THE TEMPERED ORDERED PROBIT (TOP) MODEL WITH AN APPLICATION TO MONETARY POLICY
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Introduction and Background

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- And so on...
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  - Governor tables a rate motion; members vote; majority rules; Governor has a casting vote in the event of a split decision
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- Let’s have a look at the raw data...
The Repo-Rate

- Bank of England’s *repo-rate* post-independence →
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Empirical regularity of no-change clearly evident! Over 3 bigger than 'up' or 'down'. Some (raw) evidence of insiders and outsiders acting differently (e.g., outsiders seem to have a bigger preference for tightening...).
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- Regime membership ($q = 0, q = 1$) is unobserved and must be identified on data
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- Now probability of no-change (\( \Pr y_{it} = 0 \)) has been ‘inflated’
  → 
  - *Observationally equivalent no-change outcomes, can hence arise from two distinct sources*
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- Is no requirement that $\beta_d \equiv \beta_u$; and good reasons to expect not…
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- Overall probabilities of vote choices will be

\[ Pr(1) = \Phi(\mu_0 x_0 y \beta y) \]

\[ Pr(0) = h \Phi(\mu_1 x_0 y \beta y) + h \Phi(\mu_0 x_0 s \beta d) \]

\[ Pr(1) = 1 - Pr(0) \]

Still embodies "excess" of no-change, but in a much more flexible manner ("representing member uncertainty"). So here, \( x_j \) can have opposing signs: a tempering effect in one direction and an intensifying effect in the other.
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\Pr (-1) &= \Phi \left( \mu_0 - x'_y \beta_y \right) \times \Phi \left( x'_s \beta_d \right) \\
\Pr (0) &= \left[ \Phi \left( \mu_1 - x'_y \beta_y \right) - \Phi \left( \mu_0 - x'_y \beta_y \right) \right] + \\
&\quad \left[ \Phi \left( \mu_0 - x'_y \beta_y \right) \times \Phi \left( -x'_s \beta_d \right) \right] + \\
&\quad \left[ \left( 1 - \Phi \left( \mu_1 - x'_y \beta_y \right) \right) \times \Phi \left( -x'_s \beta_u \right) \right] \\
\Pr (1) &= \left[ 1 - \Phi \left( \mu_1 - x'_y \beta_y \right) \right] \times \Phi \left( x'_s \beta_u \right)
\end{align*}
\]

- Still embodies “excess” of no-change, but in a much more flexible manner (“representing member uncertainty”)

- So here, \( x_j \) can have opposing signs: a tempering effect in one direction and an intensifying effect in the other
A Specification Test for the MIOP

- Interesting empirical issue is whether the down and up propensities are tempered to the same extent
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  - the implicit test is one of symmetry versus asymmetry in the inertia equations
Variable Selection

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  - inflation and output gap forecasts; $\pi_{Dev,t}$ and $\text{GAP}_t$
Results

- First, estimated; a simple pooled OP; MIOP; and TOP →
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2. Allow different members-specific reaction functions: random parameters on the inflation and growth variables:

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\beta_{i\pi} = \bar{\beta}\pi + e_{i\pi}; \text{ and } \beta_{iGAP} = \bar{\beta}GAP + e_{iGAP}
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- And estimate using simulated ML
# Results: Panel Effects and Economic Conditions Equation

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Distinct differences across models for Taylor-variables (although these aren’t Partial Effects) and GDP gap insignif.
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## Partial Effects: Split by Equation

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- **Strong inflation effects**
Partial Effects: Split by Equation

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Tempering equations

| TYPE       | $-0.136^{***}$ | $0.139^{***}$ | $-0.003$ |
|           | (0.051)        | (0.054)       | (0.027)  |
| FTSE       | $0.186^{***}$  | $-0.171^{***}$| $-0.015^{**}$ |
|           | (0.043)        | (0.047)       | (0.007)  |
| $\pi_\sigma$ | $-0.093^{***}$ | $0.081^{***}$ | $0.012^{**}$ |
|           | (0.023)        | (0.025)       | (0.007)  |
| GAP$_\sigma$ | $0.103^{***}$  | $-0.082^{***}$| $-0.021^{**}$ |
|           | (0.026)        | (0.027)       | (0.009)  |
| IR         | $0.162^{***}$  | $-0.206^{***}$| $0.044^{***}$ |
|           | (0.040)        | (0.035)       | (0.013)  |

- Strong inflation effects
- All uncertainty effects very significant
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- \(e.g.,\) \(IR\) months \(\rightarrow\) \(\uparrow\) chance of change; and as inflation forecast uncertainty \(\uparrow\) \(\rightarrow\) \(\downarrow\) ease rates; and so on...
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- Finally, following Train (2009) we recover member-specific inflation and GDP parameters
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- So, recovered RP estimates can tell an interesting story!
Member Specific Parameters: Inflation

Inflation Random Parameters

- Insiders
- Outsiders
- Average
Member Specific Parameters: Growth

[Graph showing estimated growth coefficients for various individuals, categorized as insiders and outsiders.]
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Questions/comments/suggestions (nice ones!) very welcome!
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