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Robustness, information–processing constraints, and the current account in small open economies☆

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ABSTRACT

In this paper we examine the effects of two types of "*induced uncertainty*", model uncertainty due to robustness (RB) and state uncertainty due to finite information–processing capacity (called rational inattention or RI), on consumption and the current account. We show that the combination of RB and RI improves the model's predictions for (i) the contemporaneous correlation between the current account and income and (ii) the volatility and persistence of the current account in small open emerging and developed economies. In addition, we show that the two informational frictions improve the model's ability to match the impulse response of consumption to income and the relative volatility of consumption to income growth.

1. Introduction

Current account models following the intertemporal approach feature a prominent role for the behavior of aggregate consumption (see Sachs 1981). For given total income, consumption is the main determinant of national saving, and the balance of national saving in excess of investment is the major component of the current account. This important role for consumption has naturally led researchers to study current account dynamics using consumption models.[1] For example, the standard intertemporal current account (ICA) model is based on the standard linear–quadratic permanent income hypothesis (LQ–PIH) model proposed by Hall (1978) under the assumption of rational expectations (RE). Within the PIH framework, agents can borrow in the international capital market and optimal consumption is determined by permanent income rather than current income; consequently, permanent income also matters for the current account. For example, consumption only partly adjusts to temporary adverse income shocks, which makes the current account tend to be in deficit. In contrast, consumption fully adjusts to permanent income shocks, with little impact on the current account.

However, many empirical studies show that the standard RE–ICA models are often rejected in the post-war data.[2] In addition, the standard models also cannot explain the different behavior of the current account and consumption in emerging and developed countries.[3] It is not surprising that the standard RE–ICA models are rejected because

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[1] See Obstfeld and Rogoff (1995) for a survey.
[2] See Ghosh (1995), Glick and Rogoff (1995), Obstfeld and Rogoff (1995), Ghosh and Ostry (1997), Bergin and Sheffrin (2000), Nason and Rogers (2006), and Gruber (2004), and Kano (2009).
[3] For example, see Neumeyer and Perri (2005), Aguiar and Gopinath (2007), Uríbe (2009), among others.

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the underlying standard PIH models have encountered their own well-known empirical difficulties, particularly the well-known 'excess sensitivity' and 'excess smoothness' puzzles. Specifically, the main problems with the standard RE–ICA models are as follows. First, the models cannot generate low contemporaneous correlations between the current account and net income (net income is defined as output minus investment and government spending).[4] If net income is a persistent trend-stationary AR(1) process,[5] the model predicts that the current account and net income are perfectly correlated, whereas in the data they are only weakly correlated.[6] Note that in the data the current account is countercyclical with real GDP and more countercyclical in the emerging economy. (For example, see Neumeyer and Perri, 2005; Aguiar and Gopinath, 2007; Uríbe, 2009). Second, they cannot generate low persistence of the current account.[7] The standard RE models predict that the current account and net income have the same degree of persistence, whereas in the data the persistence of the current account is much lower than that of net income in emerging countries and insignificantly lower than that of net income in developed countries (see Table 1).[8] Third, the models cannot generate observed volatility of the current account (Bergin and Sheffrin, 2000; Gruber, 2004). Fourth, they cannot generate more volatile consumption growth in emerging countries (Aguiar and Gopinath, 2007). Finally, the assumption of certainty equivalence in these models ignores some important channels through which income shocks affect the current account. As shown in Ghosh and Ostry (1997) in post-war quarterly data for the US, Japan, and the UK, the current account is positively correlated with the amount of precautionary savings generated by uncertainty about future net income. Fogli and Perri (2008) also show that in OECD economies changes in country-specific macroeconomic volatility are strongly correlated with changes in net external asset position.

It is, therefore, natural to turn to new alternatives to the standard RE–ICA model and ask what implications they have for the joint dynamics of consumption, the current account, and income. In this paper, we show that two types of informational frictions, robustness (RB) and information–processing constraints (rational inattention or RI), can significantly improve the model's ability to fit the data discussed above. Specifically, these two types of information imperfections interact with the fundamental shock (the income shock in our model) and give rise to closely related "*induced uncertainty*": (i) model uncertainty and (ii) state uncertainty. These two types of induced uncertainty can affect the model's dynamics even within the linear–quadratic (LQ) framework.[9] We adopt Hall's LQ–PIH setting in this paper because the main purpose of this paper is to inspect the mechanisms through which the induced uncertainty affects the joint dynamics of consumption, the current account, and income, and it is much more difficult to study these informational frictions in non-LQ frameworks.[10] After solving the models explicitly, we then examine how the induced uncertainty due to RB and RI can improve the model's predictions on these important dimensions of the joint dynamics of the current account, consumption, and net income in emerging and developed countries we discussed above. In particular, we are interested in two key features of emerging market: consumption volatility exceeds income volatility and less procyclical current accounts with net income found in the data.[11]

Table 1
Emerging vs. developed countries (averages).

A: Emerging vs. developed countries (HP filter)		
$\sigma(y)/\mu(y)$	3.19(0.20)	1.83(0.07)
$\sigma(\Delta y)/\mu(y)$	3.82(0.19)	2.07(0.06)
$\rho(y_t, y_{t-1})$	0.50(0.03)	0.44(0.03)
$\sigma(\Delta c)/\sigma(\Delta y)$	1.35(0.08)	0.98(0.04)
$\sigma(ca)/\sigma(y)$	1.53(0.09)	1.60(0.08)
$\rho(c, y)$	0.33(0.04)	0.46(0.04)
$\rho(ca_t, ca_{t-1})$	0.30(0.05)	0.41(0.03)
$\rho(ca, y)$	0.05(0.05)	0.06(0.05)
$\rho\left(\frac{ca}{y}, y\right)$	0.04(0.04)	0.15(0.04)
B: Emerging vs. developed countries (linear filter)		
$\sigma(y)/\mu(y)$	9.03(0.43)	4.37(0.18)
$\sigma(\Delta y)/\mu(y)$	3.82(0.19)	2.07(0.06)
$\rho(y_t, y_{t-1})$	0.80(0.02)	0.79(0.02)
$\sigma(\Delta c)/\sigma(\Delta y)$	1.35(0.08)	0.98(0.04)
$\sigma(ca)/\sigma(y)$	0.80(0.06)	1.35(0.06)
$\rho(c, y)$	0.68(0.04)	0.63(0.04)
$\rho(ca_t, ca_{t-1})$	0.53(0.04)	0.71(0.02)
$\rho(ca, y)$	0.13(0.05)	0.17(0.05)
$\rho\left(\frac{ca}{y}, y\right)$	0.03(0.05)	0.16(0.05)

Hansen and Sargent (1995, 2007a) first introduced robustness (a concern for model misspecification) into economic models. In robust control problems, agents are concerned about the possibility that their model is misspecified in a manner that is difficult to detect statistically; consequently, they choose their decisions as if the subjective distribution over shocks was chosen by a malevolent nature in order to minimize their expected utility (that is, the solution to a robust decision-maker's problem is the equilibrium of a max–min game between the decision-maker and nature). Robustness models produce precautionary savings but remain within the class of LQ–Gaussian models, which leads to analytical simplicity.[12] A second class of models that produces precautionary savings but remains within the class of LQ–Gaussian models is the risk-sensitive model of Hansen et al. (henceforth HST, 1999).[13]

[4] Note that here we follow Aguiar and Gopinath (2007) and Uribe (Chapter 1, 2009) and use the detrended data to compute the reported empirical second moments. Following Obstfeld and Rogoff (1995), Ghosh and Ostry (1997), Gruber (2004), Engel and Rogers (2006), among others, in this paper we net out investment and government spending because our model also suggests that consumption spending depends on income that is disposable for household consumption.

[5] It is well known that given the length and structure of the data on real GDP, it is difficult to distinguish persistent trend-stationary AR(1), unit root, and difference-stationary (DS) processes for real GDP. (See Chapter 4 of Deaton, 1992 for a detailed discussion on this issue.) We focus on the AR(1) case in this paper; the results for the DS case are available from the authors upon request. In Section *3.2*, we discuss the unit root case, in which the empirical second moments of the current account and net income are not finite. The RE model predicts that when net output follows a unit root process, the current account becomes constant.

[6] See Table 1 for the average statistics for emerging and developed countries. Here we follow Aguiar and Gopinath (2007) by dividing the small economies into emerging and developed economies and use annual data from World Development Indicators.

[7] Boz et al. (2010) also report the empirical autocorrelation of the current account and the correlation between the current account and real GDP in emerging countries, and examine how labor market frictions can improve the model's predictions on these dimensions.

[8] In this paper, we assume that there is only one shock to net income. If there are multiple structural shocks, the persistence of the detrended current account and that of detrended net income might be generated by the responses to the different shocks. See Kano (2008) for a detailed discussion.

[9] Note that in the traditional linear–quadratic, linearized, or log–linearized models, uncertainty measured by the variance of the fundamental shock does not affect the model's dynamics.

[10] See Hansen and Sargent (2007a) and Sims (2003, 2006) for detailed discussions on the difficulties in solving the non-LQ models with information imperfections. The primary alternative model is based on Mendoza (1991), a small open economy version of an RBC model. That model would be significantly less tractable than the one we use, because it involves multiple state variables.

[11] See Neumeyer and Perri (2005), Aguiar and Gopinath (2007), Boz et al. (2010) among others.

[12] It is worth noting that although both robustness (RB) and CARA preference (i.e., Caballero, 1990 and Wang, 2003) increase the precautionary savings premium via the intercept terms in the consumption functions, they have distinct implications for the marginal propensity to consume (MPC). Specifically, CARA has no impact on the MPC, whereas RB increases the MPC. That is, under RB, in response to a negative wealth shock, the consumer would choose to reduce consumption more than that predicted in the standard LQ or CARA model (i.e., save more to protect themselves against the negative shock). We think that it is a way to distinguish CARA preference and RB.

[13] See Hansen and Sargent (2007a) and Luo and Young (2010) for detailed comparisons of the two models. In our ICA model, it seems more plausible to have different degrees of robustness (ϑ) across countries than to assume different degrees of risk sensitivity (i.e., enhanced risk aversion) across countries to explain the observed different joint behavior of consumption and current accounts in emerging and developed economies. Backus et al. (2004) also discuss this issue.