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Status and the Current Account in Canada

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Abstract

This paper investigates the role of wealth in the behavior of the current account. To do so, I include direct preferences for status in a small open economy real business cycle model. Status can take two forms: absolute status or relative status. Absolute status is nonhuman wealth in levels and relative status is the ratio of nonhuman wealth to the aggregate. The absolute status model can match several of the business cycle moments when status plays a large role. Also, total wealth and the current account have a positive relation in the long run. Finally, unanticipated innovations to income and total wealth produce current account surpluses.

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1 Introductio

tegration test follows. I use the

total wealth innovations are di¤erent when status plays a large role. Following an unanticipated shock to total wealth, the current account slowly returns to its steady state. The shock is more temporary and matches the data well.

Section 5 outlines the relative status model. Consistent with Bakshi and Chen (1996) and Fisher (1999, 2004, 2005), status is individual nonhuman wealth relative to the aggregate. This model fails to match the business cycle statistics. The cointegrating relation produced by the model is similar to those produced in both the baseline model and the absolute status model. It matches t

wealth, NHW, is

$$NHW_t = A_t + D_t^d;$$

where A is domestic and foreign assets net of liabilities and D^d is domestic holdings of government debt. Measuring nonhuman wealth is straightforward. Macklem consolidates assets and liabilities of di¤erent sectors in the economy to obtain the net worth of private-sector wealth.

The trade balance is real exports minus real imports. The current account is changes in the net foreign asset position. The real interest rate is the Canadian real interest rate. I construct the real interest rate using the following measure:

$$(1 + r_t) = \frac{1 + i_t^{can}}{1 + \pi_t^{can}};$$

where i^{can} is the Canadian 3-month treasury bill rate and π^{can} is the Canadian CPI in‡ation rate.

The business cycle moments are the volatilities, the correlations, and the persistences of several variables. In most cases, the statistics are computed using the logarithm of each variable. For the trade balance and the current account, the statistics are computed by dividing by output. The variables are Hodrick-Prescott …ltered using a smoothing parameter equal to 1600.

Table 1 lists the business cycle moments. The volatilities are the ratios of the standard deviations for consumption, labor, investment, nonhuman wealth, total wealth,

the trade balance over output, and the current account over output to the standard deviation of output: ¾c=¾y = 0:61; ¾I=¾y = 0:84; ¾x=¾y = 3:37; ¾nhw=¾y = 2:14; ¾tw=¾y = 1:85; ¾tb=¾y = 1:85; and ¾ca=¾y = 0:20: The correlations are the contemporaneous correlations of consumption, labor, investment, nonhuman wealth, total wealth, the trade balance over output, and the current account over output with output: ½(c; y) = 0:60; ½(I; y) = 0:86; ½(x; y) = 0:88; ½(nhw; y) = 0:59; ½(tw; y) = 0:27; ½(tb; y) = 0:10; and ½(ca; y) = 0:23: The persistences are the …rst autocorrelations of consumption, labor, output, investment, nonhuman wealth, total wealth, the trade balance over output, and the current account over output: ½(c′; c) = 0:81; ½(l′; l) = 0

requires the speci…cation of equation 2; I must identify the lag length of the di¤erenced terms, $¢Z_{t-i}$, the system dummy variables, $©D_t$, and the system drift term, $¹$. I choose a lag length of two for the di¤erenced terms. The series appear to possess a deterministic trend, so I include $¹$. Table 3 presents the results of the Johansen Procedure. It gives the eigenvalues, $¸$, and associated trace test statistics for the number of cointegrating relations. There is one cointegrating relation among the variables of Z_t:

$$CA = \quad 0:18Y \; + 687:48r + 0:000125TW \quad 0:29I: \tag{3}$$

Equation 3 is the long-run normalized current account equation. Table 4 lists the 90% con…dence intervals for the coe¢cient estimates in equation 3. Several signs on the estimates of the coe¢cients match the theoretical prior beliefs from equation 1. The sign on the real interest rate is positive and sign on investment is negative. The sign on output, however, is negative. Empirically, agents hold long-run de…cits following rises in permanent income. The sign on total wealth is positive. Higher total wealth produces a current account surplus; agents accumulate foreign assets to tilt consumption toward the future.

2.3 Innovation Analysis

The innovation analysis includes the responses of the current account to income (out-

baseline model does not include status.

3.1 The Economic Environment

The planner chooses consumption, employment, investment, and bond holdings to maximize the expected lifetime utility

$$\max E_0 \sum_{t=0}^{\infty} \beta^t U(C_{it}, 1 - N_{it}) \quad ; \tag{4}$$

subject to

$$C_{it} + I_{it} + B_{it+1} = Y_{it} + (1 + r_t) B_{it}; \tag{5}$$

$$r_t = q_t - \delta + \theta B_t / Y_t; \tag{6}$$

$$Y_{it} = K_{it}^{\alpha} (\gamma_t N_{it})^{1-\alpha}; \tag{7}$$

and

$$K_{it+1} = (1 - \delta) K_{it} + \left(\frac{K_{it}}{I_{it}}\right)^{\mu} I_{it}; \tag{8}$$

where E is tis + i ÃW±0.0210 /F4 12 (5 6Tf -0.158

Equa

technology shock, and equation 10 is the process of the transitory world interest rate shock.

3.2 Optimality and Stationarity Conditions

Along the balanced growth path, variables except N_i and r grow at rate $Z_t = i_t = i_{t-1}$. All stationary variables are represented as X_{it}, where $X_{it} = X_{it} = i_t$ for $X_{it} = C_{it}; I_{it}; Y_{it}$. The stationary transformations for the state variables, B_i and K_i, are $B_{it+1} = i_t$ and $K_{it+1} = i_t$. I focus on a symmetric equilibrium, where $X_{it} = X_t$, $N_{it} = N_t$, $B_{it} = B_t$, and $K_{it} = K_t$: The planner's problem yields the following stat rnr g , T52f 12= f ,if N 7kno1597 c (f) Tj -110 6.75 TD144 Tc (,) Tj 0597 w 1 J 1 j TD

too low a correlation with output. Consumption, output, and investment are not persistent enough. The model predicts negative persistence for the current account when it should be positive. The model correctly predicts the volatility and persistence of the trade balance.

The baseline model produces too small a volatility for nonhuman wealth and total wealth, too small a correlation for nonhuman wealth, and both nonhuman wealth and total wealth have negative persistence. The model correctly predicts the correlation for total wealth.

3.5 Results: Cointegration Analysis

I extract the long-run series to investigate the cointegrating relations in the unrestricted baseline VAR. I compare the results of the baseline model to those produced by the data. The series for the current account, output, the real interest rate, and investment are the nonstationary series extracted from the baseline model. To get the total wealth series, I construct the human wealth variable as in the data, but using the model. Nonhuman wealth is the asset holdings, which is foreign assets plus capital. Total wealth is simply the sum of human wealth and nonhuman wealth.[4]

I compare the cointegration results produced by the baseline model to the cointegration results produced by the data. Table 5 lists the results of the Johansen Procedure. The trace test indicates that the model produces 3 cointegrating rela-

[4] The logarithm of the series

tions. I show only the …rst cointegrating vector, as the data predicts one cointegrating relation. The cointegrating relation is:

$$CA = \quad 0{:}14Y \quad 4{:}25r + 0{:}00048TW + 0{:}52I: \tag{14}$$

Equation 14 is the long-run normalized current account equation produced by the baseline model. The signs on income and total wealth match those in equation 3. A country with higher income can sustain current account de…cits in the long run. An increase in total wealth produces a long-run current account surplus; agents save their new wealth and buy foreign bonds. Table 4 shows that all estimates of the coe¢cients in equation 14, except that on income, fall outside their 90% con…dence intervals.

3.6 Results: Innovation Analysis

I pe

and permanent current account surplus.

Comparing to Figure 1, an income shock produces a current account surplus in the model and in the data. The income shock produced by the model is temporary and the current account returns to its steady state, but the data suggests that the current account rises steadily to a higher steady state. A total wealth shock produces a current account surplus in the model and in the data. The total wealth shock produced by the model is permanent and the current account rises to a higher steady state, but the data suggests that the shock is temporary and the current account falls back to its original steady state.

4 Absolute Status

This section shows a model with direct preferences for absolute status. Status is nonhuman wealth in levels.

4.1 The Eco

where S

18 is the Euler equation for the bond market. Equation 19 is the Euler equation for capital. Marginal utility of status enters equations 18 and 19, and I expect status to a¤ect holdings of foreign assets and the stock of capital.

4.3 Calibration and Numerical Method

The parameters ®, ±, r, q, and ' are set as in the baseline model. I set Ã = 2:003 to ensure that hours worked forms 30 percent of the time endowment. The domestic rate r, and world rate q, imply ¯ = 0:992. I set µ = 0:156 so that the standard deviation of investment to output is 3:37. Additionally, the parameters for the elasticity of substitution between consumption and status, ´, and the status share, °, must be set. The relationship between consumption and status changes for di¤erent values of ´ and °. There are three relevant values for the elasticity of substitution between consumption and status: ´ = 1, ´ 0, and ´ . Preferences are Cobb-Douglas when ´ = 1. Consumption and status approach perfect compliments as ´ 0. Consumption and status approach perfect substitutes as ´ . As a benchmark, the status1 model sets ´ = 0:9999 and e 3.T99 6 0 TD /F4 12 Tf -0.264 Tc (:

tdt 9u1CTD6.0.246.278c (Tc) (5) 8TjTD-0.228-0Tc (s)(1)(s

The statistics are as in the baseline model. The current account is too volatile, while labor is not volatile enough. The trade balance has too low a correlation with output. Consumption, output, and investment are not persistent enough. The model predicts negative persistence for the current account when it should be positive. The status1 model correctly predicts the volatility and the persistence of the trade balance. The volatility of nonhuman wealth and total wealth are lowered further, the correlation for nonhuman wealth is too low, and both nonhuman wealth and total wealth are negatively autocorrelated. The status1 model correctly predicts the correlation for total wealth.

To further understand the model, I present the business cycle statistics for di¤erent values of the status parameters. Table 6 lists the business cycle results from the sensitivity analysis. The status2 model sets ´ = 0:9999 and ° = 0:75, so status has a larger share. This further lowers the volatilities of nonhuman wealth and total wealth. The status3 model sets ´ = 0:1 and ° = 0:95, so consumption and status are compliments. The business cycle moments produced by this model are similar to those from the status1 model. The status4 model sets ´ = 0:1 and ° = 0:75, so consumption and status are compliments and status has a larger share. Again, the business cycle moments are similar to those from the status1 model.

The status5 model sets ´ = 5 and ° = 0:95, so consumption and status are strong substitutes.[5] This model gives a large role to status in consumer preferences.

[5] I do not present results for high η and low γ because steady state consumption falls to zero. Agents choose to sacri…ce all consumption for wealth.

The model closely matches the volatility of labor, matches the correlation of the trade balance, closely matches the persistence of consumption, and closely matches the persistence of the current account. The volatilities of nonhuman wealth and total wealth are very low in the status5 model; status plays a large role in consumer preferences and consumers are risk-averse in their wealth holdings. Adding two state variables, B and K, to agent preferences does change the business cycle moments.

4.5 Results

con…dence intervals. The absolute status model does not have an advantage over the baseline model in the cointegration analysis.

4.6 Results: Innovation Analysis

I perform innovation analysis on the unrestricted VAR in the absolute status model. The ordering of the VAR is: TW, r, CA, I, Y.

Figure 3 shows the responses of the current account to income and total wealth innovations in the status1 model. The upper panel shows the response of the current account to an unanticipated positive income shock. The income shock produces a temporary current account surplus. The current account quickly returns to its original steady state. The lower panel shows the response of the current account to an unanticipated positive total wealth shock. The total wealth shock produces an immediate and permanent current account surplus. Comparing to Figure 1, the income shock is too temporary and the total wealth shock is too permanent.

Figure 4 shows the responses of the current account to income and total wealth innovations in the status5 model. The upper panel shows the response of the current account to an unanticipated positive income shock. The shock induces a current account surplus, and the current account rises to a new steady state. The lower panel shows the response of the current account to an unanticipated positive total wealth shock. The shock induces a current account surplus, and the current account falls back to its steady state. Comparing to Figure 1, the current account responses

produced by the status5 model match the data well. The income shock produces a permanent response and the total wealth shock produces a temporary response.

5 Relative Status

This section shows a model with relative status. The model includes direct preferences for relative nonhuman wealth.

5.1 The Economic Environment

The relative status model is similar to the absolute status model, but it includes direct preferences for relative wealth. The planner's problem is:

$$\max E_0 \sum_{t=0}^{\infty} {}^{-t} U(C_{it}; S_{it}; 1 \quad N_{it}) \quad ; \tag{22}$$

subject to

$$S_{it} = \frac{B_{it} + K_{it}}{B_t + K_t}: \tag{23}$$

The momentary utility function is:

$$U(C_{it}; S_{it}; 1 \quad N_{it}) = \ln \quad °C^{\acute{}-1}$$

I premultiply status by the level of technology.[6] Equation 23 de…nes status. It is the ratio of individual nonhuman wealth to the aggregate wealth index, B + K.

5.2 Optimality and Stationarity Conditions

Status is bounded and does not grow with technology, so $S_{it} = S_{it}$. The new stationary …rst-order conditions are:

$$1 = \bar{}E_t \quad (1 + r_{t+1}) \frac{U_{C_{t+1}}}{U_{C_t} Z_{t+1}} + \frac{U_{S_{t+1}}}{U_{C_t} Z_{t+1}} \frac{1}{B_{t+1} + K_{t+1}} \tag{24}$$

$$\frac{1}{1 \quad \mu} \quad \frac{I_t Z_t}{K_t}^{\mu} = \bar{}E_t \quad \circledR \frac{Y_{t+1} Z_{t+1}}{K_{t+1}} + ¢_{\mu} \quad \frac{U_{C_{t+1}}}{U_{C_t} Z_{t+1}} + \frac{U_{S_{t+1}}}{U_{C_t} Z_{t+1}} \frac{1}{B_{t+1} + K_{t+1}} \quad ; \tag{25}$$

where $¢_{\mu} = \frac{(1-\pm)+\mu(K_{t+1}=(I_{t+1}Z_{t+1}))^{\mu-1}}{(1-\mu)(K_{t+1}=(I_{t+1}Z_{t+1}))^{\mu}}$. The new term, $1= \ B_{t+1} + K_{t+1} \ $, in equations 24 and 25 should a¤ect the optimal decision paths for bond holdings and capital.

5.3 Calibration and Numerical Method

The parameters ®, ±, r, q, $\bar{}$, ', Ã, and µ are set as in the status1 model. The status6 model is the benchmark relative status model. I set ´ = 0:9999 and ° = 0:95, so preferences are Cobb-Douglas and status has a small share.

[6] See Hercowitz and Sampson (1991).

5.4 Res

I test for cointegrating relations in the relative status model. Table 5 lists the results from the Johansen Procedure for the status6 model. It indicates that there are up to 3 cointegrating relations, but I focus on the …rst relation. The cointegrating relation is:

$$CA = \quad 0{:}19Y \quad 9{:}44r + 0{:}0016TW + 0{:}62I: \tag{26}$$

Equation 26 is the long-run normalized current account equation produced by the status6 model. I compare equation 26 to equation 3. Equation 26 matches the signs on income and total wealth. The estimate of the coe¢ cient on total wealth falls far outside the 90% con…dence interval. Both the absolute and the relative status models produce estimates on output that fall inside the 90% con…dence interval. The relative status model has no advantage over the baseline model in the cointegratio 0 tD tui Tc (

steady state. Agents have motive to hold current account surpluses to increase their status. Agents also face convex installation costs to investment, which gives them motive to hold current account de…cits. The lower panel shows the response of the current account to an unanticipated positive total wealth shock. The shock produces a permanent current account surplus.

Comparing to …gure 1, the model produces current account nts th at do 0mTD-0.

ments.

I extend the standard business cycle analysis and extract the long-run nonstationary series from the models. I test for a cointegrating relation among the variables of a multivariate VAR. The models with status produce a long-run cointegrating relation similar to that in the data. It correctly matches the signs on income and total wealth. The estimate on total wealth, however, falls outside the 90% con…dence interval from the data. I perform innovation analysis on the current account. The absolute status model closely matches the response of the current account to an unanticipated total wealth innovation. The shock is more transitory when status plays a large role in consumer preferences.

References

[1] Abel, Andrew B., "Asset prices under habit formation and catching up with the jones," American Economic Review, 1990, 80, 38-42.

[2] Bakshi, Gurip S. and Chen, Zhiwu, "The spirit of capitalism and stock-market prices," American Economic Review, 1996, 86, 133-157.

[3] Baxter, Marianne and Crucini, Mario, "Explaining saving–investment correlations," American Economic Review, 1993, 83, 416-436.

[4] Boileau, Martin and Brown, Rebecca, "The spirit of capitalism, asset returns, and the business cycle," University of Colorado Working Paper, 2004, 1-28.

[5] Brown, Rebecca Wilder, "Some macroeconomic implications of wealth," University of Colorado thesis, 2

[13] Fisher, W., "Status preference, wealth, and dynamics in the open economy," Institute for Advanced Studies, Economics Series, 1999, 1-25.

[14] Futagami, Koichi and Shibata, Akihisa, "Keeping one step ahead of the joneses: tatus, the distribution of wealth, and long run growth," Journal of Economic Behavior & Organization, 1998, 36, 109-126.

[15] Galí, Jordi, "Keeping up with the loneses: Consumption externalities, portfolio choice, and asset prices," Journal of Money, Credit, and Banking, 1994, 26, 1-8.

[16] Gong, Liutang and Zou, Heng-fu, "Direct preferences for wealth, the risk premium puzzle, growth, and policy e¤ectiveness," Journal of Economic Dynamics & Control, 2002, 26, 247-270.

[17] Hercowitz, Zvi and Sampson, Michael, "Output growth, the real wage, and employment ‡uctuations," American Economic Review, 1991, 81, 1215-1237.

[18] Johansen, Soren and Juselius, Katarina, "Maximum likelihood estimation and inference on cointegration - with applications to the demand for money," Oxford

[21] King, Robert G., Plosser, Charles I., and Rebelo, Sergio T., "Production, growth and business cycles: technical appendix," Mimeo, 1987.

[22] King, Robert G., Plosser, Charles I., Rebelo, Sergio T., "Production, growth and business cycles: I. the basic neoclassical model," Journal of Monetary Economics, 1988, 21, 195-232.

[23] Letendre, Marc-Andr¶, "Capital utilization and habit-formation in a small-open economy model," Canadian Journal of Economcis, 2004, 37, 721-741.

[24] Macklem, Ti¤ R., "Wealth, disposable income and consumption: some evidence for canada," Technical Report 71, Bank of Canada, 1994, 1-77.

[25] Macklem, Ti¤ R., "Aggregate wealth in canada," Canadian Journal of Economics, 1997, 152-168.

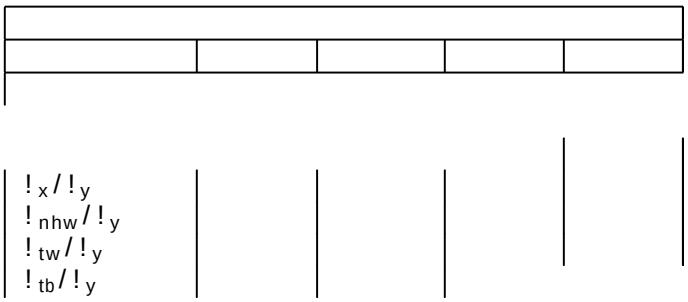
[26] Mendoza, Enrique G., "Real business cycles in a small open economy," American Economic Review, 81, 1991, 797-818.

[27] Nason, James M. and Rogers, John H., "The present-value model of the current account has been rejected: round up the usual suspect," Board of Governers of the Federal Reserve System (U.S.), International Finance Discussion Papers, 2003, 760, 1-44.

[28] Schmitt-Grohé, Stephanie and Uribe, Martín, "Closing small open economies," Journal of International Economics, 2003, 61, 163-185.

[29] Taylor, Alan M, "A century of current account dynamics," Journal of International Money and Finance, 2002, 725-748.

[30] Ventura, Jaume, "Towards a theory of the current account," conference at the Nitze School of Advanced International Studies, 2002.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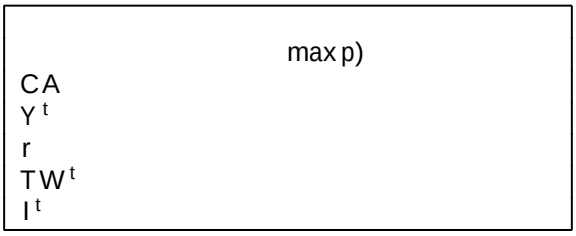

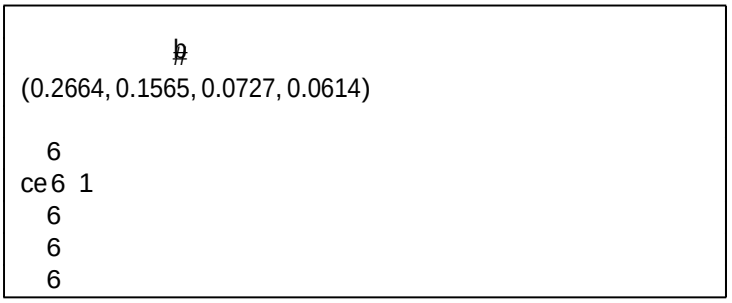

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CA	[1, 1]
Y	[−0.26, −0.11]
r^w	[387.76, 987.200]
TW	[0.0000076, 0.00017]
I	[−0.34, −0.0244]

fi ffi

Baseline	Status1	Status5	Status6
6			
6			
6			
6			
6			

Baseline Model

(0.6499, 0.4234, 0.2203, 0.1151, 0.0283)

Status1 Model

(0.6521, 0.4203, 0.2403, 0.1212, 0.0265)

Status5 Model

(0.7064, 0.4104, 0.2334, 0.1266, 0.0283)

Status6 Model

(0.6760, 0.4173, 0.2218, 0.1132, 0.0277)

$!_c/!_y$ $!_l/!_y$ $!_x/!_y$ $!_{nhw}/!_y$ $!_{tw}/!_y$ $!_{tb}/!_y$ $!_{ca}/!_y$							
$"(c,y)$ $"(l,y)$ $"(x,y)$ $"(nhw,y)$ $"(tw,y)$ $"(tb,y)$ $"(ca,y)$							
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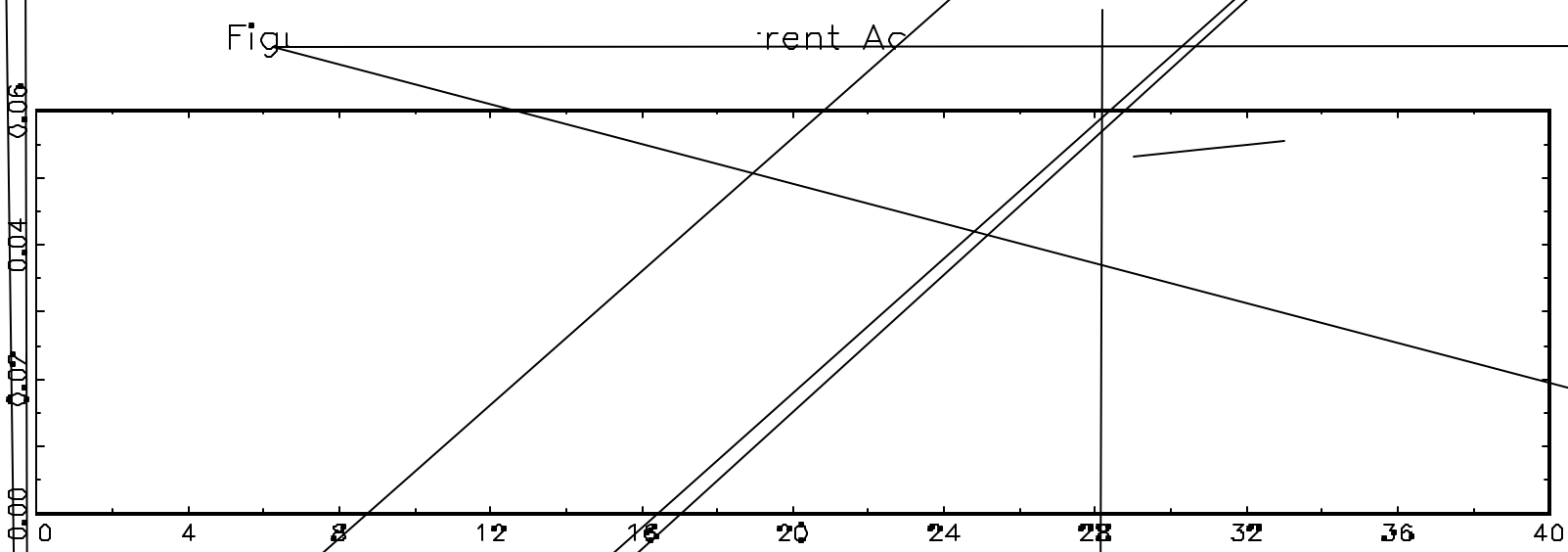

Figure 1: Response of Current Account to To

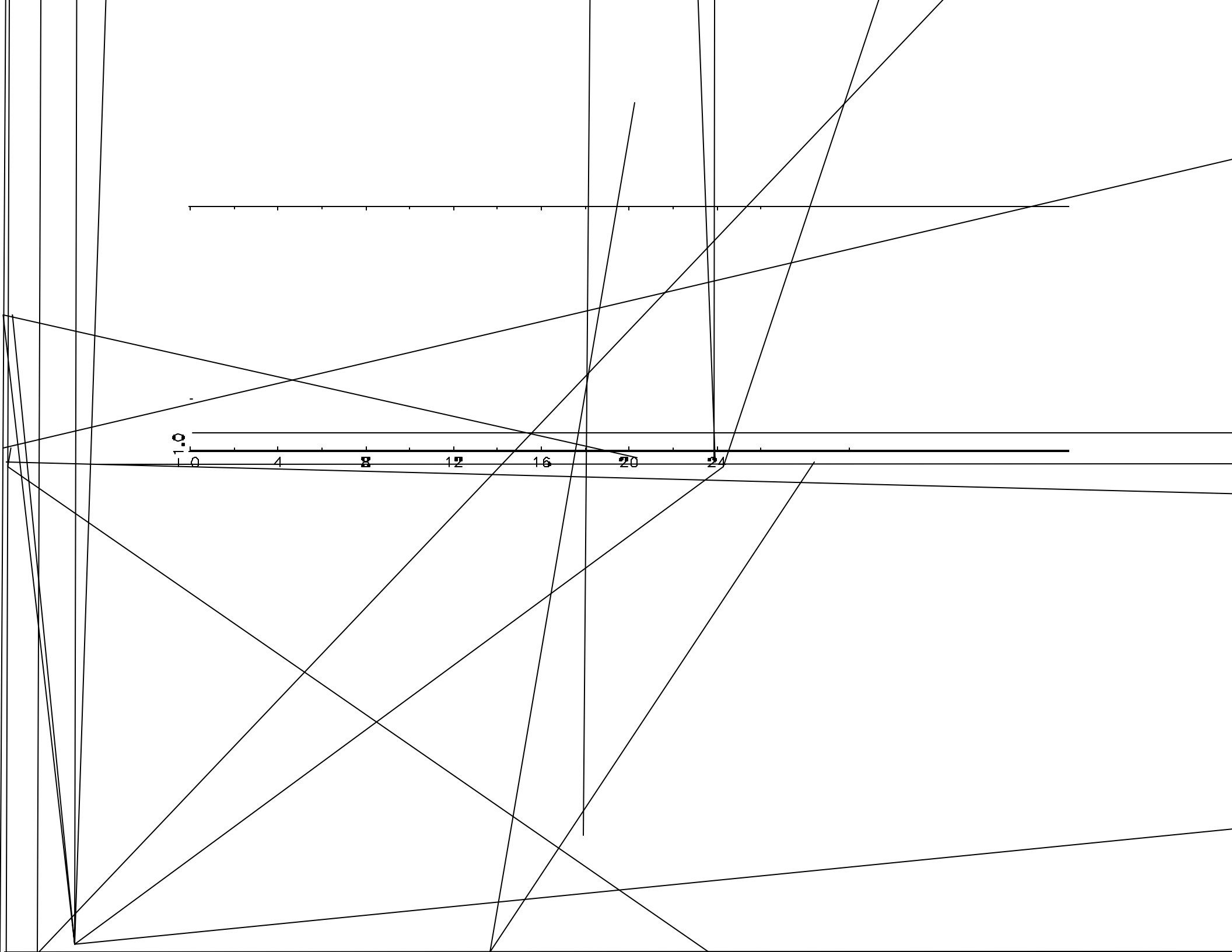
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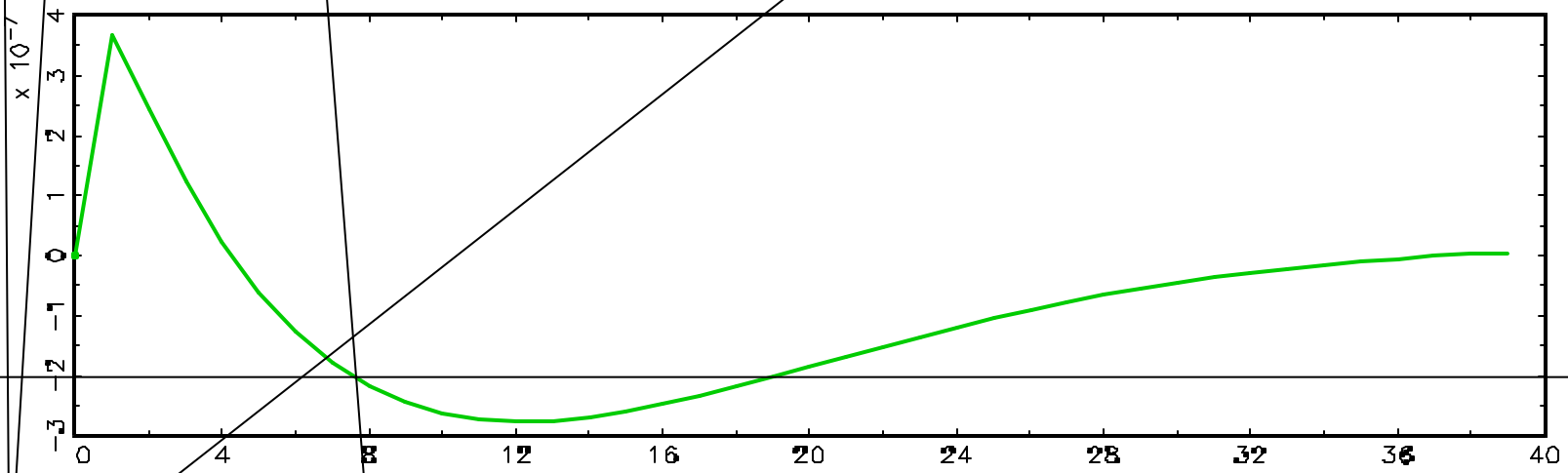
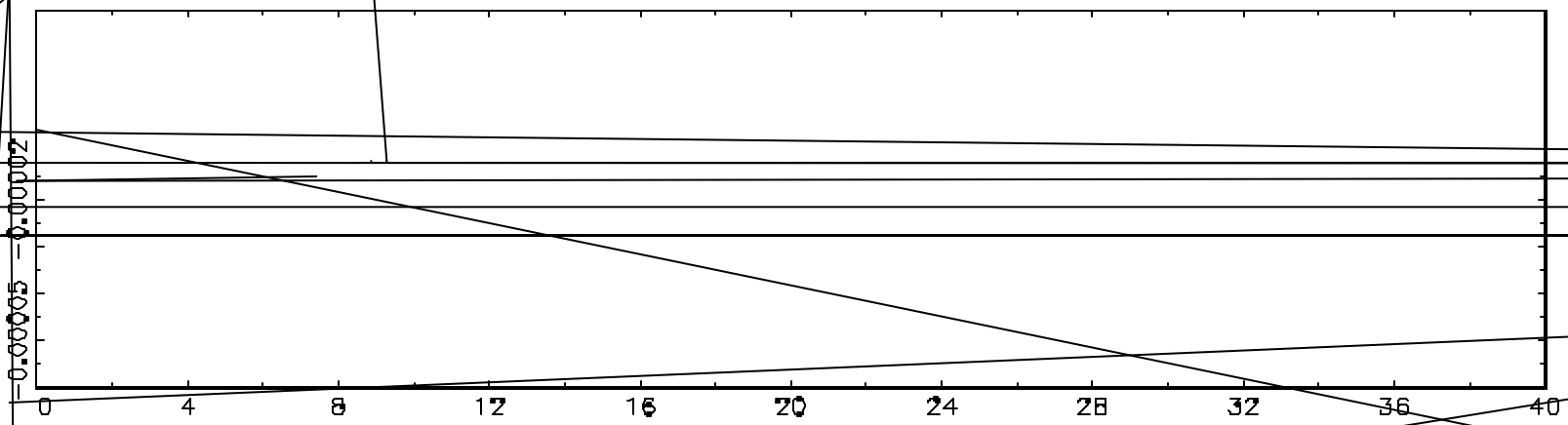
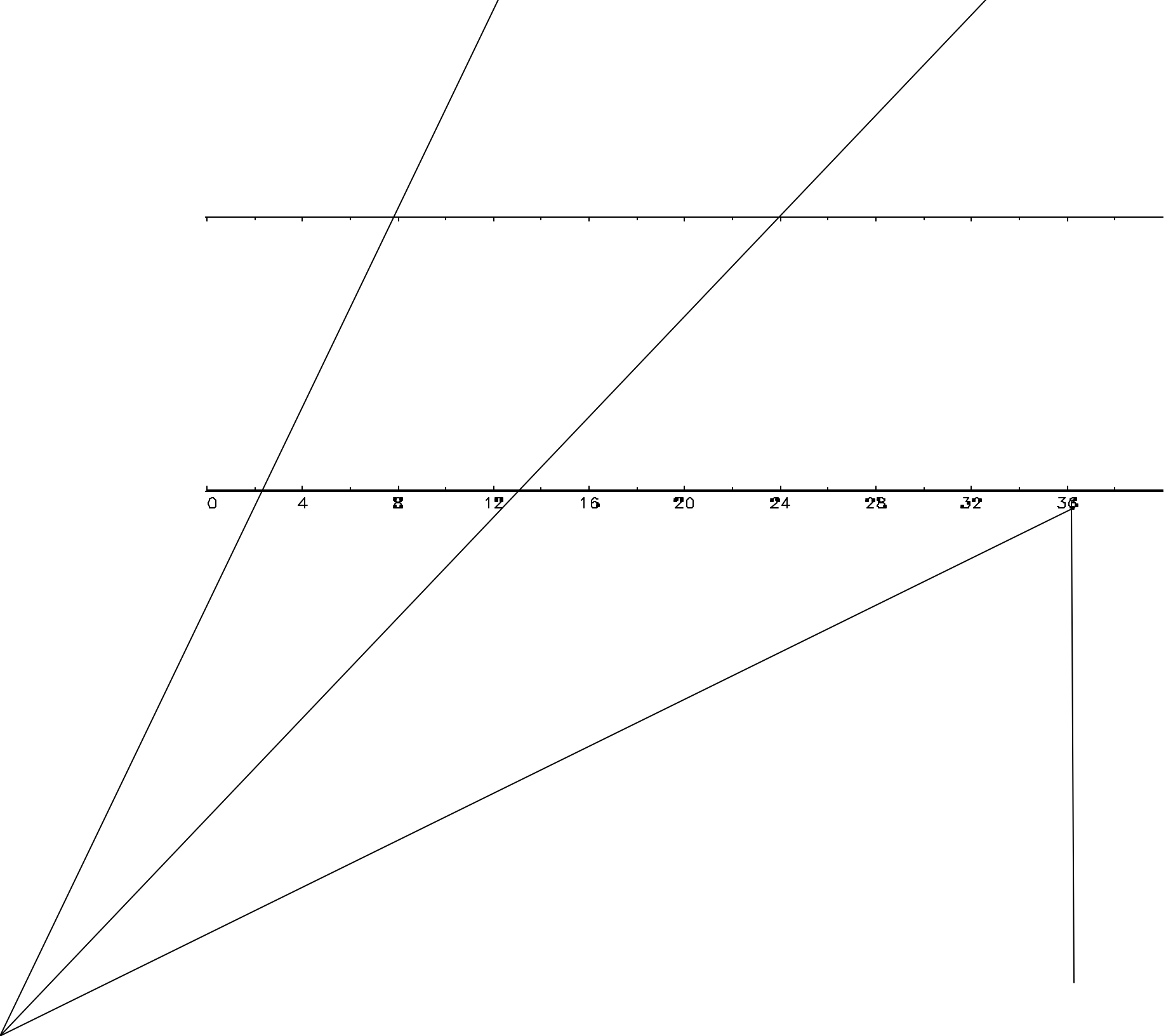
Figure 3: Response of Current Account to Income Shock



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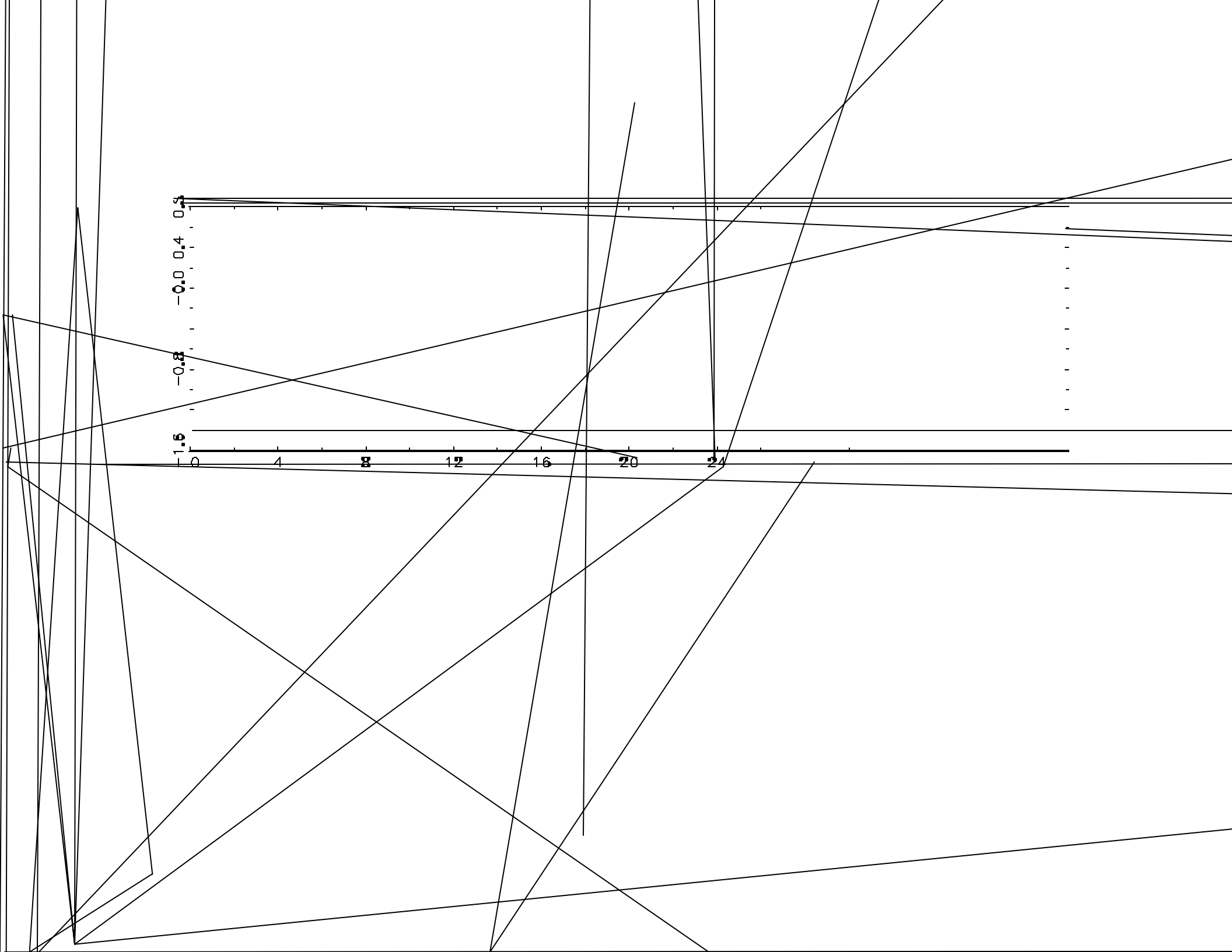
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