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).

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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)

Expectations Data: Opportunities & Challenges

- 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 <u>during the year.</u>…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
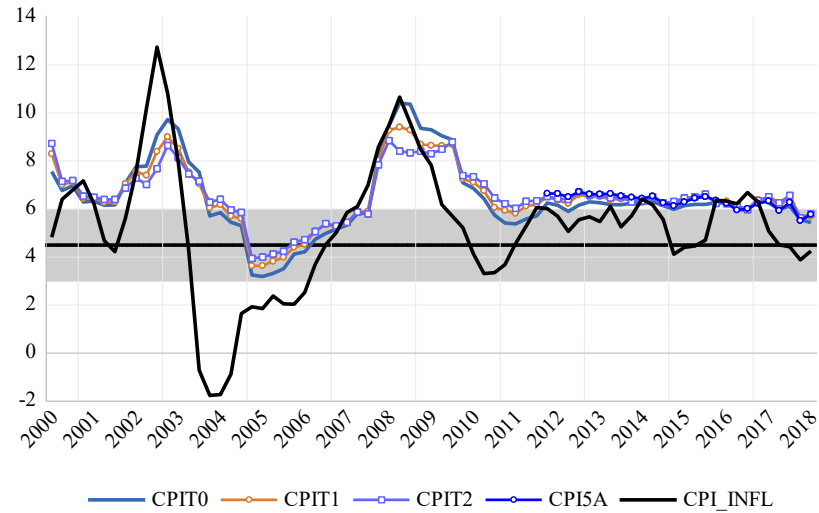
Contents of the BER Business and Financial Analysts Survey

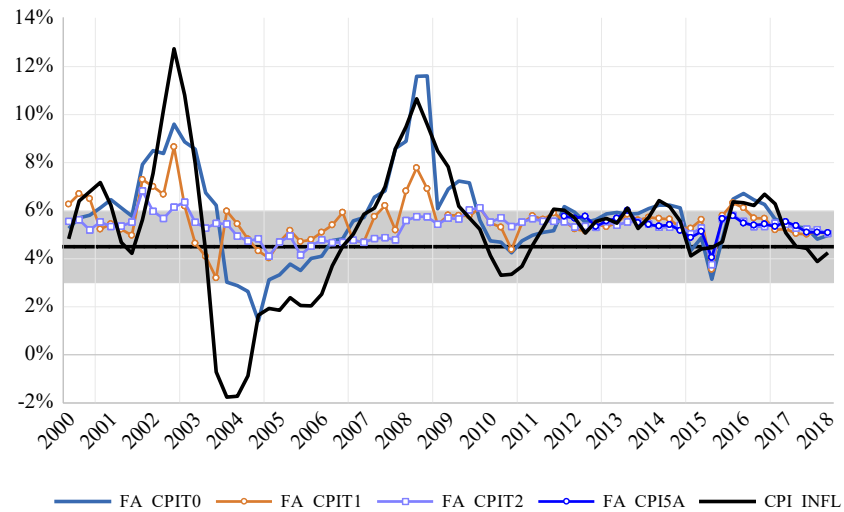| Businesses	Financial Analysts
Inflation: CY, YA, 2YA, 5YA*	Inflation: CY, YA, 2YA,5YA
GDP: CY, YA	GDP: CY, YA
Interest Rate (prime): CY, YA	Interest Rate (prime): CY, YA
Wages: CY, YA	Wages: CY, YA
RAND/US$ exchange rate: CY, YA	Rand/US$ exchange rate: CY, YA
	Capacity Utilization: CY, YA
	M3 growth: CY, YA
	Long-term Govt Bond Yield: CY, YA

Some Context: Households vs. Businesses

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

Household data from Reid et. al. (2020), *Economic Systems* (forthcoming)

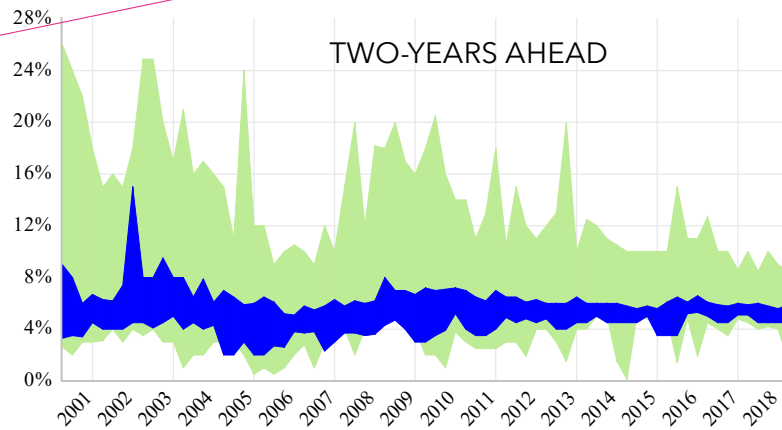**Actual versus Expected Inflation: The Full Sample**

All businesses

Financial Analysts

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Distribution Of Inflation Expectations
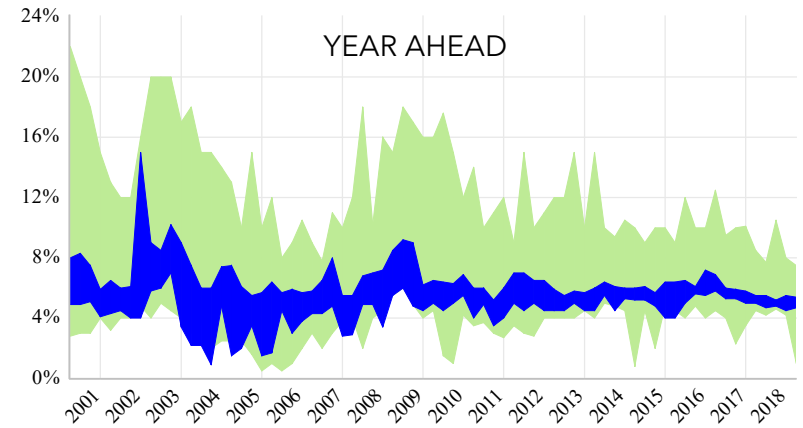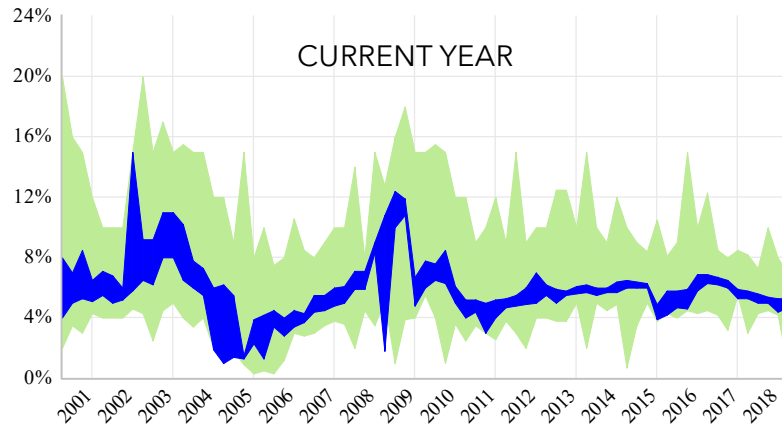
Maximum – Minimum Values for CPIT0 = Current Year Inflation Expectations BUSINESS FINANCIAL ANALYSTS

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

CURRENT YEAR

☐ (CPIT0_MAX,CPIT0_MIN)   ■ (FA_CPIT0_MAX,FA_CPIT0_MIN)

YEAR AHEAD

☐ (CPIT1_MAX,CPIT1_MIN)   ■ (FA_CPIT1_MAX,FA_CPIT1_MIN)

TWO-YEARS AHEAD
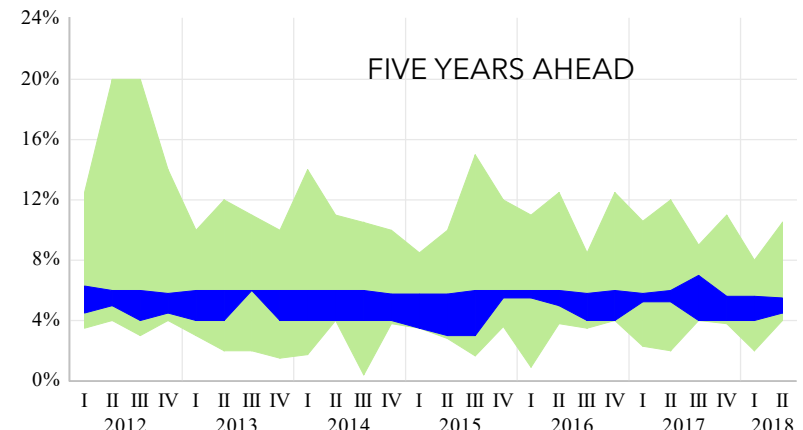
☐ (CPIT2_MAX,CPIT2_MIN)   ■ (FA_CPIT2_MAX,FA_CPIT2_MIN)

FIVE YEARS AHEAD

☐ (CPI5A_MAX,CPI5A_MIN)   ■ (FA_CPI5A_MAX,FA_CPI5A_MIN)

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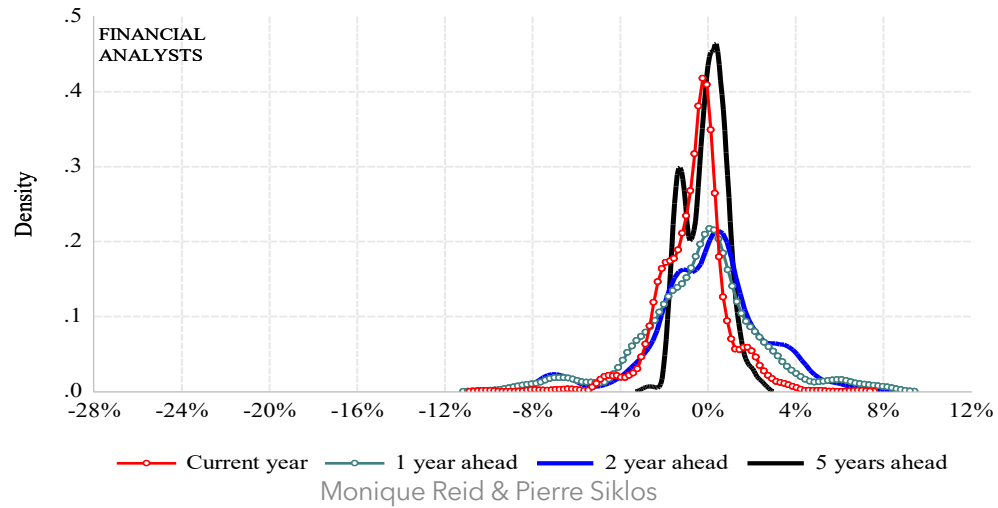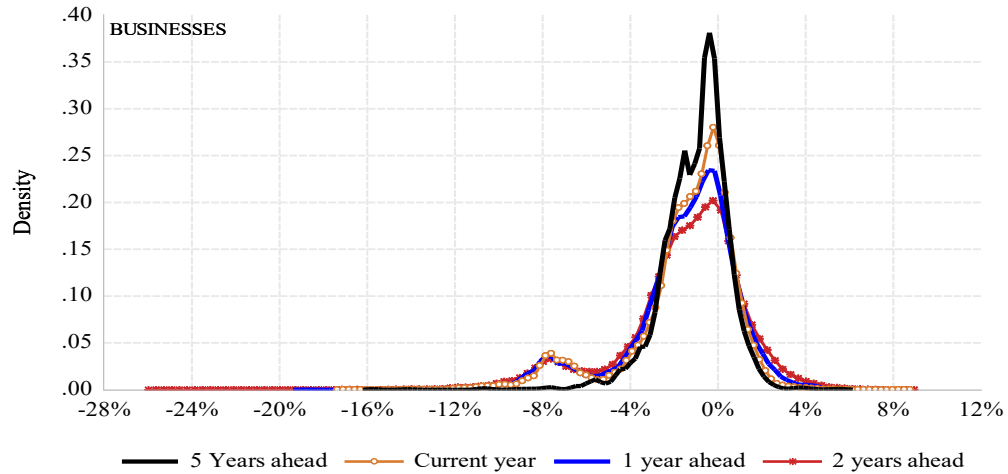
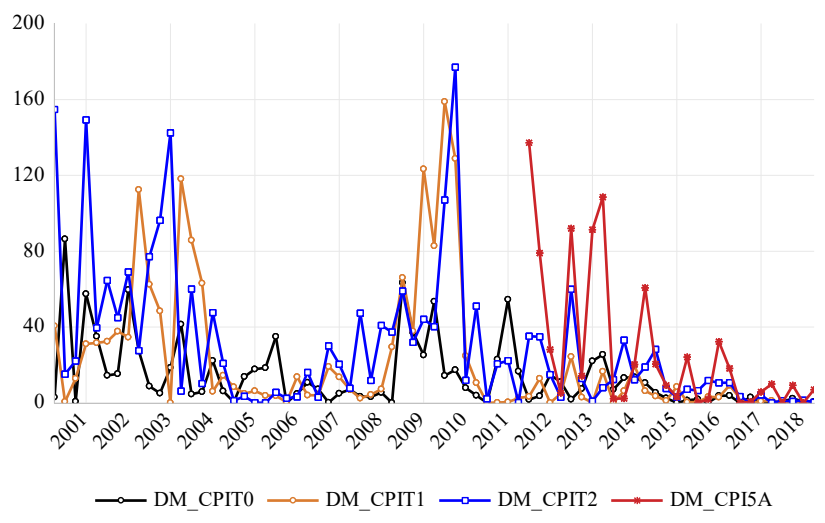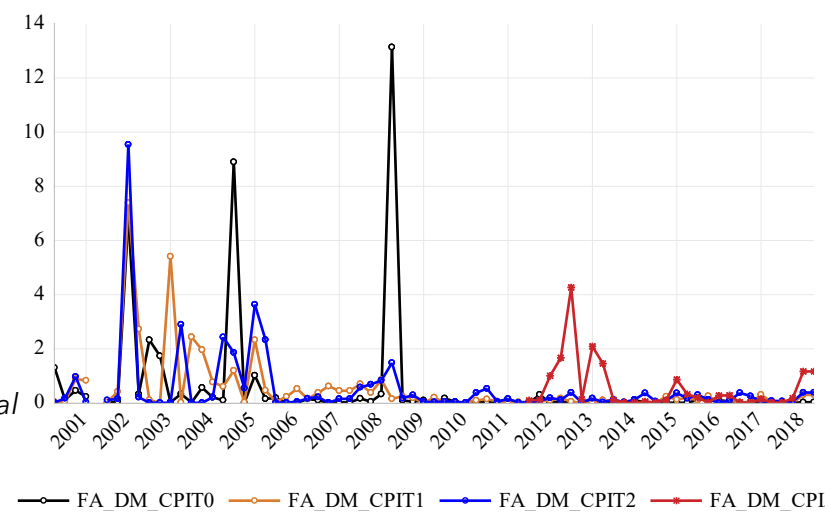## Aggregate Forecast Disagreement

$$d_{th}^j = \frac{1}{N_j - 1} \sum_{i=1}^{N_j} (F_{ith}^j - \bar{F}_{gth}^j)^2$$

No. of Individual Responses each quarter

Average of individual Quarterly Forecasts

Median of Individual Forecasts Evaluated each quarter

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*

Businesses

Legend: DM_CPIT0, DM_CPIT1, DM_CPIT2, DM_CPI5A

Financial Analysts

Legend: FA_DM_CPIT0, FA_DM_CPIT1, FA_DM_CPIT2, FA_DM_CPI5A

The SARB's Implicit Inflation Target
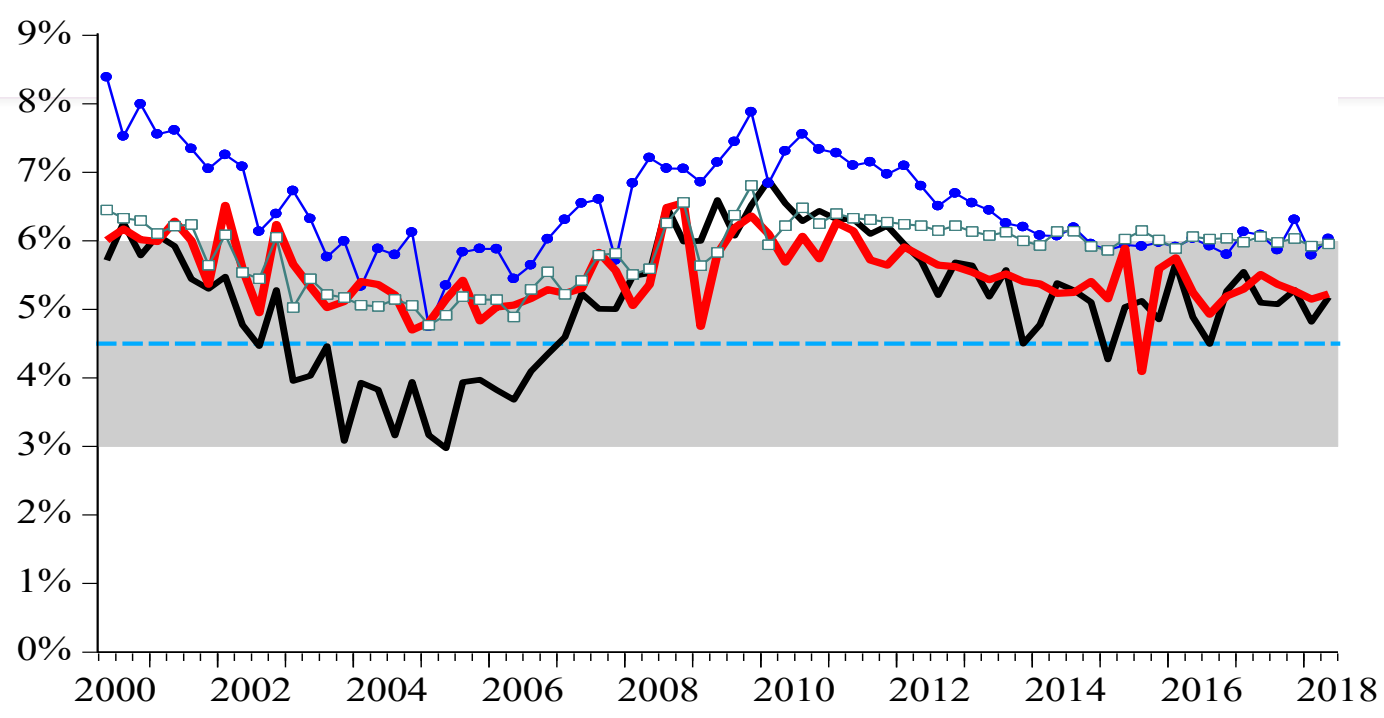
**Christiano-Fitzgerald** Asymmetric Filter (6-32Q)

Averaging the 2 delivers some emp. advantages

Legend:
- —— Observed inflation
- —— Mean Fin Anal (CPIT0&CPIT1)
- —●— Mean (CPIT0&CPIT1)
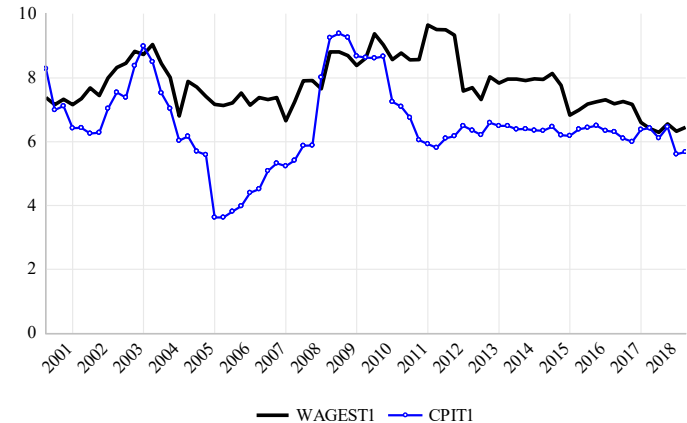- —□— Consensus forecasts
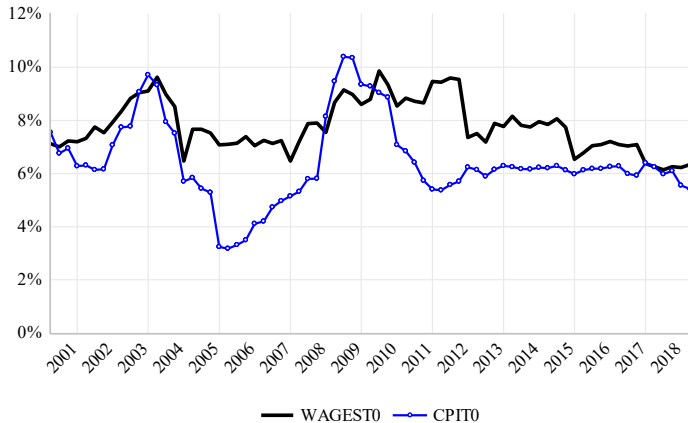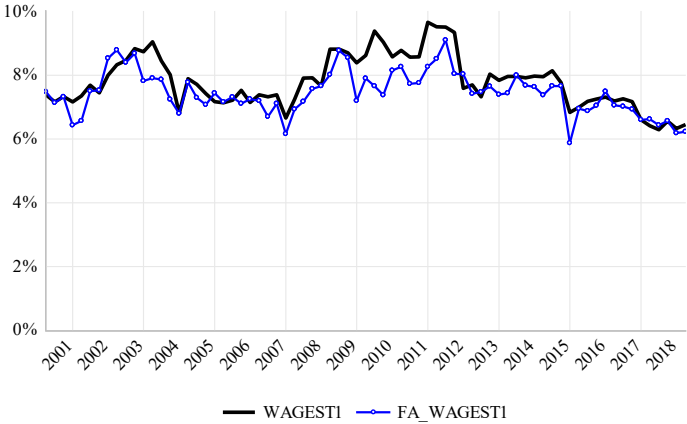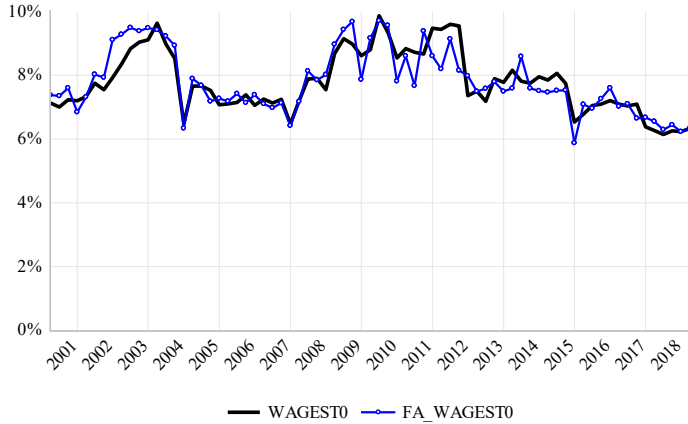
INTEREST RATE EXPECTATIONS
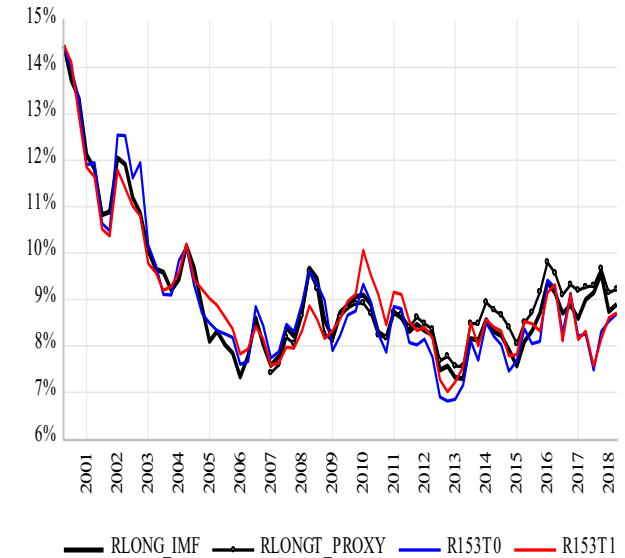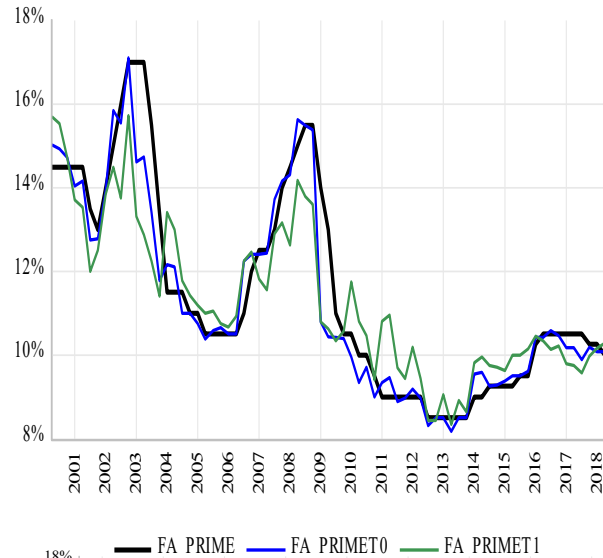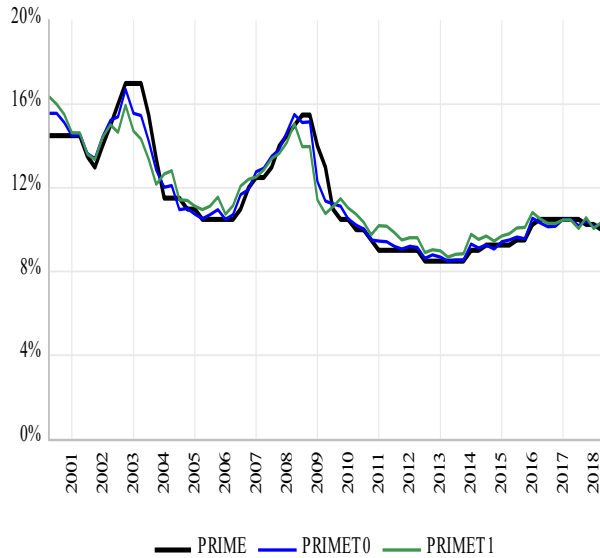
KEY: PRIME = prime interest rate;
R153 is SA long-term GOVT bond;
RLONG_IMF = "blended" govt bond yield from IMF IFS;
RLONGT_PROXY = mean of yield on 10, 5, 20 and 30 year SA
GOVT bonds;
SARB_PR = SARB policy rate

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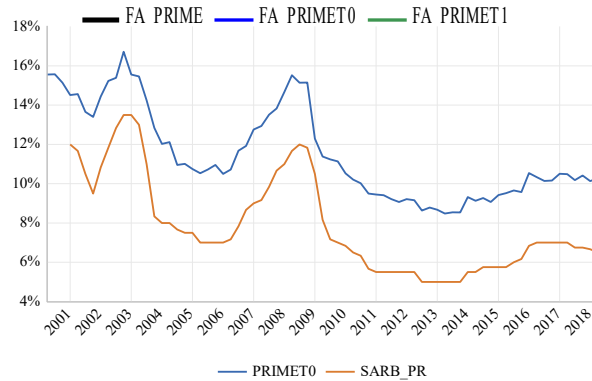
WAGE AND PRICE DEVELOPMENTS

An Application:

The Phillips Curve

THE ANCHORING OF INFLATION EXPECTATIONS

$$(\pi^e_{LT} - IT) = \alpha + \delta(\pi^e_{ST} - IT) + \gamma(\pi^e_{LT} - IT)_{t-1} + \varepsilon_t$$

$$IT = [4.5, 6], \pi^e_{LT} = CPI5a$$

Based on *Individual* Expectations 2000Q2-2018Q2

$\hat{\delta}$

Does the Sign of the Forecast Error Matter?

Business	CPIT0	CPIT1	CPIT2
Full	-.06(.03)	0.25(.00)	0.59(.00)
+ve fe	0.79(.00)		
		0.86(.00)	
			0.78(.00)
-ve fe	0.28(.00)		
		0.47(.00)	
			0.72(.00)
Financial Analysts	0.11(.00)	001(.84)	0.84(.00)
+ve fe	-0.15(.44)		
		-0.05(.80)	
			-0.87(.30)
-ve fe	0.23(.00)		
		0.70(.00)	
			0.45(.00)

Cyclical vs. Deviation from Target?

$$\pi_{it} = \alpha + \beta_0 \pi_{it}^e + \beta_1 \pi_{i(t-1)} + \lambda \tilde{x}_{it} + \boldsymbol{\theta} \boldsymbol{\Gamma}_{\mathbf{it}} + \xi_{it}$$

"slack"   Firm level, Individual level characteristics & Forecasts

3X IQR
3rd Quartile
Mean
Median
1st Quartile
3X IQR

Slope of Phillips Curve (Output-based)

Forward-Looking Inflation Component

Backward-Looking Component

95% Conf Int For median

Businesses   Financial Analysts
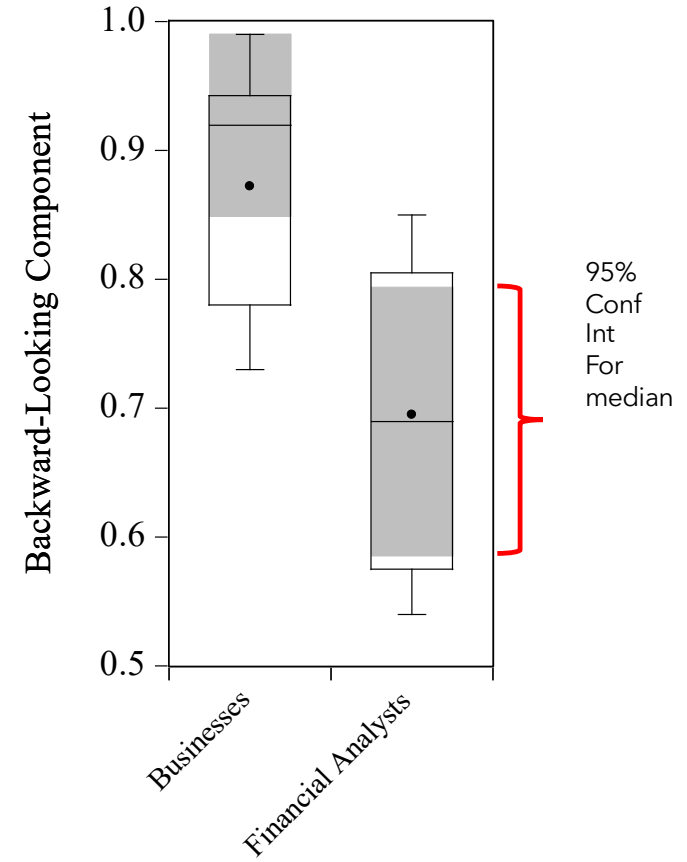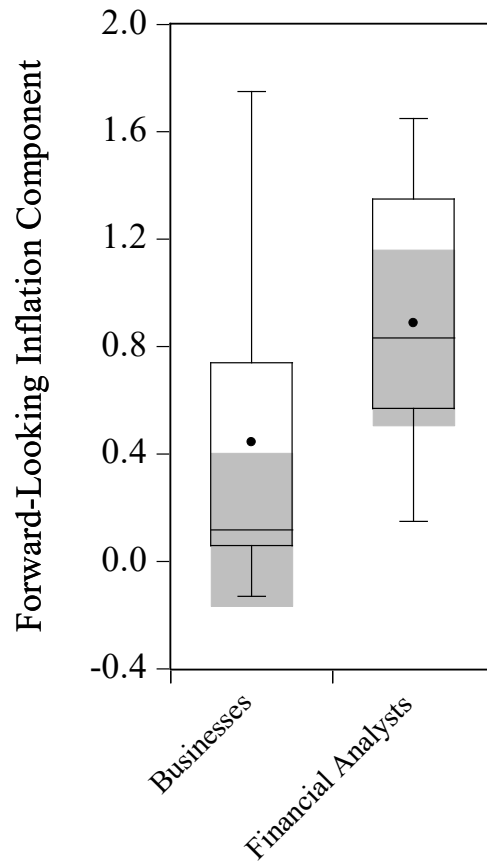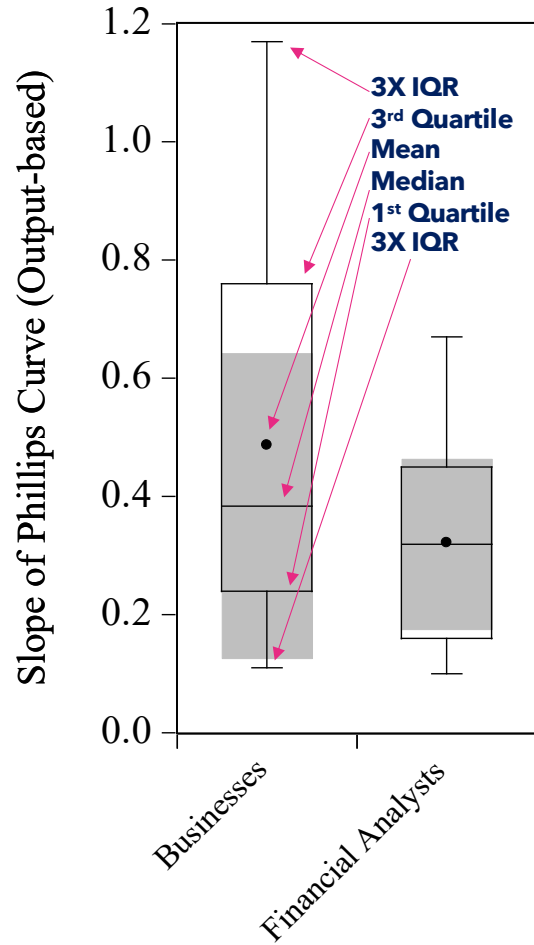
Outside Data Sources considered:

1) Labour data

2) Supply-Use and Input-Output Tables

Growth Rates in Wages in South Africa: QES Survey

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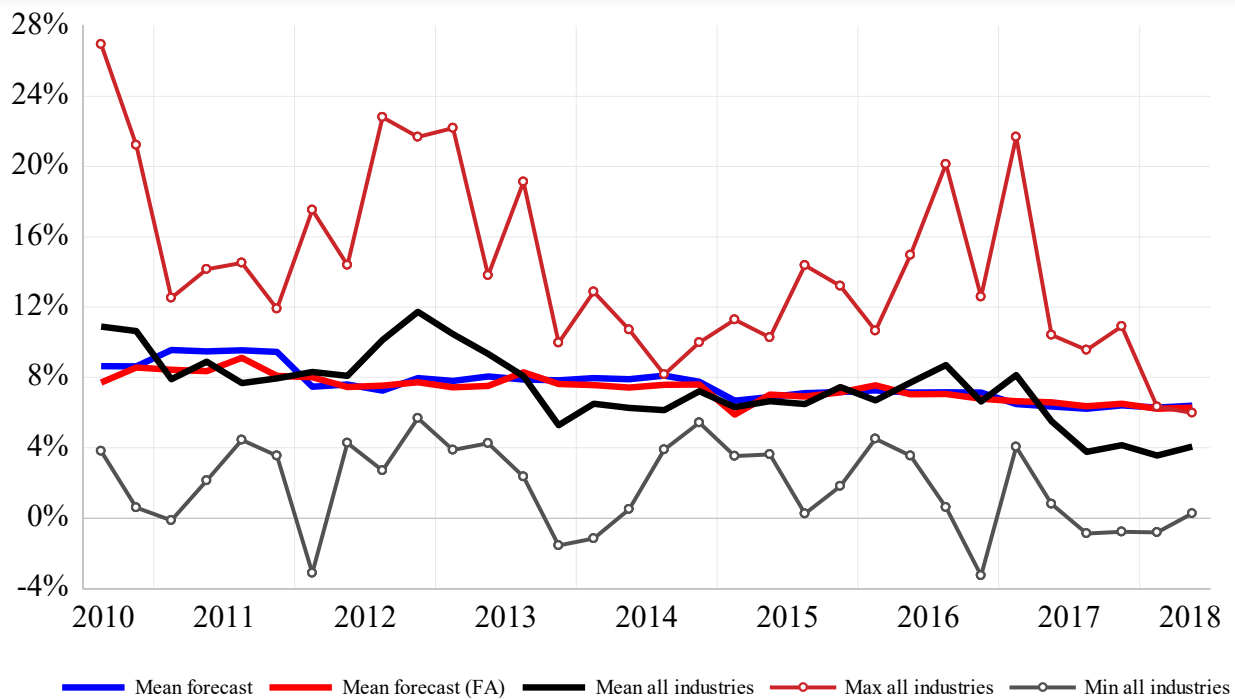
- There is substantial evidence from the labour economists in the SA suggesting that this pressure is not uniform across sectors

- 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