Optimal Inflation Target in Ukraine: A Model-Based Perspective

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Inflation Targeting in Emerging Economies – National Bank of Ukraine
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Inflation Targeting across Countries

Why target *positive* inflation?

- Sticky prices, *unconstrained* central bank rate: optimal target is zero

Many developed countries target inflation (just below) 2% – is this consistent with the trade-off? For the US, models say yes! (Coibion, Gorodnichenko and Wieland, 2012)
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- Sticky prices, central bank rate constrained by lower bound, positive target comes from **trade-off**:
  - The productive distortions caused by sticky prices and their dispersion (↑ with $\pi$)
  - The probability of the nominal interest rate reaching the lower bound (↓ with $\pi$)
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What about optimal target for Ukraine?

- Probability of hitting the lower bound is crucially influenced by:
  - Type and volatility of shocks driving the economy
  - Type of interest rate rule followed by the central bank

For the US, Coibion et al. (2012) show that salient features of the US economy are well captured by:

- Shocks to technology, risk premium, government spending and markups
- An inertial interest rate rule over inflation and output

What about Ukraine? Given the high degree of openness, foreign shocks are likely to be important.
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A Small Open Economy NK Model
Households

Maximize $E_t \sum_{t=0}^{\infty} \beta^t \left[ \ln C_t - \frac{N_t^{1+\varphi}}{1+\varphi} \right]$ subject to the budget constraint:

$$P_t C_t + D_t + \varepsilon_t D^*_t \leq W_t N_t + D_{t-1} (1 + i_{t-1}) q_{t-1} + \varepsilon_t D^*_{t-1} (1 + i^*_{t-1}) + \Pi_t - T_t, \quad \forall t$$
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where $\ln q_t = \rho_q \ln q_{t-1} + \epsilon_t^q$ is exogenously given *risk premium*
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- Aggregate household consumption contains both domestically produced and imported goods:

$$C_t = \left[ (1 - \alpha)^{1/\eta} C_{H,t}^{\eta-1} + \alpha^{1/\eta} C_{F,t}^{\eta-1} \right]^{\eta/(\eta-1)}$$
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- Delivers the following demand and pricing conditions:

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- CPI: $P_t = \left[ (1 - \alpha) P_{H,t}^{1-\eta} + \alpha P_{F,t}^{1-\eta} \right]^{1/(1-\eta)}$
Firms

- Two types of firms: producers and importers
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- Producers:

- Importers:
  - Buy imported goods at $\epsilon_t P^* F_t$, sell them to households at price $P F_t$.
  - If importers perfectly competitive, law of one price holds: $P F_t = \epsilon_t P^* F_t$.
  - If importers monopolistically competitive, face a Calvo lottery,
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- Producers:
  - $Y_t(i) = A_t N_t(i)$, where $\ln A_t = \rho_A \ln A_{t-1} + \epsilon^A_t$ is exogenously given technology process

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  - $Y_t(i) = A_t N_t(i)$, where $\ln A_t = \rho_A \ln A_{t-1} + \epsilon_t^A$ is exogenously given technology process
  - Common marginal cost function for every firm: $MC_t = \frac{W_t}{A_t} \tau_t$, where $\ln \tau_t = \rho_A \ln \tau_{t-1} + \epsilon_t^\tau$ is exogenously given cost shock process

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Government: central bank and fiscal authority

- Interest rate rule:

\[ \tilde{i}_t = \rho_{i1}\tilde{i}_{t-1} + \rho_{i2}\tilde{i}_{t-2} + (1 - \rho_{i1} - \rho_{i2})(\tilde{i} + \phi_\pi(\pi_t - \bar{\pi}) + \phi_\gamma(y_t - \bar{y})) + \epsilon^i_t \]

where \( \epsilon^i_t \) is a monetary shock
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- Effective lower bound:

\[ i_t = \max(\iota, \tilde{i}_t) \]
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- **Effective lower bound:**

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- **The fiscal authority collects lump-sum taxes to finance its consumption \( G_t \):**

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C^H_t + C^{*,H}_t + G_t = Y_t
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Calibration strategy
Calibration strategy: elasticity of import substitution

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- In order to estimate it, recall the following equilibrium relationship:

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- Direct OLS estimation (can also use 2SLS):

$$\ln \frac{P_{F,t}C_{F,t}}{P_tC_t} = -0.33^{***} + 0.50^{***} \times \ln \left( \frac{P_{F,t}}{P_t} \right)$$
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- Implies $\eta = 0.50$
Calibration strategy: foreign output and inflation

- Approximate Foreign country by the EU
  - Use cyclical component of total EU GDP to estimate foreign output AR(1) process:
    \[
    \hat{Y}_t^* = 0.89^{***} \hat{Y}_t^* , \quad \sigma_{Y^*} = 0.003
    \]

- Similarly, estimate a process for foreign inflation:
  \[
  \hat{\pi}_t^* = 0.51^{***} \hat{\pi}_t^* , \quad \sigma_{\pi^*} = 0.007
  \]
Calibration strategy: interest rate rule

- Use Ukrainian quarterly macro data (2016Q1-2020Q4) to directly estimate the interest rate rule for Ukraine

\[
\tilde{i}_t = 1.16 \times \tilde{i}_{t-1} - 0.32 \times \tilde{i}_{t-2} + 0.23 \times (\pi_t - \bar{\pi}_t) + 0.02 \times (y_t - \bar{y})
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\phi_\pi = 1.45, \phi_y = 0.14 \text{ and } \sigma_e = 0.002
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- Implies \( \phi_\pi = 1.45, \phi_y = 0.14 \) and \( \sigma_{\epsilon_i} = 0.002 \)
Calibration strategy: exogenous processes

- Use data on Ukrainian government consumption to directly estimate the spending process:
  \[ \ln G_t = 0.37 \times \ln G_{t-1}, \quad \sigma_G = 0.052 \]

- Use data on households’ lending/deposit spreads to estimate the risk-premium process:
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- Technology and cost-push processes calibrated to match observed persistence and variances of output and inflation
Calibration strategy: the rest

- Import share: $\alpha = 0.35$ (NBU calculations)

- Frisch elasticity: $\frac{1}{\varphi} = 1$

- Calvo parameter: $\theta = 0.55$ (Coibion et al. 2012)

- Within-sector elasticity: $\epsilon = 10$ (Coibion et al. 2012)

- Discount factor: $\beta = 0.995$ (steady-state real rate of 2%) (Grui, Lepushynskyi and Nikolaychuk, 2018)
Initial results
Optimal Inflation Target for Ukraine

![Diagram showing the relationship between inflation target and welfare. The graph peaks at an inflation target of 3%.]

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Optimal Inflation Target for Ukraine

![Graph showing the relationship between inflation target and welfare. The graph indicates that an inflation target of 3% corresponds to the highest welfare. The US target is marked at 2%.](image-url)
Varying the frequency of price adjustment

![Graph showing the relationship between price stickiness and optimal inflation target.](image-url)
Varying the steady-state real rate

![Graph showing the relationship between optimal inflation target and steady-state real interest rate. The graph indicates that as the steady-state real interest rate increases, the optimal inflation target decreases.]

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   - Logic: price dispersion not sensitive to changes in inflation target when it is low; hence, can (almost) painlessly raise the target until (almost) never reach ZLB
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   - Tends to produce more price dispersion: firms do not internalize the effect of their pricing decisions on the wages they have to pay
   - Need better micro understanding of Ukrainian labor market(s) and their mobility to make advanced
Conclusion

- Optimal inflation target is pinned down by the trade-off between:
  - The productive distortions caused by sticky prices and their dispersion (\(\uparrow\) with \(\pi\))
  - The probability of the nominal interest rate reaching the lower bound (\(\downarrow\) with \(\pi\))

- Initial results to quantify the optimal inflation target for Ukraine, in the context of a small open economy New Keynesian model

- Need more work with Ukrainian micro data to make quantitative advances

- Comments welcome!