Is Volatility Good for Growth?

Evidence from the G7

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6th February 2008

Appendix C: Full Results Tables for G7

Table C1: Linear and GARCH-M Results for Canada

Canada	Linear	GARCH-M
	1962:02 - 2006:10	**1962:03 - 2006:10**
Equation (22): β_0	0.6126 (6.50)	1.0379 (4.15)
M_{t-1}	-0.0706 (-1.64)	-0.0794 (-1.96)
M_{t-3}	0.1243 (2.89)	0.1089 (3.24)
M_{t-4}	0.0649 (1.51)	
M_{t-5}	-0.0813 (-1.90)	-0.0896 (-2.70)
M_{t-6}	0.0724 (1.68)	
M_{t-8}	0.0625 (1.46)	
M_{t-9}	0.0696 (1.61)	0.0730 (2.13)
M_{t-12}	-0.1435 (-3.36)	-0.1245 (-3.18)
Y_{t-9}	-0.0917 (-1.75)	-0.0934 (-1.68)
Y_{t-11}	-0.1432 (-2.81)	-0.1746 (-3.29)
Y_{t-12}	0.1430 (2.70)	
$\sigma^2_{\Delta M_t}$		-0.1614 (-2.34)
$\sigma^2_{\Delta Y_t}$		0.0640 (0.29)
Equation (23): α_0		0.0826 (1.54)
ε^2_{t-1}		0.0916 (3.91)
$\sigma^2_{\Delta M_{t-1}}$		0.8624 (19.58)
Q(4)	1.0468 [0.9026]	1.4270 [0.8395]
Q^2(4)	28.5259 [0.0000]	5.4908 [0.2405]
Equation (24): Θ_0	0.0307 (0.46)	-0.6887 (-1.83)
Y_{t-1}	-0.1754 (-4.17)	-0.1587 (-3.58)
Y_{t-3}	0.2189 (5.15)	0.2354 (5.57)
Y_{t-4}	0.1205 (2.80)	0.1303 (3.08)
Y_{t-5}	0.0877 (2.08)	0.0872 (2.04)
Y_{t-6}	0.0710 (1.68)	
Y_{t-8}	0.1128 (2.69)	0.1280 (3.16)
Y_{t-12}	-0.0863 (-2.12)	-0.1332 (-2.80)
M_{t-2}	0.0984 (2.92)	0.1095 (2.71)
M_{t-4}	0.0946 (2.81)	0.0898 (2.92)
M_{t-5}	0.0605 (1.76)	
M_{t-6}	0.0562 (1.65)	
M_{t-12}	-0.0989 (-2.91)	-0.1040 (-3.34)
$\sigma^2_{\Delta M_t}$		-0.1331 (-2.02)

$\sigma^2_{\Delta Y_t}$		1.0224 (2.63)
Equation (25): α_3		0.3278 (3.00)
v^2_{t-1}		0.1029 (2.00)
$\sigma^2_{\Delta Y_{t-1}}$		0.5773 (4.78)
Equation (26): $\rho_{\varepsilon v}$		0.0711 (1.63)
Q(4)	0.2665 [0.9919]	0.4185 [0.9809]
Q²(4)	4.9318 [0.2944]	0.7853 [0.9404]

Note: t-statistics are in brackets after each coefficient. The diagnostic tests are the Ljung Box Q-statistics for standardised residuals or squared residuals. These are reported as chi-squared statistics with p-values in square brackets. 4 lags are used for both of these tests. Estimation for GARCH-M is by BFGS method with robust standard errors

Table C2: Linear and GARCH-M Results for France

France	Linear	GARCH-M
	1961:02 - 2006:10	1961:03 - 2006:10
Equation (22): β_0	0.3208 (4.17)	0.4503 (2.84)
M_{t-1}	-0.2113 (-5.08)	-0.1793 (-3.70)
M_{t-2}	-0.0996 (-2.33)	
M_{t-3}	0.1982 (4.58)	0.2777 (6.17)
M_{t-4}	0.1191 (2.83)	0.1149 (2.60)
M_{t-5}	0.0885 (2.01)	0.0873 (2.45)
M_{t-6}	0.2063 (4.82)	0.1958 (4.68)
M_{t-8}	0.0827 (1.92)	
M_{t-9}	0.0923 (2.15)	
M_{t-11}	0.1094 (2.60)	0.1253 (4.25)
M_{t-12}	-0.0928 (-2.18)	
Y_{t-2}	-0.0885 (-2.61)	-0.0951 (-2.61)
Y_{t-4}	0.0483 (1.42)	
Y_{t-12}	-0.0901 (-2.65)	-0.0618 (-1.91)
$\sigma^2_{\Delta M_t}$		-0.0092 (-0.15)
$\sigma^2_{\Delta Y_t}$		-0.1181 (-1.38)
Equation (23): α_0		0.0147 (0.98)
ε^2_{t-1}		0.0683 (1.73)
$\sigma^2_{\Delta M_{t-1}}$		0.9211 (18.73)
Q(4)	0.3399 [0.9871]	2.4061 [0.6615]
Q²(4)	6.5245 [0.1633]	1.5161 [0.8238]
Equation (24): Θ_0	0.0765 (1.16)	-0.1971 (-1.05)
Y_{t-1}	-0.3054 (-7.65)	-0.3107 (-6.84)
Y_{t-3}	0.0829 (2.09)	

Y_{t-6}	0.1829 (4.55)	0.1852 (4.10)
Y_{t-12}	-0.0762 (-1.88)	-0.0736 (-1.41)
M_{t-1}	0.1271 (2.75)	0.1059 (2.65)
M_{t-5}	0.0784 (1.70)	0.0998 (2.12)
$\sigma^2_{\Delta M_t}$		0.0020 (0.02)
$\sigma^2_{\Delta Y_t}$		0.2133 (2.20)
Equation (25): α_3		0.9007 (2.68)
v^2_{t-1}		0.1779 (2.90)
$\sigma^2_{\Delta Y_{t-1}}$		0.1801 (0.68)
Equation (26): $\rho_{\varepsilon v}$		-0.1278 (-3.44)
Q(4)	0.9785 [0.9130]	4.1364 [0.3879]
Q²(4)	34.8388 [0.0000]	6.3969 [0.1714]

Table C3: Linear and GARCH-M Results for Germany

Germany	Linear	MGARCH-M
	1961:02 - 2003:7	1961:03 - 2003:7
Equation (22): β_0	0.4402 (6.09)	0.6742 (3.71)
M_{t-3}	0.0686 (1.59)	
M_{t-5}	0.0835 (1.94)	0.0925 (2.35)
M_{t-6}	0.0988 (2.28)	0.1172 (2.76)
M_{t-10}	-0.0681 (-1.57)	
M_{t-12}	0.1944 (4.44)	0.1738 (4.15)
Y_{t-6}	-0.0563 (-2.06)	
Y_{t-7}	-0.0943 (-3.27)	-0.0930 (-3.24)
Y_{t-8}	-0.0564 (-2.11)	-0.0677 (-2.34)
Y_{t-10}	0.0520 (1.98)	0.0493 (1.80)
Y_{t-12}	0.0390 (1.51)	
$\sigma^2_{\Delta M_t}$		-0.2036 (-0.98)
$\sigma^2_{\Delta Y_t}$		-0.0243 (-0.66)
Equation (23): α_0		0.6867 (5.65)
ε^2_{t-1}		0.2120 (3.83)
$\sigma^2_{\Delta M_{t-1}}$		0.0488 (0.40)
Q(4)	0.4428 [0.7777]	1.0570 [0.3774]
Q²(4)	0.4719 [0.7564]	0.6441 [0.6313]
Equation (24): Θ_0	-0.1288 (-1.31)	0.1823 (1.02)
Y_{t-1}	-0.3352 (-7.65)	-0.3215 (-6.82)
Y_{t-2}	-0.0861 (-1.89)	-0.0758 (-2.14)
Y_{t-3}	0.1723 (3.79)	0.1552 (3.66)

Y_{t-4}	0.1254 (2.77)	0.0998 (2.27)
Y_{t-5}	0.1159 (2.51)	0.1035 (2.66)
Y_{t-6}	0.1014 (2.31)	0.1049 (2.42)
Y_{t-11}	-0.0574 (-1.41)	
M_{t-5}	0.1171 (1.71)	
M_{t-6}	0.1991 (2.91)	0.1788 (2.95)
M_{t-11}	0.1746 (2.50)	0.2180 (3.59)
$\sigma^2_{\Delta M_t}$		-0.4093 (-2.33)
$\sigma^2_{\Delta Y_t}$		0.0417 (0.81)
Equation (25): α_3		1.6616 (7.68)
v^2_{t-1}		0.3722 (4.13)
$\sigma^2_{\Delta Y_{t-1}}$		0.1465 (2.29)
Equation (26): $\rho_{\varepsilon v}$		0.0216 (0.48)
Q(4)	2.2966 [0.0584]	0.0290 [0.9984]
Q^2(4)	0.1245 [0.9736]	0.7083 [0.5866]

Note: BHHH estimation method, BFGS does not converge for Germany

Table C4: Linear and GARCH-M Results for Italy

Italy	Linear	MGARCH-M
	1965:02 - 2006:10	1965:03 - 2006:10
Equation (22): β_0	0.4620 (5.35)	0.5387 (5.20)
M_{t-2}	0.1409 (3.28)	0.0987 (2.45)
M_{t-3}	0.2441 (5.67)	0.1853 (4.45)
M_{t-7}	0.1028 (2.37)	
M_{t-9}	0.1161 (2.59)	0.0993 (2.80)
M_{t-12}	-0.0749 (-1.69)	-0.0929 (-1.57)
Y_{t-8}	-0.0299 (-1.27)	
Y_{t-9}	-0.0327 (-1.39)	-0.0385 (-1.53)
$\sigma^2_{\Delta M_t}$		-0.1853 (-2.40)
$\sigma^2_{\Delta Y_t}$		0.0923 (3.73)
Equation (23): α_0		0.4929 (4.32)
ε^2_{t-1}		0.4853 (4.07)
$\sigma^2_{\Delta M_{t-1}}$		0.0735 (0.64)
Q(4)	0.8078 [0.9374]	3.5565 [0.4693]
Q^2(4)	27.7061 [0.0000]	2.9898 [0.5595]
Equation (24): Θ_0	-0.0963 (-0.72)	-0.0069 (-0.07)
Y_{t-1}	-0.2715 (-6.37)	-0.2236 (-4.82)
Y_{t-6}	0.1497 (3.55)	0.0978 (2.66)

Y_{t-11}	0.0902 (2.09)	
Y_{t-12}	0.0704 (1.60)	
M_{t-1}	0.1486 (1.90)	
M_{t-5}	0.1209 (1.54)	0.0868 (1.36)
$\sigma^2_{\Delta M_t}$		0.0046 (0.07)
$\sigma^2_{\Delta Y_t}$		0.0344 (1.06)
Equation (25): α_3		0.0040 (0.62)
v^2_{t-1}		0.0510 (3.66)
$\sigma^2_{\Delta Y_{t-1}}$		0.9456 (75.02)
Equation (26): $\rho_{\varepsilon v}$		0.0157 (0.31)
Q(4)	2.7297 [0.6040]	2.2958 [0.6815]
Q²(4)	40.5249 [0.0000]	8.8629 [0.0646]

Table C5: Linear and GARCH-M Results for Japan

Japan	Linear	MGARCH-M
	1961:02 - 2006:11	1961:02 – 2006:11
Equation (22): β_0	0.3588 (3.82)	0.1174 (0.21)
M_{t-1}	-0.1713 (-4.12)	-0.1794 (-4.38)
M_{t-3}	0.2608 (6.20)	0.2879 (6.77)
M_{t-4}	0.1232 (2.93)	0.1841 (4.58)
M_{t-5}	0.1069 (2.60)	0.1397 (4.16)
M_{t-6}	0.1390 (3.21)	0.1554 (4.51)
M_{t-9}	0.0830 (1.93)	0.1551 (3.38)
M_{t-11}	0.0868 (2.11)	0.0817 (2.16)
M_{t-12}	-0.0694 (-1.62)	-0.1111 (-2.13)
Y_{t-9}	-0.0722 (-1.76)	-0.0414 (-1.24)
Y_{t-12}	0.0613 (1.51)	
$\sigma^2_{\Delta M_t}$		-0.1121 (-1.91)
$\sigma^2_{\Delta Y_t}$		0.1846 (0.46)
Equation (23): α_0		0.0699 (1.22)
ε^2_{t-1}		0.1346 (2.46)
$\sigma^2_{\Delta M_{t-1}}$		0.8270 (11.33)
Q(4)	0.4238 [0.9805]	2.1960 [0.6998]
Q²(4)	61.8042 [0.0000]	3.0176 [0.5549]
Equation (24): Θ_0	0.0237 (0.28)	-0.3876 (-0.39)
Y_{t-1}	-0.2527 (-6.03)	-0.2536 (-5.36)
Y_{t-2}	0.1759 (4.29)	0.1856 (4.38)
Y_{t-3}	0.3807 (9.46)	0.3815 (8.36)
Y_{t-4}	0.1977 (4.70)	0.2008 (4.71)

Y_{t-8}	0.0636 (1.63)	
Y_{t-10}	-0.0658 (-1.69)	
M_{t-1}	0.1497 (3.86)	0.1382 (4.55)
M_{t-2}	0.1341 (3.27)	0.1286 (3.36)
M_{t-3}	0.1086 (2.66)	0.1074 (2.66)
M_{t-5}	-0.0944 (-2.29)	-0.0961 (-2.45)
M_{t-6}	-0.1055 (-2.58)	-0.1008 (-3.17)
$\sigma^2_{\Delta M_t}$		-0.0161 (-0.37)
$\sigma^2_{\Delta Y_t}$		0.3180 (0.49)
Equation (25): α_3		1.3094 (1.15)
v^2_{t-1}		0.1064 (0.84)
$\sigma^2_{\Delta Y_{t-1}}$		0.0354 (0.05)
Equation (26): $\rho_{\varepsilon v}$		-0.0959 (-2.47)
Q(4)	0.7818 [0.9409]	0.7685 [0.9426]
Q^2(4)	4.4167 [0.3525]	1.0135 [0.9077]

Table C6: Linear and GARCH-M Results for UK

UK	Linear	MGARCH-M
	1970:07 - 2006:12	1970:08 - 2006:12
Equation (22): β_0	0.1530 (3.34)	0.1461 (2.74)
M_{t-1}	0.1813 (3.82)	0.2855 (5.88)
M_{t-2}	0.0930 (1.92)	
M_{t-3}	0.1043 (2.19)	0.0971 (1.40)
M_{t-6}	0.0898 (1.90)	
M_{t-7}	0.0888 (1.85)	
M_{t-8}	0.1011 (2.12)	0.1300 (3.22)
M_{t-10}	0.0705 (1.51)	0.1138 (2.14)
Y_{t-4}	0.0303 (1.75)	0.0270 (1.72)
Y_{t-8}	-0.0270 (-1.58)	
Y_{t-12}	-0.0367 (-2.15)	-0.0314 (-2.08)
$\sigma^2_{\Delta M_t}$		-0.1744 (-0.61)
$\sigma^2_{\Delta Y_t}$		0.0605 (2.46)
Equation (23): α_0		0.1281 (6.97)
ε^2_{t-1}		0.3157 (3.71)
$\sigma^2_{\Delta M_{t-1}}$		0.1042 (2.52)
Q(4)	1.4729 [0.8314]	3.2932 [0.5100]
Q^2(4)	34.9884 [0.0000]	2.2456 [0.6907]
Equation (24): Θ_0	0.1679 (1.95)	0.0131 (0.15)

Y_{t-1}	-0.0548 (-1.16)	-0.1404 (-2.65)
Y_{t-5}	0.1182 (2.50)	0.0943 (2.35)
Y_{t-9}	-0.0881 (-1.89)	-0.0705 (-1.39)
Y_{t-12}	-0.0707 (-1.52)	-0.0610 (-1.28)
M_{t-6}	-0.1083 (-0.91)	0.0410 (0.46)
$\sigma^2_{\Delta M_t}$		0.4778 (1.22)
$\sigma^2_{\Delta Y_t}$		-0.0234 (-0.30)
Equation (25): α_3		0.0020 (0.38)
v^2_{t-1}		0.0530 (1.89)
$\sigma^2_{\Delta Y_{t-1}}$		0.9443 (36.71)
Equation (26): $\rho_{\varepsilon v}$		-0.0119 (-0.31)
Q(4)	0.9334 [0.9197]	2.8192 [0.5885]
Q²(4)	14.0394 [0.0072]	7.4543 [0.1137]

Table C7: Linear and GARCH-M Results for US

US	Linear	MGARCH-M
	1961:02 - 2006:12	1961:02 - 2006:12
Equation (22): β_0	0.1372 (4.38)	0.1180 (2.27)
M_{t-1}	0.3093 (8.03)	0.3722 (9.22)
M_{t-3}	0.1797 (4.47)	0.1801 (4.59)
M_{t-5}	0.0926 (2.27)	0.0886 (2.94)
M_{t-6}	0.1294 (3.05)	0.1169 (3.50)
M_{t-9}	0.1529 (3.77)	0.1328 (5.23)
M_{t-12}	-0.1003 (-2.52)	-0.0878 (-2.90)
Y_{t-2}	-0.0712 (-2.69)	
Y_{t-3}	-0.0834 (-3.11)	-0.0747 (-3.13)
Y_{t-11}	-0.0396 (-1.50)	-0.0521 (-2.44)
Y_{t-12}	0.0507 (1.92)	0.0573 (2.36)
$\sigma^2_{\Delta M_t}$		-0.2229 (-1.16)
$\sigma^2_{\Delta Y_t}$		0.0366 (0.55)
Equation (23): α_0		0.0159 (2.30)
ε^2_{t-1}		0.2010 (3.11)
$\sigma^2_{\Delta M_{t-1}}$		0.7145 (8.79)
Q(4)	0.1276 [0.9981]	1.4813 [0.8300]
Q²(4)	32.7668 [0.0000]	1.8320 [0.7666]
Equation (24): Θ_0	0.0998 (2.32)	0.0078 (0.09)
Y_{t-1}	0.2071 (4.86)	0.1174 (2.64)
Y_{t-2}	0.1298 (3.02)	0.1267 (3.59)

Y_{t-3}	0.1068 (2.47)	0.1420 (3.32)
Y_{t-4}	0.0936 (2.17)	0.1101 (2.83)
Y_{t-5}	-0.0728 (-1.70)	
Y_{t-9}	0.0977 (2.41)	0.0672 (1.49)
Y_{t-12}	-0.0665 (-1.65)	-0.0624 (-1.29)
M_{t-2}	0.1148 (2.05)	0.0957 (1.92)
$\sigma^2_{\Delta M_t}$		-0.3432 (-1.56)
$\sigma^2_{\Delta Y_t}$		0.4481 (2.78)
Equation (25): α_3		0.2345 (4.19)
v^2_{t-1}		0.2819 (3.22)
$\sigma^2_{\Delta Y_{t-1}}$		0.1535 (0.99)
Equation (26): $\rho_{\varepsilon v}$		-0.0385 (-1.06)
Q(4)	0.0208 [0.9999]	1.8856 [0.7568]
Q^2(4)	20.8812 [0.0003]	1.0139 [0.9077]