

# Discussion of Stock and Watson “Phillips Curve Inflation Forecasts”

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# Summary

- SW fit a range of economic and statistical models
- Find that economic models contribute little to forecasts
- Best statistical model is an unobserved components (UC) stochastic volatility (SV) model (UC-SV)
- This has two components – permanent and transitory

$$\pi_t = z_t^* + v_t$$

$$z_t^* = z_{t-1}^* + u_t.$$

$z_t^*$  = permanent component,  $v_t$  is transitory one

shocks  $v_t, u_t$  (SV)

$$\ln \sigma_{jt}^2 = \ln \sigma_{jt-1}^2 + \eta_{jt}.$$

$\text{var}(\eta_{jt})$  are equal

# UC-SV Model

- Implies unit root in inflation
- Implies variance of change of inflation is infinite
- If inflation really follows this then inflation targeting is hopeless
- So would have preferred something less extreme
- Could replace unit root in permanent component by AR(1) with .99
- Probably wouldn't change results much and more appealing

# Economic Variables

- SW find there are times when economic variables did improve forecast. But not often enough
- But in world today we need to provide an explanation for policy actions. If based on forecast need to describe its determinants and the risks with it
- Statistical models not much help for that
- In practice best for checking and tweaking model forecasts
- Even judgemental forecasts often have a model lying around in their spreadsheets

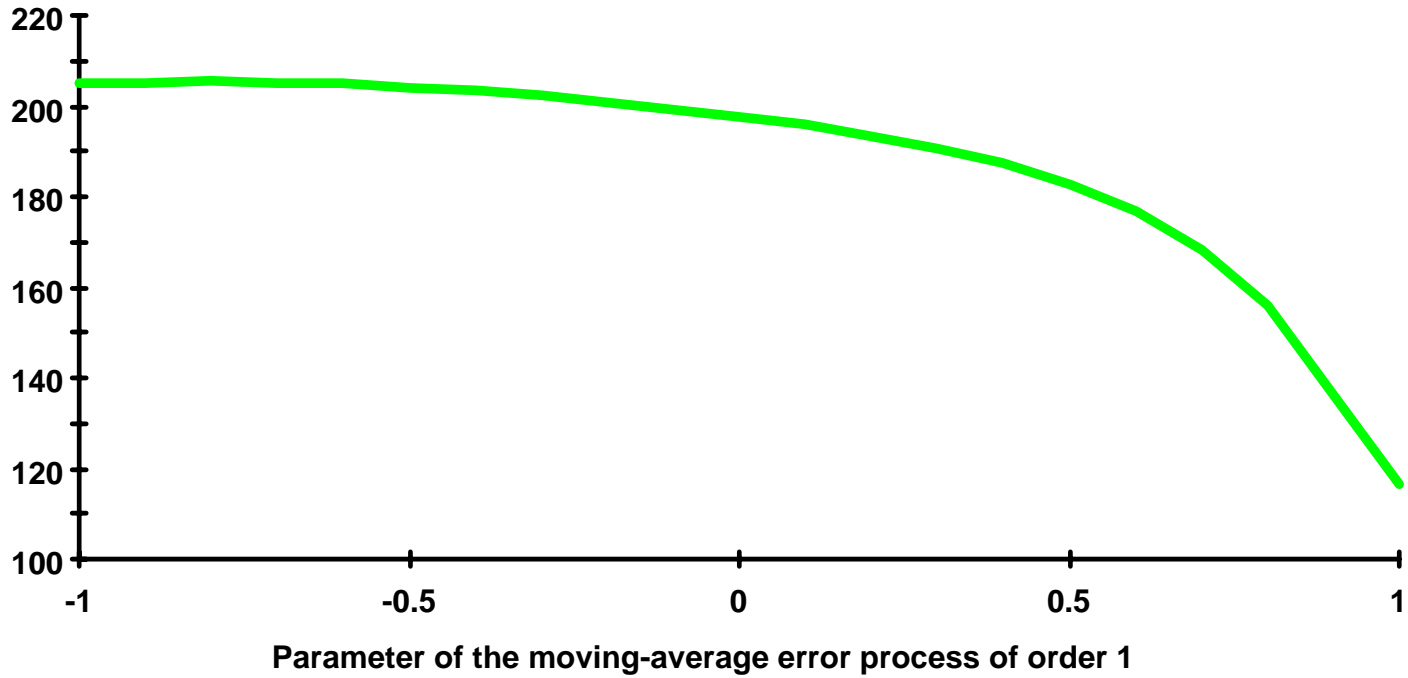
# Problems with Gauging the Impact of Economic Variables

- Suspect we all feel that if excess demand is sustained long enough and is of sufficient magnitude it will cause a rise in inflation
- But translating this into a precise influence is hard as it implies long lags and possibly threshold effects
- The events that can give precision are rare
- Generally means imprecise estimates of effects. As in VAR/BVAR comparisons often best to just put imprecisely estimated coefficients to zero

# Reminder of why UC-SV might win a forecasting competition

- Two component model without SV implies best forecast is exponentially weighted moving average of past data i.e. forecast is  $\sum (1-q)q^j \pi(t-j)$
- $q$  is determined by relative variances of permanent and transitory shocks
- $q = -\alpha$  where  $\Delta\pi(t) = e(t) + \alpha e(t-1)$
- SW report changing estimates for  $\alpha$ . Recently towards  $-1$  i.e. no unit root.
- Likelihood shows estimate is very imprecise (MLE =  $-.76$ )

## Plot of the Concentrated Log-likelihood Function for MA(1), Rolling Sample 1989/4-1999/4



# Why is EWMA Popular?

- Very popular in forecasting product demand
- Is simple to implement and has good performance in face of breaks in the series if  $q$  is allowed to adapt to the data
- SW do this by allowing for different estimates in the SV terms for the permanent and transitory components
- So perhaps not surprising it wins the competition

# Alternatives to UC-SV

- Two other methods proposed to handle breaks - Pesaran and Timmerman (2007) averaging methods and Hendry et al (2004) indicator saturation
- Need to identify the breaks and also their magnitude
- Second is most crucial aspect for forecasting

# Pesaran and Timmerman

## Averaging

- Average forecasts obtained from different samples of observations back from the forecast period
- Not averaging models which SW shows has little use
- Show useful in adapting forecast to break in random walk
- Also average EWMA forecasts using different  $q$ . This has comparable properties

# Hendry et al Indicator Saturation

- Method of indicator saturation adds on many dummy variables to account for the breaks
- Variables retained by using automatic search methods
- Show it manages to locate breaks ( 5 in experiment) quite efficiently
- Dummy variable coefficient then has size of break
- Applies to series that are not random walks

# Introducing Economic Information

- Traditionally replaces permanent component with expectations, deviations from NAIRU, supply side effects etc.
- In US this is Gordon's triangle model. But variants like it have existed in many countries since the 70s
- Apart from imprecise estimates of parameters causing difficulties further ones are needed to forecast covariates
- Studies exist that show if use final vintage estimates of covariates augmented Phillips curve forecasts may be o.k. but with real time data they fail

# Introducing Economic Information

- Might put into UC-SV model
- If in observation equation EWMA will apply to residuals after economic effects on inflation removed
- If put in equation describing change in permanent component variables would need to be not very persistent
- Feel that there is probably little mileage in this

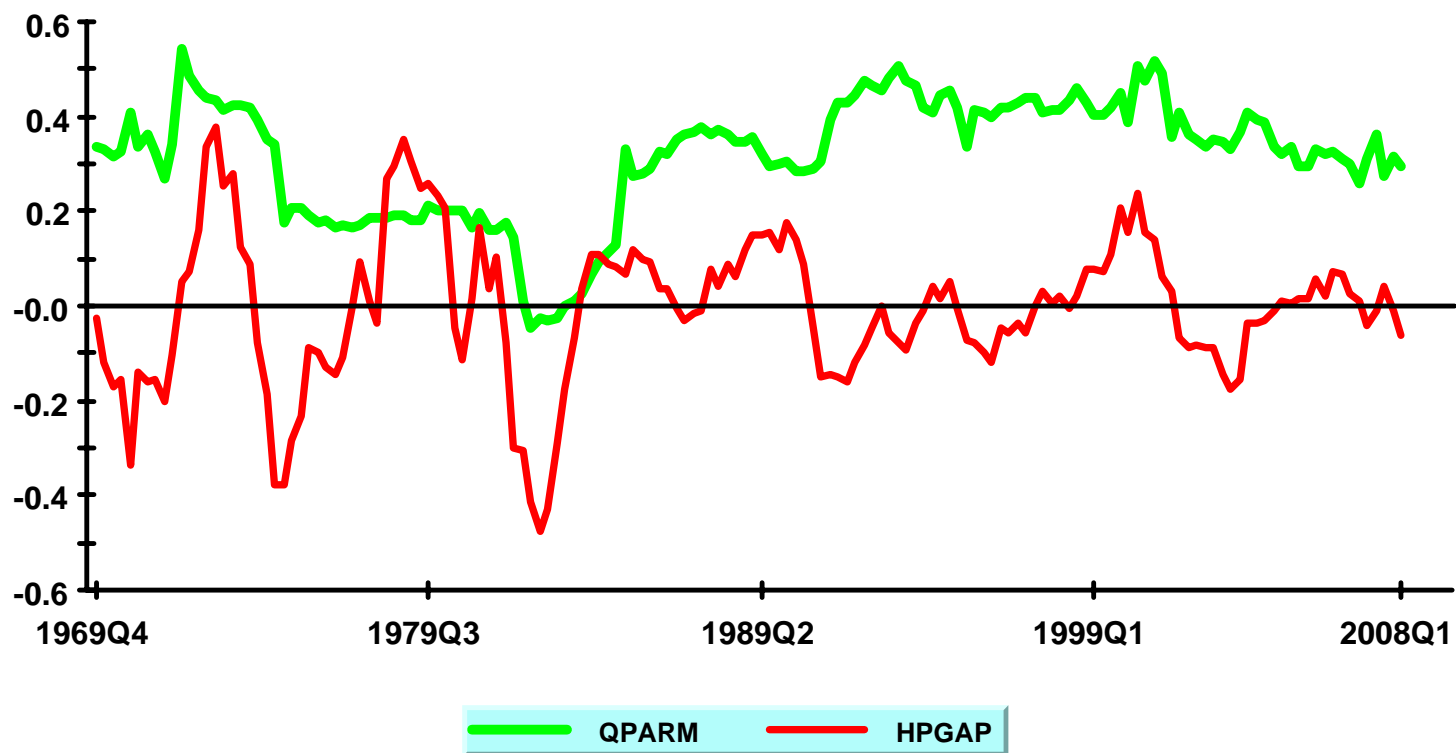
# Adapting $q$ to data

- Possible that one might make  $q$  vary with data
- Looked at that in following way
- Fit AR(1) to change in inflation with moving sample of 10 years duration. MA parameter equals this for small values but since a quadratic is mapping between them it is not so good when MA(1) coefficient goes to -1. Thus MA of -.76 gives an AR of -.48.
- But quick to fit an AR and gives right impression of movements in MA coefficient and hence  $q$
- Do this over with moving 10 year regressions and then relate to HP filtered output gap

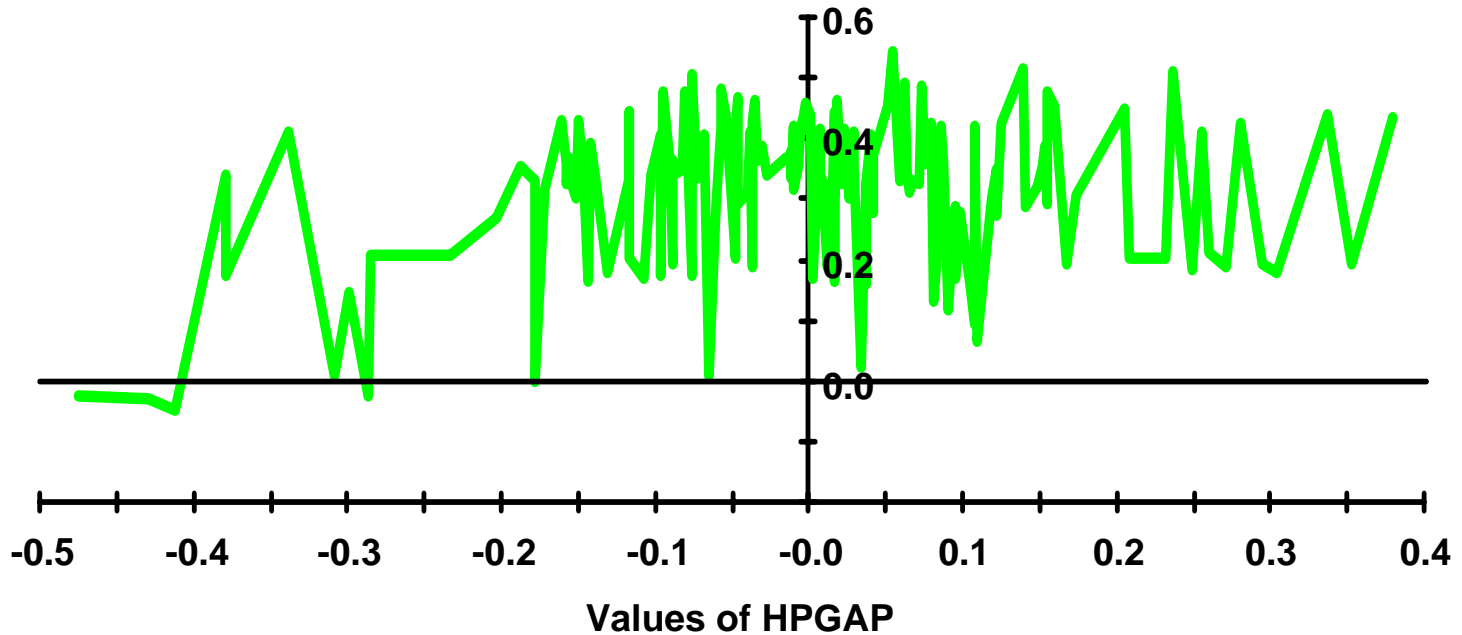
# Results

- Considerable movement in  $q$
- There is a relationship between  $q$  and gap at least when it becomes large negative (SW commented on the fact that forecasts reacted more to economic variables than)
- A regression indicated relation was significant but should really fit an MA to get  $q$  but did not have time
- It might be worth thinking about modelling  $q$

**Figure 2:  $q$  (proxied by negative of AR(1) coefficient estimated over rolling 10 year periods) and HP output Gap**



**Figure 3 Cross Plot of Approximate Estimated  $q$   
and HP Output Gap**



— QPARM

Sample from 1969Q4 to 2008Q1

# Final Comment on the Statistical Models

- Atkeson and Ohanian argue that yearly inflation i.e.  $\log P(t) - \log P(t-4)$  is best predicted by its lag
- AO is probably best statistical model after UC-SV
- Models that focus on quarterly inflation can be cast this way but would imply that lagged quarterly inflation rates might have an influence in predicting annual inflation
- Was true of Australian work and also seems true of US

# Conclusion

- SW's conclusions reinforce previous conclusions about the utility of economic variables in forecasting inflation
- Sometimes valuable, mostly not.
- Mostly valuable when extreme outcomes for them.
- Breaks in data may not be associated with economic variables so need to adapt to them
- Suggests that we need to spend more time asking how to do all these things efficiently
- Perhaps focus on EWMA forecasts and how we are to allow  $q$  to change? SV approach in SW is one such method but it concerns me to use a method that has such extreme implications for the nature of inflation