HOMEWORK #4

To test the hypothesis that inflation uncertainty is higher when inflation is higher, I examine several models about the conditional variance of CPI inflation. The first model I study is GARCH (1,1). Four different specifications are used for the explanatory variables in the mean equation of the model: (a) an AR (1) term; (b) an AR (1) term and the T-bill rate; (c) an ARIMA (0,1,1) process for CPI; (d) an ARIMA (0,1,1) process for CPI and the T-bill rate. The variance equation if the model includes the CPI level as an explanatory variable. The same variance equation is used in combination with the different mean equations mentioned before.

If inflation uncertainty is higher when the level of inflation is higher, we would expect to see a significant and positive coefficient on the CPI term in the variance equation of the GARCH (1,1) model. Panel A of Table 1 presents the results for this coefficient for different combinations of the variance equation with the mean equations. Note that for all specifications, the coefficient on the level of CPI is positive and highly significant. This provides evidence in favor of Friedman's hypothesis. It is interesting that the different specifications for the GARCH (1,1) mean equation produce almost identical point estimates and standard errors of the coefficients on the CPI term. One conclusion this leads to is that the results are robust to the different specifications.

To test the robustness of the results to different specifications of the model for conditional variance, I examine an EGARCH (1,1) specification as well. The mean and

variance equations are the same as the ones used in the case of the GARCH (1,1) model presented above. The results are contained in Panel B of Table 1. Note again that for all different combinations of the variance equation with the mean equations, the coefficient on the CPI term is positive and highly significant. The EGARCH (1,1) specification for the conditional variance of inflation also supports Friedman's hypothesis. An interesting observation is that the point estimates in Panel B are much higher than the corresponding estimates in Panel A. However, it is misleading to conclude that the EGARCH (1,1) model predicts a stronger relation between the level and the variance of CPI. The reason for this is that the dependent variable in the variance equation of the EGARCH (1,1) model is the logarithm of the conditional variance.

I also examine the same GARCH models for the case of seasonally-adjusted inflation. The results are presented in Table 2. As before, in all cases, the coefficient on the CPI term in the variance equation is positive and highly significant. Therefore, using seasonally-adjusted CPI supports Friedman's hypothesis as well.

Table 1
Results Based on the Sample Period from 1926 to 2000 for Non-Seasonally Adjusted CPI

Model	Coefficient	Std. Error	t-Statistic
A			
GARCH (1,1)			
AR (1)	1.25E-04	2.16E-05	5.80
AR (1), T-bill	1.01E-04	2.18E-05	4.63
ARIMA (0,1,1)	9.69E-05	1.93E-05	5.01
ARIMA (0,1,1), T-bill	9.65E-05	1.91E-05	5.04
B			
EGARCH (1,1)			
AR (1)	14.98	1.32	11.34
AR (1), T-bill	12.16	1.55	7.86
ARIMA (0,1,1)	24.82	1.52	16.34
ARIMA (0,1,1), T-bill	15.44	2.39	6.45

Table 2
Results Based on the Sample Period from 1926 to 2000 for Seasonally Adjusted CPI

Model	Coefficient	Std. Error	t-Statistic
A			
GARCH (1, 1)			
AR (1)	7.38E-05	2.03E-05	3.63
AR (1), T-bill	6.07E-05	1.90E-05	3.20
ARIMA (0, 1, 1)	7.41E-05	1.76E-05	4.22
ARIMA (0, 1, 1), T-bill	7.45E-05	1.77E-05	4.23
B			
EGARCH (1, 1)			
AR (1)	22.32	5.41	4.12
AR (1), T-bill	11.63	4.09	2.84
ARIMA (0, 1, 1)	5.44	2.56	2.12
ARIMA (0, 1, 1), T-bill	15.90	5.38	2.95