# Discussion of “The Age-Structure–Inflation Puzzle” by Mikael Juselius and Elod Takats

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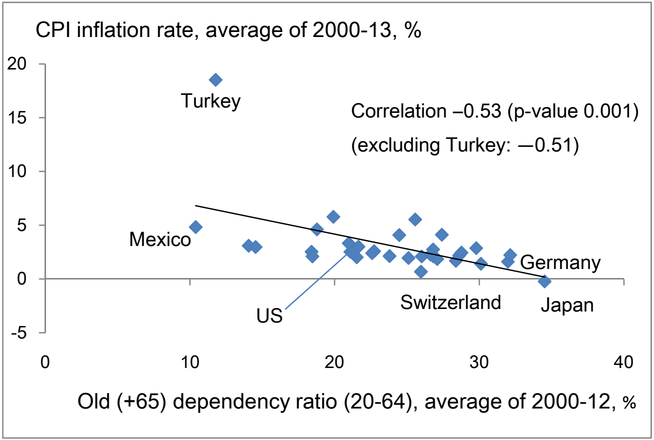
# Negative Correlation bw Aging and Inflation in OECD Countries

Aging correlated with deflation. See Katagiri, Konishi, and Ueda (2014)



# Motivation

- The authors cast a doubt on such a naive observation.
- Yes, there are a number of issues/problems.
  1. Age structure (not just 2 generations of the young & the old)
  2. Spurious correlation (non-stationary, a third variable)
  3. Causality and relation (demography exogenous while inflation endogenous)
  4. Time horizon (a population effect on inflation is a short-run or long-run phenomenon?)

# Summary

- Empirical study
  - Panel data analysis
- Find an opposite result:
  - The young and old (dependents) are inflationary, whereas the working age population is disinflationary.
  - Sizable impact of demographic changes on inflation

# Comments

- Very very important work for monetary policy
- If true, we definitely need a theory.
- But is it really true?
  - Some strange pent-up feelings.
  - Why??? Spurious correlation, time horizon

# 1. Age structure

- Rich age structure
  - k: 17 five-year age cohorts
  - t: yearly from 1955 to 2010
  - j: 22 advanced countries
- Key equation (3)

$$\pi_{jt} = \mu + \mu_{j0} + \Sigma_{p=1}^{P} \gamma_p \tilde{n}_{pjt} + \beta X_{jt} + \varepsilon_{jt},$$

where

$$\tilde{n}_{pjt} = \Sigma_{k=1}^{17} k^p (n_{kjt} - 1/17).$$

$\tilde{n}_{pjt}$ captures the deviation of demographic structure from p-th degree polynomial ($P < K$).

# What is $\tilde{n}_{pjt}$?

$$\tilde{n}_{pjt} = \Sigma_{k=1}^{3} k^p (n_{kjt} - 1/3).$$

3-generations ($K = 3$) & 2-th degree ($P = 2$)

| Case | $n_{1jt}$ | $n_{2jt}$ | $n_{3jt}$ |
|---|---|---|---|
| 1 | 0.33 | 0.33 | 0.33 |
| 2 | 0.50 | 0.33 | 0.17 |
| 3 | 0.17 | 0.33 | 0.50 |
| 4 | 0.25 | 0.50 | 0.25 |

$\rightarrow$

| Case | $\tilde{n}_{1jt}$ | $\tilde{n}_{2jt}$ |
|---|---|---|
| 1 | 0 | 0 |
| 2 | -0.33 | -1.33 |
| 3 | 0.33 | 1.33 |
| 4 | 0 | -0.17 |

Thus, the coefficient on $\tilde{n}_{pjt}$ captures the effect of demographic strcuture on inflation.

# 2. Spurious correlation

- Non-stationary?
  - Yes, $\tilde{n}_{pjt}$ is considered to be I(1).
  - Because of five-year age cohorts, $\tilde{n}_{pjt-1}$ is almost identical to $\tilde{n}_{pjt}$.
    - ★ Provided $\tilde{n}_{pjt} = \tilde{n}_{pjt-1} + \mu_{pjt}$, $\mu_{pjt}$ is close to an exogenous random variable.
    - ★ If equation (3) holds, use $\tilde{n}_{pjt-1}$ and $\mu_{pjt}$ instead and a coefficient on $\tilde{n}_{pjt-1}$ should be the same as that on $\mu_{pjt}$.
  - Relatedly, expected demographic change vs unexpected demographic change

- Maybe, a time horizon for the authors' analysis is not so short as one year.
  - Interested in long-run trend.
  - Indeed, equation (4) (Models 6 and 7) is the error correction model (ECM), where equation (3) serves as the long-run relation:

$$\Delta\pi_{jt} = \mu + \mu_{j0} + \ldots - \alpha\left(\pi_{jt-1} - \Sigma_{p=1}^{P}\gamma_p\tilde{n}_{pjt-1} + \ldots\right) + \beta X_{jt} + \varepsilon_{jt}.$$

  - I definitely prefer this specification.

# Further Questions: Final Comments

- But further questions
  - Is this enough to exclude a spurious correlation?
  - A third variable?
    - Population growth
    - Lagged $\Delta\pi_{jt}$ (dynamic panel in equation (4). Actually, equation (5) includes this. Why not in equations (3) and (4)?)
  - Why use of annual data?
  - Is demographic strcture really exogenous?
    - In a long time horizon (decades), it may be endogenous.