HOW FIRMS AND EXPERTS VIEW THE PHILLIPS CURVE:
Evidence from Individual and Aggregate Data from South Africa

Monique REID and Pierre SIKLOS
Motivation

- Inflation expectations have become increasingly important for monetary policy making, but successful use of this data is dependant on
  - How it is measured, and
  - The hypothesised economics theory about how inflation expectations relate to other economics variables e.g. the Phillips Curve

“[T]heoretical treatments tend to neglect the fact that in practice many measures of inflation expectations exist” … “expectations of businesses” are particularly scarce (Bernanke, 2007)

Almost a decade later Yellen (2015), admitted that the situation has changed little
Contributions: 1. Dataset

• Based on an international survey of business/financial analyst expectations (in a separate document) the SA survey is likely the “richest” one around
  • 19 years of quarterly data; 1, 2 and even 5 year ahead forecasts
  • Not limited to inflation or one real variable (e.g., GDP or SALES growth) but, arguably, to most essential macro/financial variables
    • INFLATION, real GDP GROWTH, RAND/US exchange rate, PRIME rate, WAGES
  • Broad set of “microeconomic” controls
    • SIZE, POSITION, SIC
    • Macroeconomic controls available from external sources

• We compare this with the analysis of financial analysts’ expectations, (same sample), and we provide some general comparisons with household level data from South Africa (Reid et. al., 2020).
Contributions: 2. Phillips Curve

- How do firms and analysts view the trade-off between inflation and real economic performance. We estimate a variety of inflation and wage growth Phillips curves as well as comment on related questions about the degree to which inflation expectations in South Africa are anchored.

*The Phillips curve approach “...has usefully informed monetary policy decision-making around the globe.”* (Yellen 2015, pg. 16)
• BER survey data offer MANY more opportunities to understand their import than similar surveys conducted elsewhere
  • Some challenges
    1. “Priming”: Consequences? Applies only to T0, T1, T2 but less so to 5Y responses.
    2. Is the BER survey design conducive to learning about expectations formation and revisions?
• Format of question (inflation):* “What do you expect…average headline inflation rate (as measured by the percentage change in the CPI) to be during the year…other questions (Prime, Rand) are for year-end forecasts

* The format is the same for the other variables. BER Inflation Expectations Survey Questionnaire: full illustration in appendix…but also see next slides
# Contents of the BER Business and Financial Analysts Survey

<table>
<thead>
<tr>
<th>Businesses</th>
<th>Financial Analysts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflation: CY, YA, 2YA, 5YA*</td>
<td>Inflation: CY, YA, 2YA, 5YA</td>
</tr>
<tr>
<td>GDP: CY, YA</td>
<td>GDP: CY, YA</td>
</tr>
<tr>
<td>Interest Rate (prime): CY, YA</td>
<td>Interest Rate (prime): CY, YA</td>
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<tr>
<td>Wages: CY, YA</td>
<td>Wages: CY, YA</td>
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<td>Capacity Utilization: CY, YA</td>
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<td>M3 growth: CY, YA</td>
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<td></td>
<td>Long-term Govt Bond Yield: CY, YA</td>
</tr>
</tbody>
</table>
### Some Context: Households vs. Businesses

<table>
<thead>
<tr>
<th>Dates</th>
<th>All Households</th>
<th>Fraction of forecasts 25% &amp; “don’t know” or 0%</th>
<th>All Businesses</th>
<th>All Financial Analysts</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 2006</td>
<td>9.01% (15.63)</td>
<td>5% 20%</td>
<td>4.97% [3.5,10] (0.88)</td>
<td>5.91% [4.8,8] (0.88)</td>
</tr>
<tr>
<td>December 2008</td>
<td>11.80% (12.18)</td>
<td>4.7% 18.60%</td>
<td>10.33% [3.9,18] (2.25)</td>
<td>7.06% [4.8,9] (0.99)</td>
</tr>
<tr>
<td>October 2014</td>
<td>8.28% (9.98)</td>
<td>3.2% 16.74%</td>
<td>6.11 [5,8.4] (0.44)</td>
<td>5.37% [4.8,5.7] (0.32)</td>
</tr>
<tr>
<td>October 2015</td>
<td>7.89% (40.50)</td>
<td>2% 14.21%</td>
<td>6.17 [0.5,15] (0.91)</td>
<td>5.92% [5.6,6.5] (0.28)</td>
</tr>
<tr>
<td>October 2016</td>
<td>7.45% (30.36)</td>
<td>4% 12.16%</td>
<td>5.96 [3.2,10] (0.74)</td>
<td>5.50% [5.2,5.9] (0.23)</td>
</tr>
</tbody>
</table>

Household data from Reid et. al. (2020), *Economic Systems* (forthcoming)
Actual versus Expected Inflation: The Full Sample

All businesses

Financial Analysts

KEY: FA = financial analysts; CPI = inflation
T0 = CY; T1 = YA; T2 = 2 YA; 5A = 5 YA
CPI_INFL = Observed CPI Inflation
Distribution Of Inflation Expectations

Key: see previous slides; MAX = Maximum values; MIN = Minimum values

Maximum - Minimum Values for CPIT0 = Current Year Inflation Expectations

BUSINESS
FINANCIAL ANALYSTS

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Densities for Forecast Errors of Inflation at Different Horizons: Individual Data

Monique Reid & Pierre Siklos
Aggregate Forecast Disagreement

\[ d_{th}^j = \frac{1}{N_j - 1} \sum_{i=1}^{N_j} (F_{ith}^j - \overline{F}_{ith}^j)^2 \]

- No. of Individual Responses each quarter
- Average of individual Quarterly Forecasts
- Disagreement, \( d \) @ time \( t \), horizon \( h \)
- Across respondent \( j \)
- \( H = T0, T1, T2, 5a \)

The time series view aggregates Quarterly observations from individual level responses

Methodology from Siklos (2013), *Journal of International Economics*
The SARB’s Implicit Inflation Target

Christiano-Fitzgerald Asymmetric Filter (6-32Q)

Averaging the 2 delivers some empirical advantages.

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INTEREST RATE EXPECTATIONS

KEY: PRIME = prime interest rate; R153 is SA long-term GOVT bond; RLONG_IMF = “blended” govt bond yield from IMF IFS; RLONGT_PROXY = mean of yield on 10, 5, 20 and 30 year SA GOVT bonds; SARB_PR = SARB policy rate
WAGE AND PRICE DEVELOPMENTS

Monique Reid & Pierre Siklos
An Application: The Phillips Curve
### THE ANCHORING OF INFLATION EXPECTATIONS

\[ (\pi_{LT}^e - IT) = \alpha + \delta(\pi_{ST}^e - IT) + \gamma\pi_{LT}^e - IT)_{t-1} + \epsilon_t \]

\[ IT = [4.5,6], \pi_{LT}^e = CPI5a \]

<table>
<thead>
<tr>
<th>Business</th>
<th>CPIT0</th>
<th>CPIT1</th>
<th>CPIT2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full</td>
<td>-0.06(0.03)</td>
<td>0.25(0.00)</td>
<td>0.59(0.00)</td>
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<tr>
<td>+ve fe</td>
<td>0.79(0.00)</td>
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<tr>
<td>+ve fe</td>
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<td>0.86(0.00)</td>
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<td>+ve fe</td>
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<td></td>
<td>0.78(0.00)</td>
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<td>-ve fe</td>
<td>0.28(0.00)</td>
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<td>-ve fe</td>
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<td>0.47(0.00)</td>
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<td>-ve fe</td>
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<td></td>
<td>0.72(0.00)</td>
</tr>
<tr>
<td>Financial Analysts</td>
<td>0.11(0.00)</td>
<td>0.01(0.84)</td>
<td>0.84(0.00)</td>
</tr>
<tr>
<td>+ve fe</td>
<td>-0.15(0.44)</td>
<td></td>
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<tr>
<td>-ve fe</td>
<td>0.23(0.00)</td>
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<tr>
<td>-ve fe</td>
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<td>0.70(0.00)</td>
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<tr>
<td>-ve fe</td>
<td></td>
<td></td>
<td>0.45(0.00)</td>
</tr>
</tbody>
</table>

Based on Individual Expectations 2000Q2-2018Q2

Does the Sign of the Forecast Error Matter?
\[ \pi_{it} = \alpha + \beta_0 \pi_{it}^e + \beta_1 \pi_{i(t-1)} + \lambda \tilde{x}_{it} + \theta \Gamma_{it} + \xi_{it} \]

3X IQR

3rd Quartile

Mean

Median

1st Quartile

3X IQR

Cyclical vs. Deviation from Target?

For median
Outside Data Sources considered:

1) Labour data
2) Supply-Use and Input-Output Tables
Growth Rates in Wages in South Africa: QES Survey
Notes on Macroeconomic controls from external sources: Options

• Cost of labour is naturally one of the first to consider given that compensation of employees is usually one of the largest financial commitment firms face

• There is substantial evidence from the labour economists in the SA suggesting that this pressure is not uniform across sectors

• We considered a number of labour datasets as a source of information about price of labour:
  • QLFS and PALMS - this data is most appropriate for many of the labour research questions and therefore has the advantage that it has been extensively examined by academics
  • The QES and Supply-Use Tables are firm-based measures, where data is collected from VAT-registered firms
    • While the omission of large parts of the working age population from these datasets is a limitation for many labour questions, in this study we are focusing only on the inflation expectations of the business sector and financial analysts
    • Some of the weaknesses of the household level datasets will be less of a concern when the data is collected at the firm level.
Notes on Macroeconomic controls from external sources: Labour data

• The QLFS is the official labour force data collected by StatsSA at a quarterly frequency
  • Collected in its current form since 2008 and the earnings question is available 2010 - 2017
  • Data is imputed for 0 or bracket responses, & there are concerns that this is distorting the data (Wittenberg (2016), Kerr and Wittenberg (2019) and references therein).

• The PALMS dataset, published by UCT’s Datafirst, uses the raw data from StatsSA and offers two ways to make adjustments for the 0 and bracket responses, that aim to reduce distortion created by the inclusion of these responses (Kerr and Wittenberg, 2019)

• This micro data would still need to be aggregated back up to the industry level to match the BER’s inflation expectations survey so this level of microdata may not be necessary.

• QES is collected from VAT registered firms faces
  • Fewer problems with accurate reporting
  • Collect data about employees, from the formal non-agricultural sector (StatsSA, 2020)
  • If an individual is employed in more than one job, that person is counted multiple times
  • Since our focus is on the experience of the firm, this representation is adequate. The limitation of this data is that it is only available since 2009Q3.
Notes on Macroeconomic controls from external sources: Exposure to

- StatsSA create SUTs and IOTs but not to the extent that would help match our BER data

- Quantec has tried to meet the demand for this data
  - But they rely on StatsSA data and use imputation and distributional estimation to create a more disaggregated time series where data is not publicly available
  - StatsSA is bound by the Stats Act that prohibits it from publishing any data that is based on assumptions (ie not fact), which is a limitation Quantec does not face