

Appendix I: MPS and section 2.1.1

This appendix includes all statistical output from the Granger causality tests and cross-correlograms which were used in deciding the appropriate amount of lags in the system for section 5.1.1

- First page gives a short overview over the variables, and their sources.
- This is followed by stationarity tests for all the variables, all variables passed both Dickie Fuller and P. Perron tests.
- The cross-correlograms and their resulting Granger causality outputs, with details from section 5.1.1 highlighted, results given in 5.1.1.
- Granger causality .ado program downloaded from, <http://ideas.repec.org/c/boc/bocode/s428201.html#related>; created by Patrick Joly, Industry Canada. (downloaded May 2005)

Unless the reader is very keen on statistical output, it is recommended that appendices I and III be skipped, as their results are summarised on the first page of the relevant appendix, and the variable description follows directly. Further from there it's all Intercooled Stata7 output and description of the output.

Change variables were investigated for stationarity and a normal distribution of residual values. Further two tests for autocorrelation in the data was undertaken. All tests concluded the data were not auto-correlated, the residuals were normally distributed, and all sets rejected the hypothesis that the data were non-stationary twice, using both the Dickie Fuller test, and the P. Perron test for stationarity. Each function was also found to be an asymptote towards MPS, necessary in Granger causality testing.

The variables - data reference the period 1987 Q1 – 2003 Q4, for the UK

- Savratcha, the percentage change in the savings ratio quarter on quarter, source: ONS (2004)
- Gdpcha, Gross Domestic Product: chained volume measures: Seasonally adjusted, percentage change quarter on quarter, source: ONS (2004)
- Rcha, Percentage change in the interest rate over the last quarter, source BoE (2003)
- Rsig, as calculated in 4.2.1: $R_{SIG} = (n \cdot r)(r_t - r_{t-1})$, source BoE (2003)
- FTSEcha, percentage change in the FTSE All-share index over the last quarter, source FTSE (2004)

Stationarity testing:

All variables stationary.

```

. dfuller savratcha

Dickey-Fuller test for unit root                Number of obs   =       65

                ----- Interpolated Dickey-Fuller -----
                Test          1% Critical    5% Critical    10% Critical
                Statistic     Value         Value         Value
-----
Z(t)           -12.215         -3.559         -2.918         -2.594
-----
* MacKinnon approximate p-value for Z(t) = 0.0000

. pperron savratcha

Phillips-Perron test for unit root             Number of obs   =       65
                                                Newey-West lags =       3

                ----- Interpolated Dickey-Fuller -----
                Test          1% Critical    5% Critical    10% Critical
                Statistic     Value         Value         Value
-----
Z(rho)         -92.131         -19.170         -13.420         -10.790
Z(t)           -12.142         -3.559         -2.918         -2.594
-----
* MacKinnon approximate p-value for Z(t) = 0.0000

```

```

. dfuller gdpcha
Dickey-Fuller test for unit root                    Number of obs =      65

              Test              ----- Interpolated Dickey-Fuller -----
              Statistic          1% Critical  5% Critical  10% Critical
              Value              Value      Value      Value
-----
Z(t)          -4.665             -3.559      -2.918      -2.594
-----
* MacKinnon approximate p-value for Z(t) = 0.0001

. pperron gdpcha
Phillips-Perron test for unit root                 Number of obs =      65
                                                    Newey-West lags =    3

              Test              ----- Interpolated Dickey-Fuller -----
              Statistic          1% Critical  5% Critical  10% Critical
              Value              Value      Value      Value
-----
Z(rho)        -32.301           -19.170     -13.420     -10.790
Z(t)          -4.624             -3.559      -2.918      -2.594
-----
* MacKinnon approximate p-value for Z(t) = 0.0001

```

```

. dfuller Rcha
Dickey-Fuller test for unit root                    Number of obs =      65

              Test              ----- Interpolated Dickey-Fuller -----
              Statistic          1% Critical  5% Critical  10% Critical
              Value              Value      Value      Value
-----
Z(t)          -5.385             -3.559      -2.918      -2.594
-----
* MacKinnon approximate p-value for Z(t) = 0.0000

. pperron Rcha
Phillips-Perron test for unit root                 Number of obs =      65
                                                    Newey-West lags =    3

              Test              ----- Interpolated Dickey-Fuller -----
              Statistic          1% Critical  5% Critical  10% Critical
              Value              Value      Value      Value
-----
Z(rho)        -41.135           -19.170     -13.420     -10.790
Z(t)          -5.421             -3.559      -2.918      -2.594
-----
* MacKinnon approximate p-value for Z(t) = 0.0000

```

```

. dfuller Rsig
Dickey-Fuller test for unit root                    Number of obs =      65

              Test              ----- Interpolated Dickey-Fuller -----
              Statistic          1% Critical  5% Critical  10% Critical
              Value              Value      Value      Value
-----
Z(t)          -6.153             -3.559      -2.918      -2.594
-----
* MacKinnon approximate p-value for Z(t) = 0.0000

. pperron Rsig
Phillips-Perron test for unit root                 Number of obs =      65
                                                    Newey-West lags =    3

              Test              ----- Interpolated Dickey-Fuller -----
              Statistic          1% Critical  5% Critical  10% Critical
              Value              Value      Value      Value
-----
Z(rho)        -45.627           -19.170     -13.420     -10.790
Z(t)          -6.084             -3.559      -2.918      -2.594
-----

```

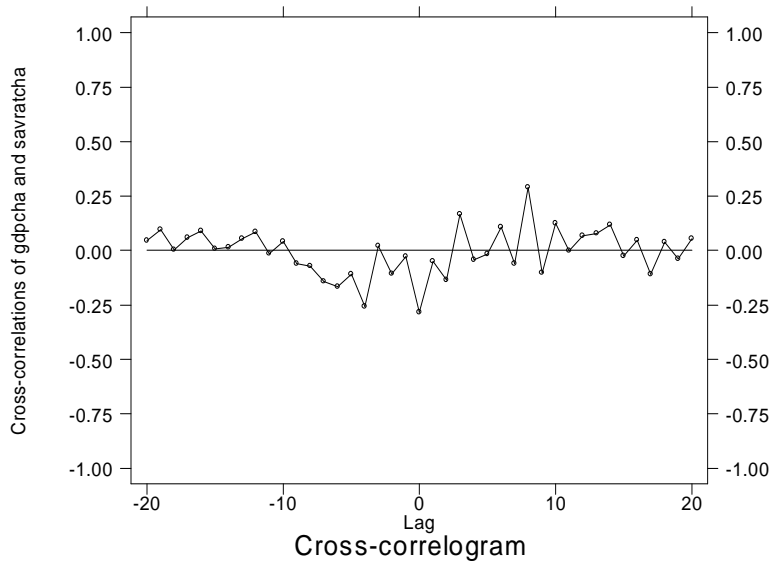
```

* MacKinnon approximate p-value for Z(t) = 0.0000

. dfuller FTSEcha
Dickey-Fuller test for unit root                    Number of obs =      65
----- Interpolated Dickey-Fuller -----
              Test          1% Critical   5% Critical   10% Critical
              Statistic      Value       Value       Value
-----
Z(t)          -8.091         -3.559      -2.918      -2.594
-----
* MacKinnon approximate p-value for Z(t) = 0.0000

. pperron FTSEcha
Phillips-Perron test for unit root                  Number of obs =      65
                                                    Newey-West lags =    3
----- Interpolated Dickey-Fuller -----
              Test          1% Critical   5% Critical   10% Critical
              Statistic      Value       Value       Value
-----
Z(rho)        -67.532        -19.170     -13.420     -10.790
Z(t)          -8.091         -3.559      -2.918      -2.594
-----
* MacKinnon approximate p-value for Z(t) = 0.0000
    
```

Cross correlograms and Granger causality.
Results as given in the relevant section



```

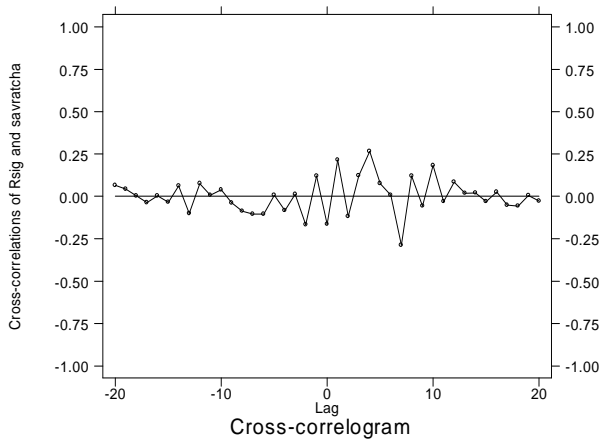
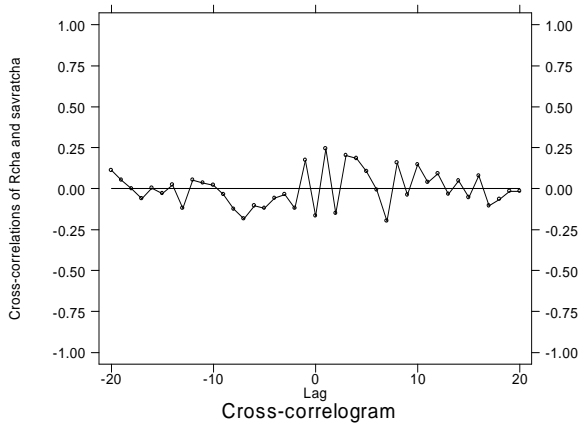
. gcause savratcha gdpcha, lags(3)
Granger causality test                               Sample: 1988q1 to 2003q3
                                                    obs = 63

H0: gdpcha does not Granger-cause savratcha

              chi2(3) =      8.85      (asymptotic)
              Prob > chi2 = 0.0314     (asymptotic)
-----
. gcause savratcha Rcha, lags(4)
Granger causality test                               Sample: 1988q2 to 2003q3
                                                    obs = 62

H0: Rcha does not Granger-cause savratcha

              chi2(4) =     12.07      (asymptotic)
              Prob > chi2 = 0.0169     (asymptotic)
    
```



```
. gcause savratcha Rsig, lags(4)
Granger causality test                               Sample: 1988q2 to 2003q3
                                                    obs = 62

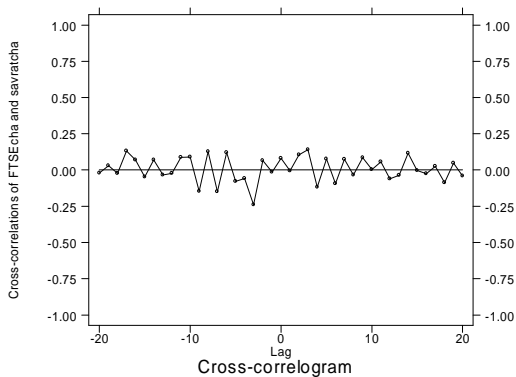
H0: Rsig does not Granger-cause savratcha

           chi2(4) =   13.45   (asymptotic)
Prob > chi2 =   0.0093   (asymptotic)
```

```
. gcause savratcha FTSEcha, lags(3)
Granger causality test                               Sample: 1988q1 to 2003q3
                                                    obs = 63

H0: FTSEcha does not Granger-cause savratcha

           chi2(3) =    4.01   (asymptotic)
Prob > chi2 =   0.2606   (asymptotic)
```



FTSE shows no g-causality at any number of lags

APPENDIX II

The FTSE statistics does suffer somewhat under the quarterly restriction, as the FTSE variable changes daily, and consumers and firms may change opinion several times over a period, we must try to isolate the effect of the change in the stock market upon the change in the savings rate. This is an attempt to demonstrate the FTSE to MPS relationship by observation, and past experience:

The observation is when official opinion has been quiet for two periods in a row. As a

```
. list savratcha FTSEcha
if Rsig==0 & Rsiglag==0
```

	savratcha	FTSEcha
13.	-12346	5053
14.	16901	-17852
20.	8491	-1346
26.	-2703	5183
34.	4167	6789
35.	-4000	4000
40.	21053	4273
54.	32609	-13
55.	18033	-1504
61.	11321	-11508
62.	-5085	-20398
63.	-10714	5121
66.	11321	2864

result we can better isolate the change in savings rate as being caused by the FTSE change. The pattern that is obvious is that as the FTSE changes positively through a period, the saving rate falls, as people expect there to be more income in future. This is consistent over most of the dataset, but as gdp (with 3 lags) and interest rate (with 4 lags) are influencing the level of the change, we must limit ourselves to observing the general pattern.

A better example comes from the end of the eighties boom, where a series of events illustrate the effect of the stock market quite well:

In the period 6 October 1989 to 8 October 1990 no Rate change (Q4 89 - Q3 90).

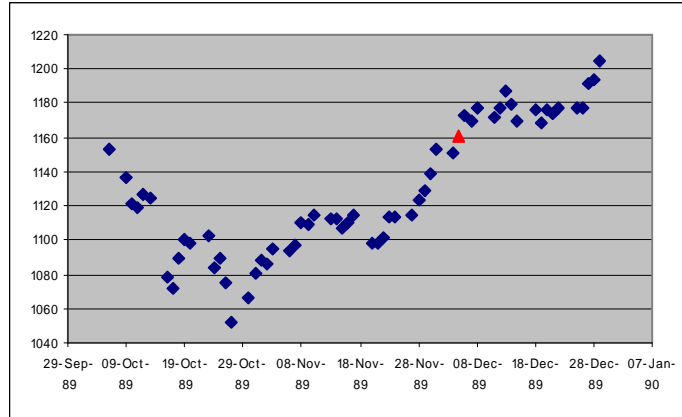
This is the period where the late 80's boom ends, and the early nineties recession starts.

Investment change:	
1989 Q3	3.1
1989 Q4	-2.5
1990 Q1	-0.1
1990 Q2	1.3
1990 Q3	-2.3
1990 Q4	-1.4

S Ratio	Change		FTSE%		Gdp %
8.3			+5.63		+0.1
7.6	-8.4%		+3.57		+0.1
8.1	+6.6%		-7.45		+0.8
7.1	-12.3%		+5.65		+0.5
8.3	+16.9%		-17.85		-1.2
8.5			+7.28		-0.6

In Q4 89 stock markets fall 8% in first month, and rises for next two; investment is down, savings up. This is a reaction to the timing of the fall - investment plans take long, so relatively greater fall, than the saving increase - who react to later rises.

[triangle: 5th Dec. First time over start price.]



Q1 1990, stock market falls 7 percent, stock markets fall overall, investment falls, savings up.

Q2 90, stock market rise, investment rise, and savings fall.

Q3 90, stock markets falls 17 percent, inv down 2.3% and savings up.”

Q4 90, interest rate down 1%, $r_{sig} = -1$, savings up, and investment down, contradicting classical interest rate theory, but following expectational pattern.

i.e. Investment is not responding to interest rate changes, and neither is consumption. so i_1 is very low, and c_1 is also low.

Recalling that changes in GDP are equivalent to changes in RHDl given no rate change, we can isolate income effect on money demand here:

89 Q4 Yd up 0.1%, but expectations of future income is high - so S down

90 Q1 Yd up 0.1%, but expectations of future income low (FTSE down) so S up

90 Q2 Yd up, savings down.

If Yd was important in determining Savings, S should have remained the same for the above period

90 Q3 Yd down, SM down, S up - dual response - no official opinion yet.

90 Q4 Yd down, $R_{sig} = -1$, BoE negative expectations, savings up, but not too much of an increase as SM up

i.e. The responsiveness of money demand to a change in income depends on expectations.

APPENDIX III – Interest rates and Investment, section 2.2

This appendix includes all regression statistics for the measurement of how investment changes its reaction to interest rate changes. Included are stationarity tests for every variable, followed by linear regressions of the two interest rate variables against investment change. Testing for normality in residuals, autocorrelation through Durbin Watson and omitted variable bias.

- First page gives a short overview over the variables, and their sources.
- Then a list of the relevant regression tables, with the variables from in section 5.2 highlighted for easy recognition.
- Stationarity tests for all variables – all passed bot Dickie Fuller and P. Perron tests.
- Specification tests for all variables, single regressions – all passed
- Specification testing the singular regressions that are restricted by the FTSE bands. All tests passed, although Durbin Watson test for auto correlation was passed with uncertain output. Given stationarity, and no autocorrelation in the full variable tests, this is not a big problem.

The variables, - data reference the period 1987 Q1 – 2003 Q4, for the UK.

- *invcha10* represents the percentage change, quarter on quarter for “Gross Fixed Capital Formation: Business Investment” Source ONS (2004)
- *ratecha10k* represents the percentage interest rate change, quarter on quarter, for the UK. Source: BoE (2003)
- *FTSEper10* represents the percentage change quarter on quarter, for the FTSE all share index, rounded to 1 Decimal Place. Source: FTSE (2004)
- *Rsig* [$R_{SIG} = (n \cdot r \Delta)(r_t - r_{t-1})$] represents the number of interest rate changes over the quarter, times the change in the rate over the quarter. Source: BoE (2003)

Actual values multiplied up by factor shown – to incorporate into Stata as time series data, this makes no difference as the percentage change taken are the exact same.

(i.e. FTSEper10>50 reads: if the FTSE share index rose by more than 5%)

```
reg invcha10 ratecha10k if FTSEper10>50
```

Source	SS	df	MS	Number of obs =	24
Model	6418.167	1	6418.167	F(1, 22) =	9.99
Residual	14131.1663	22	642.325742	Prob > F =	0.0045
				R-squared =	0.3123
				Adj R-squared =	0.2811
Total	20549.3333	23	893.449275	Root MSE =	25.344

invcha10	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
ratecha10k	.0023521	.0007441	3.16	0.005	.0008089 .0038952
_cons	19.25185	5.771116	3.34	0.003	7.28329 31.22041

```
. reg invcha10 ratecha10k if FTSEper10<50 & FTSEper10>0
```

Source	SS	df	MS	Number of obs =	21
Model	1362.02315	1	1362.02315	F(1, 19) =	1.56
Residual	16596.2626	19	873.487504	Prob > F =	0.2269
				R-squared =	0.0758
				Adj R-squared =	0.0272
Total	17958.2857	20	897.914286	Root MSE =	29.555

invcha10	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
ratecha10k	.0015057	.0012058	1.25	0.227	-.0010181 .0040296
_cons	8.887526	6.545867	1.36	0.190	-4.81313 22.58818

```
. reg invcha10 ratecha10k if FTSEper10<0
```

Source	SS	df	MS	Number of obs =	22
Model	1099.4496	1	1099.4496	F(1, 20) =	1.40
Residual	15729.6413	20	786.482065	Prob > F =	0.2509
				R-squared =	0.0653
				Adj R-squared =	0.0186
Total	16829.0909	21	801.385281	Root MSE =	28.044

invcha10	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
ratecha10k	.0008826	.0007465	1.18	0.251	-.0006745 .0024398
_cons	10.83696	5.981469	1.81	0.085	-1.640169 23.31408

Traditional relationship of higher interest, lower investment is breaking down rapidly, as expectations of profits in the economy change.

Using Rsig rather than Actual rate changes gives the following results:

```
. reg invcha10 Rsig if FTSEper10>50
```

Source	SS	df	MS			
Model	5022.51055	1	5022.51055	Number of obs =	24	
Residual	15526.8228	22	705.764672	F(1, 22) =	7.12	
				Prob > F =	0.0141	
				R-squared =	0.2444	
				Adj R-squared =	0.2101	
Total	20549.3333	23	893.449275	Root MSE =	26.566	

invcha10	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
Rsig	8.974111	3.364038	2.67	0.014	1.997522	15.9507
_cons	17.71029	5.95179	2.98	0.007	5.367033	30.05354

```
. reg invcha10 Rsig if FTSEper10<50 & FTSEper10>0
```

Source	SS	df	MS			
Model	2223.8138	1	2223.8138	Number of obs =	21	
Residual	15734.4719	19	828.130101	F(1, 19) =	2.69	
				Prob > F =	0.1177	
				R-squared =	0.1238	
				Adj R-squared =	0.0777	
Total	17958.2857	20	897.914286	Root MSE =	28.777	

invcha10	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
Rsig	15.76374	9.619654	1.64	0.118	-4.370423	35.89791
_cons	7.977452	6.435752	1.24	0.230	-5.492731	21.44763

```
. reg invcha10 Rsig if FTSEper10<0
```

Source	SS	df	MS			
Model	375.152387	1	375.152387	Number of obs =	22	
Residual	16453.9385	20	822.696926	F(1, 20) =	0.46	
				Prob > F =	0.5072	
				R-squared =	0.0223	
				Adj R-squared =	-0.0266	
Total	16829.0909	21	801.385281	Root MSE =	28.683	

invcha10	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
Rsig	1.41652	2.097678	0.68	0.507	-2.959159	5.792198
_cons	10.4432	6.121857	1.71	0.104	-2.326769	23.21317

Using Rsig may be more appropriate as R^2 adj. is higher for the times when the FTSE has gone up by the more than 0% and less than 5%. Model suggests that i_1 should be high in optimistic times, and near zero in negative times, this is demonstrated by both Rsig and Ratecha10 regressions, but the middle ground is best shown by the Rsig regression.

Testing the variables for stationarity:

Conclusion: all variables are stationary over time.

```
. dfuller ratecha10k
Dickey-Fuller test for unit root                Number of obs   =       134
                                                -----
                                                Interpolated Dickey-Fuller
Test      1% Critical   5% Critical   10% Critical
Statistic Value         Value         Value
-----
Z(t)      -9.861        -3.499        -2.888        -2.578
-----
• MacKinnon approximate p-value for Z(t) = 0.0000

. pperron ratecha10k
Phillips-Perron test for unit root            Number of obs   =       134
                                                Newey-West lags =        4
                                                -----
                                                Interpolated Dickey-Fuller
Test      1% Critical   5% Critical   10% Critical
Statistic Value         Value         Value
-----
Z(rho)    -112.328       -19.913       -13.768       -11.045
Z(t)      -9.846        -3.499        -2.888        -2.578
-----
• MacKinnon approximate p-value for Z(t) = 0.0000
```

```
. dfuller invcha10
Dickey-Fuller test for unit root                Number of obs   =       134
                                                -----
                                                Interpolated Dickey-Fuller
Test      1% Critical   5% Critical   10% Critical
Statistic Value         Value         Value
-----
Z(t)      -12.282       -3.499        -2.888        -2.578
-----
• MacKinnon approximate p-value for Z(t) = 0.0000

. pperron invcha10
Phillips-Perron test for unit root            Number of obs   =       134
                                                Newey-West lags =        4
                                                -----
                                                Interpolated Dickey-Fuller
Test      1% Critical   5% Critical   10% Critical
Statistic Value         Value         Value
-----
Z(rho)    -168.616       -19.913       -13.768       -11.045
Z(t)      -12.324       -3.499        -2.888        -2.578
-----
• MacKinnon approximate p-value for Z(t) = 0.0000
```

```
. dfuller Rsig
```

Dickey-Fuller test for unit root Number of obs = 134

Test Statistic	Interpolated Dickey-Fuller		
	1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-11.047	-3.499	-2.888

- MacKinnon approximate p-value for Z(t) = 0.0000

```
. pperron Rsig
```

Phillips-Perron test for unit root Number of obs = 134
Newey-West lags = 4

Test Statistic	Interpolated Dickey-Fuller		
	1% Critical Value	5% Critical Value	10% Critical Value
Z(rho)	-133.672	-19.913	-13.768
Z(t)	-11.072	-3.499	-2.888

- MacKinnon approximate p-value for Z(t) = 0.0000

```
. dfuller FTSEper10
```

Dickey-Fuller test for unit root Number of obs = 67

Test Statistic	Interpolated Dickey-Fuller		
	1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-8.039	-3.556	-2.916

- MacKinnon approximate p-value for Z(t) = 0.0000

```
. pperron FTSEper10
```

Phillips-Perron test for unit root Number of obs = 67
Newey-West lags = 3

Test Statistic	Interpolated Dickey-Fuller		
	1% Critical Value	5% Critical Value	10% Critical Value
Z(rho)	-65.016	-19.206	-13.436
Z(t)	-8.040	-3.556	-2.916

- MacKinnon approximate p-value for Z(t) = 0.0000

Testing individual regressions validity:

Testing overall regressions. No specification faults found in data. All data non-autocorrelated, have constant variances and no omitted variable bias.

For Ratecha10k:

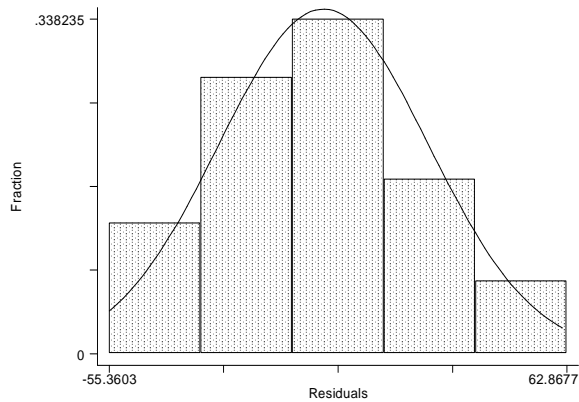
```
. reg invcha10 ratecha10k
```

Source	SS	df	MS			
Model	6932.83389	1	6932.83389	Number of obs =	68	
Residual	49093.4455	66	743.840084	F(1, 66) =	9.32	
Total	56026.2794	67	836.213126	Prob > F =	0.0033	
				R-squared =	0.1237	
				Adj R-squared =	0.1105	
				Root MSE =	27.273	

invcha10	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
ratecha10k	.0014265	.0004672	3.05	0.003	.0004936	.0023594
_cons	12.52941	3.340231	3.75	0.000	5.860426	19.1984

```
. predict res, resid
```

```
. graph res, normal
```



```
. sktest res
```

Skewness/Kurtosis tests for Normality				
Variable	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	joint Prob>chi2
res	0.274	0.771	1.32	0.5158

```
. ovtest
```

Ramsey RESET test using powers of the fitted values of invcha10

Ho: model has no omitted variables
 $F(3, 63) = 0.15$
 $\text{Prob} > F = 0.9280$

```
. dwstat
```

Durbin-Watson d-statistic(2, 68) = 1.615268

For Rsig:

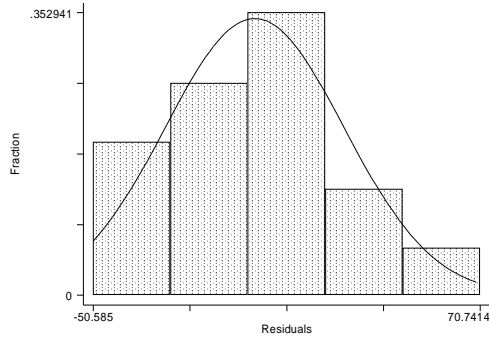
```
. reg invcha10 Rsig
```

Source	SS	df	MS			
Model	3417.509	1	3417.509	Number of obs =	68	
Residual	52608.7704	66	797.102582	F(1, 66) =	4.29	
				Prob > F =	0.0423	
				R-squared =	0.0610	
				Adj R-squared =	0.0468	

Total | 56026.2794 67 836.213126 Root MSE = 28.233

invcha10	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
Rsig	3.557863	1.71827	2.07	0.042	.1272256	6.9885
_cons	11.70071	3.435905	3.41	0.001	4.840709	18.56072

```
. predict res, resid
. graph res, normal
```



```
. sktest res
```

Skewness/Kurtosis tests for Normality

Variable	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	joint Prob>chi2
res	0.230	0.889	1.51	0.4690

```
. ovtest
```

Ramsey RESET test using powers of the fitted values of invcha10
 Ho: model has no omitted variables
 F(3, 63) = 4.15
 Prob > F = 0.0095

```
. dwstat
```

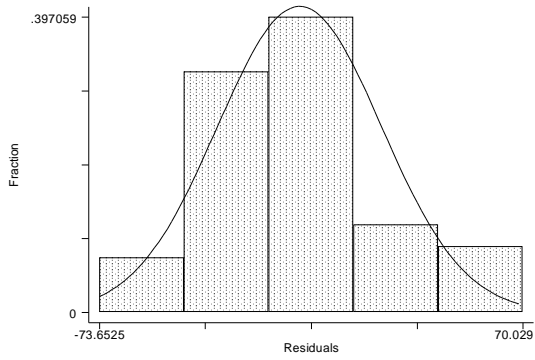
Durbin-Watson d-statistic(2, 68) = 1.446561

Testing individual regressions across different values of FTSEper10.

Conclusion: all regressions have no major faults, some residual sets are not perfectly normal, but that is to be expected when the sample sizes are reduced, the residual are however very close to being normally distributed. I.e. t-stats are valid. The Durbin Watson tests are inconclusive for the smaller samples, but are conclusive for the larger sample sizes tested above, so likelihood of autocorrelation in the change variables is minimal.

Testing for Ratecha10k

```
. reg invcha10 ratecha10k if FTSEper10>50
. predict res, resid
. graph res, normal
```



. sktest res

Skewness/Kurtosis tests for Normality

Variable	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	joint Prob>chi2
res	0.241	0.613	1.69	0.4298

. hettest

Cook-Weisberg test for heteroskedasticity using fitted values of invcha10
 Ho: Constant variance
 chi2(1) = 0.96
 Prob > chi2 = 0.3261

. ovtest

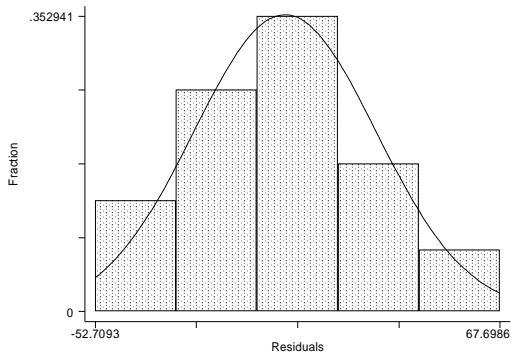
Ramsey RESET test using powers of the fitted values of invcha10
 Ho: model has no omitted variables
 F(3, 19) = 0.47
 Prob > F = 0.7087

. reg invcha10 ratecha10k if FTSEper10<50 & FTSEper10>0

Source	SS	df	MS	Number of obs =	21
Model	1362.02315	1	1362.02315	F(1, 19) =	1.56
Residual	16596.2626	19	873.487504	Prob > F =	0.2269
Total	17958.2857	20	897.914286	R-squared =	0.0758
				Adj R-squared =	0.0272
				Root MSE =	29.555

invcha10	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
ratecha10k	.0015057	.0012058	1.25	0.227	-.0010181 .0040296
_cons	8.887526	6.545867	1.36	0.190	-4.81313 22.58818

. predict res, resid



. sktest res

Skewness/Kurtosis tests for Normality

Variable	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	joint Prob>chi2
res	0.262	0.810	1.36	0.5070

. hettest

Cook-Weisberg test for heteroskedasticity using fitted values of invcha10
 Ho: Constant variance
 chi2(1) = 2.54
 Prob > chi2 = 0.1108

. ovtest

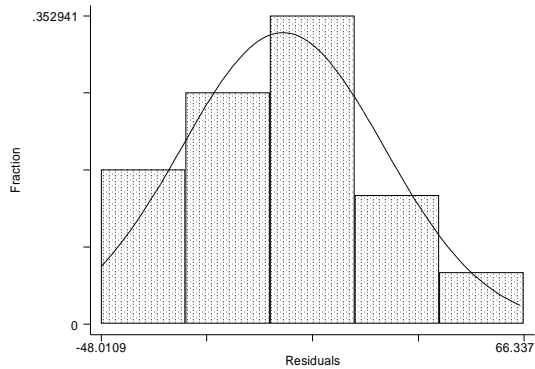
Ramsey RESET test using powers of the fitted values of invcha10
 Ho: model has no omitted variables
 F(3, 16) = 2.18
 Prob > F = 0.1303

Number of gaps in sample: 11
 Durbin-Watson d-statistic(2, 21) = .8837378

 . reg invcha10 ratecha10k if FTSEper10<0

Source	SS	df	MS	Number of obs =	22
Model	1099.4496	1	1099.4496	F(1, 20) =	1.40
Residual	15729.6413	20	786.482065	Prob > F =	0.2509
				R-squared =	0.0653
				Adj R-squared =	0.0186
Total	16829.0909	21	801.385281	Root MSE =	28.044

invcha10	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
ratecha10k	.0008826	.0007465	1.18	0.251	-.0006745 .0024398
_cons	10.83696	5.981469	1.81	0.085	-1.640169 23.31408



. predict res, resid

. sktest res

Skewness/Kurtosis tests for Normality

Variable	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	joint Prob>chi2
res	0.402	0.612	0.99	0.6102

. hettest

Cook-Weisberg test for heteroskedasticity using fitted values of invcha10
 Ho: Constant variance

```
chi2(1)      =      2.18
Prob > chi2  =      0.1399
```

```
. ovtest
```

```
Ramsey RESET test using powers of the fitted values of invcha10
Ho: model has no omitted variables
      F(3, 17) =      3.06
      Prob > F =      0.0565
```

```
Number of gaps in sample: 15
Durbin-Watson d-statistic( 2, 22) = .5273134
```

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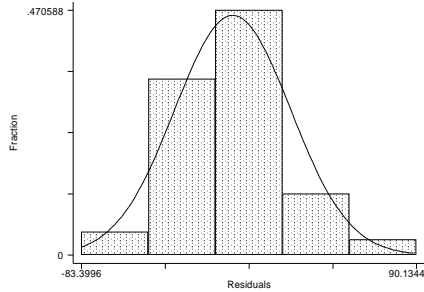
Now testing for Rsig:

```
. reg invcha10 Rsig if FTSEper10>50
```

```
-----
```

```
. predict res, resid
```

```
. graph res, normal
```



```
. hettest
```

```
Cook-Weisberg test for heteroskedasticity using fitted values of invcha10
Ho: Constant variance
      chi2(1) =      2.54
      Prob > chi2 =     0.1112
```

```
. ovtest
```

```
Ramsey RESET test using powers of the fitted values of invcha10
Ho: model has no omitted variables
      F(3, 19) =      0.38
      Prob > F =      0.7702
```

```
. sktest res
```

Skewness/Kurtosis tests for Normality

Variable	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	joint Prob>chi2
res	0.113	0.119	4.90	0.0864

```
. dwstat
```

```
Number of gaps in sample: 17
Durbin-Watson d-statistic( 2, 24) = .6482695
```

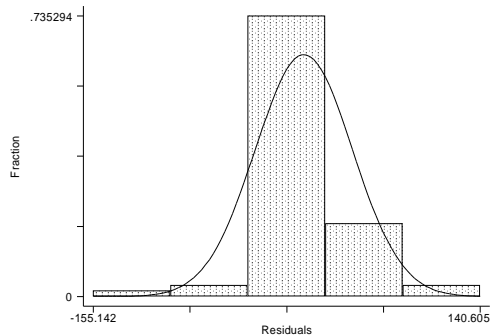
```
-----|
```

```
. reg invcha10 Rsig if FTSEper10<50 & FTSEper10>0
```

Source	SS	df	MS	Number of obs =	21
Model	2223.8138	1	2223.8138	F(1, 19) =	2.69
Residual	15734.4719	19	828.130101	Prob > F =	0.1177
				R-squared =	0.1238
				Adj R-squared =	0.0777
Total	17958.2857	20	897.914286	Root MSE =	28.777

invchal0	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
Rsig	15.76374	9.619654	1.64	0.118	-4.370423	35.89791
_cons	7.977452	6.435752	1.24	0.230	-5.492731	21.44763

. predict res, resid



. sktest res

Skewness/Kurtosis tests for Normality

Variable	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	joint Prob>chi2
res	0.304	0.000	14.45	0.0007

. ovtest

Ramsey RESET test using powers of the fitted values of invchal0
 Ho: model has no omitted variables
 F(3, 16) = 1.01
 Prob > F = 0.4145

. dwstat

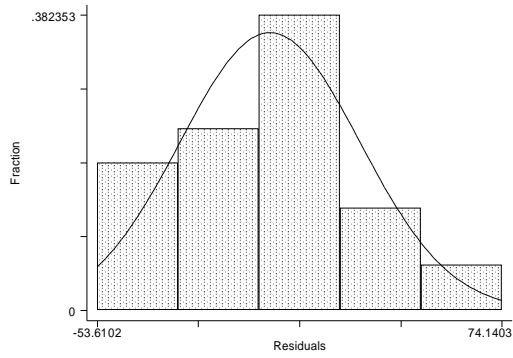
Number of gaps in sample: 11
 Durbin-Watson d-statistic(2, 21) = .9874757

. reg invchal0 Rsig if FTSEper10<0

Source	SS	df	MS	Number of obs =	22
Model	375.152387	1	375.152387	F(1, 20) =	0.46
Residual	16453.9385	20	822.696926	Prob > F =	0.5072
Total	16829.0909	21	801.385281	R-squared =	0.0223
				Adj R-squared =	-0.0266
				Root MSE =	28.683

invchal0	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
Rsig	1.41652	2.097678	0.68	0.507	-2.959159	5.792198
_cons	10.4432	6.121857	1.71	0.104	-2.326769	23.21317

. predict res, resid



. sktest res

Skewness/Kurtosis tests for Normality

Variable	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	joint Prob>chi2
res	0.521	0.760	0.51	0.7731

. ovtest

Ramsey RESET test using powers of the fitted values of invcha10
 Ho: model has no omitted variables
 F(3, 17) = 3.50
 Prob > F = 0.0383

. dwstat

Number of gaps in sample: 15
 Durbin-Watson d-statistic(2, 22) = .5009694

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