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Investment and the Current Account in the Short Run and the Long Run

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Abstract

Theoretical models of the relationship between investment and the current account impose restrictions on the joint dynamic behavior of these variables. These restrictions come in two forms. One imposes causal orderings on investment and the current account. The other restriction concerns the permanent responses of these variables to different shocks. We use these restrictions to identify empirically structural shocks from vector autoregressions of investment and the current account for Canada. Under certain identifications, our results support the implications of the intertemporal, small open economy model. However, these results are sensitive to perturbations of the identifications.

Key Words : Investment and the Current Account; Small Open Economy; Identification

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1. Introduction

Since the oil price shocks of the 1970s, attempts to explain the seemingly aberrant behavior of investment and the current account in the Group of Seven (G−7) economies have driven economists to distraction. To explain this behavior, the literature emphasizes the responses of investment and the current account to a variety of shocks given different technology, utility, asset market, and informational structures. Often, the literature judges the success of these explanations within the framework of the intertemporal, small open economy model.[1]

The implication of the intertemporal approach most tested in the literature is that the current account responds differently to temporary versus permanent domestic shocks. The current account reflects movements in output, investment, or government spending away from their expected permanent levels. Temporary shocks to these variables should affect the current account and permanent shocks should not, because consumers will attempt to smooth consumption in the face of temporary shocks by borrowing from or lending to the rest of the world, while permanent shocks cannot be smoothed away. As noted by Obstfeld and Rogoff (1995), this implication comes from assuming a small open economy, that interest rates are constant, and that shocks are country-specific. If the country is large, then shocks to income will also affect interest rates. In this case, the basic prediction that the current account should respond more to transitory than to permanent shocks will continue to be true. On the other hand, if the shock is global the intertemporal approach predicts that there should be little or no effect on the current account, even if the shock is perceived to be temporary. A temporary global shock will cause consumers in all countries to wish to borrow (or lend) so that interest rates should rise with little or no capital flows between countries.

Glick and Rogoff (1995) empirically examine several implications of the intertemporal model. Glick and Rogoff report a correlation between the change in the current account and the change in investment of −0.39 for the G−7 during the post-1975 period. At first glance, this correlation is puzzling in light of what appears to be open capital markets, which would suggest a correlation of −1.00.[2] To explain this puzzle, Glick and Rogoff argue that if variation in the world technology shock is large, theory predicts that the correlation of investment and the current account is larger than negative one (i.e., closer to zero) − even with perfect capital mobility. They find that the current account does in fact appear to respond more to country-specific technology shocks (as measured by Solow residuals) than global shocks. They also find little response to either country-specific or global government spending shocks. Thus, Glick and Rogoff's calculations suggest that variation in the world technology shock is indeed large, accounting for nearly one-half of the variation in total

[1] Obstfeld and Rogo® (1995) provide an excellent review of this research.

[2] See Feldstein and Horioka (1980) and Sachs (1981), among others. However, the intertemporal small open economy model yields an explicit prediction about the correlation of the current account and investment only given a speci¯c collection of restrictions, without which the correlation can take on any value between zero and negative one. Obstfeld (1986), Cardia (1991), and Mendoza (1991, 1993) discuss reasons for the confusion surrounding interpretations of the correlation of investment and saving (or the current account).

productivity in the typical G−7 economy.[3]

Glick and Rogoff go on to uncover a new puzzle. According to the intertemporal model, a permanent country-specific productivity shock has a larger effect on the current account than on investment. Since permanent income rises above current income following the shock, domestic saving falls, and the current account (equal to domestic saving less investment) falls by more than investment rises. However, Glick and Rogoff find that country-specific technology shocks affect investment by two or three times more than they affect the current account. The authors offer a resolution to this puzzle by arguing that the country-specific technology shock follows a near random walk rather than a random walk.

In this paper, we examine the joint dynamic behavior of investment and the current account, in order to empirically evaluate the intertemporal, small open economy model. One of the issues we confront is how to translate different aspects of the model into a just-identified structural vector autoregression (SVAR). For example, Glick and Rogoff's results suggest an identification for an empirical version of the model with the following restrictions: (i) the common, world technology shock is integrated; (ii) the country-specific technology shock is stationary; (iii) investment is causally prior to the current account, and (iv) innovations in the world technology shock do not matter for changes in the current account. Taken together, these restrictions yield an over-identified SVAR of investment and the current account.

Rather than work with this collection of over-identifying restrictions, we employ other SVAR methods that can potentially reveal more information about the joint dynamic behavior of investment and the current account. In particular, we follow King and Watson (1997), who study the short-run and long-run interactions between nominal and real variables under a variety of assumptions about either impact responses or long-run multipliers. Ours is a two-step approach. First, using particular aspects of the intertemporal model, we impose enough restrictions to just-identify an SVAR of investment and the current account. Second, we ask if results from the estimated model are consistent with those predictions of the intertemporal model that were not imposed *a priori*.

This process leads us to construct six just-identified SVARs. Since our dynamic system is derived from a stochastic, intertemporal small open economy model, the system possesses a structural interpretation. For example, when we impose the restriction that the response of the current account to a one unit permanent increase in investment is zero, the identification imposes a necessary condition of the intertemporal model − that the current account does not respond to common, world shocks. We label this identification $R1$. We use other aspects of the intertemporal model to motivate identifications $R2$ through $R6$.[4]

[3] The two-country real business cycle (RBC) model that Baxter and Crucini (1993) study typi¯es another path the literature has taken to explain the large positive correlation between saving and investment. Tesar (1991) also examines this issue.

[4] Another set of implications about the current account °ows from the present value model of the current account. This model ties current account °uctuations only to movements in the present discounted value of the permanent component of technology shocks. Nason and Rogers (2000b) report simulation experiments that explain deviations of the Canadian current account from the path predicted by the present value model with shocks to ¯scal policy and the world real interest rate and imperfect international capital mobility.

We focus on Canada, a proto-type small open economy, but note that most of our results hold for the rest of the G$-$7.[5] Although we find that some of the results generated by any particular identification support aspects of the intertemporal, small open economy model, the extent of this support varies across SVAR specifications.

It should be noted at the outset that it is not our goal to test the overidentifying restrictions of a particular intertemporal, small open economy model. One of our goals is to construct a collection of stylized facts about the joint dynamic relationship of investment and the current account that is robust to the identification scheme. In so doing, we hope to provide some guidance for the specification of intertemporal, small open economy models. We have four main results. First, most of our estimates indicate that investment and the current account are negatively correlated, i.e., that investment booms are associated with current account deficits. Second, all identifications indicate that in the long run only permanent movements in world shocks matter for investment. Third, the size and sign of the impact response of the current account to investment (or world shocks) is sensitive to the identification. Finally, the current account exhibits a persistent response to movements in country-specific shocks that is statistically significant and economically important. As we discuss below, the first two results are consistent with the intertemporal, small open economy model. However, the final result, that the current account exhibits a persistent response to movements in country-specific shocks, contradicts a central tenet of the intertemporal model. Our empirical results thus serve as a reminder of the limitations of that model to explain current account fluctuations.

The next section discusses the methods we use to construct and compute the SVARs, including discussion of the identifying restrictions. We describe the data and present our estimates in section 3. Conclusions are contained in section 4.

2. A Structural VAR Approach

As noted above, one prediction of the intertemporal model is that the current account does not respond to common, world shocks, only to country-specific shocks.[6] In a dynamic context, this places restrictions on the coefficients of the vector moving average (VMA) process of the change in investment, ΔI_t, and the change in the current account, ΔCA_t. Constructing tests of these restrictions is not a straightforward econometric exercise. If a structural model based on optimizing behavior is not available, it is difficult to impute structural content to results obtained from a bivariate autoregression of ΔI_t and ΔCA_t.

Also, see Bergin and She®rin (2000) for a recent empirical evaluation of this literature.

[5] These results can be found in the appendix of this paper, Nason and Rogers (2000a), available at WWW.ARTS.UBC.CA/econ/discpapers/DP0014.pdf.

[6] When a shock a®ects all economies in the same way, there are no gains to altering intertemporal allocations. All that occurs is the world real interest rate adjusts. A country-speci¯c shock generates gains to changing intertemporal allocations because the domestic real interest rate, as de¯ned by the marginal rate of substitution, di®ers from the world real interest rate.

To navigate our way around these problems, we adapt methods King and Watson (1997) develop. These authors explore various long-run neutrality propositions using bivariate SVARs. By imposing different identifying restrictions on a SVAR of output and money, they are able to ask which identifying restrictions are consistent with long-run monetary neutrality. In this way, they generate information about the neutrality proposition for a collection of different identifying assumptions.[7] This permits an assessment of the validity of the neutrality proposition conditional on the restrictions required to produce it. By analogy, we use different aspects of the intertemporal, small open economy model to construct six just-identified SVARs of ΔI_t and ΔCA_t and assess the predictions of the model based on the estimated SVARs.

Our long-run neutrality test involves examining the permanent response, of say, the current account to a permanent and unanticipated change in investment. When we find this response to be either economically or statistically unimportant, we can state that the current account is independent of the sources of permanent fluctuations in investment. Of course, our analysis depends on the way in which we identify both the permanent component of investment and the connection between the current account and the permanent component of investment.

2.1 Some Econometrics of the Intertemporal, Small Open Economy Model

There are several ways to estimate the responses of investment and the current account to different types of shocks. Using a model in which households use the permanent income hypothesis consumption rule, firms maximize the present discounted value of net profits subject to adjustment costs in the capital stock, and world and country-specific technology shocks follow random walks, Glick and Rogoff (1995) generate the decision rule for the level of investment

$$I_t = \phi_1 I_{t-1} + \phi_2 \Delta A_{C,t} + \phi_3 \Delta A_{W,t}, \tag{1}$$

and show that the level of the current account follows

$$CA_t = \varphi_1 I_{t-1} + \varphi_2 \Delta A_{C,t} + rCA_{t-1}, \tag{2}$$

where $A_{W,t}$, $A_{C,t}$, and r denote the level of the world technology shock, the level of the country-specific technology shock, and the constant world real interest rate, respectively.[8] To estimate variants of equations (1) and (2), Glick and Rogoff treat $A_{W,t}$ and $A_{C,t}$ as observable.

[7] Using similar methods, Jefferson (1997) presents results about the short-run and long-run neutrality of inside and outside money for the U.S., while Serletis and Koustas (1998) examine the long run response of output to identified monetary shocks across ten economies.

[8] These are equations (15) and (17) in Glick and Rogoff. The coefficients, ϕ_1; ϕ_2; ϕ_3; φ_1, and φ_2, are nonlinear functions of the technology and preference parameters of their small open economy model. The innovations to the technology shocks $A_{W;t}$ and $A_{C;t}$ are assumed to be uncorrelated at all leads and lags.

In this paper, we begin with a more general model than the above, and treat the shocks as unobserved. In particular, we consider a model that is linear in the observables, ΔI_t and ΔCA_t, and the unobserved structural shock innovations. The infinite-order VMA of the observables can be written

$$\Delta I_t \quad = \quad \mu_I \;+\; \alpha_{I,C}(\mathbf{L})\eta_{C,t} \;+\; \alpha_{I,W}(\mathbf{L})\eta_{W,t}, \tag{3}$$

and

$$\Delta CA_t \quad = \quad \mu_{CA} \;+\; \alpha_{CA,C}(\mathbf{L})\eta_{C,t} \;+\; \alpha_{CA,W}(\mathbf{L})\eta_{W,t}, \tag{4}$$

where μ_I and μ_{CA} are constant terms, the lag polynomial operators are of infinite order, $\eta_{C,t}$ is a vector of innovations of country-specific shocks, and $\eta_{W,t}$ is a vector of innovations of world shocks. Since $\eta_{C,t}$ and $\eta_{W,t}$ contain more than the innovations of technology shocks, we allow for ΔI_t and ΔCA_t to respond to a diverse collection of shocks that includes, for example, taste, fiscal, and, monetary shocks. This is analogous to King and Watson (1997), who allow for their structural shocks to be, "a vector of shocks other than money that a®ect output"; King and Watson, (1997, *p*.73). We assume that the innovations are uncorrelated at all leads and lags. The dynamics of this bivariate system reside in the lag polynomial operators $\alpha_{I,C}(\mathbf{L})$, $\alpha_{I,W}(\mathbf{L})$, $\alpha_{CA,C}(\mathbf{L})$, and $\alpha_{CA,W}(\mathbf{L})$.

Using this system, we impose, one-by-one, several theoretical restrictions on the dynamics of equations (3) and (4), by analogy to King and Watson (1997). The estimates yield dynamic responses of I_t and CA_t to the shocks, conditional on the restrictions the just-identified structure requires.

To implement the King-Watson method, the observables, I_t and CA_t, need to be integrated. We first calculate the Elliot, Rothenberg, and Stock (1996) generalized least squares modification of the Dickey-Fuller (GLS-DF) $t-$ratio and the Dickey-Fuller (DF) $t-$ratio from the augmented DF (ADF) regression. We fail to reject the unit root null at 5 percent for both I_t and CA_t. The OLS estimate of the autoregressive (AR) root from the ADF regression is 0.85 for investment and 0.87 for CA_t; the Stock (1991) lower and upper 95 percent asymptotic confidence limits of these AR roots are (0.73, 1.04) and (0.85, 1.05), respectively. Given the well known power problems inherent in tests for unit roots and the length of our sample, it is not possible to make definitive statements about the size of the largest AR root in our series. Nonetheless, it is apparent that these series are extremely persistent. We take this evidence to imply that the unit root assumption is not an unreasonable approximation.

2.2 SVAR Identifications

Under the assumption that I_t and CA_t are integrated, we construct identifications of the SVAR implied by (3) and (4). We use the permanent responses of I_t and CA_t to different shocks to construct one type of identification restriction. Under the assumptions that countries share the same technology, possess identical preferences, and have similar (initial) wealth positions, the small open economy model predicts that common, world shocks do not matter for the current account at any forecast horizon. Since all small open economies react in the same way to world shocks, the reaction of each economy's permanent income is the same, and as a result current accounts remain unchanged. This implies that the elements of the lag polynomial operator $\alpha_{CA,W}(\mathbf{L})$ in equation (4) are jointly restricted by

$$\alpha_{CA,W,0} \quad = \quad \alpha_{CA,W,1} \quad = \quad \ldots \quad = \quad \alpha_{CA,W,j} \quad = \quad \ldots \quad = \quad 0. \tag{5}$$

Glick and Rogoff (1995) test and cannot reject the hypothesis that the impact coefficient $\alpha_{CA,W,0} = 0$ for a variant of the VMA of (3) and (4) that sets $\mathbf{L} = 0$ and given their (observable) proxies for $\Delta A_{C,t}$ and $\Delta A_{W,t}$.

When we identify long-run fluctuations in I_t with, say, a permanent change in the level of the world shock, equation (3) implies it is measured by $\alpha_{I,W}(\mathbf{1})\eta_{W,t}$. Likewise, the long run response of CA_t to a permanent change in the level of the world shock is measured by $\alpha_{CA,W}(\mathbf{1})\eta_{W,t}$. The long-run change in CA_t with respect to a permanent change in I_t, is then given by

$$\mathcal{LR}_{CA,I} \quad = \quad \frac{\alpha_{CA,W}(\mathbf{1})}{\alpha_{I,W}(\mathbf{1})}. \tag{6}$$

The long-run multiplier of (6) allows us to study an implication of the joint restriction of (5). In this case, exogenous, permanent changes in the level of the world shock do not matter for CA_t in the long run. This is

$$R1: \quad \mathcal{LR}_{CA,I} \quad = \quad 0.$$

An interpretation of $R1$ is that CA_t is neutral with respect to permanent movements in investment. Hence, that part of the maintained hypothesis of the intertemporal, small open economy model – current account fluctuations are independent of common world shocks at all forecast horizons – implies $R1$. Since the restrictions of (5) embody this predictiion and restrict the long-run multiplier of (6) to be equal to zero, $R1$ is a necessary condition for the intertemporal, small open economy model.

The other long-run derivative we construct captures the response of I_t to a permanent one unit change in CA_t

$$\mathcal{LR}_{I,CA} \quad = \quad \frac{\alpha_{I,C}(\mathbf{1})}{\alpha_{CA,C}(\mathbf{1})}. \tag{7}$$

When I_t is independent of long-run changes in the country-specific shock, the long-run movement in I_t with respect to a permanent changes in CA_t is

$$R2: \quad \mathcal{LR}_{I,CA} \quad = \quad 0.$$

Glick and Rogoff implicitly invoke $R2$ to explain their empirical observation that ΔI_t responds by more to $A_{C,t}$ than does ΔCA_t.[9] When we find that the data supports $R2$ the inference we draw is that only world shocks, such as the $A_{W,t}$ emphasized by Glick and Rogoff, drive I_t in the long run.[10] Along the balanced growth path the small open economy, the level of investment responds only to common world shocks.

The other type of theoretical restriction we study imposes a causal ordering on I_t and CA_t. This kind of identification requires us to move to the SVAR implied by the VMA of equations (3) and (4):

$$\Delta I_t = \lambda_{I,CA,0}\Delta CA_t + \lambda_{I,I}(\mathbf{L})\Delta I_{t-1} + \lambda_{I,CA}(\mathbf{L})\Delta CA_{t-1} + \eta_{W,t}, \tag{8}$$

and

$$\Delta CA_t = \lambda_{CA,I,0}\Delta I_t + \lambda_{CA,I}(\mathbf{L})\Delta I_{t-1} + \lambda_{CA,CA}(\mathbf{L})\Delta CA_{t-1} + \eta_{C,t}, \tag{9}$$

where the polynomial lag operators are of order p and it is assumed that

$$\mathbf{E}\{\eta_{W,t}\} = 0, \quad \mathbf{E}\{\eta_{C,t}\} = 0, \quad \mathbf{E}\{\eta_{W,t+j}\eta_{C,t+s}\} = 0, \quad \forall\, j,\ s. \tag{10}$$

The last equality implies that the covariance matrix of $\eta_{W,t}$ and $\eta_{C,t}$ is diagonal.[11]

One way to just-identify the SVAR of equations (8) and (9) is to restrict the impact response of ΔI_t to ΔCA_t, denoted $\lambda_{I,CA,0}$. For example, imposing the restriction

$$R3: \quad \lambda_{I,CA,0} = 0$$

is equivalent to the equilibrium structure of the Glick-Rogoff version of the intertemporal model in which I_t is determined prior to CA_t in equilibrium. That is, the contemporaneous current account is computed as a residual from the aggregate resource constraint – subsequent to the determination of investment, consumption, and output – in Glick and Rogoff's

[9] To explain their empirical results, Glick and Rogoff argue that $A_{W,t}$ follows a random walk and that a stationary but persistent AR process generates $A_{C,t}$. Within the context of an intertemporal, small open economy model that possesses a balanced growth path, these restrictions on $A_{W,t}$ and $A_{C,t}$ imply that the only source of permanent movements in I_t is $A_{W,t}$.

[10] It should be noted that for $\mathcal{LR}_{CA,I}$ to exist, I_t must be integrated. However, this long-run multiplier places no restrictions on the order of integration of CA_t. For example, when CA_t is stationary, it cannot respond to permanent shocks of any kind. In this case, $\mathcal{LR}_{CA,I}$ equals zero by definition. On the other hand, when we study the long-run response of I_t to permanent changes in the country-specific technology shock, we need to assume that CA_t is integrated. This implies a non-zero current account in the steady state.

[11] Our approach to estimating the SVAR requires that investment and the current account are integrated of order one. An implication is that the variables could share a cointegrating relation. If true, a VAR in first-differences is misspecified. Johansen (1991) tests for the null of no cointegration between investment and the current account do not reject at any reasonable significance level for VAR lag lengths either of two or four.

model.[12] Hence, this version of the intertemporal model yields an impact response of ΔI_t to ΔCA_t equal to zero.

Our fourth restriction explores an implication of (5) on the short-run dynamics of the SVAR of (8) and (9). Note that the restrictions of (5) imply that

$$\lambda_{CA,I,0} \quad = \quad \lambda_{CA,I,1} \quad = \quad \ldots \quad = \quad \lambda_{CA,I,p} \quad = \quad 0. \tag{11}$$

That is, the small open economy hypothesis that CA_t does not respond to world shocks implies that ΔI_t and its lags have no predictive power for ΔCA_t. Because we need not impose all of the restrictions of (11), we only pre-set the impact response of ΔCA_t to ΔI_t

$$R4: \quad \lambda_{CA,I,0} \quad = \quad 0$$

We present direct evidence about the joint hypothesis (11) in the following way. Given a restriction on either $\lambda_{I,CA,0}$, $\lambda_{CA,I,0}, \mathcal{LR}_{I,CA}$ or $\mathcal{LR}_{CA,I}$, we compute a Wald statistic to test the hypothesis that all of the $\lambda_{CA,I,j}$ terms are zero. The Wald statistic is distributed asymptotically χ^2 with either $p+1$ or p degrees of freedom depending on whether $\lambda_{CA,I,0}$ is estimated or pre-set.

Finally, the hypotheses that are the objects of interest for Feldstein and Horioka (1980), Sachs (1981), Obstfeld (1986), Baxter and Crucini (1993), and Tesar (1991) imply restrictions that are at odds with (11). One is the impact restriction

$$R5: \quad \lambda_{CA,I,0} \quad = \quad -1,$$

while the other is its long-run analogue,

$$R6: \quad \mathcal{LR}_{CA,I} \quad = \quad -1.$$

By comparing the SVAR estimates under these restrictions to the predictions of the intertemporal, small open economy model that are not imposed, we obtain information about the support for the Feldstein-Horioka hypothesis. However, it is possible to make inferences about the degree of international capital mobility under $R5$ and $R6$ only with a specific collection of restrictions placed on the type of shocks within the model. For example, assuming perfect capital mobility, if the only source of uncertainty in the model is a country-specific technology shock and this shock has permanent effects, the model predicts that the correlation between the current account and investment equals negative one. Thus $R5$ and $R6$ represent reduced form identifications of the SVAR of (8) and (9) rather than having a generic structural interpretation within the intertemporal model.

Table 1 compactly summarizes the restrictions imposed in each of our six cases, $R1$ through $R6$. (It will be useful to refer back to this table throughout the paper.) We can bring the discussion of the various restrictions together by describing how we impose $R1 - R6$ on

[12] This restriction is not a feature of all versions of the intertemporal model. For example, in Mendoza (1991, 1993), I_t and CA_t are determined simultaneously.

the SVAR of equations (8) and (9). To be able to estimate the SVAR, we have to pre-set one of the four parameters $\lambda_{I,CA,0}$, $\lambda_{CA,I,0}$, $\mathcal{LR}_{I,CA}$, and $\mathcal{LR}_{CA,I}$. Subsequently, estimation of the remaining three parameters is handled in a recursive fashion.[13]

3. Structural VAR Estimates

This section reports the results of estimating the SVAR of equations (8) and (9) under one of the six alternative identifying conditions. We work with data on Canadian investment and the current account, in real Canadian dollars. Observations are quarterly, span the period 1973.1 − 1995.4, and are seasonally adjusted at annual rates. Our estimates are based on the 1975.1 − 1995.4 sample, with data prior to 1975.1 used for the four lags. We focus on Canada because it fits the description of the textbook small open economy, but we also conducted the analysis on the rest of the G−7. These results, and additional details about the data, are available on request in an appendix.

Our data set produces reduced form estimates of the contemporaneous correlation of ΔCA_t and ΔI_t that resemble estimates reported elsewhere. In the regression

$$\Delta CA_t \quad = \quad b_0 \, + \, b_1 \Delta I_t \, + \, \upsilon_t.$$

our estimate of b_1 for Canada is −0.38, with a standard error of 0.08. Glick and Rogoff report an analogous estimate of −0.30 with a standard error of 0.10. Of course, without an identification scheme, no structural interpretation can be given to these estimates.

3.1 Zero Long Run Multiplier Restrictions: R1 and R2

In the first two rows of table 2, we present estimates conditional on the restrictions $R1$ and $R2$, respectively. The first four columns display the estimates of $\lambda_{I,CA,0}$, $\lambda_{CA,I,0}$, $\mathcal{LR}_{I,CA}$, and $\mathcal{LR}_{CA,I}$, respectively. The final column reports Wald statistics for the joint hypothesis $\lambda_{CA,I,j} \; = \; 0, \; j \; = \; 0, \; \ldots, \; 4$, given a restriction. Our particular interest is in evaluating the model's prediction that world shocks do not matter for the current acount.

[13] The technical appendix of King and Watson (1997) provides a fuller description of the estimation strategy, as does our appendix. Much of the discussion covers the construction of the instrumental variables estimator of a just-identi¯ed SVAR. It is widely understood that instrumental variables techniques map into the full information maximum likelihood (FIML) estimator. Since many of the competing restrictions we examine can be placed in a composite small open economy model, the FIML interpretation suggests non-nested hypothesis tests. We do not present non-nested tests in our paper because we follow the SVAR literature. As is well known, the SVAR literature examines competing identi¯cation restrictions not with formal hypothesis tests, but by comparing the e®ect di®erent identi¯cations have on the data with regard either to prior views about macro theory or to learn which identi¯cation restrictions match widely held views of macro theory. Further, any problem of omitted variables that arises from our dynamic investment-current account system helps to set the parameters of future research. Our paper presents a framework that makes it possible to begin to investigate a wider set of empirical models of the current account.

First, consider estimates under $R1$ in the first row of table 2. As seen from the first and third columns, the estimated impact and long-run responses of ΔI_t to ΔCA_t are negative, suggesting that investment booms are associated with current account deficits. The estimate of $\lambda_{CA,I,0}$ is insignificantly different from zero and the Wald statistic is 9.09, indicating that the null hypothesis that $\lambda_{CA,I,j} = 0$, $j = 0, \ldots, 4$ cannot be rejected at either the 5 percent or 10 percent levels of significance (but is rejected at 11 percent). Thus, there is support for the model's prediction that world shocks do not matter for movements in CA_t under $R1$.

The second row displays estimates under the restriction $R2$: $\mathcal{LR}_{I,CA} = 0$. This identification assumes that I_t is independent of country-specific shocks in the long run. The estimate of $\lambda_{I,CA,0}$ is insignificantly different from zero, suggesting that investment is determined prior to the current account in the short run. The estimate of $\lambda_{CA,I,0}$ is negative, at -0.30 with a standard error of 0.17. The estimate of $\mathcal{LR}_{CA,I}$ is also negative, but insignificant. The Wald statistic in the final column is 11.37, indicating a rejection of the joint hypothesis that $\lambda_{CA,I,j} = 0$, $j = 0, \ldots, 4$, at better than the five percent level. This implies that world shocks do affect the current account.

3.2 Zero Impact Restrictions : R3 and R4

The third row of table 2 contains the results of estimating equations (8) and (9) given $R3$, $\lambda_{I,CA,0} = 0$. This identifying restriction implies that I_t is determined prior to CA_t. In addition, $R3$ is one of several assumptions necessary to interpret $\lambda_{CA,I,0}$ as a measure of (short-run) international capital mobility within the intertemporal model.

The estimate of $\lambda_{CA,I,0}$, -0.36, is quite close to the estimate of b_1 from the reduced-form regression reported above. The estimate possesses a $t-$ratio of -4.5. This result echoes those of other researchers, as we note in the Introduction. The estimate of $\mathcal{LR}_{CA,I}$ under $R3$ is -0.26 with a standard error of 0.12. The Wald statistic indicates that the hypothesis $\lambda_{CA,I,j} = 0$, $\forall\, j = 0, \ldots, 4$, is strongly rejected. The estimate of $\mathcal{LR}_{I,CA}$, the long-run effect of a permanent change in the country-specific shocks on I_t, is insignificantly different from zero.

The next row reports the results under $R4$, $\lambda_{CA,I,0} = 0$. The results are very similar to those under $R1$ discussed above: $\mathcal{LR}_{CA,I}$ is insignificantly different from zero, while $\lambda_{I,CA,0}$ and $\mathcal{LR}_{I,CA}$ are negative with $t-$ratios near or greater than two in absolute terms. The estimates of $\lambda_{I,CA,0}$ and $\mathcal{LR}_{I,CA}$ are -0.54 and -0.64, respectively, implying that larger current account deficits are associated with higher investment. Finally, the Wald statistic used to test the hypothesis $\lambda_{CA,I,j} = 0$, $j = 1, \ldots, 4$ indicates a borderline rejection, just as under $R1$ (the p-value is 0.15). However, we cannot reject at five percent the hypothesis that CA_t does not depend on permanent changes in the world shock. Thus, across the identifications $R1$-$R4$, rejection of the null hypothesis of (11) are fairly common; indeed, in all cases, the hypothesis is rejected at the fifteen percent level.

3.3 Reduced Form Restrictions : R5 and R6

Perhaps the most studied aspect of the intertemporal, small open economy model is its assumption of perfect capital mobility. Although $R5$, $\lambda_{CA,I,0} = -1$, and $R6$, $\mathcal{LR}_{CA,I,0} = -1$, represent only reduced form identifications, they provide us with useful information to evaluate the claims of Feldstein and Horioka (1980), Sachs (1981), and others.

The results under $R5$ appear in the fifth row of table 2. The most notable differences from imposing this restriction appear in the estimates of $\lambda_{I,CA,0}$ and $\mathcal{LR}_{CA,I}$. Under $R5$, $\lambda_{I,CA,0}$ is positive with a $t-$ratio greater than two. The estimate of $\mathcal{LR}_{I,CA}$ is also positive, but is insignificantly different from zero. This suggests that permanent, country-specific shocks have no effect on investment. The estimate of $\mathcal{LR}_{CA,I}$ is -0.75 and has a two standard deviation confidence interval that does not include zero but does include negative one. The Wald statistic is 0.90, implying that we cannot reject the hypothesis $\lambda_{CA,I,j} = 0,\ j = 1, \ldots, 4$ at any reasonable significance level. This is a marked reversal from the Wald tests under $R1$-$R4$, where there were either strong rejections or borderline rejections of the null.

In the final row of table 2, we display estimates under $R6$. The point estimates are similar to those under $R5$: $\lambda_{I,CA,0}$ and $\mathcal{LR}_{I,CA}$ are positive (but insignificant in this instance), while $\lambda_{CA,I,0}$ is negative, significantly different from zero, and insignificantly different from -1. Together, these estimates of $\lambda_{I,CA,0}$, $\lambda_{CA,I,0}$, and $\mathcal{LR}_{I,CA}$ suggest that investment is determined prior to the current account, that the response of CA_t to I_t is about negative one in the short run (which is imposed under $R5$), and that ΔI_t depends only on permanent movements in world shocks. As discussed above, these results are all consistent with predictions of the intertemporal, small open economy model. In addition, the Wald test indicates a failure to reject the joint hypothesis $\lambda_{CA,I,j} = 0,\ j = 0, \ldots, 4$. Thus, under the restriction $R6$, the Canadian data appear to satisfy many predictions of the intertemporal model.

3.4 Some Graphical Evidence

The results in table 2 provide some support for the restrictions that make only permanent movements in world shocks matter for I_t and that place the determination of I_t prior to CA_t. That is, our results support $R2$ and $R3$. On the other hand, our results provide evidence to reject the identifications of $R4$ and $R5$.

At the same time, the evidence on $R1$ ($\mathcal{LR}_{CA,I} = 0$) and $R6$ ($\mathcal{LR}_{CA,I} = -1$) is mixed. In order to obtain additional information on the plausibility of $R1$ versus $R6$, we ask whether there exist other identifications built on either $\lambda_{I,CA,0}$, $\lambda_{CA,I,0}$ or $\mathcal{LR}_{I,CA}$ that yield estimates of $\mathcal{LR}_{CA,I}$ significantly different from either zero or negative one. This approach produces information that allows us to evaluate the competing hypotheses of $R1$ and $R6$. We build these alternative identifications on the closed interval $[-1,\ 1]$ for either $\lambda_{I,CA,0}$ or $\mathcal{LR}_{I,CA}$ and the closed interval $[-1,\ 0]$ for $\lambda_{CA,I,0}$ running in increments of 0.05.

The graphical evidence appears in figure 1. The top row and lower left panel of the figure contain the 95 percent confidence interval of $\mathcal{LR}_{CA,I}$ given identifications based on $\lambda_{I,CA,0}$, $\lambda_{CA,I,0}$, and $\mathcal{LR}_{I,CA}$, respectively. The lower right panel displays the 95 percent confidence ellipse of $\lambda_{I,CA,0}$ and $\lambda_{CA,I,0}$ under $R6$ (*i.e.*, given $\mathcal{LR}_{CA,I} = -1$). In the first three panels we are interested to know whether $\lambda_{CA,I,0}$ is closer to zero or -1, while in the final panel we want to know if the point $[-1, 0]$ is in the ellipse.

First, consider the 95 percent confidence interval of $\mathcal{LR}_{CA,I}$ given $\lambda_{I,CA,0}$, which appears in the top left panel of figure 1. The confidence interval always includes zero as $\lambda_{I,CA,0}$ moves from negative one toward zero. However, as $\lambda_{I,CA,0}$ begins to approach zero and then turns positive, $\mathcal{LR}_{CA,I}$ becomes significantly less than zero, thereby rejecting $R1$ under those values of $\lambda_{I,CA,0}$. However, even as we push $\lambda_{I,CA,0}$ toward one, the 95 percent confidence interval never includes negative one, as would be implied by $R6$. Hence, this plot provides evidence that can both support and reject $R1$, but no evidence to support $R6$.

Evidence is similarly mixed in the confidence intervals displayed in the upper right and lower left panels of figure 1. In the upper right panel, the 95 percent confidence interval of $\mathcal{LR}_{CA,I}$ includes both zero, when $\lambda_{CA,I,0}$ is near zero, and negative one, when $\lambda_{CA,I,0}$ is negative (beginning at around -0.87). Thus, depending on the pre-set range of values of $\lambda_{CA,I,0}$ there exists identifications that generate evidence to support either $R1$ or $R6$. In the next sub-section, we examine the link between pre-set values of $\lambda_{CA,I,0}$ and the resulting estimate of $\mathcal{LR}_{CA,I}$ analytically.

Examining the lower left hand panel, support for $R1$ appears for any value of $\mathcal{LR}_{I,CA}$ we pre-select. At the same time, there are no values of $\mathcal{LR}_{I,CA}$ in the range we consider that provide support for $R6$ and at the same time reject $R1$.

In summary, the 95 percent confidence intervals of $\mathcal{LR}_{CA,I}$ make clear that the identification matters for inference about hypotheses tests of $R1$ and $R6$. We can choose identifications using either $\lambda_{I,CA,0}$ or $\mathcal{LR}_{I,CA}$ to generate confidence intervals for $\mathcal{LR}_{CA,I}$ that include zero. Although there exist other identifications using these parameters in which the hypothesis $\mathcal{LR}_{CA,I} = 0$ is rejected, these identifications require implausible values for either $\lambda_{I,CA,0}$ or $\mathcal{LR}_{I,CA}$; for example positive values for these parameters are often required in order to reject the hypothesis of $R1$. On the other hand, we rarely find evidence to support $R6$. The only way to identify this SVAR and not reject $R6$ is to set $\lambda_{CA,I,0}$ close to negative one. On the other hand, when the identification selects a value of $\lambda_{CA,I,0}$ close to zero, the 95 percent confidence interval of $\mathcal{LR}_{CA,I}$ contains support for $R1$.

Finally, the 95 percent confidence ellipse in the lower right hand panel of figure 1 displays the joint distribution of $\lambda_{I,CA,0}$ and $\lambda_{CA,I,0}$ given $\mathcal{LR}_{CA,I} = -1$. We use this to test the joint hypothesis $\lambda_{I,CA,0} = 0$ and $\lambda_{CA,I,0} = -1$. The joint hypothesis makes I_t causally prior to CA_t and contains the reduced form-short run restriction $R5$, given the reduced form-long run identification $R6$ (as implied by the intertemporal model).

The ellipse appears large. This reflects the size and standard errors of the estimates as well as the large negative correlation between $\lambda_{I,CA,0}$ and $\lambda_{CA,I,0}$ under $R6$. Although the ellipse shows that it is not possible to reject the joint hypothesis $\lambda_{I,CA,0} = 0$ and $\lambda_{CA,I,0} = -1$, it also indicates that there are *many* other combinations of $\lambda_{I,CA,0}$ and

$\lambda_{CA,I,0}$ that are equally valid. The 95 percent confidence ellipse thus displays the extent of the uncertainty that exists under the identification $R6$ and makes it next to impossible to select between different combinations of $\lambda_{I,CA,0}$ and $\lambda_{CA,I,0}$.

Figure 2 extends the analysis of the previous plot, by depicting 95 percent confidence ellipses of $\lambda_{I,CA,0}$ and $\lambda_{CA,I,0}$ under four different pre-set values of $\mathcal{LR}_{CA,I}$: 0.00, −0.25, −0.5, and −0.75. Once again, we are interested in seeing if these ellipses contain the combination $\lambda_{I,CA,0} = 0$ and $\lambda_{CA,I,0} = -1$. Two results are clear. First, as the pre-set value of $\mathcal{LR}_{CA,I}$ goes toward zero, the size of the ellipse decreases. Second, the combination of $\lambda_{I,CA,0} = 0$ and $\lambda_{CA,I,0} = -1$ no longer appears within the 95 percent confidence ellipse as $\mathcal{LR}_{CA,I}$ becomes less negative than −0.75. The results show quite vividly that support for the intertemporal model is sensitive to seemingly small perturbations in the identification.

3.5 How Do $\lambda_{\mathsf{I;CA;0}}$, $\lambda_{\mathsf{CA;I;0}}$, and $\mathcal{LR}_{\mathsf{I;CA}}$ Affect Estimates of $\mathcal{LR}_{\mathsf{CA;I}}$?

From the discussion above, it appears difficult to decide on the merits of an identification that sets $\mathcal{LR}_{CA,I}$ equal to, say, either −0.85, negative one (as would be suggested by $R6$), or zero (as would be suggested by $R1$). An examination of the response of I_t to a permanent movement in the CA_t and of the CA_t to a permanent movement in I_t lets us uncover why this difficulty exists. To begin, note that the reduced-form VAR(4)

$$\begin{bmatrix} I_t \\ CA_t \end{bmatrix} = \begin{bmatrix} A_{\Delta I,\,\Delta I}(\mathbf{L}) & A_{\Delta I,\,\Delta CA}(\mathbf{L}) \\ A_{\Delta CA,\,\Delta I}(\mathbf{L}) & A_{\Delta CA,\,\Delta CA}(\mathbf{L}) \end{bmatrix} \begin{bmatrix} I_{t-1} \\ CA_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{\Delta I,t} \\ \varepsilon_{\Delta CA,t} \end{bmatrix},$$

implies that

$$\begin{bmatrix} \varepsilon_{\Delta I,t} \\ \varepsilon_{\Delta CA,t} \end{bmatrix} = \begin{bmatrix} 1 & -\lambda_{I,CA,0} \\ -\lambda_{CA,I,0} & 1 \end{bmatrix}^{-1} \begin{bmatrix} \eta_{W,t} \\ \eta_{C,t} \end{bmatrix},$$

or equation-by-equation $\varepsilon_{\Delta I,t} = [1 - \lambda_{I,CA,0}\lambda_{CA,I,0}]^{-1}[\eta_{W,t} + \lambda_{I,CA,0}\eta_{C,t}]$ and $\varepsilon_{\Delta CA,t} = [1 - \lambda_{I,CA,0}\lambda_{CA,I,0}]^{-1}[\lambda_{CA,I,0}\eta_{W,t} + \eta_{C,t}]$. The former expression reveals that movements in $\eta_{C,t}$ become less important for fluctuations in ΔI_t as $\lambda_{I,CA,0}$ goes toward zero. In symmetric fashion, the expression for $\varepsilon_{\Delta CA,t}$ shows that $\eta_{W,t}$ matters more for ΔCA_t as $\lambda_{CA,I,0}$ moves from zero toward negative one. Next, construct the long-run trends of I_t and CA_t

$$\mathcal{LR}_{I,t} = [1 - A_{\Delta I,\,\Delta I}(\mathbf{1})]^{-1}[A_{\Delta I,\,\Delta CA}(\mathbf{1})\mathcal{LR}_{CA,t} + \varepsilon_{\Delta I,t}],$$

and

$$\mathcal{LR}_{CA,t} = [1 - A_{\Delta CA,\,\Delta CA}(\mathbf{1})]^{-1}[A_{\Delta CA,\,\Delta I}(\mathbf{1})\mathcal{LR}_{I,t} + \varepsilon_{\Delta CA,t}].$$

Substituting $\varepsilon_{\Delta I,t}$ and $\varepsilon_{\Delta CA,t}$ from above into these expressions, and doing a bit of algebra, it is straightforward to show

$$(12) \qquad \frac{\partial \mathcal{LR}_{I,t+j}/\partial \eta_{C,t}}{\partial \mathcal{LR}_{CA,t+j}/\partial \eta_{C,t}} \;=\; \frac{\lambda_{I,CA,0}[1 \;-\; A_{\Delta CA,\,\Delta CA}(\mathbf{1})] \;+\; A_{\Delta I,\,\Delta CA}(\mathbf{1})}{\lambda_{I,CA,0}A_{\Delta CA,\,\Delta I}(\mathbf{1}) \;+\; [1 \;-\; A_{\Delta I,\,\Delta I}(\mathbf{1})]},$$

and

$$(13) \qquad \frac{\partial \mathcal{LR}_{CA,t+j}/\partial \eta_{W,t}}{\partial \mathcal{LR}_{I,t+j}/\partial \eta_{W,t}} \;=\; \frac{\lambda_{CA,I,0}[1 \;-\; A_{\Delta I,\,\Delta I}(\mathbf{1})] \;+\; A_{\Delta CA,\,\Delta I}(\mathbf{1})}{\lambda_{CA,I,0}A_{\Delta I,\,\Delta CA}(\mathbf{1}) \;+\; [1 \;-\; A_{\Delta CA,\,\Delta CA}(\mathbf{1})]}.$$

The long-run derivatives (12) and (13) are equivalent to $\mathcal{LR}_{I,CA}$ and $\mathcal{LR}_{CA,I}$, respectively. Since $\lim_{j\rightarrow\infty} \partial X_{t+j}/\partial \eta_{W,t} \;=\; \partial \mathcal{LR}_{X,t}/\partial \eta_{W,t}$ and $\lim_{j\rightarrow\infty} \partial X_{t+j}/\partial \eta_{C,t} \;=\; \partial \mathcal{LR}_{X,t}/\partial \eta_{C,t}$, where $X_t \;=\; I_t,\; CA_t$, we can equate the left hand sides of (12) and (13) with the response of I_t to a permanent movement in CA_t and to the response of CA_t to a permanent movement in I_t, respectively.

Now use the derivatives (12) and (13) to consider the effect of the different identification schemes on estimates of $\mathcal{LR}_{CA,I}$. First, consider imposing $R3$ on (12). This yields $\mathcal{LR}_{I,CA}(R3) \;=\; [1 \;-\; A_{\Delta I,\,\Delta I}(\mathbf{1})]^{-1}A_{\Delta I,\,\Delta CA}(\mathbf{1})$. Second, evaluate (13) at $R4$ to produce $\mathcal{LR}_{CA,I}(R4) \;=\; [1 \;-\; A_{\Delta CA,\,\Delta CA}(\mathbf{1})]^{-1}A_{\Delta CA,\,\Delta I}(\mathbf{1})$. These long-run multipliers, $\mathcal{LR}_{I,CA,I}(R3)$ and $\mathcal{LR}_{CA,I}(R4)$, together with a bit of algebra, allows us to write the derivative of (13) as

$$(14) \quad \mathcal{LR}_{CA,I} \;=\; \frac{\lambda_{CA,I,0} \;+\; \mathcal{LR}_{CA,I}(R4)[1 \;-\; A_{\Delta I,\,\Delta I}(\mathbf{1})]^{-1}[1 \;-\; A_{\Delta CA,\,\Delta CA}(\mathbf{1})]}{\lambda_{CA,I,0}\mathcal{LR}_{I,CA}(R3) \;+\; [1 \;-\; A_{\Delta I,\,\Delta I}(\mathbf{1})]^{-1}[1 \;-\; A_{\Delta CA,\,\Delta CA}(\mathbf{1})]},$$

where we use $\mathcal{LR}_{CA,I} \;\equiv\; [\partial \mathcal{LR}_{CA,t+j}/\partial \eta_{W,t}]/[\partial \mathcal{LR}_{I,t+j}/\partial \eta_{W,t}]$.

Equation (14) shows how our assumptions about $\lambda_{CA,I,0}$ drive point estimates of $\mathcal{LR}_{CA,I}$. The second term in the numerator, $\mathcal{LR}_{CA,I}(R4)[1 - A_{\Delta I,\Delta I}(\mathbf{1})]^{-1}[1 - A_{\Delta CA,\Delta CA}(\mathbf{1})]$, is equal to 0.01. Thus, when $\lambda_{CA,I,0}$ (the only other term in the numerator) is close to zero, the numerator itself is close to zero. As $\lambda_{CA,I,0}$ becomes smaller than, say -0.35, the numerator of (14) takes on the sign (negative), and approximately the value, of $\lambda_{CA,I,0}$. In the denominator, the term $[1 \;-\; A_{\Delta I,\,\Delta I}(\mathbf{1})]^{-1}[1 \;-\; A_{\Delta CA,\,\Delta CA}(\mathbf{1})]$ dominates. Since $[1 \;-\; A_{\Delta I,\,\Delta I}(\mathbf{1})]^{-1}[1 \;-\; A_{\Delta CA,\,\Delta CA}(\mathbf{1})]$ takes on the value of 0.66 for Canada, this term is greater than $\lambda_{CA,I,0}\mathcal{LR}_{I,CA}(R3)$ for any value we choose to impose on $\lambda_{CA,I,0}$ in order to identify the SVAR.

This explains how estimates of $\mathcal{LR}_{CA,I}$ depend crucially on the value of $\lambda_{CA,I,0}$. If we assume that ΔCA_t does not respond to ΔI_t at impact, we find the current account to be independent of permanent movements in investment. However, when we impose $\lambda_{CA,I,0} = -1$ under $R5$, the current account responds in an equal and opposite direction to investment. The top right panel of figure 1 verifies this.

3.6 *Forecast Error Variance Decompositions*

In order to measure the importance of world shocks, $\eta_{W,t}$, and country-specific shocks, $\eta_{C,t}$, for fluctuations in I_t and CA_t under the identifications $R1$, $R2$, and $R6$, we compute forecast error variance decompositions (FEVDs). Our choice of identifications $R1$, $R2$, and $R6$ follows from table 2 and figure 1, where we find that these identifications produce the most economically sensible results.

Table 3 contains the results. The top panel reports the response of I_t to $\eta_{W,t}$ and the bottom panel reports the response of CA_t to $\eta_{C,t}$. The FEVDs are reported at horizons of zero, two, four, 12, and 24 quarters. We also report small sample standard errors.[14] According to the FEVDs reported in the top row, under $R1$ ($\mathcal{LR}_{CA,I} = 0$), $\eta_{W,t}$ accounts for more than 79 percent of the variance of I_t at impact, a share that changes only slightly over the forecast horizon. The top row of the bottom panel reports the FEVD of the current account response to $\eta_{C,t}$ under $R1$. These FEVDs show that more than 85 percent of the fluctuations in CA_t are explained by $\eta_{C,t}$ at all horizons. This provides support for the intertemporal model's hypothesis that $\eta_{W,t}$ does not matter for movements in the current account.

The second row of the top and bottom panel of table 3 contain the FEVDs under $R2$, $\mathcal{LR}_{I,CA} = 0$. We find that $\eta_{W,t}$ accounts for nearly 100 percent of the fluctuations in I_t at all forecast horizons and that country-specific shocks account for about 90 percent of the fluctuations in CA_t at all forecast horizons. This is consistent with the FEVDs under $R1$, and is evidence in favor of the prediction that only country-specific shocks should matter.

In the third row of table 3, we present the FEVDs of I_t with respect to $\eta_{W,t}$ under $R6$, $\mathcal{LR}_{CA,I} = -1$. These begin to resemble the FEVDs under $R1$ and $R2$ only beginning at forecast horizons approaching six years. The FEVDs of CA_t with respect to $\eta_{C,t}$ under $R6$ appear in the final row of table 3. At impact and shorter forecast horizons world shocks explain at least 90 percent of CA_t movements, in contrast to the prediction of the intertemporal model.

The FEVDs that appear in table 3 are generally consistent with the intertemporal, small open economy model. The top panel indicates that world shocks contribute more to fluctuations in I_t than do country-specific shocks. This evidence is particularly striking for I_t at the lower-order forecast horizons under $R1$ and $R2$ and for the higher-order forecast horizons under $R6$. In the bottom panel of table 3, we find generally that country-specific shocks contribute most to fluctuations in CA_t, the exception being the results under $R6$.

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[14] We compute the standard errors of the FEVDs by generating 1000 bootstrap replications using the covariance matrix of the residuals of the reduced form VARs. This gives the standard errors a small sample interpretation as the uncertainty surrounding the FEVD point estimate at a particular horizon. To study the robustness of the bootstrap standard errors, we also examined the Monte Carlo integration method of Sims and Zha (1995). For the most part, this method generates standard errors that are slightly smaller than the bootstrap standard errors. Since the latter objects yield a small sample interpretation, we choose to report these standard errors.

4. Conclusion

We study the joint dynamic behavior of investment and the current account during the post-1975 period, focusing on Canada, a proto-type small open economy. The restrictions we place on the dynamics arise from different aspects of the intertemporal, small open economy model. Using these restrictions, we construct six just-identified SVARs and compare estimates to the predictions of the intertemporal model that are not imposed *a priori*. We find that identifications with differences that appear innocuous produce different levels of empirical support for the intertemporal model. This suggests that tests of the predictions of the intertemporal model can be made arbitrarily to deliver almost any particular result.

Perhaps the best way to interpret our results is to consider the effect of the different identifications on the joint dynamic behavior of investment and the current account. Since different identifications change the cross-equation restrictions placed on this dynamic system, perturbations to the identification scheme alter these restrictions and as a result alter the observed empirical relationship between investment and the current account. Although there exist some elements of this relationship that are robust across identifications, our results make plain that the observed relationship between investment and the current account often depends fundamentally on the identification. Indeed, our results suggest that understanding the effects of the identification used to construct and interpret empirical models of investment and the current account is as important as analysis of the sampling distribution of the estimates. Minus an appreciation of the effect of the identification, claims can be made about the relationship between investment and the current account that turn out not to be robust.

Although many of our results are sensitive to seemingly minor perturbations of the identification scheme, there exists some consistency across identifications. We find four main results, each of which has implications for the intertemporal approach. First, most estimates indicate that investment booms are associated with current account deficits. Second, investment is independent of country-specific shocks, particularly in the long run. Third, the size and sign of the impact response of the current account to investment (or world shocks) is sensitive to the identification. Finally, the current account exhibits a persistent response to movements in country-specific shocks that is statistically significant and economically important. The first result is a fundamental implication of the intertemporal model, and stands in contrast with the predictions of the standard Mundell-Fleming model that emphasizes fiscal and monetary shocks. Since the second result implies a balanced growth path, it can be made consistent with the intertemporal, small open economy model with little effort. Our third result suggests that estimates of the impact response of the current account to investment contain little useful information for tests of the intertemporal, small open economy model. This echoes findings elsewhere in the literature. The final result, that the current account exhibits a persistent response to movements in country-specific shocks, contradicts a central tenet of the intertemporal model. At present, there is no consensus intertemporal model that generates persistence in the level of the current account. Our empirical results thus serve as a reminder of the limitations of the intertemporal model to explain current account fluctuations.

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Table 1. Six Identi¯cation Restrictions

De¯nition	Restriction	Implication
$R1$	$\mathcal{LR}_{CA,I} = 0$	CA_t Neutral to $\eta_{W,t}$ in the Long Run
$R2$	$\mathcal{LR}_{I,CA} = 0$	I_t Neutral to $\eta_{C,t}$ in the Long Run
$R3$	$\lambda_{I,CA,0} = 0$	At Impact $\eta_{C,t}$ Does Not Matter for ¢I_t
$R4$	$\lambda_{CA,I,0} = 0$	Necessary for $\eta_{W,t}$ to Not Matter for ¢CA_t
$R5$	$\lambda_{CA,I,0} = -1$	Reduced-Form Claim of Perfect Capital Markets in the Short Run
$R6$	$\mathcal{LR}_{CA,I} = -1$	Reduced-Form Claim of Perfect Capital Markets in the Long Run

The impact response (long-run multiplier) of X_t to Z_t is denoted as $\lambda_{X,Z,0}$ ($\mathcal{LR}_{X,Z}$), where X, $Z = I$, CA. The vector of innovations to world (country-specific) shocks is $\eta_{W,t}$ ($\eta_{C,t}$).

Table 2. SVAR Parameter Estimates

	$\lambda_{I,CA,0}$	$\lambda_{CA,I,0}$	$\mathcal{LR}_{I,CA}$	$\mathcal{LR}_{CA,I}$	Wald Statistic
$R1$	-0.56	0.02	-0.68	0	9.09
	(0.27)	(0.20)	(0.50)	–	[0.11]
$R2$	-0.11	-0.30	0	-0.21	11.37
	(0.25)	(0.17)	–	(0.19)	[0.04]
$R3$	0	-0.36	0.17	-0.26	28.40
	–	(0.08)	(0.42)	(0.12)	[0.00]
$R4$	-0.54	0	-0.64	-0.01	6.75
	(0.12)	–	(0.35)	(0.13)	[0.15]
$R5$	2.06	-1	3.45	-0.75	0.90
	(0.79)	–	(2.98)	(0.19)	[0.92]
$R6$	4.50	-1.29	7.69	-1	1.43
	(5.05)	(0.34)	(13.44)	–	[0.92]

The table contains estimates of the parameter listed in the top row, under each of the six alternative identifications listed in the first column. Standard errors appear in parenthesis and the brackets contain p-values. For $R1$, $R2$, $R3$, and $R6$, the Wald statistic and p-values are based on the hypothesis $\lambda_{CA,I,j} = 0$, $j = 0, \ldots, 4$, and five degrees of freedom. For $R4$ and $R5$, the hypothesis is that $\lambda_{CA,I,j} = 0$, $j = 0, \ldots, 4$, and the Wald statistic has four degrees of freedom.

Table 3. Variance Decompositions

I_t Response to the World Shock

	0	2	4	12	24
$R1$	79.14	77.54	78.29	79.01	79.22
	(18.64)	(19.81)	(19.70)	(19.89)	(19.95)
$R2$	99.27	98.91	99.02	99.20	99.25
	(5.70)	(6.13)	(6.00)	(5.86)	(5.80)
$R6$	38.46	52.76	64.58	65.11	90.13
	(17.64)	(20.03)	(22.84)	(21.59)	(19.49)

CA_t Response to the Country-Speci¯c Shock

	0	2	4	12	24
$R1$	87.01	86.13	86.87	86.74	86.70
	(6.88)	(7.08)	(7.43)	(7.49)	(7.58)
$R2$	91.94	89.62	91.44	91.64	91.71
	(14.39)	(15.97)	(16.79)	(17.72)	(17.97)
$R6$	4.54	6.21	8.46	2.21	1.00
	(9.61)	(11.82)	(14.55)	(17.25)	(18.21)

The top (bottom) panel reports the contribution of world (country-specific) shocks to explaining the forecast error variance of investment (the current account) at the particular forecast horizon. Small sample empirical standard errors appear in parenthesis. We generate 1000 replications of the SVAR to compute the empirical standard errors.

Figure 1: Canadian Results

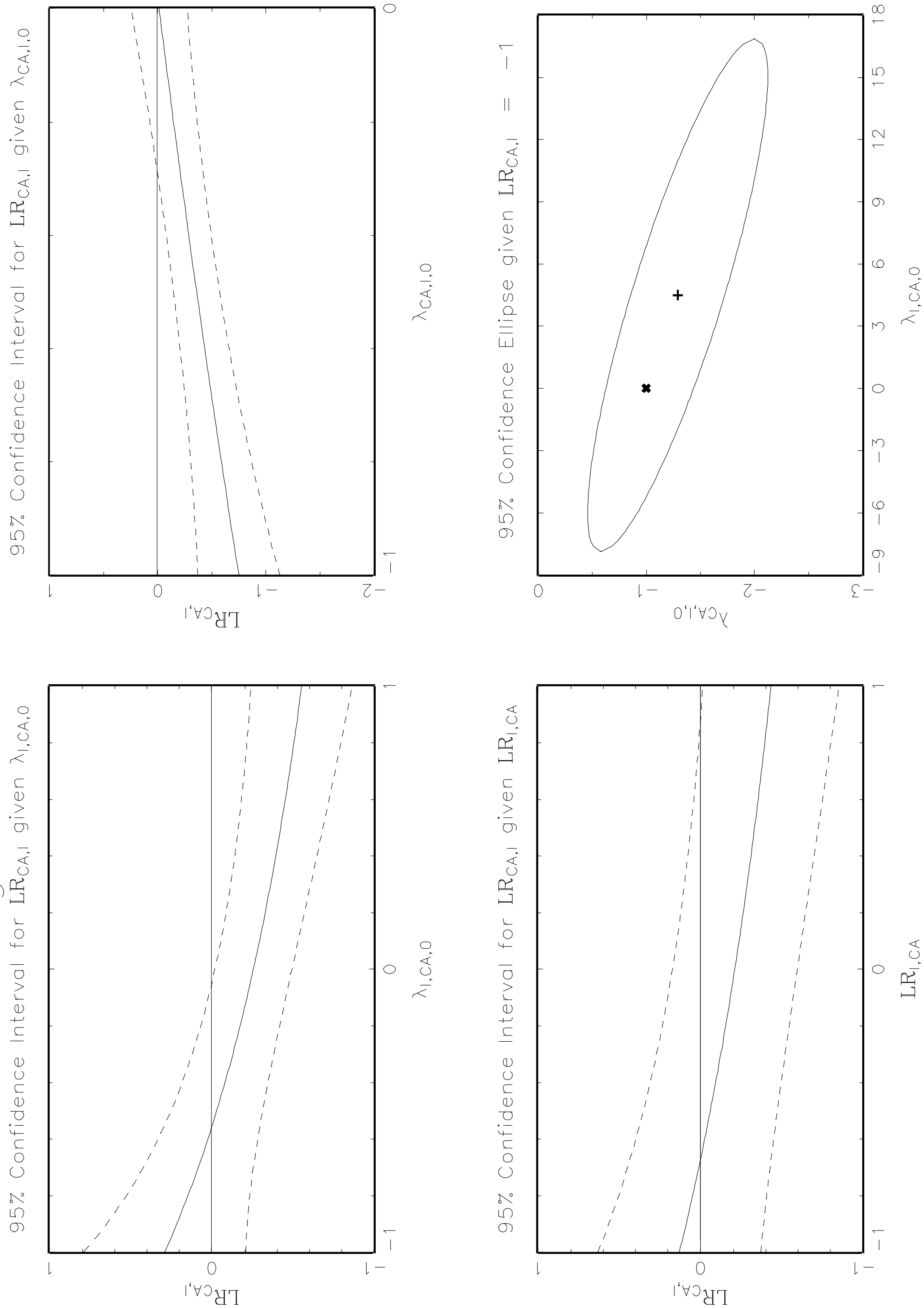

Figure 2: Canadian 95% Confidence Ellipses