Weak Policy in an Open Economy:
The US with a Floating Exchange Rate, 1974-2009

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This paper examines the effectiveness of US macroeconomic policy in an open economy model focused on the exchange rate and trade balance. Yearly data cover the period of the dollar float from 1974 to 2009. Monetary expansion raises output weakly but depreciates the dollar and lowers the trade balance. Fiscal "expansion" decreases output. There is a polar deficit effect between the government budget and trade balance. These results question a number of standard policy prescriptions. The implied structural coefficients suggest rethinking a number of accepted theoretical assumptions.

Keywords: fiscal policy, monetary policy, exchange rate, trade balance

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This paper directly examines the effectiveness of US monetary and fiscal policies in an error correction estimate with annual data during the flexible exchange rate period from 1974 to 2009. Freidman (1972), Brunner and Meltzer (1972), Tobin (1972), and Blanchard and Perotti (2002) discuss issues of policy viability. The present open economy model focuses on the exchange rate rather than the interest rate by assuming international interest rate parity. Structural parameters in the product market, money market, and trade balance are derived from the estimated model.

Monetary expansion is found to weakly stimulate output but depreciate the dollar and decrease the trade balance. Fiscal "expansion" lowers output, not only crowding out but overcrowding private spending. There is a polar deficit between the government budget and trade balance. US output depends primarily on world output.

Estimates are consistent with theoretical assumptions regarding the effects of depreciation and absorption, and the effects of home and world incomes on the trade balance. Depreciation lowers the trade balance implying import and export demands are inelastic. In an effect not noted in the theoretical literature, a trade deficit raises the demand for money.

The following section presents a modified income determination model followed by a section on the data and pretests. The third section presents the model estimate followed by a section on simulated adjustments. Section 5 derives the structural model implied by the estimated system.

1. The money market, product market, and trade balance

The present modification of the income determination model of Hicks (1937), Mundell (1963), and Fleming (1962) focuses on depreciation and the trade balance. For a given international interest rate, interest parity implies depreciation equals the difference between it and the domestic interest rate. Response in the endogenous trade balance (balance on goods and services) relates directly to national income. Equilibria in the money market, product market, and trade balance are the structural equations of the model.

In the money market, demand starts as a function of income and the interest rate. Money market equilibrium is $M = L(Y, i)$ where M is the money supply, L(.) is the demand for cash balances, Y is income, and i is the interest rate. Increased income raises the transactions demand for money, $L_Y > 0$. An increase in the interest rate decreases money demand $L_i < 0$ by raising the opportunity cost of holding cash.

International interest rate parity implies the interest rate i equals the exogenous world interest rate i* less the depreciation rate $\delta \equiv d\ln E$ where E is the dollar price of foreign currency, that is $i = i^* - \delta$. For given i*, equilibrium in the money market is stated $M = L(Y, \delta)$. Depreciation affects money demand through the interest rate opportunity cost, $L_\delta > 0$.

Present estimates reveal a novel effect on money demand. The trade balance B is found to decrease money demand in the implied structural parameters. If foreign exchange from export revenue pays for import spending, a trade deficit implies a cash shortage. Where $L_B < 0$ the money market equilibrium becomes

$$M = L(Y, \delta, B). \tag{1}$$

In the product market, supply equals demand along along the IS curve equilibrium specified as

$$Y = A(Y_d, \delta, F) + B \tag{2}$$

where A(.) is the absorption function, Y_d is disposable income, and F is the fiscal budget. For the present empirical specification F is defined as tax revenue T relative to government spending G, $F \equiv$

T/G. Absorption is domestic spending by consumers, investors, and government. The partial derivative effect of disposable income $Y_d = Y - T$ on absorption is positive, $A_{Y_d} > 0$.

An increase in depreciation δ implies a decrease in the interest rate. Investment spending would rise but depreciation also affects the trade balance B. Price inelastic imports would favor a negative effect of depreciation through B on Y that could outweigh the positive effect of the interest rate on investment spending. The investment spending effect of the interest rate disregards the interest rate parity link between depreciation and the trade balance in an open economy.

An exogenous decrease in the fiscal budget F due to an increase in government spending G or a decrease in taxes T is generally assumed to raise absorption, $A_F < 0$. Investment spending, however, may be crowded out due to a higher interest rate if the government borrows. In the present estimates, there is not only crowding out but overcrowding in the partial derivative effect $A_F > 0$. Fiscal "expansion" is a misnomer for the present sample.

The final functional relationship in the model is the trade balance,

$$B = B(Y, Y^*, \delta) \tag{3}$$

where Y* is income in the rest of the world. Present estimates are consistent with the two income effects based on the import propensities, $B_Y < 0$ and $B_{Y^*} > 0$. The effect of depreciation on the trade balance depends on the Marshall-Lerner condition. The present results uncover a negative effect implying price inelastic trade, $B_\delta < 0$. Typical assumptions are either a flexible exchange rate with balance of payments equilibrium, or a fixed exchange rate with an endogenous balance of payments. The present model instead focuses on simultaneous adjustments in the exchange rate and trade balance adjustments in (3).

2. Data and pretests

Annual data cover the period of the floating dollar exchange rate from 1974 to 2009. Income Y, the money supply M, the government budget F, and the trade balance B are from the National Accounts of the US Department of Commerce (2010). Income Y* in the rest of the world is from the US Department of Agriculture (2010). The exchange rate E is from the Federal Reserve Bank of Saint Louis (2010).

Output Y is real GDP in per capita terms to control for population growth over the 35 years of the sample. The money supply M is real M2 per capita. World output Y* is real GDP for the rest of the world. The exchange rate E is the broad trade weighted dollar exchange rate, a random walk that meanders close to its mean 1.05 with standard deviation of 0.14.

The government fiscal policy variable F is tax revenue relative to government spending, $F \equiv T/G$. Similarly, the trade balance B is the ratio of export revenue to import spending, $B \equiv X/M$. These two ratios imply elasticity estimates in the log linear specification.

Figure 1 shows plots of series relative to means. Depreciation plotted as $1 + \delta$ ranges from 0.90 to 1.20 with mean 1.01 and standard deviation 0.07. Output Y grows but with some slowdowns and a few decreases. The trade balance B is generally less than 1 indicating trade deficits but with large swings on the order of 0.2 to 0.4. The money supply M generally rises but with short periods of decline. The fiscal budget F is generally less than 1 indicating deficits with long periods of decline but intermittent increases. World income Y* increases steadily.

* Figure 1 *

Lower case letters indicate natural logs of variables. Table 1 reports natural logs of variables are I(1) stationary by augmented Dickey-Fuller (1979) ADF critical t and ϕ statistics. The trade balance b requires three lags, and the depreciation rate δ and world income y* two lags. The other variables are I(1) by ADF tests with single lags. There is no residual correlation in the ADF regressions according to reported t-tests, and no residual heteroskedasticity according to ARCH(1) F-tests. Difference stationary variables suggest estimating the model with difference equations or error correction if the variables are cointegrated.

* Table 1 *

Variables are also I(2) stationary as shown in the last column of Table 1 suggesting double difference regressions or perhaps error correction on differences. Double difference regressions in fact produce the best fit and most reliable statistics. The related error correction processes are robust and included in the derivation of model parameters.

3. Model specification and estimation

The present model treats the money supply m and fiscal variable f as exogenous. Both are controlled in large part by monetary and fiscal policies. Output y* in the rest of the world is also assumed exogenous. US output averages 37% of output in the rest of the world during the sample period, increasing from 31% to 40% during the 1990s but falling to 35% in 2009.

The vector autoregression technique of Sims (1980) and Eichenbaum and Evans (1995) and the structural vector autoregressions of Blanchard and Quah (1989) and Clarida and Gali (1994) would have the advantage of making no assumptions regarding which variables are exogenous. An advantage of the present approach is that the following tractable model contains estimated coefficients of the reduced form equations.

The general model in (1) through (3) is specified in log linear form. The money market equilibrium condition from (1) is specified as $m = \alpha_0 + \alpha_1 y + \alpha_2 \delta + \alpha_3 b$. Differentiate to find

$$dm = \alpha_1 dy + \alpha_2 d\delta + \alpha_3 db. \quad (4)$$

The product market equilibrium in (2) is specified as $y = b_0 + b_1y + b_2\delta + b_3f + b_4b$ where lower case letters refer to natural logs. Differentiate and reduce to

$$dy = \beta_1 d\delta + \beta_2 df + \beta_3 db. \tag{5}$$

Note that the unit effect of the trade balance B on Y in (2) is relaxed in the natural log specification. Differentiate the trade balance function $b = \gamma_0 + \gamma_1 y + \gamma_2 \delta + \gamma_3 y^*$ in (3) to find

$$db = \gamma_1 dy + \gamma_2 dy^* + \gamma_3 d\delta. \tag{6}$$

Combine these three log linear equations (4) through (6) into the comparative static system

$$\begin{pmatrix} \alpha_1 & \alpha_2 & \alpha_3 \\ 1/\beta_2 & -\beta_1/\beta_2 & -1 \\ -\gamma_1/\gamma_2 & -\gamma_3/\gamma_2 & 1/\gamma_2 \end{pmatrix} \begin{pmatrix} \partial y \\ \partial \delta \\ \partial b \end{pmatrix} = \begin{pmatrix} \partial m \\ \partial f \\ \partial y^* \end{pmatrix}. \tag{7}$$

The present approach estimates the inverse of (7) with each endogenous variable a function of the three exogenous variables in the system,

$$\begin{pmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{pmatrix} \begin{pmatrix} \partial m \\ \partial f \\ \partial y^* \end{pmatrix} = \begin{pmatrix} \partial y \\ \partial \delta \\ \partial b \end{pmatrix}. \tag{8}$$

The estimate of (8) assumes each equation has its own independent stochastic error term ε_i.

Table 2 reports preliminary regressions on the natural logs levels of variables. Coefficient estimates are similar in the following difference and error correction regressions except for the effects of y^* on both δ and b that prove insignificant. For the income and trade balance estimates, standard errors are understated due to the residual correlation indicated by Durbin-Watson (1951) statistics. These two residuals are also heteroskedastic as indicated by ARCH(1) statistics. In contrast, the depreciation equation produces reliable statistics. Variables in the depreciation equation are cointegrated according to the Engle-Granger (1987) test while variables in the other two equations are not.

* Table 2 *

Table 3 reports regressions on first differences as well as the associated error correction models that include residuals of the cointegrating regressions on levels in Table 2. Zero constants indicate the lack of trends in the three dependent variables. Output y increases with the money supply m, a fiscal surplus f, and world output y*. A fiscal “expansion” lowering the government budget decreases output. Coefficients in the two output Δy regressions are similar with no error correction effect. Differences of variables in the output equation are cointegrated by the Engle-Granger test, suggesting an error correction model on double differences.

* Table 3 *

The only effect in the depreciation $\Delta\delta$ equation in Table 3 is from the money supply, an elastic effect with increased impact from a strong error correction process. These differences are also cointegrated by the Engle-Granger test suggesting a double difference error correction model.

Standard errors in the trade balance Δb regression in Table 3 are unreliable due to residual correlation. Increased money supply m and fiscal surplus f may lower the trade balance b. These trade balance variables are not cointegrated according to the Engle-Granger test.

Table 4 reports the more successful double difference regressions. Insignificant constants indicate the lack of trends in the differences of dependent variables. The significant error correction coefficients are evidence that differences are strongly cointegrated. Residual correlation in the double difference regressions disappears in the error correction regressions. Residual heteroskedasticity is not an issue according to ARCH(1) tests. Correlations between residuals in the three equations are $(\rho_{y\delta}, \rho_{yb}, \rho_{\delta b})$ = (-0.02, -0.46, 0.11). The high ρ_{yb} diminishes with a single lag and without significant correlations between residuals lagged up to three years. Total effects including the derived error correction adjustments enter the derivation of model coefficients. Residuals of the three regressions pictured in Figure 2 reflect reasonable fit.

* Table 4 * Figure 2 *

Table 5 presents the derived reduced form coefficients in (8) from coefficient estimates in Table 4 including the error correction effects through the difference coefficient estimates in Table 3. Standard errors are derived by error propagation calculations.

* Table 5 *

Every 1% increase in the money supply m raises output by 0.24% while depreciating the dollar by 1.24% and lowering the trade balance by 1.88%. The elastic effect on depreciation is perhaps a surprise although the direction of the effect is familiar. The elastic reduction in the trade balance due to a money supply increase may explain why depreciation does not raise the US trade balance. Tests of the relationship between the exchange rate and trade balance that omit the money supply, not to mention the fiscal budget and world output, suffer omitted variable bias.

Regarding exogenous changes in the fiscal budget f, every 1% increase in f raises output by 0.61%. An increase of 10% in government spending, for instance, decreases output 6.1%. This overcrowding is opposite to received theory as discussed in the following sections. Every 1% increase in the fiscal budget also decreases the trade balance by -0.87%.

World output has a robust effect on US output, every 1% increase in world output y* raising US output y by 0.81%. The US economy is more dependent on the rest of the world than may be appreciated. World output has no effect on depreciation or the trade balance.

4. Simulated adjustments to policy shocks

To gain a feel for the comparative static effects in the model, consider relatively large changes in the levels of the money supply M and fiscal budget F equal to their means plus two standard deviations. Adjustments in endogenous variables are derived with the model coefficients in Table 5. These resulting adjustments are gauged relative to their level in 2009, output Y = 46.0, the exchange rate E = 1.29, and the trade balance B = 0.80.

The mean change in the money supply M during the sample period is 1.8% with standard deviation 0.5%. A 3% increase in M shifts the LM curve increasing output Y by 0.72% = 3 x 0.24 from 46.0 to 46.3. The depreciation rate δ increases by 4.3% = 3 x 1.42 raising E from 1.29 to 1.35. The trade balance B falls by -5.6% = 3 x -1.88 from 0.80 to 0.76. Such an increase in the money supply has noticeable effects on the exchange rate and trade balance, but not output. The standard textbook example of a 10% increase in the money supply, radical by this historical standard, raises output 2.4% from 46.0 to 47.1 but depreciates the dollar 14.2% from 1.29 to 1.47 and reduces the trade balance 18.8% from 0.80 to 0.65.

The mean and standard deviation of the change in the fiscal budget F during the sample period are -0.8% and 0.9%. A decrease of -3% in F could be due to an increase of 3% in government spending G, a decrease of 3% in taxes T, or some combination. The typical increase in the fiscal deficit F over the sample is counterproductive for output with Y falling by -1.8% = -3 x 0.61 from 46.0 to 45.4. The trade balance B rises by 2.6% = -3 x -0.87 from 0.80 to 0.82 in a polar deficit effect. The fiscal budget F has no effect on depreciation δ or by implication the interest rate. Overcrowding occurs not through an interest rate effect but through expansion of the public sector.

Turning to growth in world output y*, its mean and standard deviation are 2.8% and 0.2%. The very regular increase of 3% in Y* increases output Y by 2.4% = 3 x 0.81 from 46.0 to 47.1. The rising gap between actual and predicted output suggests monetary and fiscal policies are a net drag on US output. Holding monetary and fiscal policies constant, world output growth predicts US output would have risen to 54.3 rather than the actual 46.0 over the 35 years.

Consider the policy responses in 2008 to the financial bankruptcies. The increase of 7.8% in the money supply raises output 1.9% but also raises the depreciation rate 11.1% as it decreases the trade balance -14.7%. The simultaneous decrease in the fiscal budget of -14.3% lowers output -8.7% while raising the depreciation rate 1.4% and the trade balance 12.4%. Together the model predicts these two unprecedented policy shocks decrease output Y by -6.9%, depreciate the dollar by 12.5%, and reduce the trade balance by -2.2%. The US, it seems, had to recover from the policy responses rather than the bankruptcies. Including the effects of the simultaneous 2.3% increase in world output, the model predicts endogenous adjustments in (Y, δ, B) of (-5.0%, 13.7%, -3.1%) while the actual changes were (-3.9%, 9.1%, 10.7%).

To gauge model performance explaining long term output, the mean yearly changes in exogenous (M, F, Y*) predict output changes of (0.43%, -0.49%, 2.27%) that sum to 2.21%. Over the 35 years of the sample period, the model then predicts output changes of (15.1%, -17.2%, 79.5%) that sum to 77.4% while actual output growth was 83.3%.

5. The underlying open economy macro model

Comparative static results of the previous section relate to the underlying structural model of the money market, product market, and trade balance. The derived structural model differs in a few parameters from standard assumptions of the Mundell-Fleming model.

Table 6 presents the inverted matrix of estimated coefficients in (8) and Table 5 as the system of structural equations in (7). Standard errors derived by the delta method assuming 10% variation in estimated parameters calculated through partial derivatives of the inverse matrix. Derived standard errors are insensitive to a wide range of parameter variations.

* Table 6 *

Stated in natural log level form, the model equations derived from the estimated coefficients in Table 6 are

LM curve: $m = \alpha_0 - 0.38y + 0.36\delta - 0.31b$ (9)

IS curve: $y = \beta_0 + 3.01\delta + 2.75f + 2.14b$ (10)

BT curve: $b = \gamma_0 - 1.60y + 1.48y^* - 1.06\delta$. (11)

The negative effect of output y on money demand in (9) might be explained by increased reliance on credit cards lowering demand for M2 over the sample period. Also, the diminishing variance of output over the sample period might have reduced the demand for ready cash. Money velocity offers no explanation as a random walk hovering about its mean of 1.91 with a standard deviation of 0.02 and no trends in level or variance.

Depreciation δ in (9) raises the demand for cash balances. While it may seem odd to demand more of a depreciating currency, paying for imports would provide motivation. This positive effect is consistent with price inelastic trade. An increase in depreciation implies a lower interest rate, consistent with the increased money demand. A decrease in the trade balance b raises money demand in (9) to pay for imports. Price inelastic imports are consistent with the positive effect of depreciation δ on money demand.

In the product market (10) depreciation δ raises output y holding the trade balance constant. An increase in depreciation implies a decrease in the interest rate, making this positive effect consistent with the theory of investment spending.

The positive link between the fiscal budget f and output y in (10) extends crowding out to overcrowding. Fiscal deficits diminish private spending by more than any combination of increased government spending and reduced taxes. Overcrowding extends the typical crowding out of government borrowing on the interest rate and investment spending, and the present regression holds depreciation and the interest rate constant. The present fiscal effect is due to the expansion of the relatively unproductive public sector at the expense of the private sector.

The trade balance b has an elastic effect on output in (10) indicating deficits are a drag on output. As an accounting identity, a trade deficit decreases income dollar for dollar but the present estimate is stronger. Oil imports might explain this elastic effect with an increased trade deficit reflecting increased spending on fuel that would depress a wide range of economic activity. An increase in the trade deficit raises the demand for money to pay for imports, lowering spending on domestic products.

The trade balance b relation in (11) indicates domestic output y and world output y* have elastic import propensities. The US economy has become more open to international trade with falling protection and transport costs over the sample period. The elastic effect of foreign income is consistent with its positive effect on home income in the reduced form system.

Depreciation δ has an elastic negative effect on the trade balance b in (11) implying inelastic trade. The composition of trade has evolved over the sample period. Increased imports of price inelastic oil might have contributed to price insensitivity.

5. Conclusion

The present model uncovers weak output effects of monetary policy and counterproductive output effects of fiscal policy for the US from 1974 to 2009. Monetary expansion depreciates the dollar and decreases the trade balance. Fiscal expansion increases the trade balance in a polar deficit effect. US output primarily depends on world output in a strong open economy effect. In the associated structural model, depreciation decreases the trade balance implying price inelastic trade. Depreciation also raises the demand for cash balances to pay for imports.

Contrary to received theory, fiscal deficits lower output. The effectiveness of fiscal or monetary policies can be expected to vary across countries and time periods, reflected in estimates of the present model by different policy parameters and structural coefficients. The present results do not extend to other countries or even to the US during a different time period. For instance, the US from the end of World War II to the collapse of Bretton Woods had a fixed exchange rate with surpluses in the government budget and trade balance.

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Table 1. Stationary Pretests

		I(1)	I(2)
y	ADF t	-2.31	-2.91
lnY	F ϕ	3.94	3.82
	ρ t	0.02	-0.13
	ARCH(1) F	0.11	0.67
δ	ADF_2 t	-3.21	ADF_4 -2.79
lnD	F	3.68	6.41
	ρ t	0.11	-0.24
	ARCH(1) F	0.71	0.01
b	ADF_3 t	-2.70	-3.30
lnB	F	5.13	3.64
	ρ t	0.18	0.20
	ARCH(1) F	0.09	0.62
m	ADF t	-2.11	-2.92
lnM	F	4.57	3.42
	ρ t	1.25	-0.24
	ARCH(1) F	0.55	0.07
f	ADF t	-2.13	-2.66
lnF	F	4.44	2.58
	ρ t	1.26	0.10
	ARCH(1) F	0.08	0.37
y*	ADF_2 t	-3.31	-3.02
lnY*	F	6.78	3.37
	ρ t	0.14	0.04
	ARCH(1) F	0.43	0.07

Y = real output D = depreciation rate B = trade balance,
M = money supply F = government budget Y* = output rest of world
Critical τ = -3.50 ϕ = 6.73 F = 2.92 DW = 1.58   t = 1.69

Table 2. Preliminary Regressions

	constant	m	f	y*	
y	0.03*** (0.004)	0.16*** (0.05)	0.31*** (0.04)	0.62*** (0.03)	R^2 .995 DW 0.67* ARCH 8.24* EG -2.52
δ	0.01 (0.02)	0.77*** (0.19)	0.001 (0.17)	-0.40*** (0.11)	R^2 .374 DW 1.73 ARCH 0.01 EG -4.78*
b	-0.23*** (0.02)	-1.34*** (0.30)	-0.54** (0.23)	0.44** (0.18)	R^2 .672 DW 0.36* ARCH 18.6* EG -1.49

Table 3. Difference Models

	Constant	Δm	Δf	Δy*	EC	
Δy	0.01 (0.01)	0.15** (0.06)	0.27*** (0.05)	0.34* (0.20)		R^2 .732 DW 1.96 ARCH 1.50 EG -5.79*
	0.01 (0.006)	0.15** (0.06)	0.30*** (0.06)	0.36* (0.20)	-0.19 (0.015)	R^2 .744 DW 1.72 ARCH 0.17
Δδ	0.04 (0.04)	0.91* (0.42)	0.23 (0.31)	-1.82 (1.45)		R^2 .153 DW 2.36* ARCH 0.01 EG -6.63*
	0.02 (0.03)	1.17*** (0.33)	0.19 (0.24)	-1.30 (1.12)	-0.89*** (0.19)	R^2 .516 DW 1.93 ARCH 0.02
Δb	-0.01 (0.03)	-1.11*** (0.29)	-0.68*** (0.21)	0.60 (0.86)		R^2 .487 DW 1.01* ARCH 0.83 EG -2.75
	0.01 (0.03)	-1.28*** (0.29)	-0.66*** (0.21)	0.15 (0.91)	-0.17 (0.13)	R^2 .517 DW 0.91* ARCH 0.90

Table 4. Double Difference Models

	constant	$\Delta\Delta m$	$\Delta\Delta f$	$\Delta\Delta y^*$	EC	
$\Delta\Delta y$	-0.001 (0.003)	0.07 (0.09)	0.27*** (0.06)	0.35 (0.26)		R^2 .618 DW 2.77* ARCH 0.49
	-0.0002 (0.002)	0.08 (0.06)	0.32*** (0.04)	0.45** (0.17)	-1.07*** (0.18)	R^2 .831 DW 1.80 ARCH 1.57
$\Delta\Delta\delta$	-0.005 (0.02)	0.23 (0.81)	-1.02** (0.49)	1.64 (1.83)		R^2 .1.37 DW 2.66* ARCH 0.41
	0.005 (0.013)	0.31 (0.55)	-0.37 (0.35)	2.73** (1.25)	-1.21*** (0.20)	R^2 .616 DW 2.04 ARCH 0.19
$\Delta\Delta b$	0.004 (0.007)	-1.32*** (0.27)	-0.43** (0.19)	-0.58 (0.75)		R^2 .599 DW 2.28 ARCH 0.07
	0.002 (0.007)	-1.33*** (0.24)	-0.53*** (0.17)	-0.67 (0.68)	-0.49*** (0.18)	R^2 .684 DW 1.97 ARCH 0.85

Table 5. Model (8) Coefficients

$\Delta\Delta$ECM	m	f	y*
y	0.24*** (0.09)	0.61*** (008)	0.81*** (0.28)
δ	1.42* (0.89)	-0.10 (0.37)	0.53 (1.33)
b	-1.88*** (0.34)	-0.87*** (0.24)	-0.37 (1.81)

Standard errors derived by error propagation

Table 6. Inverted System Matrix (7)

	y	δ	b
m	-0.38*** (0.06)	0.36*** (0.05)	-0.31*** (0.04)
f	0.36** (0.15)	-1.09*** (0.13)	-0.78*** (0.11)
y*	1.08*** (0.14)	0.71*** (0.12)	0.68*** (0.05)

Standard errors derived by the delta method with 10% parameter variation

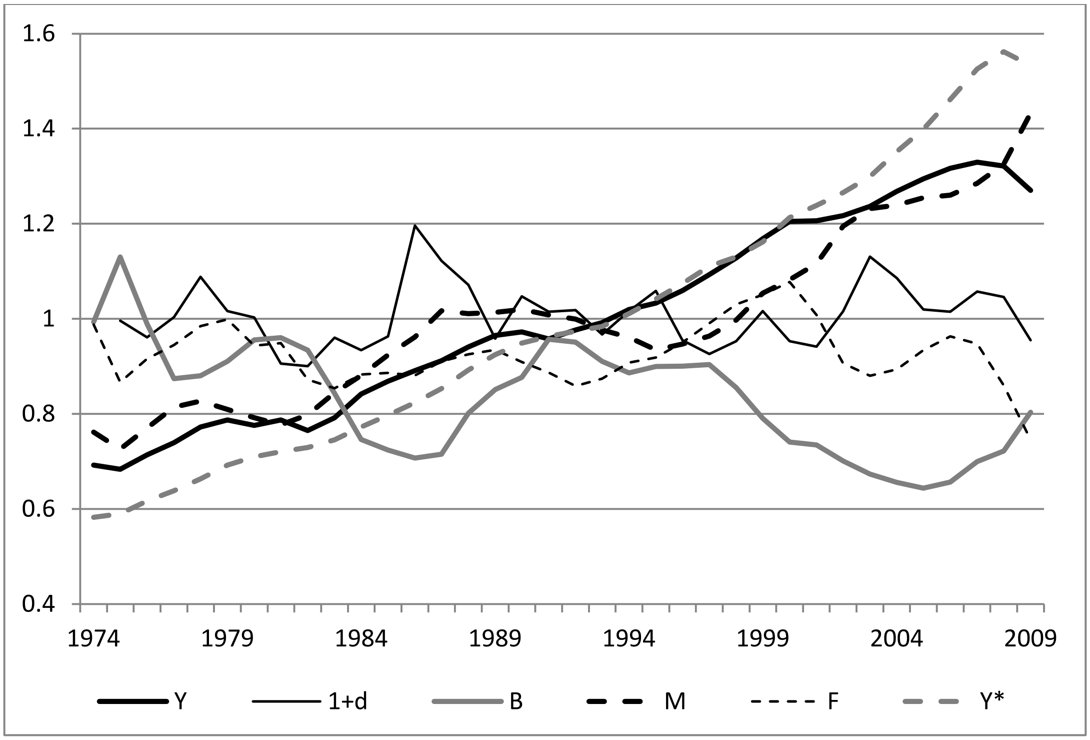

Figure 1. Variable Plots

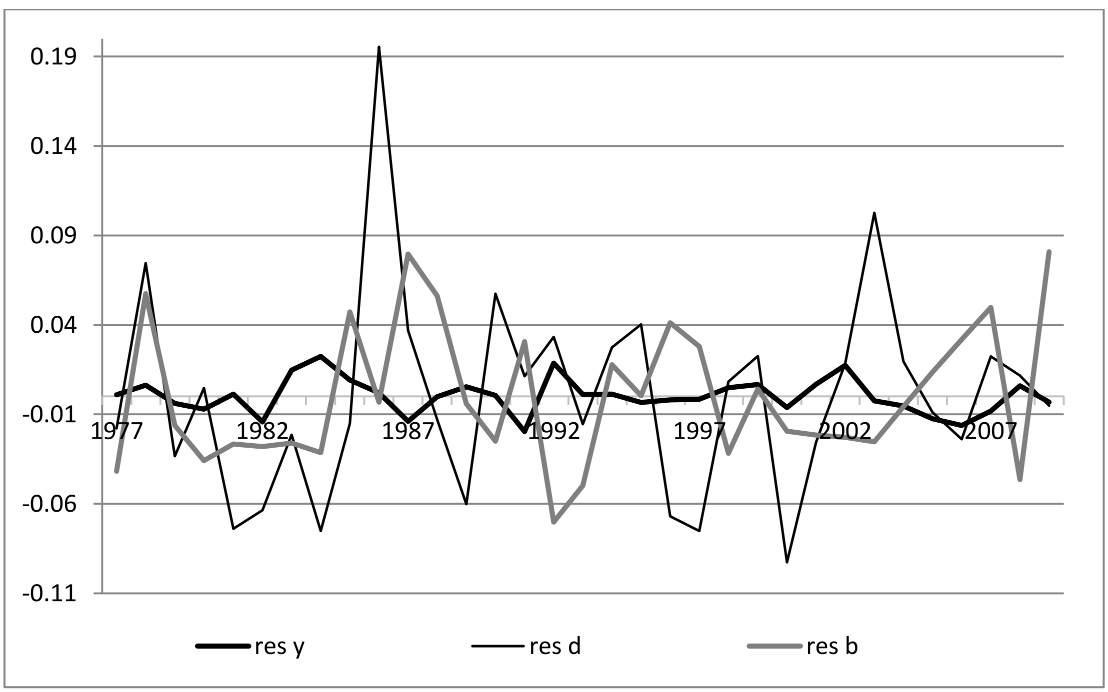

Figure 2. Model Residuals