What Drives US Foreign Borrowing? Evidence on External Adjustment to Transitory and Permanent Shocks

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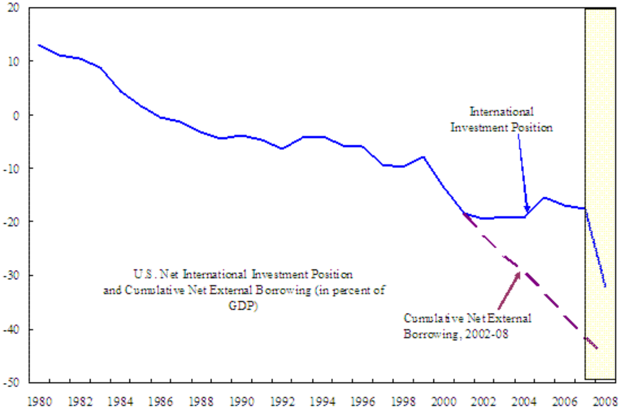
Introduction

- Over the recent past, rising current account deficit in the US...
- Correctly measured, the US external position can be estimated to be as high as -15% of US GDP in 2007. A picture from Milesi-Ferretti:



What drives the current account? Basic theory

- Modern international economics stress that the current account results from the intertemporal investment and consumption decisions by firms and households: $CA_t = S_t - I_t$ = Changes in net foreign wealth (NFA).
- Models of equilibrium dynamics of foreign wealth builds on the Permanent Income Hypothesis (PIH) and later developments of consumption theory (see e.g. Obstfeld and Rogoff (1995, 1996)).
  - Countries should run deficits when shocks lower the current (net) output is below its permanent level; or when returns fluctuate around their long-run levels.
  - In the presence of financial frictions, domestic income and production uncertainty tends to generate surpluses (via higher precautionary savings, and lower investment) – Mendoza et al. 2008, JPE.

What drives the current account? From theory to empirics

- The essential ingredients of the intertemporal-trade model

  1. Because of smoothing, consumption should adjust swiftly to ***permanent*** increases in income, but be relative insulated from ***transitory*** variations – in ***all forms of income: production or portfolio***.
  2. In response to positive shocks that raise net output gradually towards a higher long-run level, consumption smoothing implies that the economy should run a current account deficit.

- Despite the relevance of the intertemporal-trade approach to the current account, the empirical evidence on these basic propositions has remained controversial.

- Why?

Empirical models

- Early approach employs variants of Campbell (1987) and Campbell and Shiller (1987): testing frameworks build on enough restrictions to derive a present value relation equating, in expectations, the current account balance to the present discounted value of changes in net output:

$$\mathcal{CA}_t = -\sum_{i=1}^{\infty}\left(\frac{1}{1+r}\right)^i \mathrm{E}_t\left\{\Delta\mathcal{Z}_{t+i}\right\}.$$

- These present-value restrictions are not rejected for some countries, strongly rejected for others
- Limits of the early approach: strong auxiliary assumptions commonly adopted to make the model testable e.g. quadratic preferences and constant return to net foreign wealth.

Restrictive assumptions (1): returns

- Two main assumptions are extremely restrictive from the outset:

1 Constant return on NFA portfolio

- when the return to net foreign wealth is allowed to vary stochastically according to some stationary process, this improves considerably the fit of the model (Bergin and Sheffrin (2000), Nason and Rogers (2006)).
- In this case foreign markets are seen not only as an opportunity to trade intertemporally, but also as a source of shocks external to the domestic economy.
- Gourinchas and Rey (2007a) underscore capital gains and losses (and therefore stochastic returns) on foreign assets driven by expected movements in exchange rates as a distinct, financial adjustment channel, complementing the traditional trade channel

Restrictive assumptions (2): permanent/transitory

2. All shocks to (net) output are permanent – there is only one disturbance, a unit root country-specific technology shock that generates a permanent response in output!
   - Without being necessary to the main *thesis*, this assumption is based on the finding that (net) output is well characterized as an integrated process, hence it possesses a unit root.
   - The fact that output is an integrated process, should not be taken to imply that it does not have a strong transitory component.
   - In contrast, since it is deviations of output from its trend that matter (as it is not a pure random walk), other transitory shocks might be of importance as well.

Restrictive assumptions: theory-consistent data

- Most previous empirical models employed current account data based either on national accounting identities, or on balance of payments data.
- Results in Tille (2003), Lane and Milesi-Ferretti (2001, 2007) and Gourinchas and Rey (2007b) demonstrate that the relation between changes in a countries NFA position (market-valued estimates) and official measures of the *CA* bear little, if any, relation.

Taking stock: two main questions

- To understand the $\mathcal{CA}$, the relevant shocks are:
  - returns vs. output,
  - transitory vs. permanent

1. What is the evidence on the relative weight of different shocks in explaining external imbalances?
2. Does the macroeconomic response to these different types of shocks square the main predictions of $\mathcal{CA}$ theory ($\mathcal{ICA}$)?

- We charactere empirically the joint dynamics of consumption, (net) output, and market valued foreign assets and liabilities for the United States, for the post-Bretton Woods period.
- Drawing on Campbell and Mankiw (1989) and Lettau and Ludvigson (2001, 2004), we adopt a methodology that
  - allows us to decompose shocks moving these variables according to their transitory and permanent nature.
  - relax a number of restrictive assumptions e.g. preferences/returns.

Key assumptions

- Our results are based on a minimal set of assumptions (enough) that guarantee the existence of a long-run equilibrium.
  - All the is required is that a country's intertemporal budget constraint holds, and ...
  - a *balanced-growth* assumption to be satisfied in the limit.
  - Note: no specific assumptions about preferences, but non-satiation.
- We allow variables to have different trending behavior in-sample, as long as the deterministic trends converge in the limit.
- We deal with potential issues in structural changes (liberalization).

An overview of the main results

- Virtually all variation in aggregate consumption is dominated by permanent innovations, while it is not excessively smooth *vis-à-vis* persistent shocks to income.
- Instead, consumption seems completely insulated from transitory variations in income (output/returns).
- In contrast, transitory shocks explain
  - most of the variation in net output over short and medium horizons;
  - most of the variability in gross asset and liabilities positions (more than 60% of their fluctuations over the 40 quarters horizon).
  - or 97% of the current account fluctuations at virtually all horizons.
- Our study also documents that transitory fluctuations in gross positions (stocks) are highly correlated with transitory fluctuations in the returns on the underlying assets

Rest of The Talk I

- Intertemporal Budget Constraint: Assumptions and Implications
- Empirical Framework
- Main Findings
- Extensions and Robustness
- Conclusions

Intertemporal Budget Constraint: Definitions

- The current account ($\mathcal{CA}_t$) of c country is defined as the **change** in the **value** of net foreign assets between any two periods.

- Let $\mathcal{A}_t$ denote (the value of the stock of) gross assets, $\mathcal{L}_t$ gross liabilities, at the beginning of period t, $\mathcal{Y}_t$ output, $\mathcal{C}_t$ private consumption, $\mathcal{G}_t$ government spending, $\mathcal{I}_t$ investment and r_t the realized return the country's net foreign assets:

$$\begin{aligned} \mathcal{CA}_t &\equiv (\mathcal{A}_{t+1}-\mathcal{L}_{t+1}) - (\mathcal{A}_t-\mathcal{L}_t) = \\ & \mathcal{Y}_t-\mathcal{G}_t-\mathcal{I}_t-\mathcal{C}_t + r_t\,(\mathcal{A}_t-\mathcal{L}_t) \\ &= \mathcal{Z}_t + r_t\,(\mathcal{A}_t-\mathcal{L}_t)\,, \end{aligned}$$

  where $\mathcal{Z}_t \equiv \mathcal{Y}_t-\mathcal{G}_t-\mathcal{I}_t$ denotes net output, and where r_t varies with capital gains and losses on bonds/equity/fdi/other financial assets in the foreign portfolio.

- Variables are in units of domestic consumption.

Intertemporal Budget Constraint: Assumptions

- Let us decompose any variable $\mathcal{X}_t$ distinguishing between a deterministic trend $\exp(\gamma_{x,t})$, and a non-deterministic-trend component X_t, i.e. $\mathcal{X}_t = X_t \exp(\gamma_{x,t})$.
- Under this notational convention, the constraint reads:

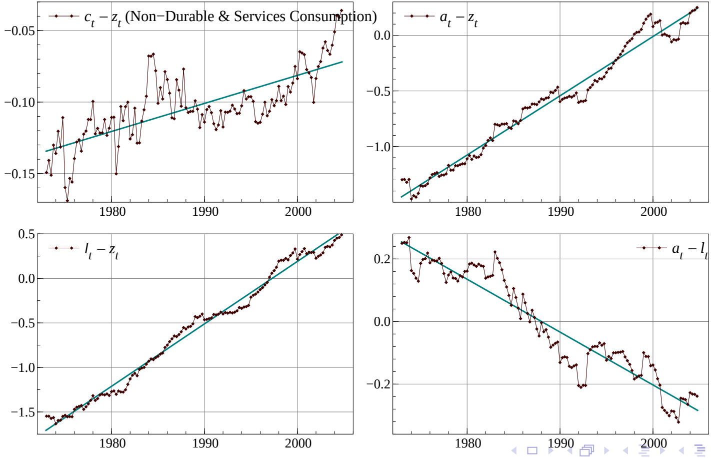
$$\begin{aligned} A_{t+1} \exp\left(\gamma_{a,t+1}\right) - L_{t+1} \exp\left(\gamma_{l,t+1}\right) \\ = Z_t \exp\left(\gamma_{z,t}\right) - C_t \exp\left(\gamma_{c,t}\right) + \\ (1+r_t)\left[A_t \exp\left(\gamma_{a,t}\right) - L_t \exp\left(\gamma_{l,t}\right)\right], \text{ with } A_0, L_0\text{: given} \end{aligned} \tag{1}$$

  where A_t is the de-trended stock of gross assets, L_t the de-trended stock gross liabilities, both measured at the beginning of period t, Z_t denotes de-trended net output, C_t de-trended consumption and r_t is the real rate of return.

- The deterministic trend component of each variable is denoted by $\gamma_{w,t+i}$, for $w = A, L, Z, C$ in period $t+i$.

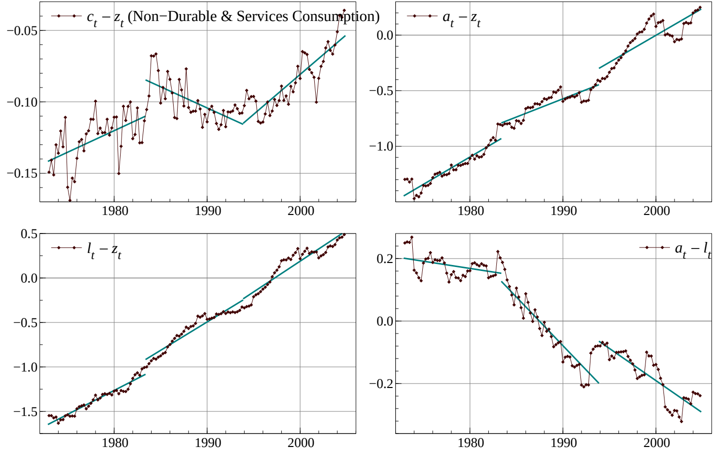
Intertemporal Budget Constraint: Assumptions

- The deterministic trend component of each variable $\gamma_{w,t+i}$, for $w = A, L, Z, C$ in period $t+i$, need not be the same of all variables! Is this necessary?



Intertemporal Budget Constraint: Assumptions

- So, $\gamma_{w,t+i}$, might be any deterministic function of time $(t+i)$ in principle. Is this necessary?



Intertemporal Budget Constraint: Assumptions

Assumption

1. ***(Balanced Growth)*** $\lim_{k\to+\infty} \gamma_{w,t+k} = \gamma_{t+k}$, *for* $w = c, z, a, l$.
2. ***(Transversality)***
$\lim_{k\to\infty} \mathrm{E}_t \left\{R_{t,t+k}\left[A_{t+k+1}\exp\left(\bar{\gamma}_{a,t+k+1}\right) - L_{t+i+1}\exp\left(\bar{\gamma}_{l,t+k+1}\right)\right]\right\} = 0.$
3. *The expectation terms*
$\mathrm{E}\left(\sum_{i=0}^{\infty} R_{t,t+i}C_{t+i}\exp\left(\bar{\gamma}_{c,t+i}\right) / \sum_{i=0}^{\infty} R_{t,t+i}Z_{t+i}\exp\left(\bar{\gamma}_{z,t+i}\right)\right)$,
$\mathrm{E}\left[A_t\exp\left(\bar{\gamma}_{a,t}\right) / \sum_{i=0}^{\infty} R_{t,t+i}Z_{t+i}\exp\left(\bar{\gamma}_{z,t+i}\right)\right]$,
$\mathrm{E}\left[L_t\exp\left(\bar{\gamma}_{l,t}\right) / \sum_{i=0}^{\infty} R_{t,t+i}Z_{t+i}\exp\left(\bar{\gamma}_{z,t+i}\right)\right]$,
$\mathrm{E}\left[Z_t\exp\left(\bar{\gamma}_{z,t}\right) / \sum_{i=0}^{\infty} R_{t,t+i}Z_{t+i}\exp\left(\bar{\gamma}_{z,t+i}\right)\right]$ *and*
$\mathrm{E}\left[C_t\exp\left(\bar{\gamma}_{c,t}\right) / \sum_{i=0}^{\infty} R_{t,t+i}C_{t+i}\exp\left(\bar{\gamma}_{c,t+i}\right)\right]$ *exist and are finite.*
4. ***(Empirical in–sample Approximation)*** $\bar{\gamma}_{w,t} = \bar{\gamma}_w \times t$, *for* $w = c, z, a, l$.

- A framework flexible enough to accommodate a wide range of theoretical structures (abstracting from preferences altogether).

IBC: Under These Assumptions...

1. The log ratios: $c_t - z_t$, $a_t - z_t$ and $l_t - z_t$ are trend-stationary, or that the variables are pair-wise cointegrated around deterministic trends.
2. It is possible to obtain a present value relation of the form

$$\underbrace{-\left(c_t - z_t - \bar{\bar{\gamma}}_c t\right) + \rho_a \left(a_t - z_t - \bar{\bar{\gamma}}_a t\right) + \rho_l \left(l_t - z_t - \bar{\bar{\gamma}}_l t\right) + \frac{(\rho_a + \rho_l)}{\mathrm{E}[1 + r_t]} r_t}_{\widetilde{CA}_t}$$

$$\approx \mathrm{E}_t \left\{ -\frac{1}{\rho_d} \sum_{i=1}^{\infty} \rho_{Z\Psi}^i \Delta \hat{z}_{t+i} + \sum_{i=1}^{\infty} \rho_{C\Phi}^i \Delta \hat{c}_{t+i} - \sum_{i=1}^{\infty} \left(\rho_{C\Phi}^i - \frac{1}{\rho_d} \rho_{Z\Psi}^i \right) r_{t+i} \right\}$$

Cointegration Analysis

- In our analysis $\mathbf{x}_t = [c_t, z_t, a_t, l_t]'$. We first examine whether the log-ratios: $c_t - z_t$, $a_t - z_t$ and $l_t - z_t$ are trend-stationary as assumed in our derivations.
- Under these cointegrating restrictions, we estimate a VEC Model for $\mathbf{x}_t$ which takes the form

$$\Gamma(L)\,\Delta\mathbf{x}_t = \boldsymbol{\delta} + \boldsymbol{\alpha}\left(\hat{\boldsymbol{\beta}}', \hat{\boldsymbol{\theta}}_1\right)\begin{pmatrix} \mathbf{x}_{t-1} \\ t-1 \end{pmatrix} + \mathbf{u}_t, \tag{2}$$

  where $\boldsymbol{\alpha}$ is a (4×3) matrix, $\hat{\boldsymbol{\beta}}$ is the (4×3) matrix of the cointegrating coefficients, $\hat{\boldsymbol{\theta}}_1$ are the coefficients of the deterministic trends (in the cointegrating space), and $\Gamma(L)$ is a finite matrix polynomial in the lag operator.

- Cointegration with rank $r = 3$, implies that there is just one permanent shock – common trend as in Stock and Watson (1988). Then shocks may be distinguished by their degree of persistence.

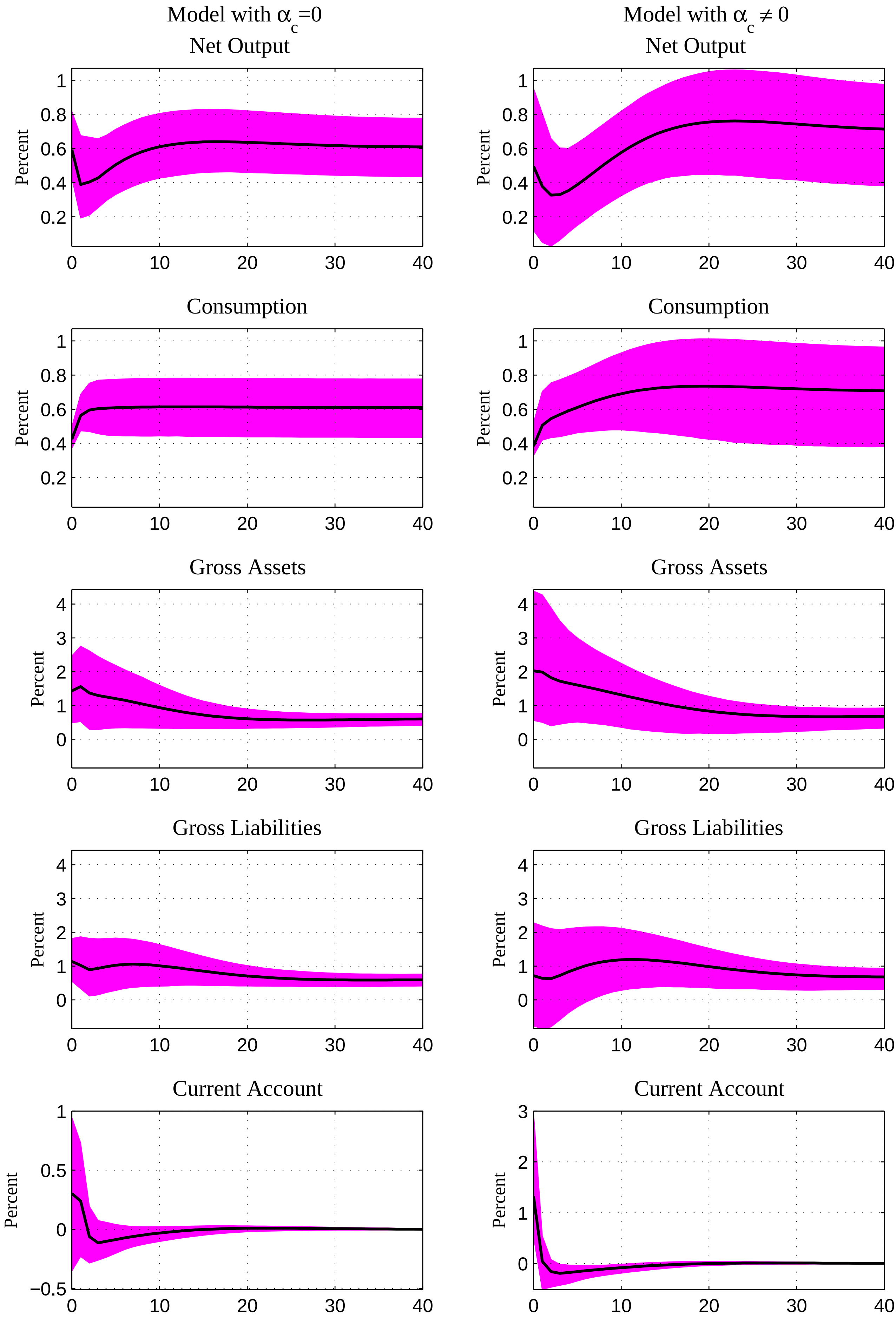
Permanent and Transitory Decomposition

- Following Gonzalo and Granger (1995), Gonzalo and Ng (2001): a shock η_{1t}^{P} is permanent if it has long-run effect on the level of the variables, whereas it is transitory if it does not have long-run effects on the level of the variables.
- The Idea:
  - As cointegration restricts the long-run multipliers of shocks... we may identify one (***unique***) ***permanent shock*** η_{1t}^{P}. We interpret this as a ***permanent supply shock***.
  - Assuming orthogonality between P and T shocks, we identify three transitory shocks $\boldsymbol{\eta}_t^T$. These cannot be interpreted as structural shocks without further identifying assumptions – a venture from which we abstract. Instead, in what follows we study the joint effect of the transitory shocks.

	$\Delta c_{t+h} - \mathrm{E}_t \Delta c_{t+h}$	$\Delta z_{t+h} - \mathrm{E}_t \Delta z_{t+h}$	$\Delta a_{t+h} - \mathrm{E}_t \Delta a_{t+h}$	$\Delta l_{t+h} - \mathrm{E}_t \Delta l_{t+h}$	$CA^{\star}_{t+h} - \mathrm{E}_t CA^{\star}_{t+h}$
Panel A: Consumption Adjustment Coefficients set to Zero ($\alpha_c = 0$)					
h	**A.1: Contribution of Permanent Shock (η^P_t)**				
1	1	0.257	0.122	0.142	0.012
	[1, 1]	[0.130, 0.388]	[0, 0.230]	[0.007, 0.252]	[0, 0.024]
4	0.997	0.299	0.154	0.133	0.020
	[0.994, 1]	[0.123, 0.472]	[0, 0.290]	[0, 0.246]	[0, 0.037]
8	0.997	0.459	0.187	0.176	0.023
	[0.996, 1]	[0.274, 0.694]	[0, 0.347]	[0, 0.324]	[0, 0.042]
40	0.999	0.850	0.297	0.349	0.023
	[0.999, 1]	[0.779, 0.999]	[0.055, 0.483]	[0.130, 0.548]	[0, 0.042]
h	**A.2: Contribution of Transitory Shocks (η^T_t)**				
1	0	0.743	0.878	0.858	0.988
	[0, 0]	[0.612, 0.870]	[0.770, 1]	[0.748, 0.993]	[0.976, 1]
4	0.003	0.701	0.846	0.867	0.980
	[0, 0.006]	[0.528, 0.877]	[0.710, 1]	[0.755, 1]	[0.963, 1]
8	0.003	0.541	0.813	0.824	0.977
	[0, 0.004]	[0.306, 0.726]	[0.653, 1]	[0.676, 1]	[0.958, 1]
40	0.001	0.150	0.703	0.651	0.977
	[0, 0.001]	[0.001, 0.221]	[0.518, 0.945]	[0.452, 0.870]	[0.958, 1]
Panel B: Consumption Adjustment Coefficients set to their Estimated Values ($\alpha_c \neq 0$)					
h	**B.1: Contribution of Permanent Shock (η^P_t)**				
1	0.838	0.180	0.242	0.057	0.229
	[0.701, 1]	[0, 0.356]	[0, 0.484]	[0, 0.113]	[0, 0.457]
4	0.872	0.213	0.274	0.061	0.223
	[0.763, 1]	[0, 0.407]	[0, 0.543]	[0, 0.120]	[0, 0.437]
8	0.905	0.308	0.330	0.119	0.227
	[0.822, 1]	[0, 0.548]	[0, 0.641]	[0, 0.227]	[0, 0.444]
40	0.980	0.824	0.477	0.398	0.228
	[0.962, 1]	[0.720, 0.977]	[0.151, 0.809]	[0.033, 0.643]	[0, 0.446]
h	**B.2: Contribution of Transitory Shocks (η^T_t)**				
1	0.162	0.820	0.758	0.943	0.771
	[0, 0.229]	[0.644, 1]	[0.516, 1]	[0.887, 1]	[0.543, 1]
4	0.128	0.787	0.726	0.939	0.777
	[0, 0.237]	[0.593, 1]	[0.457, 1]	[0.880, 1]	[0.563, 1]
8	0.095	0.692	0.670	0.881	0.773
	[0, 0.178]	[0.452, 1]	[0.359, 1]	[0.773, 1]	[0.556, 1]
40	0.020	0.176	0.523	0.602	0.772
	[0, 0.038]	[0.023, 0.280]	[0.192, 0.849]	[0.357, 0.968]	[0.555, 1]

Variance Decompositions: What's New?

- A measure of the US current account: $CA_t^\star \equiv \Delta NFA_{t+1}$, with $NFA_t = \exp(a_t) - \exp(l_t)$.
  - **T** shocks account for the vast majority of the fluctuations in (this proxy of) the $\mathcal{CA}$: between 96% and 98% at virtually all horizons; **P** shocks contribute between 2% and 4% to its variability.
- In response to **P** shocks (to net output), consumption almost completely adjusts on impact, while the current account fluctuates in the short and the long run.
- While consumption has almost no temporary component, temporary fluctuations affect jointly net output and the stocks of external assets and liabilities (and their combination).
- Finding that transitory movements in assets and liabilities are quite significant, and last longer than transitory movements in net output, is consistent with the idea that
  - international financial markets are a relevant ***source of shocks*** which need to be ***smoothed via intertemporal trade***.



Model with α_c=0
Net Output
Model with $\alpha_c \neq 0$
Net Output
Consumption
Consumption
Gross Assets
Gross Assets
Gross Liabilities
Gross Liabilities
Current Account
Current Account
Percent

Impulse Responses to Permanent Shock

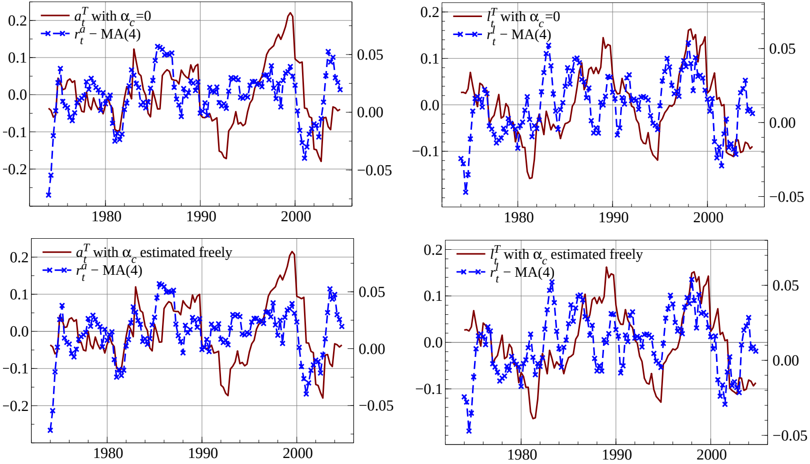
Another Look at a_t and l_t

- The correlation in the movements of a_t and l_t is a ***novel empirical result*** in the literature, which turns out to be robust to different methodologies — e.g. it is also found by Corsetti et al. (2008b), in response to productivity (and demand) shocks to US tradables.
- Overall, the above results provide an intriguing empirical benchmark for theoretical work on portfolio diversification (e.g. Devereux and Sutherland, 2010).
  - To the extent that optimal portfolio strategies prescribe domestic agent to re-scale their asset holding as a function of wealth, a permanent increase in net output (translating into higher US wealth) should indeed lead US households and firms to invest more abroad, while possibly adjusting their foreign liabilities by more.
  - Early instances of models stressing this point — in the framework of Merton's portfolio analysis — are put forward by Kraay and Ventura (2000, 2003).

Transitory Shocks and Variations in Gross Positions

- In our results, temporary fluctuations are an important driver of z_t, but even more so of gross positions and $CA_t^\star$.
- Since the effect of transitory innovations on z_t die out relatively quickly, the transitory components in gross positions must be primarily associated with fluctuations in returns.
- In order to investigate this issue, we extract the transitory components of gross assets and liabilities by means of a multivariate Beveridge–Nelson decomposition, employing our cointegrated VAR.

Transitory Shocks and Variations in Gross Positions



Extensions

Table: **Long-Horizon Regressions (Approximate Current Account Expression) – Sample:1973-2004**

Horizon H	1	2	3	4	8	12	16
Dependent Variable				regressed on $\widetilde{CA}_t$			
$\sum_{h=1}^{H} \Delta c_{t+h}$	-0.014	-0.042	-0.062	-0.099	-0.091	0.060	-0.002
[t-stat]	[-0.544]	[-0.823]	[-0.748]	[-0.903]	[-0.569]	[0.246]	[-0.008]
$\bar{R}^2$	-0.006	0.0003	0.002	0.007	-0.003	-0.007	-0.009
$\sum_{h=1}^{H} \Delta z_{t+h}$	**-0.290**	**-0.468**	**-0.602**	**-0.787**	**-0.853**	**-0.772**	**-0.988**
[t-stat]	[-4.144]	[-4.800]	[-5.230]	[-6.170]	[-5.082]	[-3.206]	[-2.991]
$\bar{R}^2$	0.114	0.189	0.242	0.309	0.287	0.172	0.199
$\sum_{h=1}^{H} r_{t+h}$	-1.556	**-4.269**	**-6.908**	**-7.999**	**-9.003**	*-8.497*	-9.177
[t-stat]	[-1.422]	[-2.928]	[-3.603]	[-4.118]	[-3.075]	[-1.860]	[-1.595]
$\bar{R}^2$	0.008	0.049	0.109	0.120	0.087	0.055	0.057
$\sum_{h=1}^{H} (r^a_{t+h} - r^l_{t+h})$	-0.301	**-0.833**	**-1.345**	**-1.515**	**-1.695**	*-1.606*	-1.698
[t-stat]	[-1.302]	[-2.853]	[-3.690]	[-4.158]	[-3.027]	[-1.744]	[-1.422]
$\bar{R}^2$	0.005	0.040	0.096	0.101	0.071	0.043	0.039

Conclusions

- In this paper, we carry out an analysis of the US external balance differentiating between *trend* and *cycle* components in US consumption, net output, gross foreign assets and gross foreign liabilities.
    - We identify permanent and transitory shocks, and analyze the dynamics of the adjustment mechanism.
- ***A key finding***: transitory variations in output, gross asset positions and on the current account are quantitatively large over both short and long horizons.
    - transitory shocks contribute to the majority of fluctuations in quarterly gross positions and the current account—well beyond typical business cycle frequencies.
    - ***Importantly***, temporary fluctuations in the stocks of valuation-adjusted US foreign assets and liabilities match fluctuations in the rates of returns on these stocks.

Conclusions

- ***In line with the IACA***: consumption is ‘insulated’ from the corresponding transitory variations in *output* and *gross asset positions*.
    - Consumption is well described by a trend component/its variation is dominated by permanent shocks.
    - Consumption responds swiftly to permanent shocks, adjusting within a year.
        - In response to positive shocks that raise net output gradually towards its new long-run level, the economy thus runs a current account deficit.
- We find that much of the movements in valuation-adjusted gross external positions are of transitory nature, but these movements are quite persistent.
    - So: while transitory build up of assets and liabilities can be expected to revert to trend, the process may take quite some time.

International Financial Adjustment in the G-7: How Much? How Fast?

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Two Complementary Approaches: The traditional

- As external imbalances occur because of savings and investment decisions, current imbalances merely reflect high investment relative to national savings ($CA < 0$ and $TB < 0$).
- In the near future the will be some re-balancing by higher production of economies currently in deficit, and the subsequent increase in net exports.
- External adjustment of a country occurs through movements in the trade balance, as a consequence of changes in the allocation of real quantities and equilibrium relative prices (Obstfeld, 2004; Obstfeld and Rogoff, 2004, 2005).

The alternative (complementary) view

- Recent financial integration has led to increases in gross assets and liabilities positions, resulting in country portfolios that may be heavily affected by fluctuations in asset prices.
- These ***valuation effects*** have been overlooked thus far, both from theory and empirical analyses of the current account.
- Recent results (e.g. Gourinchas and Rey, 2007a, 2007b; Lane and Milesi-Ferretti, 2001, 2005, 2007a, 2007b; Tille, 2003, 2008) have documented that...
- ... for the US ***valuation effects*** have accounted for a large fraction of the changes in its (NFA) position.

A *New* Theory

- Tille (2008) focuses on how valuation effects affect the transmission of monetary shocks.
- Blanchard, Giavazzi, and Sa (2005) set up a portfolio problem with imperfect asset substitutability and examine the role of the exchange rate in the valuation channel.
- Devereux and Saito (2006) emphasize the interaction between monetary policy and the *CA* for hedging purposes.
- Devereux and Sutherland (2009) in a GE model make a distinction between 'anticipated' (i.e. predictable) and 'unanticipated' valuation effects, arguing that the former are small.
- Benigno [2009] examines whether the valuation channel due to the exchange rate is desirable from a global welfare perspective. He argues that this is the case in a world without frictions.
- Ghironi, Lee and Rebucci (2007) examine valuation effects by setting up a portfolio problem with imperfect asset substitutability, focusing on the role of underlying return differentials.

How Much Can Valuation Effects Do?

- Gourinchas and Rey (2007a) provide a framework to analyze the question of external adjustment, and characterize two adjustment channels.
  1. The traditional TRADE CHANNEL: current imbalances are related to future trade surpluses.
  2. The VALUATION CHANNEL: expected future (NFA) portfolio returns can potentially contribute to the process of adjustment.
- **Idea:** Follow Campbell and Shiller (1988), Lettau and Ludvigson (2001), and construct measures of cyclical external imbalances, and then relate them to future expected net exports growth and excess NFA returns.
- They find that
  1. ... an imbalance today predicts future positive excess returns on US external assets and a future depreciation of the dollar.
  2. ... roughly 27% of external imbalances can be restored by subsequent movements in NFA portfolio returns (*valuation channel*).
  3. ... the rest of the adjustment comes from trade flows (*trade channel*).

This Paper ...

Examines the relative importance of the *valuation* and *trade* channels of external adjustment for all G7 countries.

- We investigate how much the two channels contribute to the process of cyclical external adjustment, hence their relative importance.
- We also assess the horizons at which cyclical external adjustment takes place,
- ... and finally, which of the two channels operate at which horizons. Alternatively, we are in a position to make statements regarding the exact horizon at which the two channels are operational
    - The latter is implemented as a simple non-parametric approach, estimated by GMM.

This Paper ...

Puts together data for the G7 countries on a comparable basis

- We built a comprehensive dataset for all G7 economies on a comparable basis...
    - Stocks of foreign assets and liabilities on an annual basis are put together in Lane and Milesi-Ferretti (2007a).
    - We construct quarterly, market-valued, stocks of gross assets and liabilities (in fact for four broad classes: portfolio equity, portfolio debt, other portfolio investment and FDI). Covers various periods from the first quarter of 1971 to the fourth quarter of 2004.
    - We also put together market-based returns on these gross positions, following Gourinchas and Rey (2007b).

This Paper ...

Makes a methodological contribution in constructing measures of cyclical imbalances

- We work with a modified set of assumptions, relative to Gourinchas and Rey (2007a) which imply that
  - Gross positions, exports and imports relative to GDP might be trending over time.
  - The ratios of A/L, X/M, and X/A are also allowed to have trends (in-sample) – similar to Corsetti and Konstantinou (2009).
  - We exploit the trend-stationarity of the ratios A/L, X/M, and X/A to construct measures of cyclical external imbalances, where the trend functions might be non-linear (e.g. breaks at unknown dates of unknown type: level, trend, or both).
  - In this instance, we provide a simple, intuitive alternative, without having to employ low-frequency filters (e.g. HP).

This Paper ...

Makes a methodological contribution in measuring the amount and speed of adjustment due to trade flows and due to valuation effects

- Following the method suggested by Konstantinou (2010), we assess the relative importance (how much?) and the horizon (how fast?) the two channels operate in one go!
- The alternative is to do the assessment in two steps.
  - First, evaluate the extent to which channel contributes to the process of external adjustment
  - Second, indirectly asses the horizon at which it operates, by means of a set of predictive regressions
  - Results in Konstantinou (2010) highlight that these two might differ.

In This Paper ...

We find that

1. There are strong valuation effects for Japan, U.S., and (under some *restrictive* assumptions) Germany.
2. The majority of external imbalances correction takes place through trade flows (the traditional view) for all G7 countries, while there are no important valuation effects for Canada, France, Italy and the U.K.
3. The contribution of the valuation channel in the process of external adjustment is very short-lived (less than one year in Japan and the U.S.; less than two years in Germany).
4. The whole adjustment of cyclical external imbalances is swift (less than three years for all G7 countries), with more than 60% of the correction taking place within three years.

The Basic Framework

- Consider the accumulation identity for *NFA* between t and $t+1$:

$$NFA_{t+1} = R_{F,t+1}(NFA_t + NX_t), \tag{1}$$

- Let us start by dividing the accumulation identity (1) by Y, the level of output. Defining $\tilde{Z}_t \equiv Z_t / Y_t$ we obtain

$$\tilde{A}_{t+1} - \tilde{L}_{t+1} = R_{F,t+1}/\Gamma_{t+1} \left(\tilde{A}_t - \tilde{L}_t + \tilde{X}_t - \tilde{M}_t \right), \tag{2}$$

  where $\Gamma_{t+1} \equiv Y_{t+1}/Y_t$ denotes the growth rate of output between t and $t+1$.

  - Define $\bar{Z}_t$ as the (equilibrium) trend-value of the ratio Z/Y at time t. This economy also satisfies an external accumulation identity of the form:

$$\bar{A}_{t+1} - \bar{L}_{t+1} = \bar{R}_{F,\,t+1}/\bar{\Gamma}_{t+1} \left(\bar{A}_t - \bar{L}_t + \bar{X}_t - \bar{M}_t \right), \tag{3}$$

    where $\bar{\Gamma}_{t+1}$ and $\bar{R}_{F,t+1}$ denote the trend-growth rate of output and equilibrium (gross) return on the *NFA* portfolio, in the deterministic economy.

The Basic Framework

Assumption

1. *Let* $\varepsilon_t^z \equiv \ln\left(\tilde{Z}_t/\bar{Z}_t\right)$, $\hat{r}_{F,t+1} \equiv \ln\left(R_{F,t+1}/\bar{R}_{F,t+1}\right)$, *and* $\varepsilon_t^{\Delta y} = \ln\left(\Gamma_t/\bar{\Gamma}_t\right)$. *We assume that* $\hat{r}_{F,t+1}$, ε_t^z, *and* $\varepsilon_t^{\Delta y}$ *are zero-mean stationary processes with a small bounded support.*

2. *The deterministic trend components* $\bar{Z}_t$ *admit a decomposition of the form* $\bar{Z}_t = \bar{Z} \times \gamma_t + d_t^z$, *where* γ_t *is a common – possibly time varying – growth rate, and* d_t^z *is an 'idiosyncratic' component that differs among variables.*

3. *The deterministic trend components converge asymptotically, as the economy reaches a balanced growth path: (a) For* $k \to \infty$, $\gamma_{t+k} \to 1$; *(b) For* $k \to \infty$, $d_{t+k}^z \to 1$; *(c) Similarly, for* $k \to \infty$ *the gross return converges to its steady-state value,*$\bar{R}_{F,t+k+1} \to R$ *, and the output trend-growth rate converges to its long-run value,* $\bar{\Gamma}_{t+k} \to \Gamma$, *such that* $R > \Gamma$.

The Basic Framework

- Under these assumptions it is possible to derive a first-order approximation of (2) around (3), which satisfies:

$$nxa_{t+1} \approx \frac{1}{\rho} nxa_t + r_{F,t+1} + \Delta nx_{t+1}, \tag{4}$$

  where

$$\begin{aligned} nxa_t &\equiv \left|\mu^a\right| \varepsilon^a_t - \left|\mu^l\right| \varepsilon^l_t + \left|\mu^x\right| \varepsilon^x_t - \left|\mu^m\right| \varepsilon^m_t; \\ \Delta nx_{t+1} &\equiv \left|\mu^x\right| \Delta\varepsilon^x_{t+1} - \left|\mu^m\right| \Delta\varepsilon^m_{t+1} - \varepsilon^{\Delta y}_{t+1}; \text{ and} \\ r_{F,t+1} &\equiv \left|\mu^a\right| r^a_{t+1} - \left|\mu^l\right| r^l_{t+1} \end{aligned} \tag{5}$$

  where $\mu^a = \bar{A}/(\bar{A} - \bar{L})$; $\mu^l = \mu^a - 1$; $\mu^x = \bar{X}/(\bar{X} - \bar{M})$; $\mu^m = \mu^x - 1$; and $\rho = 1 + (\bar{X} - \bar{M})/(\bar{A} - \bar{L})$

- Finally, we also assume that our measure of cyclical external imbalances satisfies the stability condition $\lim_{h\to\infty} \rho^h nxa_{t+h} = 0$.

The Basic Framework

- Hence, we can iterate equation (6) forward, and take conditional expectations to obtain

$$nxa_t \approx -\sum_{h=1}^{+\infty} \rho^h \mathrm{E}_t \left[r_{F,t+h} + \Delta nx_{t+h} \right] \tag{6}$$

- Consider a country that is a net debtor ($nxa_t < 0$): External adjustment may come through future increases in net exports $\mathrm{E}_t \Delta nx_{t+h} > 0$ (the *trade channel*); or it may come from high expected net portfolio returns $\mathrm{E}_t r_{F,t+h} > 0$ (the *valuation channel*).
- The whole approach make sense if:
  1. Economies have well defined steady states, in which NFA_{ss} and TB_{ss} differ from zero.
  2. We also need: either $\mu^a > 0$ and $\mu^x < 0$, or $\mu^a < 0$ and $\mu^x > 0$ for the approach to make sense, and for $\rho < 1$, so the the model is well defined.

Empirical Methodology

- In order to proceed we need estimates of μ^z and ρ.
  - Gourinchas and Rey (2007a) use the HP-filter to extract the trend used in calculating e.g. μ^a and the cyclical component, ϵ_t^a. Then calculate $\mu^a = \bar{A}/(\bar{A} - \bar{L})$ as a function of the HP-trends and employ the previously obtained cyclical components to get nxa_t.
- In our work, we show that we can proxy e.g. μ^a as the mean of the stationary relation $a_t - l_t$ potentially around broken trends (we find that this is in fact the case for some countries).
  - For instance

$$\mu^a = \frac{\bar{A}}{\bar{A} - \bar{L}} = \frac{1}{1 - \left(\bar{L}/\bar{A}\right)} = \frac{1}{1 - \exp\left(\ln \bar{L} - \ln \bar{A}\right)}$$

$$\approx \frac{1}{1 - \exp\left(\mathrm{E}[l_t - a_t + \phi'_{al} D_t]\right)} = \frac{1}{1 - \exp\left(-\mathrm{E}\left[a_t - l_t - \phi'_{al} D_t\right]\right)}$$

  - We also need the differences of transitory components, e.g. $\varepsilon_t^a - \varepsilon_t^l$, which are estimated as $\left(a_t - l_t - \phi'_{al} D_t\right) - \mathrm{E}\left[a_t - l_t - \phi'_{al} D_t\right]$.

Empirical Methodology

We proceed in two steps:

1. Let $\mathbf{w}_t = (nxa_t, r_t, \Delta nx_t)'$. Then a VAR(1) takes the form:

$$\mathbf{w}_{t+1} = \mathbf{A}\mathbf{w}_t + \mathbf{v}_t,$$

from which we may obtain forecasts

$$\mathrm{E}_t\left(\mathbf{w}_{t+i}\right) = \mathbf{A}^i\mathbf{w}_t.$$

Then

$$nxa_t \approx -\sum_{h=1}^{+\infty} \rho^h \mathrm{E}_t\left[r_{F,t+h} + \Delta nx_{t+h}\right],$$

may be expressed as

$$\mathbf{e}'_{nxa}\mathbf{w}_t = -\mathbf{e}'_r\rho\mathbf{A}\left(\mathbf{I} - \rho\mathbf{A}\right)\mathbf{w}_t - \mathbf{e}'_{\Delta nx}\rho\mathbf{A}\left(\mathbf{I} - \rho\mathbf{A}\right)\mathbf{w}_t = nxa_t^{\mathrm{r}} + nxa_t^{\Delta nx}.$$

Empirical Methodology

2. Iterating forward for H periods $nxa_{t+1} \approx \frac{1}{\rho} nxa_t + r_{F,t+1} + \Delta nx_{t+1},$, we obtain:

$$nxa_t = -\sum_{h=1}^{H} \rho^h r_{F,t+h} - \sum_{h=1}^{H} \rho^h \Delta nx_{t+h} + \rho^{H+1} nxa_{t+H+1}.$$

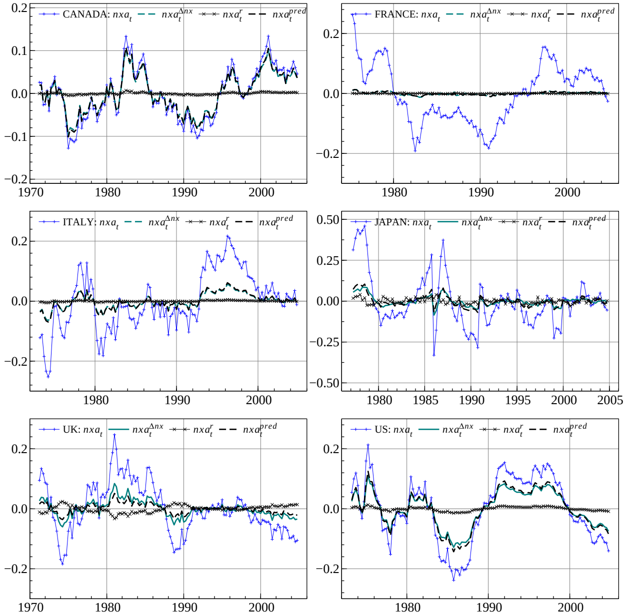
Then

$$\begin{aligned} \mathrm{Var}\left(nxa_t\right) \approx & -\sum_{h=1}^{H} \rho^h \mathrm{Cov}\left(r_{F,t+h}, nxa_t\right) - \sum_{h=1}^{H} \rho^h \mathrm{Cov}\left(\Delta nx_{t+h}, nxa_t\right) \\ & + \rho^{H+1} \mathrm{Cov}\left(nxa_{t+H}, nxa_t\right) \end{aligned}$$

which decomposes the variance of *nxa* into three parts: predictability of NFA portfolio returns, net exports growth, and the last term predictability beyond horizon H (autocorrelation in *nxa*).

- The weights μ^a, μ^l, μ^x and μ^m for Germany are such that they imply $\rho > 1$. (Net Creditor and Net Exporter as a steady-state). Hence, we *initially* exclude Germany from the analysis.

Empirical Findings (1): VAR Results



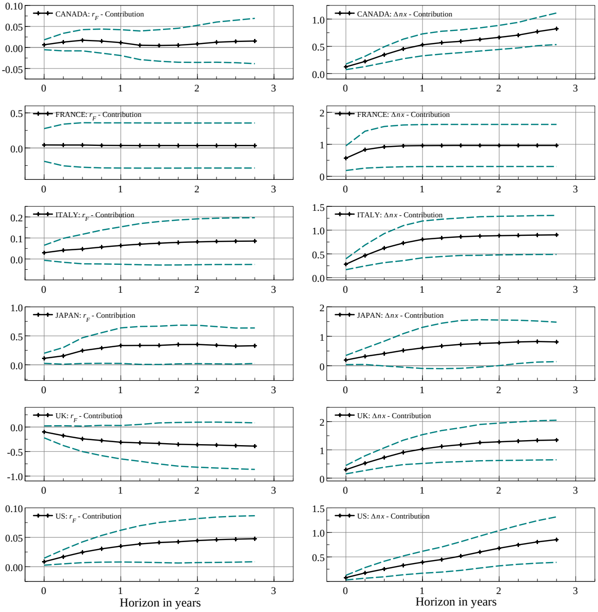
Empirical Findings (2): Variance Decomposition

Variance Component	Quarters: 1-4		Quarters: 5-8		Quarters: 9-12		Quarters: 13–		Total (Variable)	
					Panel A: Canada					
r_F ($\times$ 100)	0.004	1.52%	-0.003	-0.98%	0.003	1.00%			0.004	1.54%
[t-stat]	[0.873]		[-0.600]		[0.807]				[0.471]	
Δnx ($\times$ 100)	**0.125**	45.21%	**0.048**	17.42%	**0.054**	19.59%			**0.227**	82.22%
[t-stat]	[4.133]		[2.478]		[2.303]				[4.673]	
nxa_{t+H} ($\times$ 100)							0.045	16.24%	0.045	16.24%
[t-stat]							[1.292]		[1.292]	
Total (Horizon) ($\times$ 100)	**0.129**	46.73%	**0.045**	16.44%	**0.057**	20.59%	0.045	16.24%	**0.276**	100%
[t-stat]	[4.139]		[2.138]		[2.318]		[1.292]		[8.098]	
					Panel B: France					
r_F ($\times$ 100)	0.002	3.73%	-9.58×10^{-5}	-0.22%	5.40×10^{-8}	0.00%			0.001	3.51%
[t-stat]	[0.191]		[-0.615]		[0.013]				[0.180]	
Δnx ($\times$ 100)	**0.041**	95.14%	**0.001**	1.34%	4.17×10^{-6}	0.01%			**0.041**	96.49%
[t-stat]	[1.769]		[1.719]		[0.798]				[2.417]	
nxa_{t+H} ($\times$ 100)							$\mathbf{1.28\times10^{-6}}$	0.00%	$\mathbf{1.28\times10^{-6}}$	0.00%
[t-stat]							[2.312]		[2.312]	
Total (Horizon) ($\times$ 100)	**0.042**	98.87%	**0.0005**	1.12%	4.23×10^{-6}	0.01%	$\mathbf{1.28\times10^{-6}}$	0.00%	**0.043**	100%
[t-stat]	[1.877]		[1.935]		[0.769]		[2.312]		[1.892]	
					Panel C: Italy					
r_F ($\times$ 100)	0.017	5.68%	0.006	2.15%	0.002	0.68%			0.025	8.51%
[t-stat]	[1.163]		[1.223]		[1.444]				[1.260]	
Δnx ($\times$ 100)	**0.214**	72.75%	**0.044**	14.82%	**0.007**	2.40%			**0.264**	89.97%
[t-stat]	[3.243]		[3.651]		[1.864]				[3.606]	
nxa_{t+H} ($\times$ 100)							0.004	1.52%	0.004	1.52%
[t-stat]							[0.970]		[0.970]	
Total (Horizon) ($\times$ 100)	**0.230**	78.43%	**0.050**	16.97%	**0.009**	3.08%	0.004	1.52%	**0.294**	100%
[t-stat]	[3.104]		[3.243]		[1.963]		[0.970]		[3.435]	

Empirical Findings (2): Variance Decomposition

Variance Component	Quarters: 1-4		Quarters: 5-8		Quarters: 9-12		Quarters: 13–		Total (Variable)	
Panel D: Japan										
r_F ($\times$ 100)	**0.203**	29.09%	0.041	5.93%	-0.015	-2.10%			**0.230**	32.93%
[t-stat]	[1.814]		[0.569]		[-0.494]				[1.768]	
Δnx ($\times$ 100)	0.365	52.25%	0.165	23.66%	0.036	5.09%			**0.565**	81.00%
[t-stat]	[1.508]		[1.228]		[0.431]				[1.986]	
nxa_{t+H} ($\times$ 100)							-0.097	-13.92%	-0.097	-13.92%
[t-stat]							[-1.373]		[-1.373]	
Total (Horizon) ($\times$ 100)	**0.568**	81.35%	**0.206**	29.59%	0.021	2.99%	-0.097	-13.92%	**0.698**	100%
[t-stat]	[2.698]		[2.822]		[0.323]		[-1.373]		[3.874]	
Panel E: UK										
r_F ($\times$ 100)	-0.052	-27.55%	-0.015	-7.75%	-0.007	-3.67%			-0.074	-38.97%
[t-stat]	[-1.469]		[-0.799]		[-0.971]				[-1.352]	
Δnx ($\times$ 100)	**0.173**	91.11%	**0.065**	34.38%	**0.018**	9.26%			**0.256**	134.75%
[t-stat]	[3.470]		[2.345]		[1.804]				[3.170]	
nxa_{t+H} ($\times$ 100)							0.008	4.22%	0.008	4.22%
[t-stat]							[0.518]		[0.518]	
Total (Horizon) ($\times$ 100)	**0.121**	63.56%	0.051	26.64%	0.011	5.58%	0.008	4.22%	**0.190**	100%
[t-stat]	[2.159]		[1.325]		[0.806]		[0.518]		[2.196]	
Panel F: US										
r_F ($\times$ 100)	**0.024**	3.05%	0.009	1.20%	0.004	0.51%			**0.037**	4.75%
[t-stat]	[3.047]		[1.199]		[0.508]				[2.000]	
Δnx ($\times$ 100)	**0.256**	32.82%	**0.212**	27.17%	**0.197**	25.30%			**0.665**	85.29%
[t-stat]	[2.811]		[2.507]		[2.399]				[3.027]	
nxa_{t+H} ($\times$ 100)							0.078	9.96%	0.078	9.96%
[t-stat]							[0.889]		[0.889]	
Total (Horizon) ($\times$ 100)	**0.280**	35.86%	**0.221**	28.37%	**0.201**	25.81%	0.078	9.96%	**0.780**	100%
[t-stat]	[2.872]		[2.458]		[2.382]		[0.889]		[3.573]	

Variance Decomposition-Cumulative Contributions



Summary

- Using a newly developed dataset, we have examined the relative importance of the trade and valuation channels for the process of external adjustment.
- We found that the VALUATION channel is important for Japan, the U.S. and Germany (under some restrictive assumptions - results not shown here).
    - They operate at very short horizons (strictly less than two years).
- The bulk of the adjustment takes place through trade flows.
- Importantly
    1. The overall adjustment process is swift, taking place within three years
    2. In our dataset, valuation effects have a smaller impact on external adjustment for the US (about 5%) relative to the figure reported in Gourinchas and Rey (2007a, about 27%).