A New Vehicles Transaction Price Index

Brendan Williams and Erick Sager

Introduction

- Transaction data for new vehicle sales
  - Advantages: Superindex better approximates cost-of-living, measurement precision from big data
  - Challenges of price measurement: Annual introductions and replacement of vehicles creates product cycle, prices decline strongly
- Addressing product life cycle
  - Chain drift: Apply RYGEKS
  - Little effect, suggesting chain drift not the issue
  - Apply current BLS method of item replacement?
  - Leads to a mechanical bias associated with annual cycle
- Use a year-over-year (YOY) measure

Explaining Price Declines

- A matched model index (Chart 2, blue) shows a dramatic price index drop compared to an increasing index in the production CPI
- Chain drift does not seem to be the issue
- Rooling year QERS index does not offset declines in a matched model index (Chart 2, green)
- We do not see “bouncy” weights associated with chain drift
- Drops can be explained by persistent price declines
- Potential product life cycle effects
  - Intertemporal price discrimination
  - Inventory management
  - Salish

Intertemporal Price Discrimination

- Evidence of price discrimination found in Alzcorbe et al. (2010)
- Violates cost-of-living assumed preferences
- Stability, different consumer types over product life cycle
- Heteroskedastic, income changes the time—no scale—of purchase
- Systematic violations mean price indexes reflect change in consumer type, not just cost-of-living

Product Cycle in the Current CPI

- CPI currently offsets within model year price declines with a model “changeover” during annual item replacement
- When item replacement is linked out, the CPI for new vehicles only reflects within model year price and declines strongly (Chart 3)
- In a dynamically weighted index, changeover price change can be overcorrected, if weighted heavily, or can fail to offset model year price change if underweighted
- Using “changeover” entails keeping fixed weights
  - Precludes superindex formulas
  - Requires fixing sample and creates a new goods issue
  - Impact of changeovers is related to sample rotation frequency

Offsetting Product Cycle in the CPI

- Year-over-Year Indexes
  - Year-over-Year resolves product cycle issues
  - Compare prices at same points in product cycle
  - Implicitly uses product age as a vehicle characteristic
  - Measure price change relative to last comparable good observed
  - Long history of use for price indexes and other indicators

Data

- 1/3 of new vehicle transactions in the US covered in data purchased from JD Power
- Final price with recorded rebates and concessions
- 60 total variables per transaction
  - Vehicle features, financing terms, days to turn, (time in inventory), and, sometimes, cost to dealer
  - An abbreviated Vehicle Identification Number (VIN) that identifies a set of features, used as model identifier
- Confirms a frequent finding in prior research: strict matched model (same vehicle and same model year) price relatives have a strong tendency to show price declines (Chart 1)

Year-over-Year + Cycle Index

- Monthly Indexes
  - Monthly indexes
    - Use fixed-frequency change
    - Item replacement used but problematic in dynamically weighted indexes
    - Decompose into trend and cyclical components with filter
    - Band-pass filter
    - Cyclic patterns (Chart 4) are correlated regardless of data source

Conclusions

- Product life cycle effects should be taken into account, and a year-over-year price relative may be used to offset these effects
- Item replacement procedures can have a large impact on indexes
- Weighting can effect usage of item replacement
- Different methods may be needed to capture fluctuations at different frequencies, but a single index can still be created that combines measurements across frequencies

References
