Some Comments on Cieslak and Povala's

Expecting the Fed

FRB SF

March 1, 2003

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Contributions

(1) $$i_{t+h} - i_t = (\text{Fcst of } i_{t+h} - i_t) + \beta'(\text{lags of } i_t) + \text{error}$$

Yield Curve, Surveys, Greenbook

$\boldsymbol{\beta \neq 0}$

(2) Implications and interpretation …

Selected Evidence from Paper (*t* indexes quarters in my slides)

(1) Long-sample short-rate regressions

Table 1: $i_{t+4} - i_t = \beta_0 + \delta_0 i_t + \delta_1 i_{t-\mathrm{lag1}} + \delta_2 i_{t-\mathrm{lag2}} + \delta_3 i_{t-\mathrm{lag3}} + error$

Table 2: $i_{t+4} - i_t = \beta_0 + \sum_{i=1}^{j} \beta_j PC_{j,t} + \delta_1 i_{t-\mathrm{lag1}} + \delta_2 i_{t-\mathrm{lag2}} + error$

Regressions lags are long, for some sample periods (1952-1979 and 1984-2011), δ's are statistically significant, marginal R^2 from lags is large. Some instability across these two periods.

(2) Post 1983 regressions using Fed Funds Rate (FFR)

$$FFR_{t+h} - FFR_t = \beta_0 + \beta_1[E_t^*(FFR_{t+h}) - FFR_t] + \delta FFR_{t-4}^c + error$$

with $FFR_t^c = FFR_t - \hat{\beta}\gamma(\mathrm{L})\pi_t$; $\gamma(\mathrm{L}) = \gamma\sum_{i=0}^{120}(.9865)^i \mathrm{L}^i$

δ is statistically significant and marginal R^2 is large. Estimated value of δ and marg. R^2 increase as h increases from $h = 1$ to $h = 4$.

Complications with evaluating evidence:

(1) $i_{t+4} - i_t = \beta_0 + \delta_o i_t + \boldsymbol{\delta_1} i_{t-\text{lag1}} + \boldsymbol{\delta_2} i_{t-\text{lag2}} + \boldsymbol{\delta_3} i_{t-\text{lag3}} + error$

- i_t is persistent
- *rhs* is $i_{t+4} - i_t$, so error is serially correlated. Newey-West (6 lags) used.
- *lags* are long

(2) $FFR_{t+h} - FFR_t = \beta_0 + \beta_1[E_t^*(FFR_{t+h}) - FFR_t] + \boldsymbol{\delta} FFR_{t-4}^c + error$

- FFR_t is persistent
- *rhs* is $FFR_{t+h} - FFR_t$ so error is serially correlated. Newey-West (6 lags) used.
- $FFR_t^c = FFR_t - \hat{\beta}\gamma(\text{L})\pi_t$; $\gamma(\text{L}) = \gamma\sum_{i=0}^{120}(.9865)^i \text{L}^i$

(1) Long-sample short-rate regressions

Table 1: $i_{t+4} - i_t = \beta_0 + \delta_o i_t + \boldsymbol{\delta_1} i_{t-\text{lag}1} + \boldsymbol{\delta_2} i_{t-\text{lag}2} + \boldsymbol{\delta_3} i_{t-\text{lag}3} + error$

Table 2: $i_{t+4} - i_t = \beta_0 + \sum_{i=1}^{j} \beta_j PC_{j,t} + \boldsymbol{\delta_1} i_{t-\text{lag}1} + \boldsymbol{\delta_2} i_{t-\text{lag}2} + error$

- i_t is persistent
    - Familiar "Dickey-Fuller" problems
        - "Mean Reversion" bias in OLS
        - non-normal *t*-stat
        - $R^2 \sim O_p(T^{-1})$ (as usual)

(1) Long-sample short-rate regressions

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Table 2: $i_{t+4} - i_t = \beta_0 + \sum_{i=1}^{j} \beta_j PC_{j,t} + \delta_1 i_{t-\text{lag}1} + \delta_2 i_{t-\text{lag}2} + error$

- *rhs* is $i_{t+4} - i_t$ so error is serially correlated. Newey-West (6 lags) used.
  - $i_{t+4} - i_t = \Delta i_{t+1} + \Delta i_{t+2} + \Delta i_{t+3} + \Delta i_{t+24}$, so OLS bias is multiplied by 4
  - Effect on *t*-stat depends on details of HAC estimator

(1) Long-sample short-rate regressions

Table 1: $i_{t+4} - i_t = \beta_0 + \delta_o i_t + \delta_1 i_{t-\text{lag}1} + \delta_2 i_{t-\text{lag}2} + \delta_3 i_{t-\text{lag}3} + error$

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- *lags* are long: $\Delta y_{t+1} = \rho_1 y_t + \rho_2 y_{t-k} + \varepsilon_t$
  - y_t, y_{t-k}, nearly collinear if k is small. When y is very persistent, $(X'X)$ has one eigenvalue that is $O_p(T^2)$ and one that is $O_p(T)$. Persistence in regressors affects $\hat{\rho}_1 + \hat{\rho}_2$ but not other linear combinations of $\hat{\rho}_1$ and $\hat{\rho}_2$, which behave as if data were "iid".
  - y_t, y_{t-k}, not as collinear if k is large. $(X'X)$ has two eigenvalues that are $O_p(T^2)$. Persistence in regressors affects all linear combinations of $\hat{\rho}_1$ and $\hat{\rho}_2$.
  - Whether lags are "Large" or "Small" depends on (lag/T).

Selected CP Empirical results:

Table 1: $i_{t+4} - i_t = \beta_0 + \delta_0 i_t + \delta_1 i_{t-\text{lag}1} + \delta_2 i_{t-\text{lag}2} + \delta_3 i_{t-\text{lag}3} + error$

$(1 \le lag1 \le 4,\ 5 \le lag2 \le 8,\ 13 \le lag3 \le 26)$

Sample	T	δ_0 (tstat)	δ_1 (tstat)	δ_2 (tstat)	δ_3 (tstat)	R^2	R^2 (no lags)
1951-2011	240	-0.01 (-0.10)	-0.27 (-1.88)	0.04 (0.38)	0.14 (1.59)	0.13	0.06
1951-1979	116	-0.52 (-3.47)	-0.37 (-2.78)	0.34 (3.26)	0.51 (3.71)	0.39	0.04
1984-2011	112	0.02 (0.27)	-0.47 (-3.63)	-0.01 (-0.10)	0.23 (3.16)	0.41	0.11

Similar results for

Table 2: $i_{t+4} - i_t = \beta_0 + \sum_{i=1}^{j} \beta_j PC_{j,t} + \delta_1 i_{t-\text{lag}1} + \delta_2 i_{t-\text{lag}2} + error$

Distribution of statistics for based on $\Delta i_t = \varepsilon_t$

Regression: $\Delta i_{t+1} = \beta_0 + \delta_0 i_t + \varepsilon_t$ – "Dickey-Fuller"

	T = 240				T = 115		
	50%	95%	99%		50%	95%	99%
$\|tstat\|$	1.6	2.9	3.4		1.6	2.9	3.5
R^2	1%	3%	4%		1%	6%	9%

Regression: $i_{t+4} - i_t = \beta_0 + \delta_0 i_t + u_t$ – "DF + Longer lead of LHS"

	T = 240				T = 115		
	50%	95%	99%		50%	95%	99%
$\|tstat^{NW}\|$	1.8	3.7	4.7		2.0	4.3	5.7
R^2	4%	12%	17%		7%	23%	31%

Regression: $i_{t+4} - i_t = \beta_0 + \delta_0 i_t + \delta_1 i_{t-16} + u_t$ – "DF + LL LHS + Longer Lags RHS"

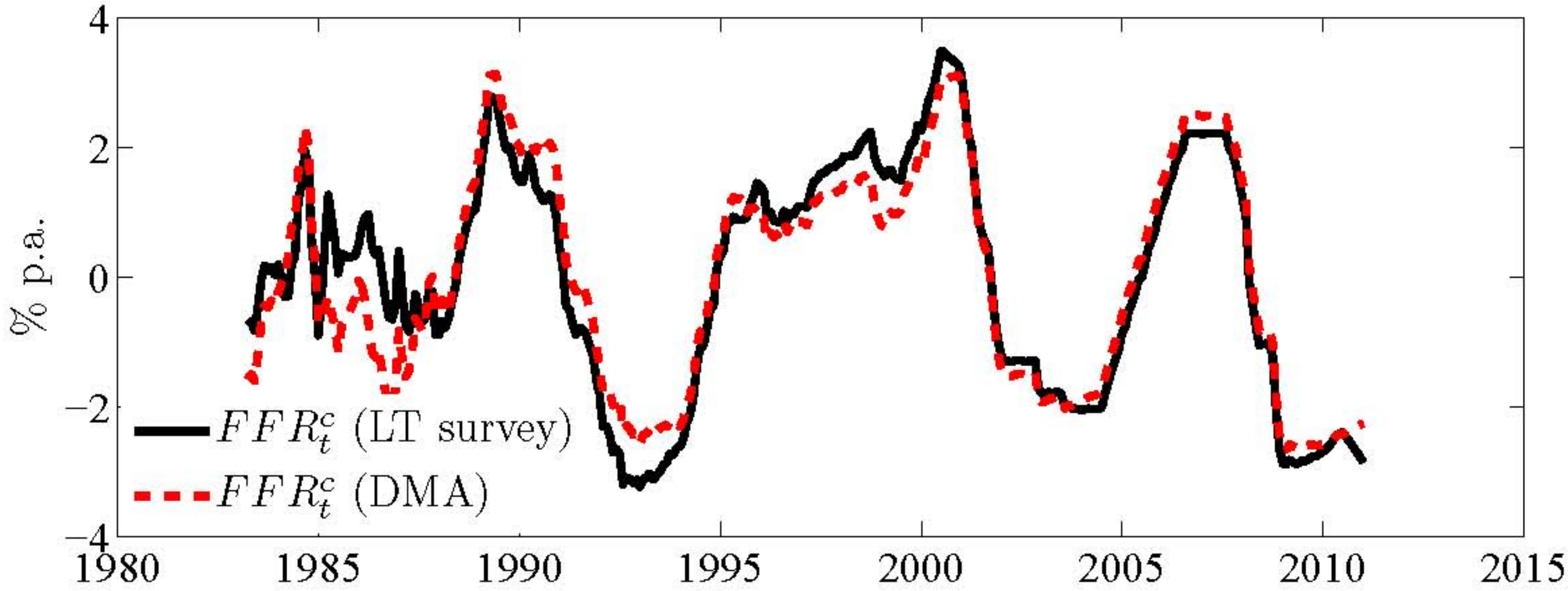
	T = 240				T = 115		
	50%	95%	99%		50%	95%	99%
$\|tstat_0^{NW}\|$	1.3	3.6	4.8		1.9	4.4	5.9
$\|tstat_1^{NW}\|$	0.9	2.7	3.6		1.0	3.1	4.4
R^2 (no lags)	4%	12%	17%		7%	23%	31%
Marg. R^2	0%	6%	11%		1%	13%	21%

$$(2)\ FFR_{t+h} - FFR_t = \beta_0 + \beta_1[E_t^*(FFR_{t+h}) - FFR_t] + \delta FFR_{t-4}^c + error$$

- FFR_t is persistent
- *rhs* is $FFR_{t+h} - FFR_t$ so error is serially correlated. Newey-West (6 lags) used.

- $FFR_t^c = FFR_t - \hat{\beta}\gamma(\mathrm{L})\pi_t;\ \gamma(\mathrm{L}) = \gamma\sum_{i=0}^{120}(.9865)^i \mathrm{L}^i$

  - This "detrending" leaves a persistent component in FFR^c (compare the demeaning)



Selected CP Empirical results: Table IV (1983-2010, $T = 112$)

$$FFR_{t+h} - FFR_t = \beta_0 + \beta_1[E_t^*(FFR_{t+h}) - FFR_t] + \delta FFR_{t-4}^c + error$$

	h = 1	h = 2	h = 3	h = 4
$\hat{\delta}$ (*tstat*)	-0.1 (-3.2)	-0.2 (-3.8)	-0.4 (-4.9)	-0.6 (-6.1)
Marg. R^2	4%	10%	17%	25%

An experiment: $\Delta y_t = \varepsilon_t$, $\varepsilon_t \sim$ iidN(0,1) and $x_t = y_t + a_t$, $a_t \sim$ iidN(0,4)

$$y_t^c = y_t - \hat{\beta}\gamma(\mathrm{L})x_t$$

Regression: $y_{t+h} - y_t = \alpha + \delta y_t^c + u_t$

Quantiles of distribution for selected statistics ($T = 115$)

	$h = 1$				$h = 4$		
	50%	95%	99%		50%	95%	99%
$-\hat{\delta}$	0.07	0.17	0.23		0.24	0.57	0.73
$-tstat^{NW}$	2.2	4.1	5.1		2.6	5.4	6.9
R^2	3%	9%	12%		12%	31%	39%

Some problems with my discussion:

- Numerical results computed for $I(1)$ stochastic process, which does not characterize i_t. And many other important features of stochastic process (instability, stochastic volatility, etc.) were ignored.

- CPs analysis includes many other empirical exercises that I haven't discussed. Example: regressions:

$$y_{t+\mathrm{h}} - y^s_{t,t+h} = \beta_0 + \beta_1 (y^s_{t,t+h} - y^s_{t-1,t+h}) + error$$

  $\hat{\beta}_1$ is positive and statistically significant …

Nordhaus (1987) – Empirical result
Elliott, Komunjer, Timmermann (2005) – Loss function
Engleberg, Manski, Williams (2009) – Survey Panels
Coibion-Gorodnichenko (2012) – Stickiness
Kirchgässner-Müller (2006) − Stability