Abstract

In the theoretical part of the paper, we analyze the positive and normative e¤ects of a surprise monetary expansion in a small open economy characterized by imperfect competition and short-run price rigidity in the domestic sector. The temporary output boom fostered by the monetary expansion is shown to come at the cost of a permanent squeeze of the domestic sector. In general this a¤ects welfare ambigously, since the welfare gain from the monetary expansion reduces as net foreign assets become smaller and eventually turns negative if the economy accumulates too large a debt towards the rest of the world. The empirical part of the paper provides evidence in favour of a crucial role of monetary shocks in current account ‡uctuations. This holds especially for the more open economies in the G7, namely the European countries and Canada.

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CURRENT ACCOUNT AND EXCHANGE RATE DYNAMICS

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1 Introduction

Recently, there has been a revived interest in international macroeconomics in a research strategy aimed at bridging the gap between ad hoc monetary models used for policy analysis and modern intertemporal economics. [2] The distinguishing feature of this literature is the introduction of market imperfections, namely monopoly distortions and price stickiness, into a dynamic general equilibrium model, along the lines originally proposed in the closed-economy setting by Blanchard and Kiyotaki [1987] and Ball and Romer [1990]. The approach has several advantages. Micro-founded models of imperfect competition have an intertemporal dimension, emphasizing the budget constraints as a key element in the analysis. This implies that the current account plays a crucial role in the international transmission of monetary and real shocks. Moreover, the new models allow for a rigorous welfare analysis, by providing an index of social welfare (namely, the expected util-

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[2] The redux model by Obstfeld and Rogo¤ [1995b] is generally considered as the starting launchpad for this literature, although a dynamic general equilibrium model of imperfect competition is provided yet in Svensson and van Winbergen [1989]. The policy-oriented research program in international macroeconomics has been recently revitalized by Corsetti and Pesenti [1997]. In their analytical framework, classical policy issues such as strategic interdependence can be easily addressed. Lane [1999b] surveys the new open economy literature.

ity of the national representative agent) that is logically consistent with the model's assumptions.

The literature has largely emphasized two-country models, focussing on international spillovers and macroeconomic interdependence in the world economy. This comes at the cost of considerable formal complexity that may be conveniently reduced in the analysis of small economies. Accordingly, this paper models a stylized small open economy and studies the monetary transmission mechanism from a theoretical as well as an empirical perspective.

The theoretical part of the paper analyzes the positive and normative e¤ects of a surprise monetary expansion by means of a comparative static exercise. As opposed to the models in Obstfeld and Rogo¤ [1995b]; [1996] and Lane [1997]; the economy is speci…ed so as to account for spillovers between the traded and the nontraded sector that translate into current account imbalances. Lane [1999a] provides an analytical framework akin to the one presented in this paper, also allowing for current account imbalances. In his speci…cation, however, comparative static analysis is not permitted. The exercise proposed in this paper has several attractions. The model's implications for current account and real exchange rate dynamics can be illustrated with an intuitive graphical apparatus. Furthermore, the analysis need not be con…ned to small policy shocks. Finally and more importantly, the welfare gain (or loss) from a permanent monetary expansion can be indexed to the external account.

In the empirical part of the paper, VAR econometrics is used in order to study the driving forces of current account ‡uctuations. The main reason for this investigation is to assess whether monetary shocks empirically matter in

explaining the dynamics of the external account, as suggested by models like the one proposed in this paper.

The paper is organized as follows. Section I models the small open economy. Section II presents the short- and long-run effects of a monetary expansion and discusses its normative implications. Section III contains the empirical investigation on the determinants of current account fluctuations. Section IV concludes. Appendix A contains the details on the model's solution, while Appendix B describes the data set.

2 A small open economy

The economy is inhabited by a continuum of agents $j \in [0;1]$. Each citizen has a monopoly over the production of a differentiated nontraded good, $y_N(j)$; and is endowed with a constant quantity of the traded good, $\bar{y}_T$; each period:

The Cobb-Douglas real consumption index

$$C = C_T^{\gamma} C_N^{1-\gamma} \tag{1}$$

aggregates consumption of the traded good, C_T, and consumption of the nontraded good, C_N, defined as

$$C_N = \left[\int_0^1 c_N(j)^{\frac{\mu+1}{\mu}} dj \right]^{\frac{\mu}{\mu+1}} \tag{2}$$

where $\mu > 1$ captures the degree of substitutability among nontradables; the higher μ the less the monopoly distortion in the production of nontradable goods.

The agent's lifetime utility is

$$U(j)_t = \sum_{s=t}^{\infty} \beta^{s-t} \left[\frac{C(j)_s^{1-\frac{1}{\sigma}}}{1-\frac{1}{\sigma}} - \frac{\kappa}{2} y_N(j)^2 \right] \tag{3}$$

where the quadratic term represents the disutility from forgone leisure. Markets are incomplete, the only internationally traded financial asset is a bond denominated in units of the traded good, B, that yields an exogenously given real interest rate r: The real interest rate is constant and normalized to $r = (1-\beta)/\beta$; where β is the discount factor:

The period budget constraint of individual j in real terms is

$$\begin{aligned} B_{t+1}^j + \frac{M_t^j}{P_{Tt}} = {} & (1+r)B_t^j + \frac{M_{t-1}^j}{P_{Tt}} + \frac{P_{N(j)t}}{P_{Tt}} y_N(j) + \\ & + \bar{y}_T - \frac{P_{N(j)t}}{P_{Tt}} C(j)_{Nt} - C(j)_{Tt} - T_t^j \end{aligned} \tag{4}$$

where T are lump-sum taxes denominated in units of the traded good.

The consumption-based price index is

$$P = P_T^{\omega} P_N^{1-\omega} \omega^{-\omega} (1-\omega)^{1-\omega} \tag{5}$$

where P_T is the domestic currency price of the traded good, which coincides with the nominal exchange rate after normalizing the foreign-currency price to one, and P_N is

$$P_N = \left[\int_0^1 p_N(j)^{1-\mu} dj \right]^{\frac{1}{1-\mu}} \tag{6}$$

where $p_N(j)$ is the money price of the nontraded good j:

Agents are subject to the cash-in-advance constraint

$$M^{j}_{t-1} > PC_t \tag{7}$$

Finally, the government runs a balanced budget in each period

$$0 = T_t + \frac{M_t - M_{t-1}}{P_{Tt}} \tag{8}$$

Since this model does not allow for a solution in closed form, we log-linearize it around an appropriate initial steady state (details on the solution are contained in Appendix A). Then, we carry out the analysis of the monetary transmission mechanism by means of a simple comparative static exercise. This is particularly helpful in describing the welfare implications of the monetary shocks, while not a¤ecting the qualitative results relative to the loglinearized solution. Speci…cally, we can express social welfare as a decreasing function of net foreign assets so as to argue that the welfare gain from a surprise monetary expansion may turn negative for a critical value of the external account.

2.1 The initial steady state

We assume that net external assets are initially zero, $\overline{B}_0 = 0$ (barred variables refer to steady-state values, variables with no time subscript refer to short-run values) and agents are symmetric, so they set identical money prices. After normalizing the real exchange rate to one, output of nontradables is

$$\overline{y}^{0}_{N} = \left[\frac{(\mu - 1)}{\mu}\right]^{\frac{1}{(1+\theta)}} \left[\frac{(1-\theta)}{(1+\theta)}\right] \tag{9}$$

Due to the monopoly distortions in the nontraded sector, $\bar{y}_N^0$ is suboptimally low.[3]

3 A surprise monetary expansion

3.1 Positive analysis

Consider a permanent unexpected increase in money supply. We suppose that the prices of nontradables are …xed for one period so that domestic output is demand-determined within the period. The monetary expansion depreciates the real exchange rate boosting the current demand for the nontraded good. Making use of (7) to substitute for P_T in the optimal demand for nontradables (16), we obtain

$$\frac{y_N}{\bar{y}_N^0} = \frac{\overline{M}_1}{\overline{M}_0} \tag{10}$$

where a permanent increase in money growth proportionally rises the short-run production of the nontraded good relative to the initial steady state.

The boom in the nontraded sector spills over onto the traded sector, a¤ecting the current demand for the traded good: agents are able to consume more or less traded goods with respect to their endowment by lending or borrowing resources abroad. Spillovers between the traded and the nontraded

[3] In the decentralized economy, agents fail to coordinate on the e¢cient output level as they have no incentive to increase their own output unilaterally, since the bene…ts accrue mainly to the other agents through a lower relative price. A planner, on the other hand, would set output e¢ciently at

$$\bar{y}_N^{Plan} = \left[\frac{1}{\cdot}\right]^{\frac{1}{(1+\gamma)}} \circ^{\frac{(1-\gamma)}{(1+\gamma)}} > \bar{y}_N^0$$

sector are positive when domestic and foreign goods are complements in consumption and negative otherwise. [4]

The short-run aggregate equilibrium can be represented in the c_T c_N space as the consumption allocation that simultaneously satis…es the equilibrium condition in the goods market, (16), as well as the current account identity. The former condition draws the GE line; while the latter corresponds to the CA line in Figure 1. In the wake of the monetary expansion, the exchange rate depreciates tilting the GE line downwards relative to the original steady state, 0: When foreign and domestic goods are complements, nominal undershooting occurs and the economy moves from 0 to A: When goods are substitutes, nominal overshooting drives the short-run equilibrium to B. As apparent in Figure 1, exchange rate variability increases when the monetary expansion a¤ects the current account. In the case of a balanced current account, in fact, the nominal (and real) exchange rate immediately jumps on the new steady-state value. [5] This feature of the monetary transmission mechanism is consistent with a substantial body of evidence stressing that very large exchange rate movements seem to be required to o¤set apparently quite small current account imbalances (see, for example, Bryant, Holtham and Hooper [1988]).

After one period, when the prices of nontradables can be adjusted, the

[4] A standard result with power utility and CES consumption index is that two goods are substitutes in consumption if the intertemporal elasticity of substitution (here 1=½) is greater than the intratemporal elasticity of substitution (here 1) and complements otherwise.

[5] In general, the relationship between current account and exchange rate volatility is driven by two factors: the consumption elasticity of money demand (accounting for the overshooting result) and the interplay between intratemporal and intertemporal elasticity of substitution (accounting for the sign of the current account reaction to the monetary shock).

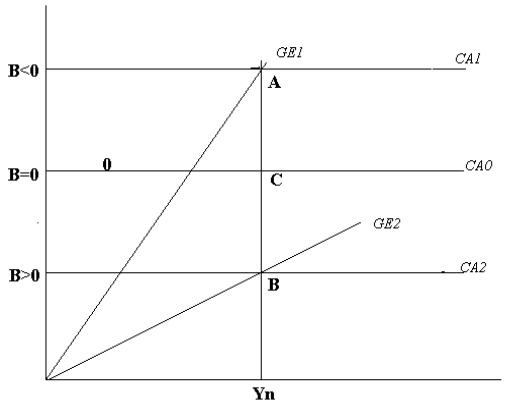

Figure 1: "Short-run Equilibrium"

economy reaches the new steady-state equilibrium. The accumulation of external assets permanently changes consumption. When $\overline{B}_1$ is negative, equilibrium in the current account requires long-run consumption of tradables to fall in order for the trade surplus to …nance the interest payment on the external debt. In equilibrium, a decline in tradables consumption requires a long-run depreciation of the real exchange rate. When $\overline{B}_1$ is positive, tradables consumption increases and the real exchange rate appreciates.

An interesting implication of our model is that consumption of the non-traded good always falls in the new steady state. The temporary expansion in the domestic sector in fact comes at the cost of a permanent squeeze of the production of nontradables. [6] The reason underlying this result is the wealth

[6] In analitical terms, this can be seen by replacing $\overline{y}_T$ with $\overline{c}_T$ in (9), using the long-run current account identity and di¤erentiating the resulting expression with respect to $\overline{B}_1$; obtaining

$$\frac{@\overline{y}_N}{@\overline{B}_1} = -\overline{B}_1$$

where $- = \frac{°(1 ¡ ½)}{2+(° ¡ 1)(1 ¡ ½)} \frac{\overline{y}^0_N}{\overline{c}_T}$:

e¤ect associated with the accumulation (decumulation) of net foreign assets. The wealth e¤ect acts on the level of desired consumption of the nontraded good as well as on the optimal supply of labor to the nontraded sector. The former e¤ect prevails when the intratemporal elasticity of substitution is high relative to the intertemporal elasticity.

3.2 Normative analysis

As the economy starts o¤ in a suboptimally low equilibrium, not too large an expansion of the nontraded sector certainly improves welfare in the short run. When monetary shocks a¤ect the country's net external assets, however, the welfare e¤ects of the long-run transfers should also be considered. [7]

The normative analysis of monetary policy will be carried out considering the lifetime utility of the representative agent

$$U = \frac{C^{1-\rho}}{1-\rho} - \frac{\kappa}{2} y_N^2 + \frac{1}{r}\left[\frac{\bar{C}^{1-\rho}}{1-\rho} - \frac{\kappa}{2}\bar{y}_N^2\right] \tag{11}$$

As already stressed, in the comparative static approach welfare analysis need not be restricted to small policy shocks, that is to local deviations from the original steady state. This is not to say, however, that monetary policy shocks are unbounded in this case. In response to a surprise monetary expansion, each agent must be willing to supply more output and this will occur only to the extent that the marginal revenue from producing the nontraded good o¤sets the marginal cost in terms of utility

[7] Although the long-term e¤ects are of the order of the interest rate relative to short-term e¤ects, this does not imply that they are empirically negligible (see the discussion on the transfer problem in chapter 10 of Obstfeld and Rogo¤ [1996]).

$$\frac{P_N}{P} \geq (1-\theta)\cdot y_N C^{\frac{1}{2}} \tag{12}$$

Condition (12) says that the real price of the nontraded good must be sufficiently high (not lower than the marginal rate of substitution between labor and leisure) so as to provide agents with the incentive to supply more output. In other words, monetary shocks cannot move the economy beyond the standard of perfect competition.[8]

The welfare impact of a permanent monetary expansion can be calculated by differentiating lifetime utility (11) with respect to M; obtaining

$$\frac{\partial U}{\partial M} = \beta\left\{\left(\frac{P_N}{P}-(1-\theta)\cdot\bar{y}_N C^{\frac{1}{2}}\right)+\frac{1}{2}\left(\frac{C}{\bar{C}}\right)^{\frac{1}{2}}\bar{B}_1\left[\frac{\bar{P}_T}{\bar{P}}\frac{1-\theta}{\theta}+\frac{1}{r}\left(\frac{\bar{P}_N}{\bar{P}}-(1-\theta)\cdot\bar{y}_N\bar{C}^{\frac{1}{2}}\right)\right]\right\} \tag{13}$$

As apparent from (13), the sign of marginal lifetime utility is ambiguous and the welfare impact of the monetary expansion indeterminate. Three points, however, are worth stressing.

First, in the range of admissible monetary shocks the sign of marginal lifetime utility depends on long-run welfare (the term in curly brackets). When net foreign assets are positive, agents can produce less (nontradables) and consume more (tradables). Long-run welfare improves if the real exchange rate appreciates sufficiently. [9] When external assets are negative, agents consume less of both domestic and foreign goods. Long-run welfare always

[8] Condition (12) is obtained by deriving lifetime utility with respect to short-run output of nontradables and using the optimal demand for nontradables.

[9] In equilibrium, the degree of real exchange rate appreciation increases with the accumulation of external assets.

deteriorates as the gain from less work e¤ort is smaller than the consumption loss when output is suboptimally low. The overall welfare impact of the money shock may eventually turn negative in this case. [10]

Second, when net external assets are zero the optimal monetary expansion - the one that drives (13) to zero - raises output to its e¢cient level. This does not hold in general. When net foreign assets are negative, the optimal monetary policy is necessarily less expansionary than required to lead output to the competitive standard. The monetary expansion that raises output to its e¢cient level, in fact, also leads to an 'excessive' depreciation of the real exchange rate, reducing the purchasing power of the country's income.[11] By the same token, when net foreign assets are positive, the optimal monetary policy leads to an 'insu¢cient' appreciation of the real exchange rate, that reduces long-run welfare. The optimal monetary policy may lead to the e¢cient output level and at the same time provide a net welfare gain in this case only if the short-run welfare gain is su¢ciently high.

Third, marginal lifetime utility reduces as the degree of openness of the economy, measured by the share of nontradables in consumption, $1 - \circ$; becomes larger. This implies that the more open the economy, the smaller the welfare gain from a surprise monetary expansion. This is a well-known result for a niche of empirical literature which documents a negative correlation between in‡ation performance and trade openness in a broad cross-section of countries (see Romer [1993] and Lane [1997]). What is new is that the welfare-based incentive to unleash a surprise monetary expansion may be

[10] By the envelop theorem, there exists a critical value of the external debt that triggers a net welfare loss.

[11] When $\overline{B}_1 < 0$; the monetary expansion that raises output to its e¢cient level would require a negative real exchange rate.

smaller in net debtor countries relative to net creditor countries, since the optimal monetary policy never leads to the e¢cient output level when net external assets are negative.

4 Empirics of the external account

Until recently, previous empirical study on the dynamics of the current account has mainly focussed on the transmission of real shocks in the international business cycle, consistently with the theoretical foundations of the intertemporal approach to the current account. [12] The new open economy literature, by relying on price stickiness, has naturally prompted the question of the empirical relevance of monetary shocks in explaining international macroeconomic interdependence. [13] This section addresses this task by investigating whether monetary shocks empirically matter in explaining current account ‡uctuations in the G7 countries.

4.1 The VAR model

Since the contributions in Eichenbaum and Evans [1995] and Clarida and Galì [1994], VAR methods have been largely used in the study of the monetary transmission mechanism in open economies. Following this approach, we propose the three-variable system $x = \left[\frac{Y}{Y^w}; \frac{CA}{Y}; \frac{i}{i^w} \right]$ where $Y=Y^w$ is the log

[12] See, among others, the contributions in Backus, Kehoe and Kydland [1994], Glick and Rogo¤ [1995] and Elliott and Fatàs [1996]. Obstfeld and Rogo¤ [1995a] survey this literature.

[13] In a growing number of contributions in the new open economy literature attempts have been made to quantify the theory's properties and compare them with properties of national economies. Calibration exercises have typically computed unconditional moments of real and nominal exchange rates. See, among others, Chari, Kehoe and Mc Grattan [1997], Betts and Devereux [1997] and Kollmann [1997].

ratio of domestic to world output, $CA=Y$ is the ratio of domestic current account to output and $i=i^w$ is the ratio of domestic to world nominal short-term interest rate. As in Galì [1992], both short- and long-run restrictions are used in order to identify the monetary shocks. [14] Lane [1999a] estimates a similar system, where the ratio of home to foreign price levels replaces the ratio of the interest rates. Innovations to the price level, however, can be more a¤ected by nominal factors other than monetary policy shocks relative to interest rate innovations. Furthermore, by using long-run restrictions he imposes complete monetary neutrality in the long run which is not consistent with models like the one we have presented. [15]

We assume that the trivariate system is represented by the vector moving average

$$x = C(L)u \tag{14}$$

where x is a covariance-stationary vector process, $u = \left[u^Y; u^{CA}; u^i\right]$ is a vector white noise process and $C(L) = [C_{ij}(L)]$ for $i; j = 1; :::; 3;$ is a matrix polynomial in the lag operator L.

The statistical model is exactly identi…ed as follows: innovations to the current account and the interest rate do not a¤ect output permanently while innovations to the nominal interest rate do not a¤ect output contemporaneously. The …rst two restrictions di¤erentiate aggregate demand from supply shocks, as proposed in Blanchard and Quah [1992]. The rationale is that

[14] Di¤erently from Gali [1992], however, our model does not distinguish between money demand and money supply shocks.

[15] Related contributions in the empirical literature include Lee and Chinn [1998] and Kumar and Prasad [1997], among others.

the contribution of demand shocks to the unit root of output is negligible, if any. The third restriction distinguishes between the real (absorption) and the monetary demand shock. The restriction can be rationalized as re‡ecting transmission lags in monetary policy. Consistently with our theoretical model, this identi…cation structure does not restrict the current account dynamics in the short as well as in the long run.

The VAR models are estimated in …rst di¤erences with eight lags for the G7 countries over 1974:1-1997:4. [16]

4.2 Results

We simulate a positive supply shock, a positive absorption shock and a negative monetary shock by perturbing the estimated system with a one standard deviation increase in the innovation of, respectively, output, the current account and the interest rate. The three graphs in Figures 2 to 8 show the resulting impulse response functions and describe the behavior of the current account after each shock in turn (dashed lines represent §2% standard deviation bands [17]).

The sign of the current account response to the monetary shock is different across the G7 countries, consistently with our theoretical model. In the wake of a negative monetary shock, the current account immediately goes into surplus in the UK, Italy, France and Canada. The surplus is quite

[16] All variables in the system are I(1) according to Aumented Dickey-Fuller tests. A Johansen cointegration test reveals no cointegration among the variables, hence the …rst-di¤erence speci…cation is appropriate. The order of the VAR has been chosen using the Akaike information criteria and a complete set of LR tests. These results are available upon request.

[17] Standard errors of the impulse response functions are calculated with the delta method.

persistent over 30 quarters. An unexpected monetary restriction at home by appreciating the real exchange rate makes domestic goods more expensive. In the theoretical model the external account goes into surplus when the degree of complentarity between foreign and domestic goods is su¢ciently high. In real data, other factors may drive the current account response, like investments for example. [18] In the US, Germany and Japan, the current account initially deteriorates and slowly starts to improve, although not always signi…cantly. This is reminiscent of a J curve e¤ect.

To illustrate the size of the contribution of monetary shocks in current account ‡uctuations, we present the forecast error variance decomposition for the current account generated by the estimated system (Figures 9 to 15).

At very short horizons, current account ‡uctuations are overwhelmingly driven by monetary shocks which explain more than half of the current account variance in all countries. In Japan and France almost the whole variance of the external account is accounted for by the monetary shock in the …rst few quarters. Real (demand or supply) shocks increasingly a¤ect the variance of the external account at longer horizons, generally after one year. These …ndings are consistent with models like the one we have presented where the current account represents the key transmission channel of monetary impulses.

Even at longer horizons (up to thirty quarters) the monetary shock significantly drives more than half of the current account variation in the European countries and Canada, while accounting for no more of 30 percent of total variance in Japan and the US. This result is not surprising considering the

[18] Bergin [1997] provides a general equilibrium model that details the intertemporal e¤ects at work in the consumption and investment decisions.

smaller degree of openness of the last two economies relative to Europe and Canada. The more closed the economy, in fact, the larger is the interest rate e¤ect of the monetary shock and the smaller its impact on the exchange rate and the current account.

5 Concluding remarks

This paper has analyzed the e¤ects of a surprise monetary expansion in a small open economy from a positive as well as a normative perspective. The paper has also provided an empirical investigation, based on structural VAR methods, aimed at assessing the driving forces in current account ‡uctuations across the G7 countries.

On theoretical grounds, the paper has shown that the temporary output boom fostered by the surprise monetary expansion comes at the cost of a permanent squeeze of the domestic sector. In general this a¤ects welfare ambiguously, although the external account helps interpreting the normative implications of the model. The welfare gain from a surprise monetary expansion, in fact, reduces as net foreign assets become smaller, eventually turning negative if the economy accumulates too large a debt towards the rest of the world.

The empirical part of the paper has provided evidence in favor of a key role of monetary shocks in current account ‡uctuations. This holds especially for the more open economies in the G7, namely the European countries and Canada.

6 Appendix A

The …rst order conditions from maximizing utility (3) subject to (4) and (7) are:

$$\frac{C_{Tt+1}}{C_{Tt}} = \left[\frac{P_t}{P_{Tt}}\frac{P_{Tt+1}}{P_{t+1}}\right]^{(\frac{1}{½}\,i\,1)} \tag{15}$$

$$C_{Tt} = \frac{P_{Nt}}{P_{Tt}}\frac{°}{1\,¡\,°}C_{Nt} \tag{16}$$

$$y_N(j)_t^{\frac{¹+1}{¹}} = \frac{(¹\,¡\,1)}{¹\cdot}C_{Nt}^{A\frac{1}{¹}}C_t^{\,i\,½}\frac{P_{Nt}}{P_t} \tag{17}$$

Log-linearizing the consumption Euler equation (15), the optimal demand (16) and the labor-leisure trade-o¤ (17) we, respectively, obtain (hatted variables denote the long-run percentage deviation from the initial steady state, variables with a tilde represent the short-run deviation)

$$\mathbf{b}_T\,¡\,\mathbf{e}_T = \left[\frac{1}{½}\,¡\,1\right](\mathbf{e}_T\,¡\,\mathbf{e}) - \left[\frac{1}{½}\,¡\,1\right](\mathbf{b}\,¡\,\mathbf{b}_T) \tag{18}$$

$$\mathbf{b}_N\,¡\,\mathbf{b}_T = ¡\,(\mathbf{b}_N\,¡\,\mathbf{b}_T) \tag{19}$$

$$\mathbf{b}_N = \frac{(1\,¡\,½)\,°}{(1+½)}(\mathbf{b}_N\,¡\,\mathbf{b}_T) \tag{20}$$

The current account identity in the long and the short run links the steady-state and the short-run consumption of the traded good as follows

$$\mathbf{b}_T = ¡\,r\mathbf{e}_T \tag{21}$$

When prices are sticky, domestic production is demand-determined implying

$$y_N = p_T + e_T \tag{22}$$

Finally, the short-run and the log-run equilibrium conditions in the money market imply

$$m = p_T + e_T \tag{23}$$

$$m = p_T + b_T \tag{24}$$

Equations (18)-(24) allow to solve the model, obtaining

$$\begin{aligned}
y_N &= M \\
e_T &= (1 - \theta) a_2 M \\
p_T &= a_3 M \\
b_N &= -a_4 M \\
b_T &= -\frac{(1-\theta)a_2}{r} M \\
p_N - p_T &= -(1-\theta) a_6 M \\
p_T &= a_7 M
\end{aligned}$$

where the positive constants $a_2; a_3; a_4; a_6; a_7$ are function of the model's parameters.

7 Appendix B

The source of the data is the International Monetary Fund's IFS CD-ROM, data are quarterly over 1974:1 1997:4. The rest of the world is proxied by the

G7 countries, excluding the domestic country. Rest of the world variables are constructed as GDP-weighted averages of national variables. The series for the current account is in nominal terms and seasonally adjusted. The real exchange rate is de…ned as the ratio of GDP de‡ators, adjusted by the nominal exchange rate. The interest rate is the call money rate for European countries and Japan, the overnight money market rate for Canada and the Federal Funds rate for the US.

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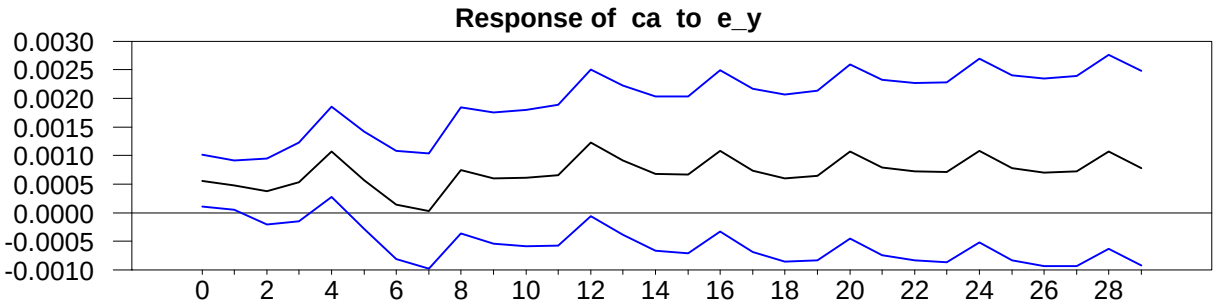
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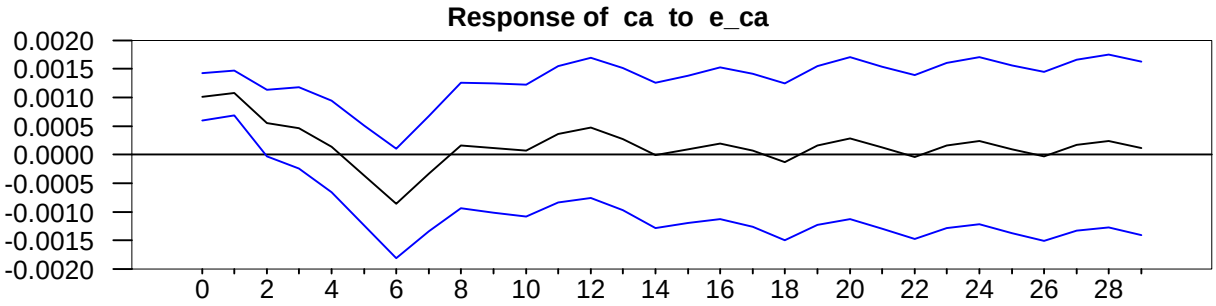
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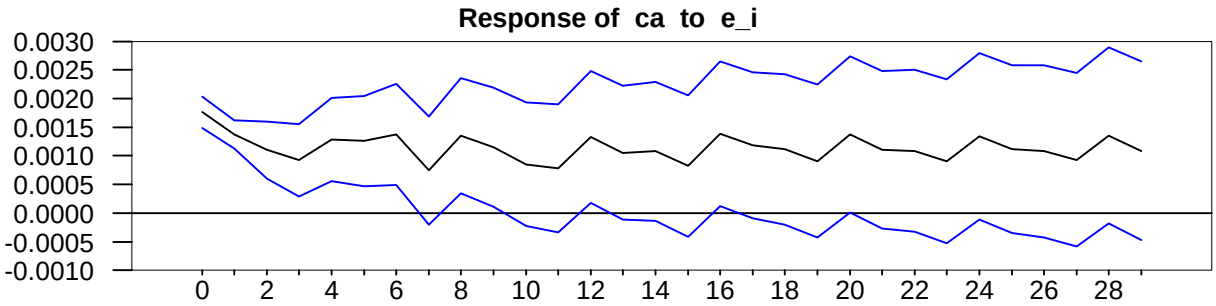
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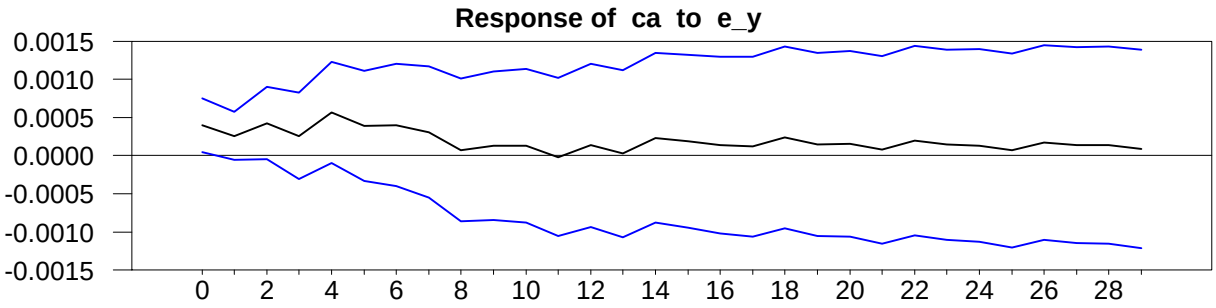
France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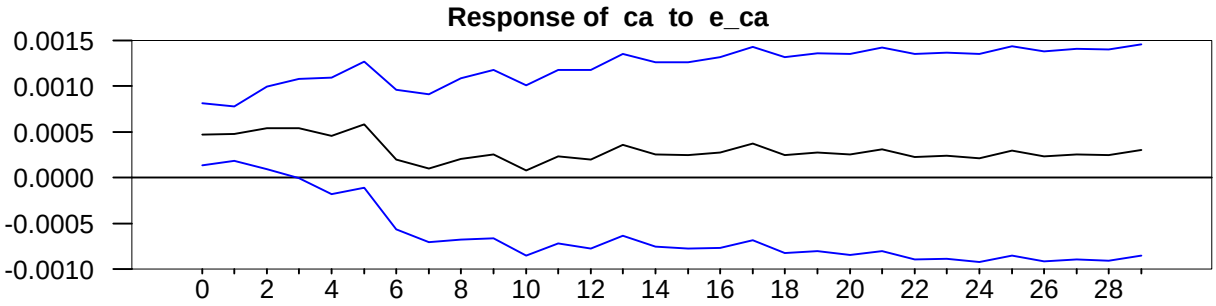
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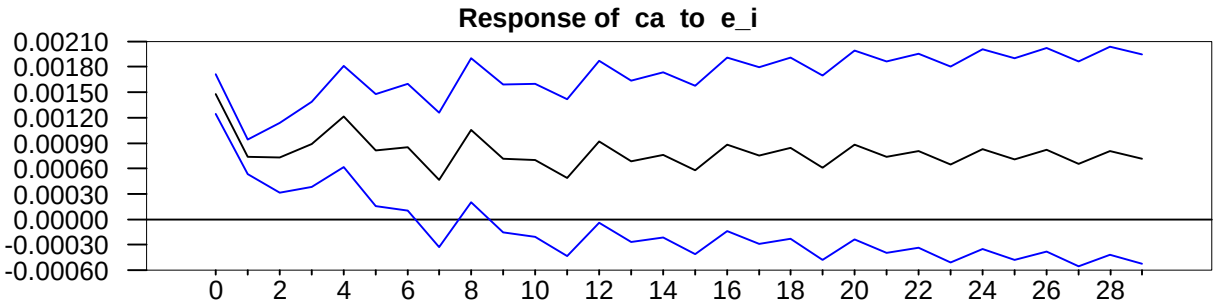
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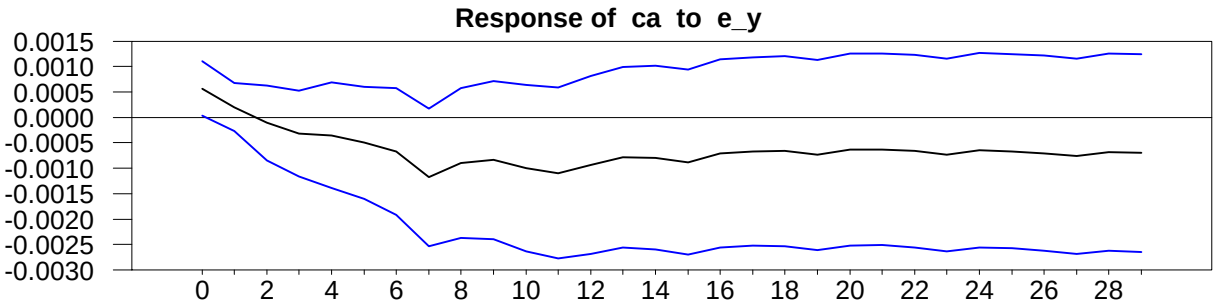
Germany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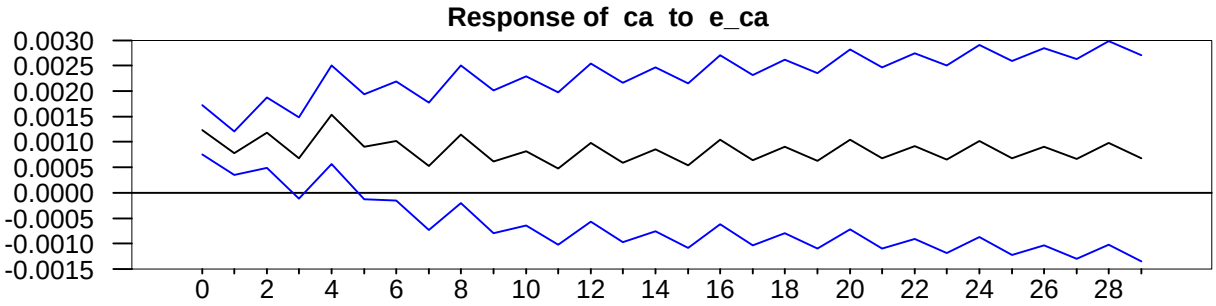
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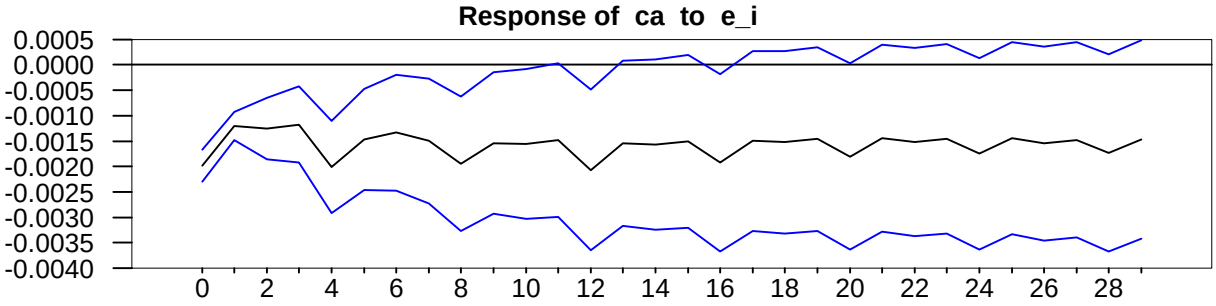
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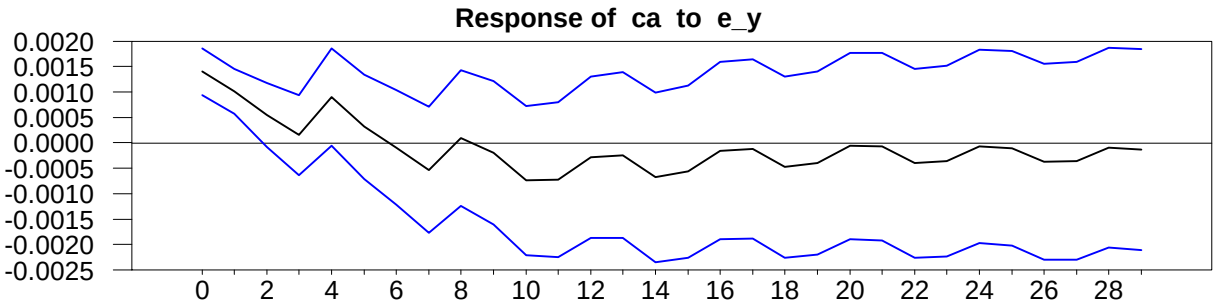
Italy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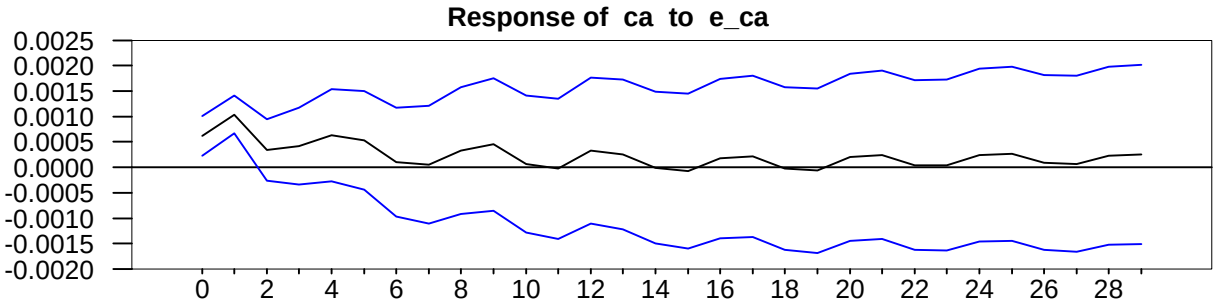
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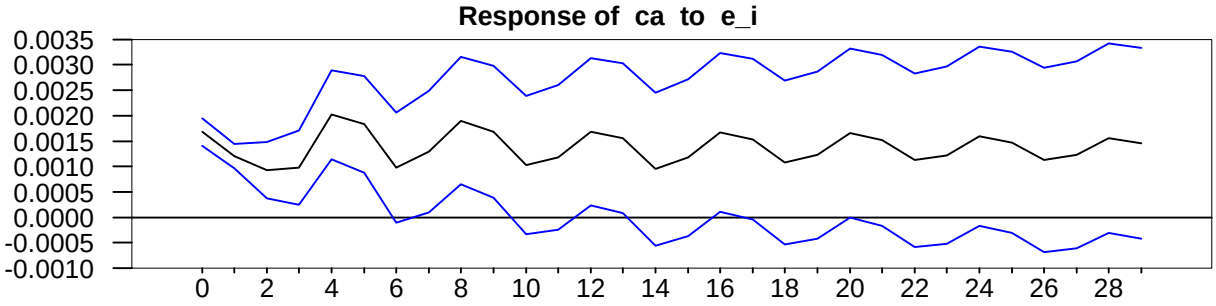
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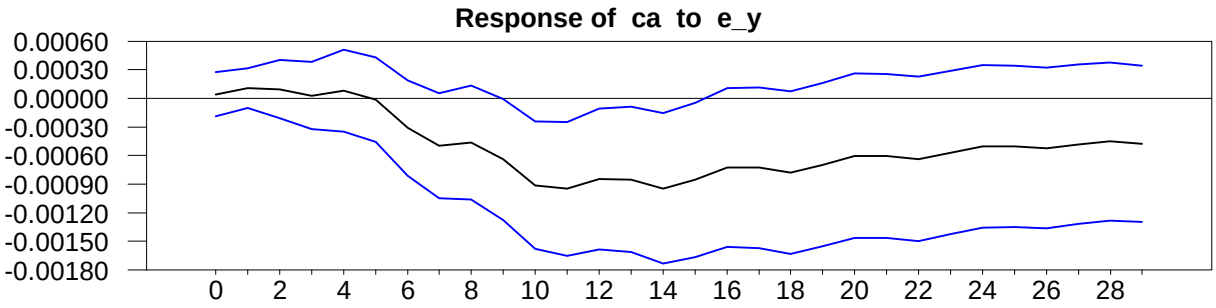
Japan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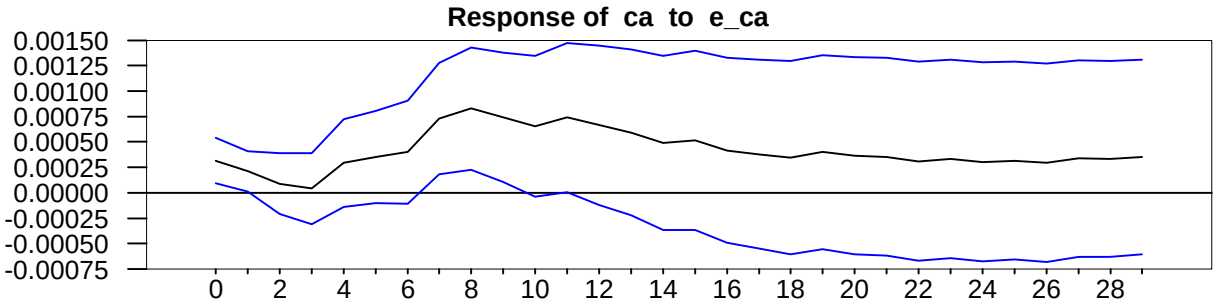
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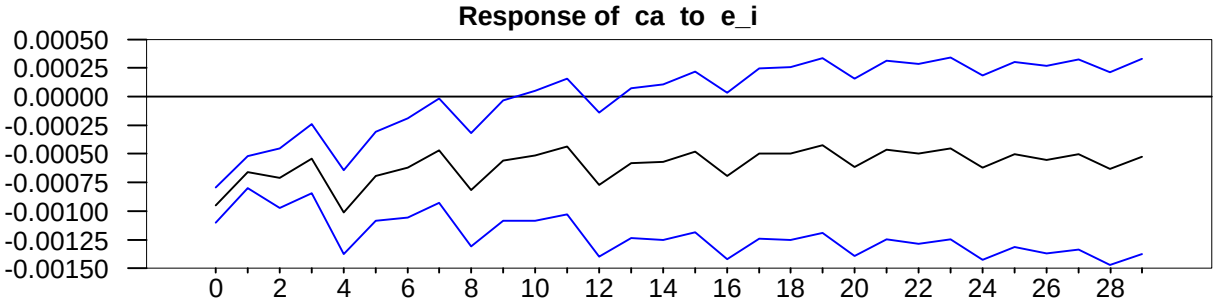
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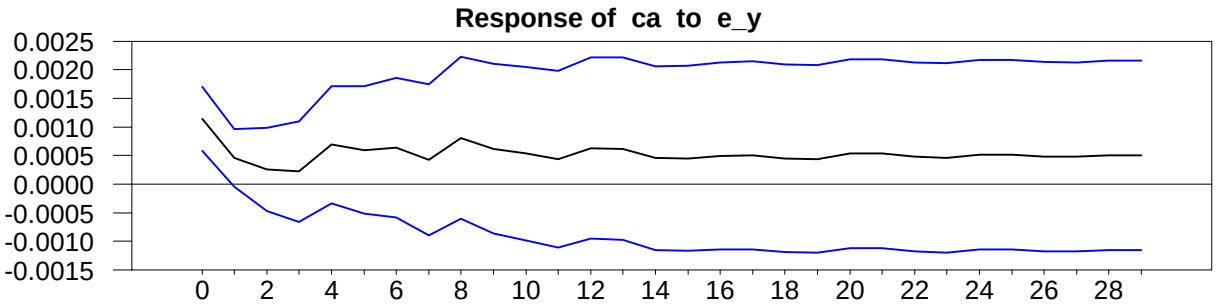
UK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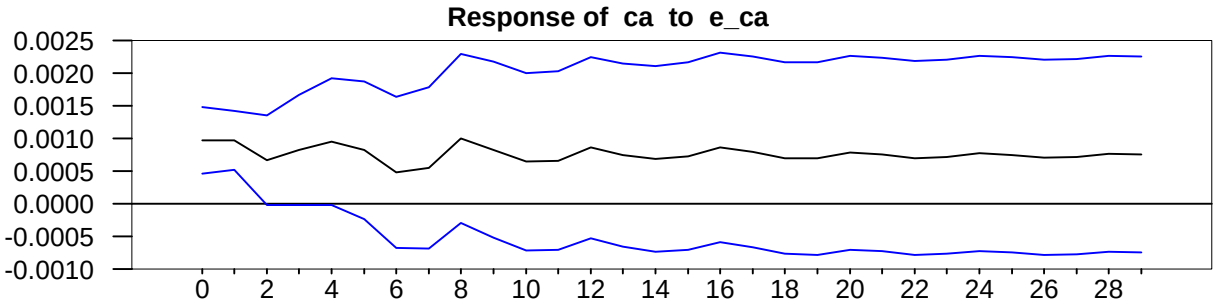
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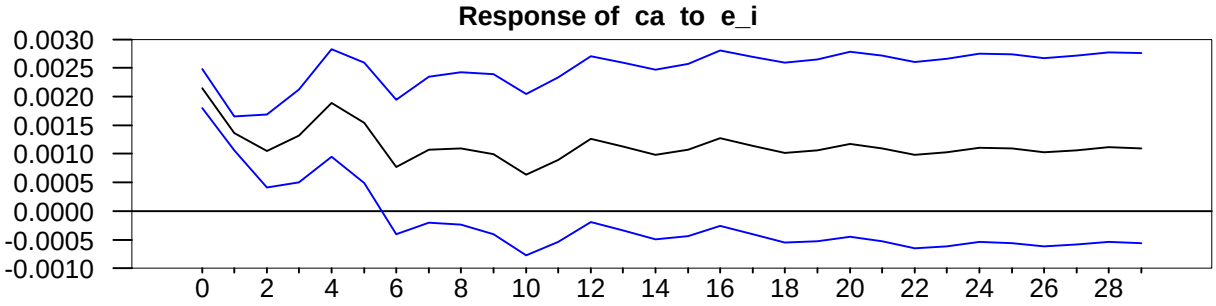
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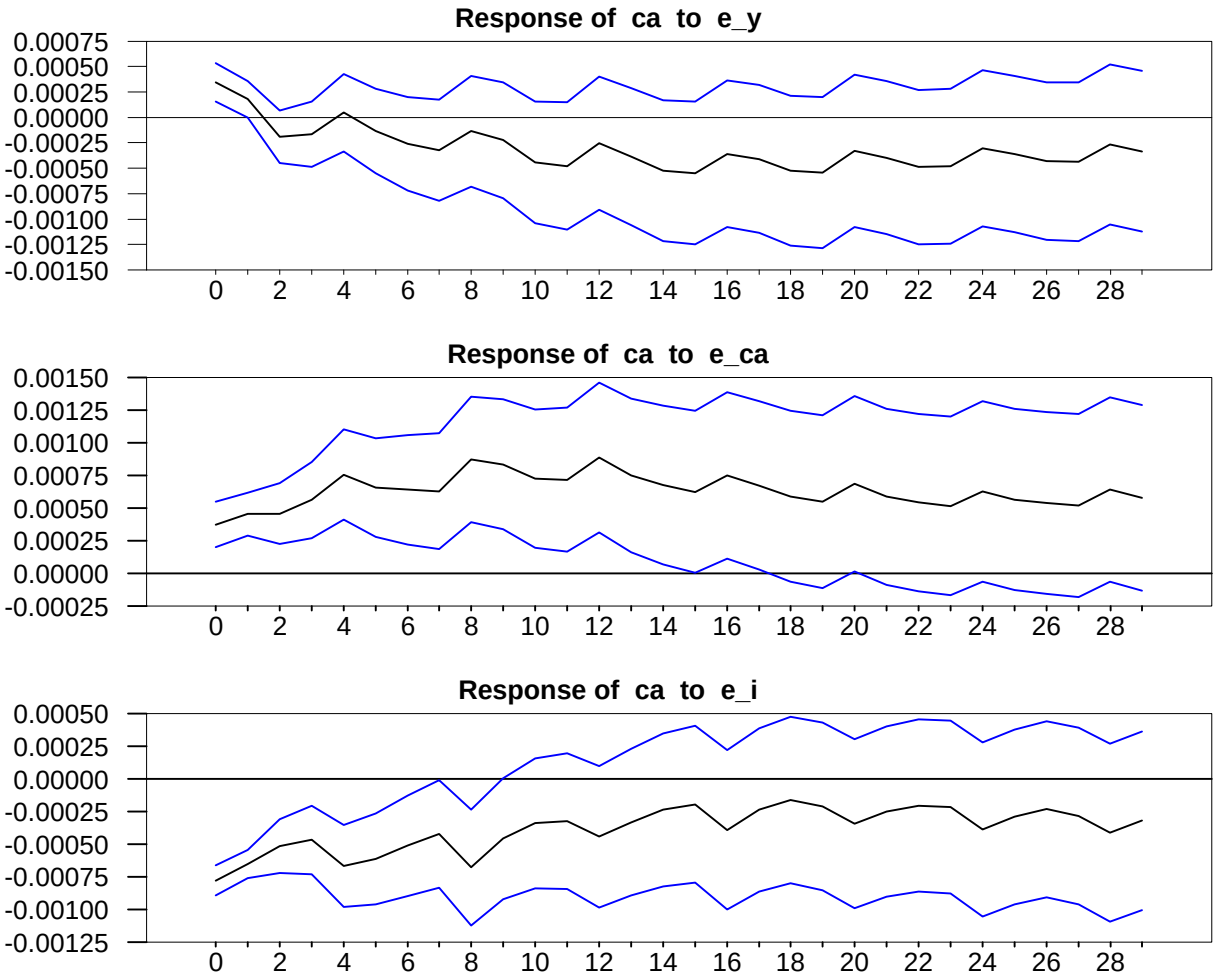
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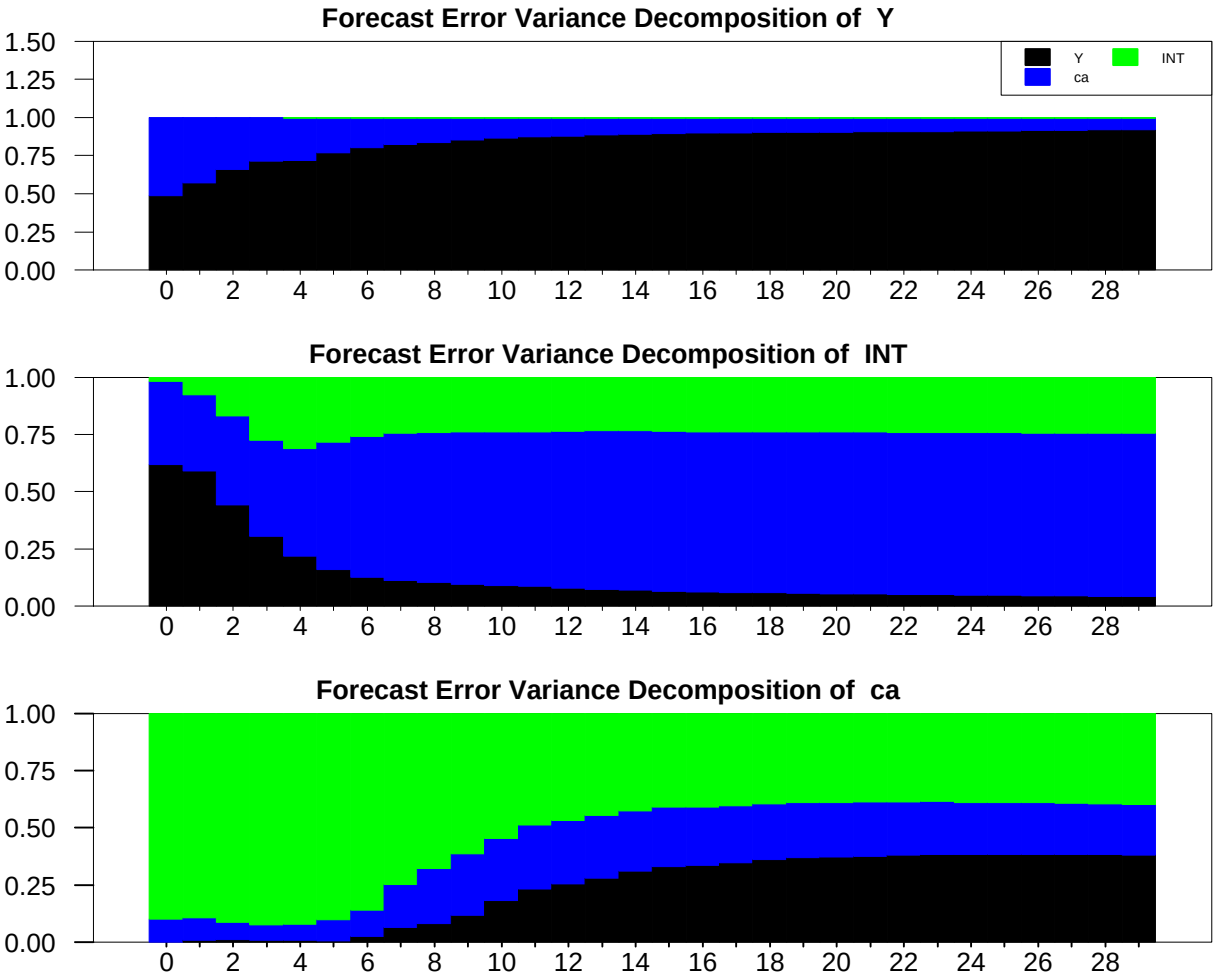
Japan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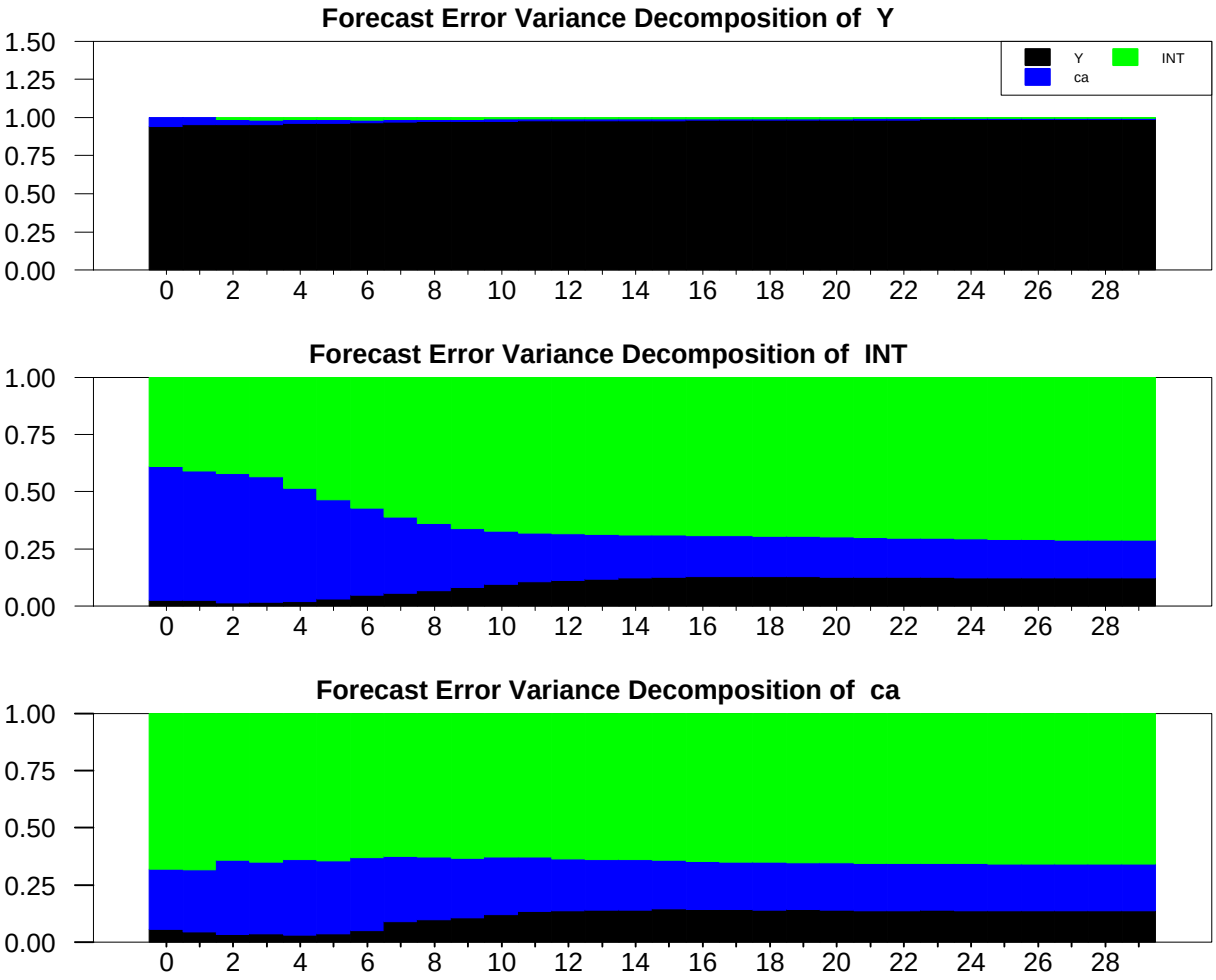
Germany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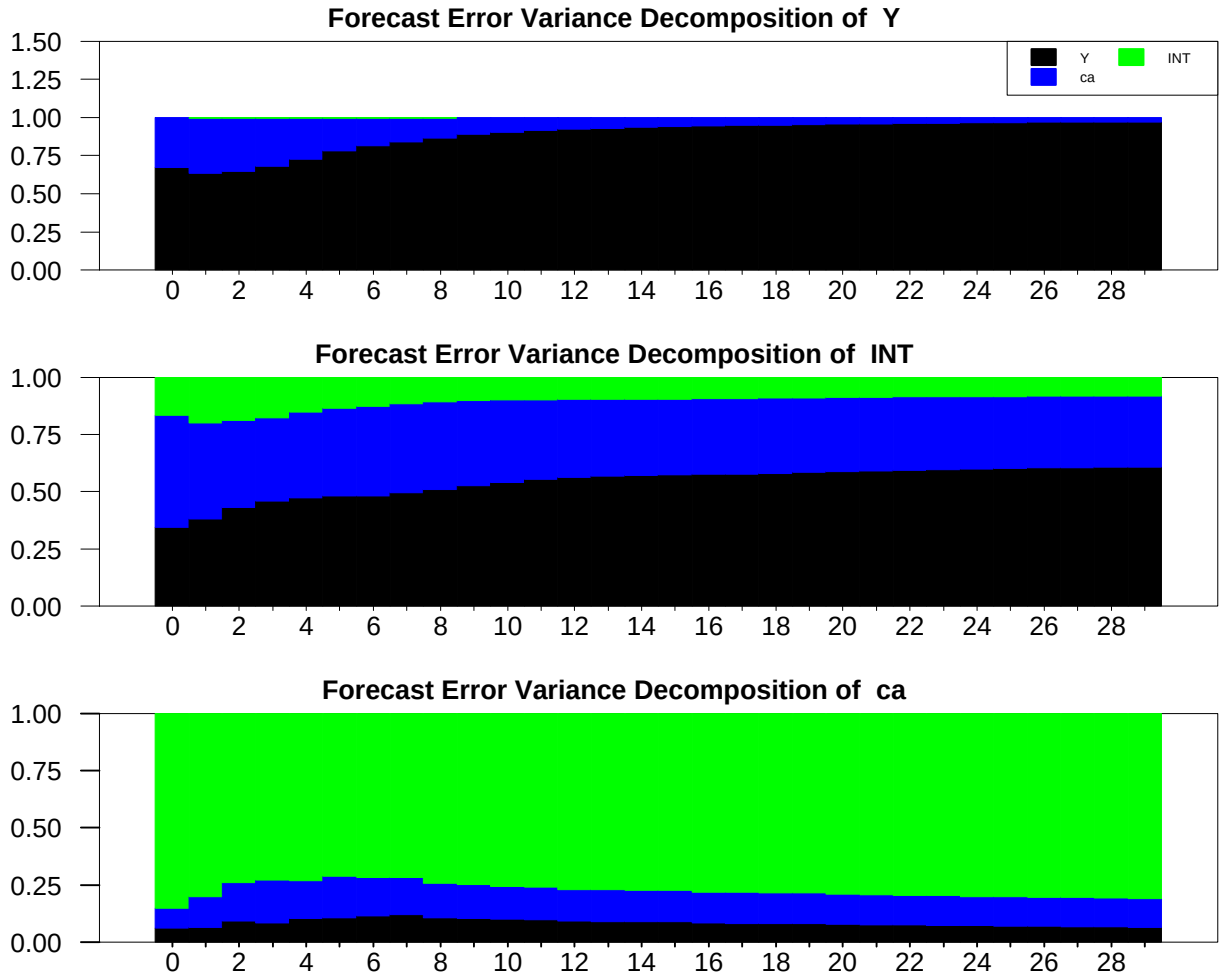
France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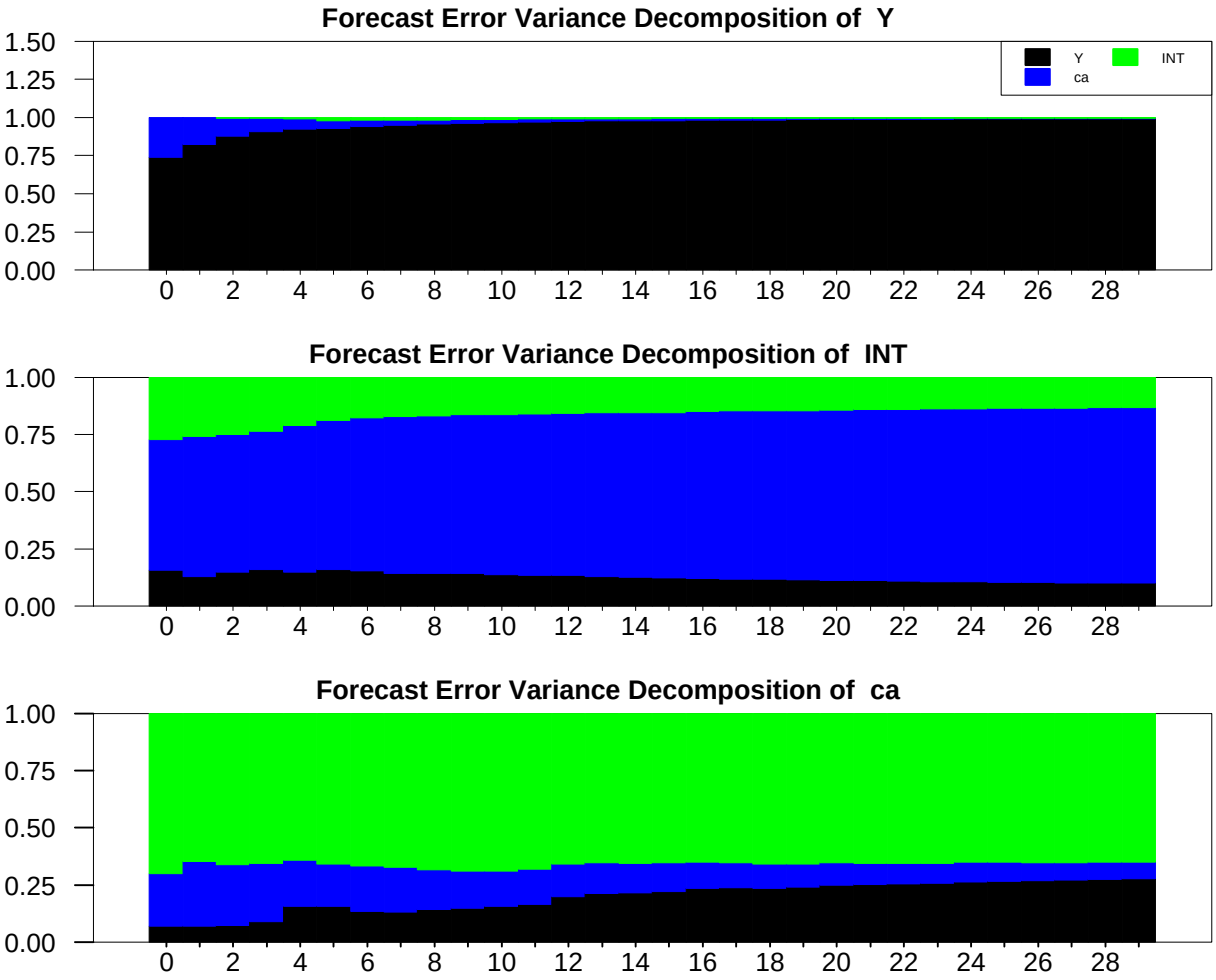
Canada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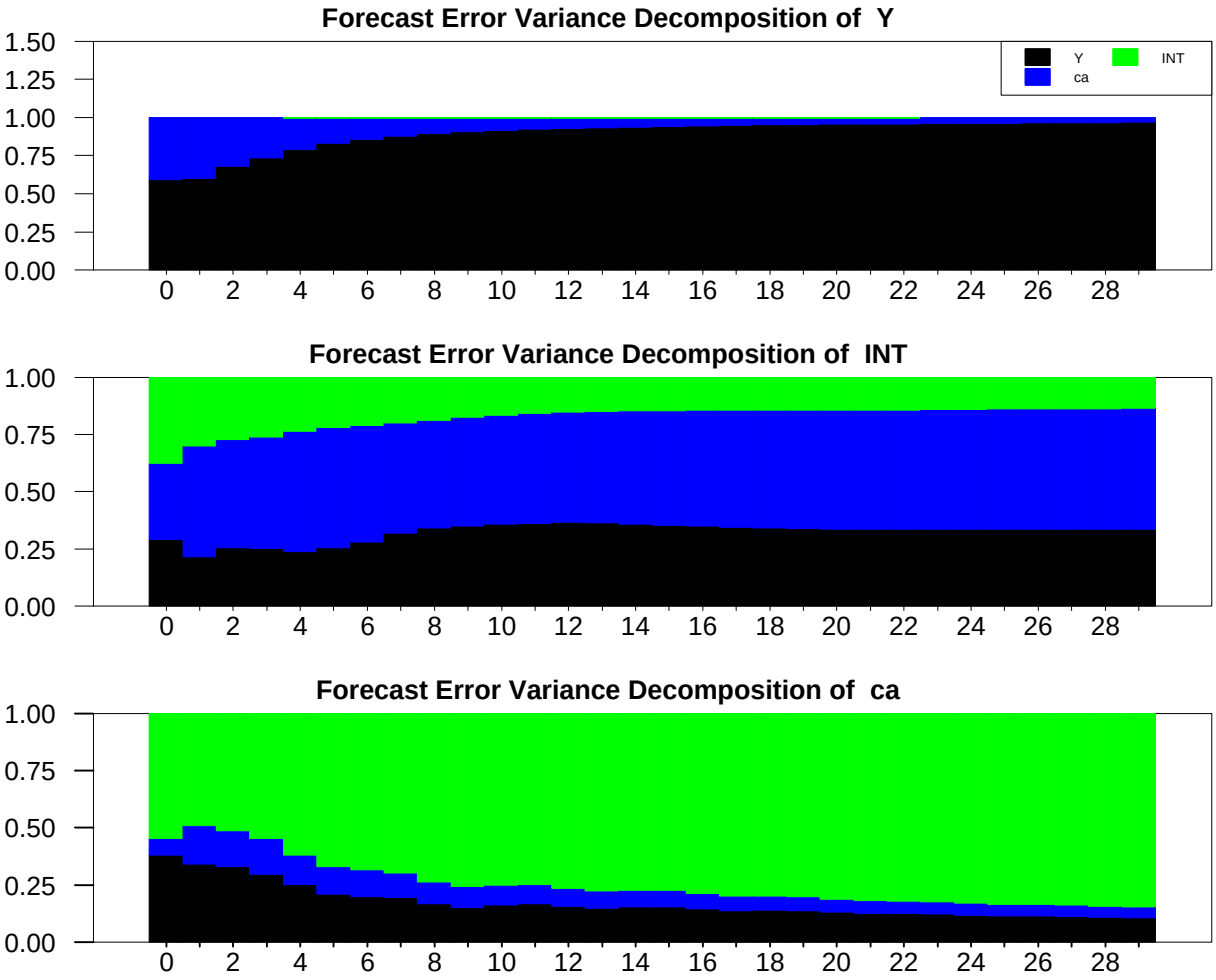
Italy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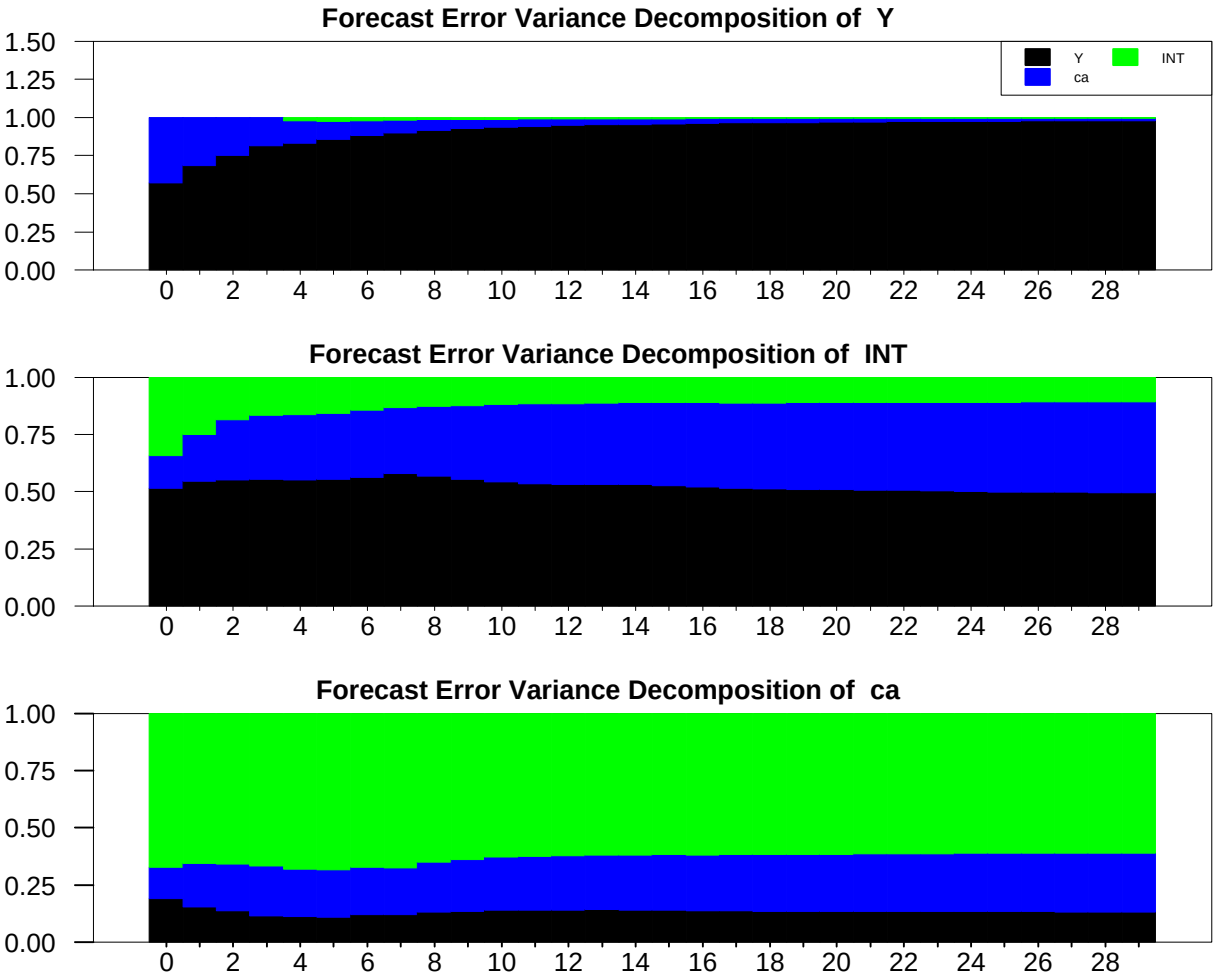
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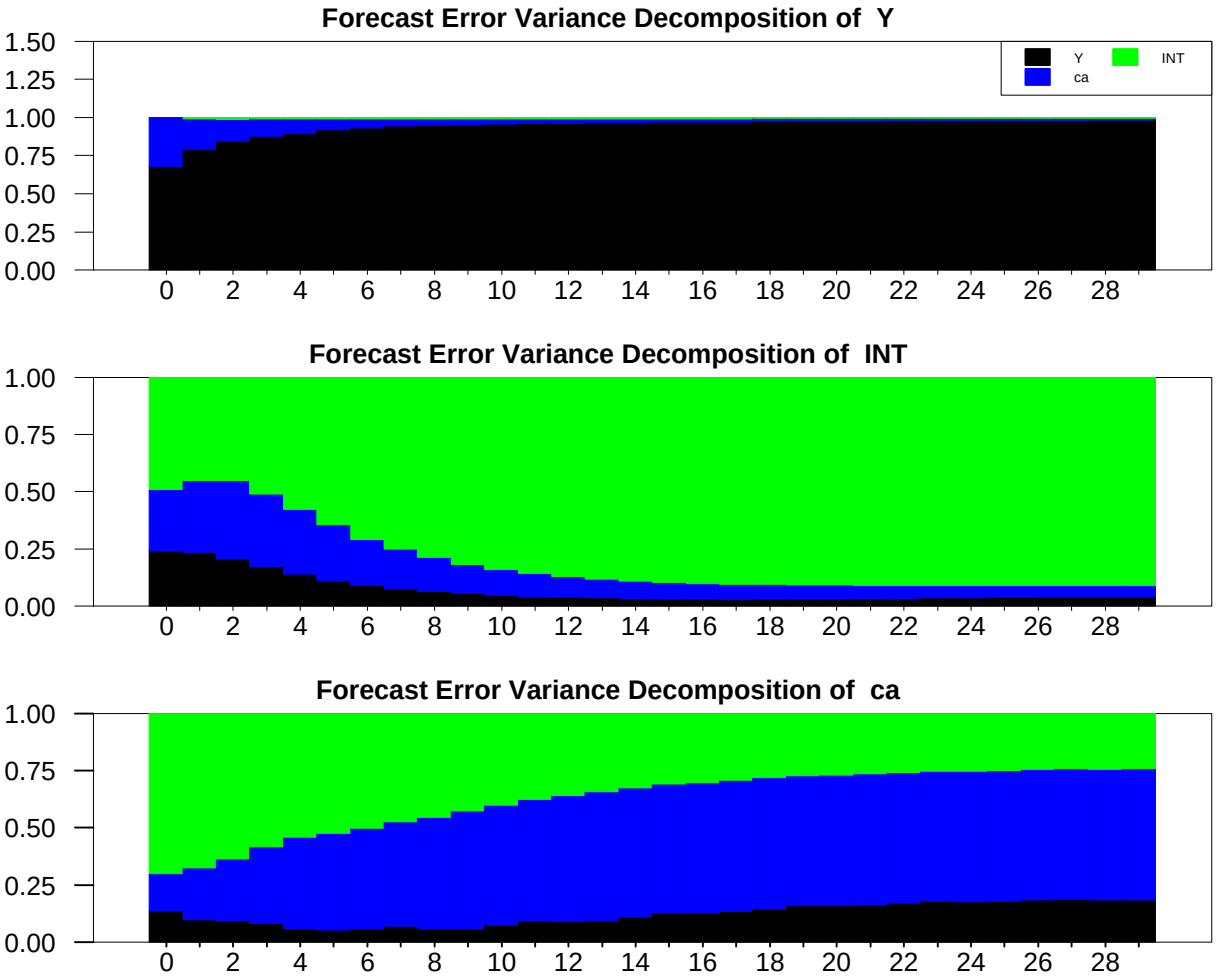
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