant source of inducing variations in CA for the short, medium, and long run. At the one year-horizon, nearly 98 percent variation in the external balance of Pakistan is explained by the income effect, while the share of the substitution effect is only 2 percent. At a longer horizon, however, even though the contribution of the substitution effect improves, the share of the income effect still dominates as its contribution in the CA variance appears as 83 percent. Hence, while the substitution effect, to some extent, appears significant for explicating the dynamics of the CA, the income effect remains dominant.

Concerning the role of the individual components of the substitution effect, both the world RIR and the RER contribute relatively more significantly than terms of trade in the CA variance. This implies that the global shocks significantly influence Pakistan's CAB mainly via the world RIR and the RER compared to the TOT. This finding follows the results obtained by the study for the intertemporal model, as given in Table 6.

5. CONCLUSION

Since the early 1980s, the intertemporal approach to the current account has gained considerable attention from researchers and policymakers and is considered a standard tool in determining the current account balance. This approach describes that the current account balance is determined through the domestic saving and investment decisions by the optimizing agents with forward-looking expectations. This research aims to see if the intertemporal approach is appropriate for analyzing the dynamics of the current account balance over the period from 1960 to 2016 in Pakistan. The version of the PVMCA used by the study incorporates the stochastic world real interest rate, the real exchange rate, and the terms of trade for measuring the effects of external sector shocks in inducing current account dynamics in Pakistan.

The results indicate that the cross-equation restrictions that the model uses are not overruled by the current account data under formal tests. Similarly, through informal tests, it appears that the model's fit is reasonably good. Hence, our findings suggest the influential role of domestic and foreign shocks in explaining the fluctuations in the current account balance of Pakistan. Nonetheless, we also find the insignificant impact of the terms of trade in influencing the current account balance by separately investigating the effects of the stochastic world real interest rate, the real exchange rate, and the terms of trade. Thus, we find no statistical support in favor of the HLM effect in Pakistan within the framework of the intertemporal model. Therefore, it appears that intertemporal substitution effects arising from the movements in the world real interest rate and the real exchange rate play a significant role in augmenting the performance of the intertemporal model.

Given Pakistan's accelerated trade openness and financial sector liberalization trajectory, the study's overall findings are particularly relevant for policy purposes. Because the modified PVMCA appears to be a theoretically sound framework for determining current account balance, Pakistan's government ought to first comprehend the private sector's response to external shocks before taking any policy actions to address them. Any methodology the government proposes for assessing the current account balance should take into account the channels via which external shocks can alter this balance. Furthermore, the government should maintain policies that encourage Pakistan's economic integration with the global economy so that the current account balance can survive external sector shocks while reflecting consumers' unfettered optimum choices. Finally, the policy targeted at further liberalizing capital flows, including inflows and outflows, will assist economic agents in smoothing out their consumption to the desired optimal level, allowing for a higher current account deficit to achieve potentially higher economic growth without fear of insolvency.

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REFERENCES

Adedeji, O.S. (2001). Consumption-Based Interest Rate and the Present-Value Model of the Current Account—Evidence from Nigeria. *IMF Working Papers*, *2001*(093).
Adler, J. (2003). The open economy excess sensitivity hypothesis: Theory and Swedish evidence. *Working Papers in Economics*, (88). Department of Economics, Goteborg University, Sweden.
Agénor, P.R., Bismut, C., Cashin, P., & McDermott, C.J. (1999). Consumption smoothing and the current account: evidence for France, 1970–1996. *Journal of International Money and Finance*, *18*(1), 1-12.
Bergin, P.R., & Sheffrin, S.M. (2000). Interest rates, exchange rates and present value models of the current account. *The Economic Journal*, *110*(463), 535-558.
Bouakez, H., & Kano, T. (2008). Terms of trade and current account fluctuations: The Harberger–Laursen–Metzler effect revisited. *Journal of Macroeconomics*, 30(1), 260–281.
Campbell, J.Y. (1987). Does saving anticipate declining labour income? An alternative test of the permanent income hypothesis. *Econometrica*, 55(6), 1249–1273.
Campbell, J.Y., & Shiller, R.J. (1987). Cointegration and tests of present value models. *Journal of Political Economy*, 95(5), 1062–1088.
Campa, J.M., & Gavilan, A. (2011). Current accounts in the euro area: An intertemporal approach. *Journal of International Money and Finance*, *30*(1), 205-228.
Darku, A.B. (2008). Consumption smoothing, capital controls and the current account in Ghana. *Applied Economics*, 40(20), 1-16.
Edwards, S. (2001). *Does the Current Account Matters*? NBER Working Paper No. 8275.
Friedman, M. (1957). *A theory of the Consumption Function*. Princeton: Princeton University Press.
Ghosh, A.R., & Ostry, J.D. (1995). *The* current account in developing countries: A perspective from the consumption-smoothing approach. *World Bank Economic Review*, 9(2), 305-333.
Glick, R., & Rogoff, K. (1995). Global versus country-specific productivity shocks and the current account. *Journal of Monetary Economics*, 35(1), 159-192.
Goh, S.K. (2007). Intertemporal consumption smoothing and capital mobility: Evidence from Malaysia. *Journal of Business and Public Affairs*, 1(1), 21-36.
Gruber, J.W. (2004). A present value test of habits and the current account. *Journal of Monetary Economics*, 51(7), 1495–1507.
Hall, R.E. (1978). Stochastic implications of the life cycle-permanent income hypothesis: Theory and evidence. *Journal of Political Economy*, 86(6), 971- 987.

Hall, R.E. (1988). Intertemporal substitution in consumption. *Journal of Political Economy*, 96(2), 339-357.

Iscan, T.B. (2000). The terms of trade, productivity growth and the current account. *Journal of Monetary Economics*, 45 (3), 587–611.

Kano, T. (2009). Habit formation and the present-value model of the current account: Yet another suspect. *Journal of International Economics*, 78(1), 72–85.

Khan, A.H., Hassan, L., & Malik, A. (1992). Dependency ratio, foreign capital inflows and the rate of savings in Pakistan. *The Pakistan Development Review*, 31 (4), 843-856.

Khundrakpam, J.K., & Ranjan, R. (2008). Can an inter-temporal model explain India's current account balance? *Reserve Bank of India Occasional Papers*, 29 (1), 1-18.

Kydland, F., & Zarazaga, C. (2003). Argentina's lost decade and subsequent recovery: Hits and misses of the neoclassical growth model. *Center for Latin America Working Papers*, *403*. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.199.2669&rep=rep1&type=pdf

Landeau, S.A.S. (2002). The intertemporal approach to the current account: Evidence for Chile. *Revista de Análisis Económico*, 17(2), 95-122.

Machi, S. (2013). *An intertemporal current account model for EA-12/ Are recent current accounts imbalances in the EA-12 reasonable in terms of intertemporal consumption smoothing?* Master's Thesis, Department of Economics, School of Business, Aatlo University, Finland.

Makrydakis, S. (1999). Consumption-smoothing and the excessiveness of Greece's current account deficits. *Empirical Economics*, 24(2), 183-209.

Milbourne, R., & Otto, G. (1992). Consumption smoothing and the current account. *Australian Economic Papers*, 31(59), 369-384.

Mukhtar, T., & Khan, A.H. (2011). The current account dynamics in Pakistan: An intertemporal optimisation perspective. *The Pakistan Development Review*, 50(4), 401-421.

Nason, J.M., & Rogers, J.H. (2006). The present-value model of the current account has been rejected: Round up the usual suspects. *Journal of International Economics*, 68(1),159–187.

Ogus, A., & Niloufer S. (2006). *An Intertemporal Benchmark Model for Turkey's Current Account*, Working Paper No. 01, Department of Economics, Izmir University of Economics, Turkey.

Ostry, J.D., & Reinhart, C.M. (1992). Private Savings and Terms of Trade Shocks: Evidence from Developing Countries. *IMF Staff Papers*, 39(3), 495-517.

Otto, G. (1992). Testing a present-value model of the current account: Evidence from the US and Canadian time series. *Journal of International Money and Finance*, 11(5), 414-430.

Otto, G. (2003). Terms of trade shocks and the balance of trade: there is a Harberger-Laursen-Metzler effect. *Journal of International Money and Finance*, 22(2), 155–184.

Sachs, J.D., Cooper, R.N., & Fischer, S. (1981). The current account and macroeconomic adjustment in the 1970s. *Brookings Papers on Economic Activity*, *1981*(1), 201-282.

Saksonovs, S. (2006). *The Intertemporal Approach to the Current Account and Currency Crises*, Darwin College Research Report No.005, Cambridge University, United Kingdom.

Sheffrin, S.M., & Woo, W.T. (1990). Present value tests of an intertemporal model of the current account. *Journal of International Economics*, 29(3-4), 237-253.

Singh, T. (2007). Intertemporal optimizing models of trade and current account balance: A survey. *Journal of Economic Surveys*, 21(1), 25-64.

Uribe, M. (2002). The price-consumption puzzle of currency pegs. *Journal of Monetary Economics*, 49(3), 533-569.

Appendix A: VAR Estimates and Diagnostic Tests

Dependent Variable	Regressor					Diagnostic Tests: χ^2 (*p* values are in the parentheses)			
	Δno_{t-1}	CA_{t-1}	r_{t-1}	Δp_{t-1}	Δq_{t-1}	S.Correlation	F.Form	Hetero.	Normality
Δno_t	0.164	-0.644***	0.035	-0.084*	0.012	0.362	0.191	0.567	0.742
	(0.142)	(0.117)	(0.031)	(0.046)	(0.013)	(0.595)	(0.763)	(0.424)	(0.323)
CA_t	0.152	0.591**	0.041	-0.097	0.014	0.697	0.174	0.913	0.977
	(0.137)	(0.224)	(0.038)	(0.117)	(0.131)	(0.324)	(0.778)	(0.337)	(0.301)
r_t	0.076	0.098	0.253**	0.048	0.017	0.257	0.282	0.217	0.708
	(0.214)	(0.187)	(0.107)	(0.128)	(0.259)	(0.682)	(0.657)	(0.746)	(0.321)
Δp_t	-0.149*	-0.168**	0.029	0.138**	0.018	0.088	0.097	0.384	0.098
	(0.082)	(0.072)	(0.152)	(0.062)	(0.077)	(0.917)	(0.905)	(0.583)	(0.907)
Δq_t	0.099	0.035	0.055	0.094*	0.167	0.448	0.293	0.466	1.116
	(0.183)	(0.088)	(0.226)	(0.051)	(0.089)*	(0.529)	(0.649)	(0.515)	(0.266)

Notes: The numbers in the parentheses are the standard errors. ***, ** and * indicate significant at 1% , 5% and 10% levels respectively