### Central Bank Communication

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#### PhD Course on Subjective Beliefs in Macroeconomics and Household Finance

\* The views expressed here do not necessarily represent the views of the Bank of England, the MPC, FPC, Irish Fiscal Advisory Council, or anyone else other than the authors.

## Outline

- 1. Expectations in Macro
- 2. History of Central Bank Communication
- 3. Communication with Financial Markets
  - Computational linguistics (3Ts)
- 4. Communication with General Public
  - Why?
  - Experiments
  - 3E's
- 5. Conclusion and Future Projects
  - Complexity and Uncertainty
  - Linguistic Complexity
  - The  $\pi_t^e$  distribution channel of monetary policy

### $Macro \mathbb{E} conomics$

- Expectations are absolutely central to core macroeconomic models
- Consider the RBC model:
  - Non-linear system of equations including:  $\frac{1}{C_t} = \beta \mathbb{E}_t \left[ \frac{R_{t+1}}{C_{t+1}} \right]$
  - Non-linear equations but that is not such a big problem
  - Expectations (forward looking behavior) are the bigger problem how the economy behaves today depends on how agents think the economy will behave in the future for all possible outcomes:
    - Typically rational expectations
    - Agent-based models in which agents predict according to some of pre-specified rules are easier to solve

### Central Bank Interest: The Basic New Keynesian Model

#### New Keynesian Phillips Curve

$$\pi_t = \beta E_t \{ \pi_{t+1} \} + \kappa \widetilde{y}_t$$

where  $\kappa \equiv \lambda \left( \sigma + \frac{\varphi + \alpha}{1 - \alpha} \right)$ .

#### Dynamic IS equation

$$\widetilde{y}_t = E_t\{\widetilde{y}_{t+1}\} - \frac{1}{\sigma} (i_t - E_t\{\pi_{t+1}\} - r_t^n)$$

where  $r_t^n$  is the natural rate of interest, given by  $r_t^n \equiv \rho + \sigma \ E_t \{ \Delta y_{t+1}^n \} = \rho + \sigma \psi_{ya} E_t \{ \Delta a_{t+1} \}$ 

**Missing block:** Description of monetary policy (determination of  $i_t$ ).

### Monetary Policy and Expectations I

#### Inflation Expectations



Sources: University of Michigan; Board of Governors of the Federal Reserve System; authors' calculations.

#### Source: Groen and Middeldorp

### Monetary Policy and Expectations II



### Monetary Policy and Expectations III

"There is not much doubt that the process of reducing inflation from around 15 per cent per annum in the mid-eighties to below 2 per cent in 1991 had an adverse impact on growth and employment during that period. I have often acknowledged that point, and indeed I know of no central banker who would claim with any confidence that inflation can be reduced from a high level to a low level without at least some, temporary, impact on growth and employment. **The** reasons for this are now widely understood and relate to the way in which a policy to reduce inflation interacts with expectations that inflation will continue at its previous pace. But shortly after inflation was first reduced to the 0 to 2 per cent target in 1991, the economy began to grow again and unemployment began to fall."

Donald T Brash, Governor of the Reserve Bank of New Zealand (February 2000)

### External Central Bank Communications Now Central

### • Blinder (1998):

"expectations about future central bank behavior provide the essential link between short rates and long rates."

### • Bernanke (2003):

"A given [monetary] policy action... can have very different effects on the economy, depending (for example) on what the private sector infers... about the information that may have induced the policymaker to act, about the policymaker's objectives in taking the action..."

#### • Gurkayanak, Sack and Swanson (2005):

Central bank statements move markets beyond the effect of the change in the current policy rate (event study).

# Monetary Transmission Mechanism

**Communications Channel** 



### Why Does This New Era of Communication Matter?

- 1. Raises *new* questions that are of first-order importance.
  - e.g. To whom should central bank communications be targeted? e.g. Does their communication create additional uncertainty?
- 2. We need to *rethink* how we study some fundamental monetary-economics questions empirically.
  - e.g. Multidimensional signals (GSS, 2005; Romer & Romer, 2000): Policy action vs. information effect



### Why Does Central Bank Communication Matter?

Open questions concern why CB communication matters?

- 1. Does the source of news reflect an information effect?
  - Central bank private information on economic conditions
    - Romer & Romer (2000)
  - vs. Direct signal of policy action
- 2. What is the nature of the information deficit? How does it vary over time? How responsive is the central bank in responding it?

### Important Distinctions

#### Important Note

In practice, the mapping between information, signals and updated beliefs is highly complex and multidimensional.



### Identification Problem

$$i_m = r_m^* + \pi^* + \phi^T \omega_m + \epsilon_m$$

• r<sub>t</sub><sup>\*</sup>: equilibrium real interest rate

• 
$$\boldsymbol{\omega}_{m} = \left(\pi_{m;h}^{CB}, \tilde{y}_{m;h}^{CB}\right)^{T}$$
  
•  $\pi_{m;h}^{CB} \equiv \mathbb{E}_{m}^{CB} \left[\pi_{m+h}\right] - \pi^{*}$   
•  $\tilde{y}_{m;h}^{CB} \equiv \mathbb{E}_{m}^{CB} [\tilde{y}_{m+h}]$ 

- Information on  $\omega_m$  can provide signal on  $r_m^*$  or  $\epsilon_m$
- But can still say something on nature of information
- And smoking gun? Especially if linked to the channel

## The 3 Ts of Text Analysis

#### Topic

Often measured with Latent Dirichlet Allocation (LDA)

#### Tone

e.g. Dictionary Methods, VADER

#### Time

Rarely captured explicitly

- Monetary policy is inherently forward-looking policy
- Most past and even current information is public
- But the information that fills an information deficit is unclear

## Communication Revolutions

### Questions that guided central banks' communication strategies

#### Until 1990s

"Do we communicate this?"

#### 1990s $\rightarrow$ GFC $\equiv$ 1st Revolution

"Why wouldn't we communicate this?"

#### Now $\equiv$ 2nd Revolution

"How should we communicate this in a way that engages a broader cross-section of society?"

- Blinder 2008: "It may be time to pay some attention to communication with the general public."
- 2018: "Central banks will keep trying to communicate with the general public, as they should. But for the most part, they will fail."

### Selective Revolution

• Large body of academic evidence that indicates that central bank communication is itself a powerful lever of monetary policy.



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### Other International Evidence Coenen et al (2017)

#### Figure 1: Length of monetary policy minutes



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### Other International Evidence Coenen et al (2017)

#### Figure 2: Length of ECB/FOMC monetary policy statements and difficulty of language employed



## Twin Deficits of Understanding and Trust

- Which group of people set Britain's basic interest rate level?
- Which of these groups do you think sets the interest rates?
- Which of these do you think best describes the Monetary Policy Committee?

• Rate their satisfaction with the way the Bank of England is doing its job to set interest rates to control inflation.





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### Is it desirable to communicate with a broader audience?

- First skepticism: What would Hayek say?
  - Can't finanicial prices transmit the information?
  - Convince the experts
    - $\Rightarrow$  change the prices
    - $\Rightarrow$  influence the broader audience!
- We consider 4 reasons why central banks might want to directly address the general public

### Reason 1: Household Expectations

- Households are central to economic activity
- Households' expectations and behaviour are shaped by a large range of factors not just financial prices
  - The role of Narrative Economics (Shiller, 2017)
- Growing evidence that household expectations matter for activity and financial choices
  - Bachmann, Berg and Sims (2015), Armantier et al. (2015), Malmendier and Nagel (2016)
- Financial prices may not work perfectly

### Regression analysis of inflation attitudes survey

	(	(-)	(-)
	(1)	(2)	(3)
Main Regressors	$ \mathbb{E}_t [\pi_{t+1}] - \pi *  $	$ \mathbb{E}_t [\pi_{t+2}] - \pi *  $	$\left \mathbb{E}_{t}\left[\pi_{t+5}\right]-\pi*\right $
Knowledge	-0.032***	-0.068***	-0.066***
	[0.00]	[0.00]	[0.00]
Satisfaction	-0.14***	-0.19***	-0.22***
	[0.00]	[0.00]	[0.00]
Constant	1.80***	2.80***	3.11***
	[0.00]	[0.00]	[0.00]
0	50.146	04.160	01 500
Observations	52,140	24,168	21,533
R-squared	0.081	0.057	0.044
	01.0	01.0	01.0
Estimation	OLS	OLS	OLS
Demographic Controls	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Sample	2001-2017	2009-2017	2009-2017

### Reason 2: Confidence $\rightarrow$ Trust and Credibility

	(1)	(2)
Main Regressors	Statisfaction	Credibility
Knowledge	0 10***	0 052***
Kilowieuge	[0 00]	[0 00]
Satisfaction	[0.00]	0.37***
		[0.00]
Constant	2.92***	2.04***
	[0.00]	[0.00]
Observations	58,730	3,382
R-squared	0.118	0.279
Estimation	OLS	OLS
Demographic Controls	Yes	Yes
Year Fixed Effects	Yes	No
Sample	2001-2017	2017

### Reason 3 and 4: Information

- 3. Help traditional information intermediaries
  - Help mainstream media and financial markets
  - · Also react to, and learn from, the use of narratives

- 4. Improve the information set of central banks
  - Importance of committees in aggregating information
  - Epictetus:

"We have two ears and one mouth so that we can listen twice as much as we speak"

### Innovation at the Bank of England

- Super Thursday (8 times per year):
  - Interest rate decision
  - Monetary Policy Summary
  - Inflation Report (Quarterly Feb, May, Aug, Nov)
- November 2017:
  - Broader-interest version of the IR
  - New layered content as a complement to the existing material
  - New website: www.inflationreport.co.uk

### Bank of England Layered Content I

We think our economy can only grow at a new speed limit of around one-and-a-half per cent a year at the moment before it leads to higher inflation.



### Layer 2 Content

#### Flesch-Kincaid Grade Level of 7.8

"Inflation is above our 2% target, because of the sharp fall in the pound triggered by the EU referendum. We have to balance how quickly we take inflation back to the target with the support we give to jobs and activity. With more people in work and growth in the economy steady, there are limits to the extent to which we can accept above-target inflation. People need to be able to rely on low and stable inflation. To make sure of that, we need to keep economic growth around its new, lower, speed limit."

"To ensure a sustainable return of inflation to the target we have raised interest rates from 0.25% to 0.5%. That means taking our foot a little off the accelerator, reducing slightly the amount of support we are providing to the economy. We expect any further rises to happen at a gradual pace and to a limited extent. Interest rates are likely to remain substantially lower than a decade ago."

"We have raised interest rates to 0.50%."

# Monetary Policy Summary

Flesch-Kincaid Grade Level of 13.4

"The Bank of England's Monetary Policy Committee (MPC) sets monetary policy to meet the 2% inflation target, and in a way that helps to sustain growth and employment. At its meeting ending on 1 November 2017, the MPC voted by a majority of 7-2 to increase Bank Rate by 0.25 percentage points, to 0.5%." ...

"The MPC's outlook for inflation and activity in the November Inflation Report is broadly similar to its projections in August. In the MPC's central forecast, conditioned on the gently rising path of Bank Rate implied by current market yields, GDP grows modestly over the next few years at a pace just above its reduced rate of potential. ... " Overview Macro Expectations CB Comms Fin Mkts Gen Public Experiments Trust 1st E 2nd E 3rd E Conclusion

### Comparing the Message Reach I Social Media Hits

	August 2016 IR	August 2017 IR	November 2017 IR
Website hits	16,600	12,460	30,900
o/w Layer 2	n/a	n/a	16,200
Tweets	1,745	320	1,566
${\rm o/w}$ Layer 1	n/a	n/a	845

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### Comparing the Message Reach III

Agents Survey of Regional Contacts



### Experiment

- Ran an experiment on two samples
  - Public Sample
  - MPhil Sample (1st year graduate students)

Experiment involved:

- $1. \ \mbox{Ask}$  about knowledge of the IR
- 2. Ask questions on expectations for the economy
- 3. Randomly assigned a reading
  - Monetary Policy Summary
  - Layered content
- 4. Ask them questions based on reading

### Regression analysis of communication experiment

	(1)	(2)
Main Regressors	Understand	Understand
D(Layers)	0.71***	0.63***
	[0.00]	[0.00]
D(Economics)	0.54***	
	[0.00]	
BoE Confidence	0.10	0.16
	[0.10]	[0.29]
Constant	2.68***	3.63***
	[0.00]	[0.00]
Observations	285	68
R-squared	0.226	0.140
Estimation	OLS	OLS
Demographic Controls	Yes	No
Sample	Public	MPhil

### Regression analysis of communication experiment

	(1)	(2)	(3)	(4)
Main Regressors	Understand	Understand	$\Delta$ Perception	$\Delta$ Perception
D(Layers)	0.71***	0.63***	0.083	0.35**
	[0.00]	[0.00]	[0.33]	[0.01]
D(Economics)	0.54***		-0.032	
	[0.00]		[0.76]	
BoE Confidence	0.10	0.16	0.15***	-0.14
	[0.10]	[0.29]	[0.00]	[0.19]
Constant	2.68***	3.63***	3.19***	3.12***
	[0.00]	[0.00]	[0.00]	[0.00]
Observations	285	68	285	66
R-squared	0.226	0.140	0.055	0.111
Estimation	OLS	OLS	OLS	OLS
Demographic Controls	Yes	No	Yes	No
Sample	Public	MPhil	Public	MPhil

### Regression analysis of communication experiment

-	(1)	(2)	(3)	(4)	(5)	(6)
Main Regressors	Understand	Understand	$\Delta$ Perception	$\Delta$ Perception	D(Adjust)	D(Adjust)
D(Layers)	0.71***	0.63***	0.083	0.35**	0.35**	0.090
	[0.00]	[0.00]	[0.33]	[0.01]	[0.04]	[0.78]
D(Economics)	0.54***		-0.032		-0.24	
	[0.00]		[0.76]		[0.32]	
BoE Confidence	0.10	0.16	0.15***	-0.14	-0.11	0.28
	[0.10]	[0.29]	[0.00]	[0.19]	[0.28]	[0.26]
Constant	2.68***	3.63***	3.19***	3.12***	-0.21	-0.81***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.52]	[0.01]
Observations	285	68	285	66	285	68
R-squared	0.226	0.140	0.055	0.111		
Estimation	OLS	OLS	OLS	OLS	Probit	Probit
Demographic Controls	Yes	No	Yes	No	Yes	No
Sample	Public	MPhil	Public	MPhil	Public	MPhil

### Extending that analysis to examine the role of trust

	(1)	(2)	(3)	(4)	(5)	(6)
	Understand	$\Delta$ Perception	D(Adjust)	Understand	$\Delta$ Perception	D(Adjust)
D(Layers)	0.73***	0.098	0.33*	0.46	0.16	-0.16
	[0.00]	[0.23]	[0.06]	[0.14]	[0.49]	[0.76]
Trust $\times$ D(Layers)	0.21	0.12	-0.089	0.26	0.30	0.37
	[0.11]	[0.19]	[0.64]	[0.47]	[0.18]	[0.50]
D(Economics)	0.54***	-0.033	-0.24			
	[0.00]	[0.75]	[0.33]			
Trust	0.016	0.10*	-0.065	-0.015	-0.31*	0.044
	[0.81]	[0.10]	[0.63]	[0.96]	[0.07]	[0.91]
Constant	2.68***	3.20***	-0.21	3.74***	3.23***	-0.66*
	[0.00]	[0.00]	[0.51]	[0.00]	[0.00]	[0.07]
Observations	285	285	285	68	66	68
R-squared	0.235	0.062		0.150	0.138	
Estimation	OLS	OLS	Probit	OLS	OLS	Probit
Demographic Controls	Yes	Yes	Yes	No	No	No
Sample	Public	Public	Public	MPhil	MPhil	MPhil

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## Effect of Trust

Understanding



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# Effect of Trust



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## Effect of Trust

#### On Expectation Adjustment



#### Similar Experiment - Bholat et al (2019)

#### Figure 4: Self-reported comprehension scores



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#### Similar Experiment - Bholat et al (2019)

Figure 6: The effect of different summaries on perceptions of the Bank of England



#### Large Scale Experiment - CGW (2021)

	Outcome: forecast revision								
Treatments	Immediat	e revision	Revision aft	er 3 months	Revision afte	Revision after 6 months			
	(1)	(2)	(3)	(4)	(5)	(6)			
T5 (pop growth)	-0.218**	-0.269**	-0.074	-0.097	0.086	0.096			
	(0.105)	(0.109)	(0.090)	(0.093)	(0.102)	(0.104)			
T6 (UE)	-0.337***	-0.330***	-0.231**	-0.250***	-0.116	-0.115			
	(0.104)	(0.109)	(0.093)	(0.096)	(0.101)	(0.103)			
T4 (gas prices)	1.491***	1.430***	-0.169*	-0.190**	-0.121	-0.117			
	(0.114)	(0.119)	(0.092)	(0.095)	(0.102)	(0.103)			
T2 (past inflation)	-1.039***	-1.111***	-0.014	-0.067	0.276***	0.251**			
	(0.104)	(0.109)	(0.091)	(0.094)	(0.102)	(0.104)			
T3 (inflation target)	-0.996***	-1.034***	-0.329***	-0.394***	0.032	-0.017			
	(0.102)	(0.109)	(0.091)	(0.095)	(0.101)	(0.103)			
T7 (Fed inflation forecast)	-1.071***	-1.143***	-0.220**	-0.240**	0.162	0.142			
	(0.102)	(0.108)	(0.093)	(0.095)	(0.101)	(0.103)			
T8 (FOMC statement)	-1.197***	-1.213***	-0.138	-0.163*	0.078	0.075			
	(0.103)	(0.108)	(0.092)	(0.095)	(0.104)	(0.107)			
T9 (USA today coverage)	-0.444***	-0.528***	-0.196**	-0.211**	0.117	0.104			
	(0.105)	(0.109)	(0.092)	(0.095)	(0.101)	(0.103)			
Remove outliers	Yes	Yes	Yes	Yes	Yes	Yes			
Using sampling weights	Yes	Yes	Yes	Yes	Yes	Yes			
Controls for demographics	No	Yes	No	Yes	No	Yes			
Observations	19,269	17,629	13,339	12,553	11,716	11,223			
R <sup>2</sup>	0.048	0.061	0.002	0.012	0.002	0.015			

#### Table 2: Average Household Responses to Treatments.

Notes: The table reports the average change in inflation expectations of individuals in each treatment group relative to those in the control group. Columns (1) and (2) consider the immediate change in expectations after the treatment, columns (3) and (4) consider the changes in beliefs after three months, columns (5) and (6) report changes in beliefs over a six month horizon. In each case, differences in beliefs are measured relative to initial beliefs from the first wave measured before all treatments. Treatments are described in detail in the text. For each time horizon, the second column uses the same specification as in the first column but augmented with respondentspecific controls. Results are from Huber robust regressions to control for outliers and influential observations. Robust standard errors are reported in parentheses.

Panel A: Information comparisons									
	Group					Individual			
	t -	+1	<i>t</i> -	+2	t -	+ 1	<i>t</i> -	+2	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
Point	-5.057		-7.829**		-6.460		-13.082*		
	(3.37)		(3.32)		(5.71)		(6.99)		
Point&Density	-2.155	$2.902^{*}$	-4.795	$3.034^{*}$	-7.376	-0.916	-9.759	3.322	
	(3.51)	(1.52)	(3.47)	(1.72)	(4.94)	(4.93)	(6.61)	(6.04)	
α	$35.901^{***}$	$30.844^{***}$	$42.690^{***}$	$34.862^{***}$	43.161***	$36.701^{***}$	$56.678^{***}$	$43.596^{***}$	
	(3.26)	(0.82)	(3.17)	(1.00)	(4.05)	(4.03)	(5.30)	(4.56)	
N	7306	4872	7054	4704	6604	4343	6377	4194	
$\chi^2$	5.237	3.629	7.437	3.094	2.336	0.0346	3.684	0.303	

#### Table 3: Absolute forecast errors

Panel A: Information comparisons									
		Gr	oup			Individual			
	t+1 $t+1$		<i>t</i> -	+2	<i>t</i> -	+ 1	t+2		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
Point	$-14.937^{**}$		$-15.685^{**}$		-8.346		-11.102		
	(7.16)		(6.31)		(11.41)		(9.96)		
Point&Density	-10.616	4.321	-10.038	$5.647^{*}$	-9.342	-0.997	-11.406	-0.304	
	(7.29)	(2.83)	(6.63)	(3.13)	(10.80)	(12.50)	(10.45)	(11.37)	
α	$31.634^{***}$	$16.697^{***}$	$31.259^{***}$	$15.574^{***}$	74.220***	65.875***	72.889***	61.787***	
	(6.95)	(1.76)	(6.08)	(1.68)	(6.80)	(9.22)	(6.36)	(7.72)	
N	1080	720	1080	720	1080	720	1080	720	
$\chi^2$	5.877	2.335	8.368	3.245	0.941	0.00635	1.753	0.000716	

Table 4: Disagreement in inflation forecasts

Panel A: Information comparisons									
		Gr	oup			Individual			
	t+1		<i>t</i> -	+2	$2   t \rightarrow$		t -	+2	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
Point	-9.377***		-11.790**		-3.858		-5.129		
	(3.53)		(4.70)		(3.26)		(3.61)		
Point&Density	3.650	$13.027^{***}$	1.938	$13.728^{***}$	0.305	4.163	0.089	5.218	
	(4.06)	(2.92)	(4.98)	(3.52)	(3.47)	(3.09)	(3.82)	(3.39)	
α	$26.703^{***}$	$17.326^{***}$	32.894***	$21.105^{***}$	23.339***	19.482***	$26.047^{***}$	20.918***	
	(3.20)	(1.49)	(4.15)	(2.19)	(2.56)	(2.02)	(2.85)	(2.22)	
N	7559	5040	7559	5040	6840	4500	6840	4500	
$\chi^2$	22.96	19.92	17.30	15.20	2.301	1.811	3.142	2.376	

Table 5: Uncertainty in inflation forecasts

Panel A: Information comparisons									
		Gr	oup			Individual			
	t + 1 $t +$			+2	<i>t</i> -	+1	t+2		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
Point	$0.267^{***}$		$0.156^{***}$		0.270***		$0.146^{***}$		
	(0.03)		(0.02)		(0.03)		(0.02)		
Point&Density	$0.196^{***}$	-0.071*	$0.082^{***}$	$-0.074^{***}$	$0.140^{***}$	$-0.130^{***}$	$0.059^{***}$	-0.087***	
	(0.03)	(0.04)	(0.02)	(0.02)	(0.03)	(0.05)	(0.02)	(0.03)	
$\alpha$	$0.147^{***}$	$0.413^{***}$	$0.152^{***}$	0.308***	0.109***	$0.378^{***}$	$0.114^{***}$	0.260***	
	(0.01)	(0.03)	(0.01)	(0.02)	(0.01)	(0.03)	(0.01)	(0.02)	
Ν	7559	5040	7559	5040	6840	4500	6840	4500	
$\chi^2$	98.30	2.812	62.74	10.05	72.07	7.668	42.92	10.13	

Table 6: Credibility of central bank projectionsI

#### Trust

- 1. HMM (2019) solve a model of communication with a rationally-inattentive public:
  - Even though people will not pay full attention, CB should provide all the detailed information
- 2. Develop model of trust, understanding & simplified communication:
  - Shows that there are risks to 'partial' engagement
  - These may be worth it if trust is inherently low; otherwise may not be
- 3. We explore the 3 E's as ways to mitigate the dangers

### Explanation

- The core of communication & expectations management
  - Why the central bank made its decisions
  - Views on the state of the economy and its likely evolution
  - How the central might react in the future
- Recent efforts include:
  - Increasing transparency about the policy process
  - Forward guidance
  - Attempts to explain to a wider audience
    - e.g. Nov 2017: BoE introduces layered content as a complement to the existing IR material

#### Low frequency communication

- Inflation Targeting *is* a device to manage expectations and communicate with the masses
- Low frequency communication is also subject to the 3 E's.
- And efforts may be highly complementary across high and low frequency communication
  - e.g. Education about how the economy works helps both

### Bank of Jamaica



#### The 2nd revolution may be the manner not the objective

#### How does the Bank of Jamaica manage inflation?

The Bank of Jamaica depends on its monetary policy to manage inflation. In formulating this policy, the Bank establishes a *Financial Programme*, which outlines movements in key economic variables, which are consistent with the specified inflation objectives of the Bank. These variables are subsequently monitored on an annual, quarterly, monthly, weekly and even daily basis, as data availability allows.

The Bank's *monetary policy framework* embraces four stages of policy design and monitoring. These are

- (a) Monetary Policy Instruments (open market operations and reserve requirements)
- (b) Operating Targets (monetary base and interest rates)
- (c) Intermediate Targets (exchange rates and money supply)
- (d) The objective of monetary policy (price stability)

we take this opportunity to extend our grantidue to an who have supported the process and would like to invite suggestions and comments from all our readers.

### Clarity without engagement is a failure

- Clearly-explained communication will count for nothing if people don't engage with these communication
  - Our participants were incentivised to engage
    - 34% had never heard of of the IR
    - 6% had ever read it
    - 1 participant claimed to read it regularly (out of 285)
- But engagement without understanding might not be as bad
  - Engagement in itself might contribute to building and maintaining trust
- The need to win the battle for public support for ideas
  - if the central bank isn't talking to people, someone else will fill the void with possibly noisier messages
- We consider two specific avenues:
  - 1. Media and the Narrative Channel
  - 2. Direct engagement businesses and citizens

#### New Media, New Opportunities?



From McMahon, Schipke and Xiang (2018)

#### Time Series of IR Engagement



#### Direct Engagement: Citizens' Panels



# Southampton, we're listening



#### Direct Engagement: Citizens' Panels

The event has:



#### Education for the masses

- What if we engage the public, but they quickly become confused by the complexity of the economy?
  - "inflation" and "GDP" (central to policy discussions) are not well understood by the general public
- Better economic education:
  - appears positively with trust
  - may reduce the costs of engagement
  - may reduce the reaction to surprises
- But who should be responsible?
  - Who teaches people what interest rates are?
  - how do we feed peoples' desire to understand?
    - Broader engagement challenge for macroeconomics

#### Monetary education for the masses

- CB has the primary role for educating the public on its framework, strategy, analysis and policy decisions.
- Regular educational briefing
  - Notes for and videos aimed at businesses and major banks explaining new ideas on the economy.
  - Increasing provision of videos and social media channels explaining recent issues or research in layman's terms.
- Guides to how the economy and monetary policy interact:
  - St Louis Fed: "In Plain English: Making Sense of the Federal Reserve"
  - BoE: "Knowledge Bank: The economy made simple" website
  - ECB: "The ECB Explains"
- Specific educational resources:
  - "Chairman Bernanke's College Lecture Series"
  - BoE resources for secondary schools
  - Younger audiences?

#### Comic Book Approach



### Conclusion

- In the last decade, central banks have worked to communicate more regularly with a broader audience.
  - Response to the challenges posed by the fallout of the financial crisis
- Simplifying communication is a desirable and feasible action to take
- But *explanation* through simplified communication may, alone, be necessary but not sufficient.
- Need complementary efforts in *engagement* and *education*
- There is much still to be done to understand the optimal design and use of communication with the general public.

### On-going work

- 1. Communication of Uncertainty (Friday)
- 2. Linguistic vs Semantic Complexity in Language
- 3. Effects of Distribution on transmission mechanism



Figure 1a: Time series of the Flesch-Kincaid measure for IR, MPS and VS



Figure 1e: Time series of the Proportion of Jargon measure for IR, MPS and VS



Figure 1f: Time series of the Frequency of Technical Concepts measure for IR, MPS and VS

			SC	
		Low	Med	High
	Low	Text 1	Text 2	
CC	Med FTC	Text 7 + 8		
	Med both	Text 3	Text 4	
	High		Text 5	Text 6

#### Distribution of Beliefs about the Inflation Target





Notes: The figure plots the distribution of responses from individuals about what inflation rate they thought the Federal Reserve was trying to achieve in the long-run. This figure includes only respondents from the May 2018 part of survey wave 1, which did not have a "do not know" option for the question eliciting perceptions of the inflation target. Overview Macro Expectations CB Comms Fin Mkts Gen Public Experiments Trust 1st E 2nd E 3rd E Conclusion

#### Appendix



Production Function

$$Y_t = K_t^{1-\alpha} (A_t N_t)^{\alpha} \qquad 0 < \alpha < 1 \tag{1}$$

Capital Accumulation

$$K_{t+1} = (1 - \delta)K_t + Y_t - C_t$$
 (2)

- Technological change  $A_t = A_t^* \tilde{A}_t$ 
  - Deterministic Component:  $GA_t^* = A_{t+1}^*$
  - Shock process:  $a_t = \phi a_{t-1} + \varepsilon_t$ where  $a_t = \log \tilde{A}_t$ , and  $\varepsilon_t$  has mean 0 and is serially uncorrelated.  $\log(A_t) = a_t^* + \phi a_{t-1} + \varepsilon_t$  (3)



• Representative Household's Objective

$$U = E \sum_{i=0}^{\infty} \beta^{i} U(C_{t+i}, 1 - N_{t+i}),$$
$$U(C_{t}, 1 - N_{t}) = \log(C_{t}) + \theta \frac{(1 - N_{t})^{1 - \gamma_{n}}}{1 - \gamma_{n}}$$

#### Full RBC FOCs • Return

• Define  $R_t$  the interest factor received by HH. Firm Behavior implies:

$$R_{t} = (1 - \alpha) \left(\frac{A_{t}N_{t}}{K_{t}}\right)^{\alpha} + (1 - \delta)$$

$$W_{t} = \alpha A_{t}^{\alpha} \left(\frac{K}{N_{t}}\right)^{1 - \alpha}$$
(5)

• Household behavior

$$\frac{1}{C_t} = \beta E_t \left[ \frac{R_{t+1}}{C_{t+1}} \right]$$
(6)
$$\frac{W_t}{C_t} = \theta (1 - N_t)^{-\gamma_n}$$
(7)

- From (7),  $\gamma_n$  is inversely related to the elasticity of labor supply.
- The numbered equations constitute a system of seven equations in the seven variables  $Y_t, K_t, N_t, C_t, R_t, W_t$  and  $A_t$ .

### Outline of Model Jump to details

- 3-equation New Keynesian model with altered information:
  - Firms observe current shock realisations
  - Households observe shocks only after a one-period lag
- 2 exogenous shocks:
  - Technology shock a<sub>t</sub>
  - Cost-push shock v<sub>t</sub>
- CB communicates imperfectly using 2 independent linear signals:
- Households add idiosyncratic noise to these signals (RI):
  - Paying more attention  $\equiv$  less idiosyncratic noise to signals  $\Rightarrow \tau$  's  $\uparrow$
  - Extra information costs  $\mu$  per bit of information
- Optimally choose attention to maximise utility
  - The expected utility loss from being less than fully informed about shocks is proportional to the variance of  $(c_t^* c_t)$

## Welfare I

#### Result

- When the central bank communicates less information (i.e. increases the variance of public noise in their signal) about either shock, the variance of inflation rises. The variance of the output gap rises when the central bank communicates less information about technology shocks, but may increase or decrease in response to less information about cost-push shocks.
- Under standard calibrations, the variance of inflation is more important to the overall welfare effect and therefore central banks should provide as much information as possible.

#### Welfare II



Welfare Loss, percentage difference from signals with no public noise
## A model with trust and communication

1. Change the structure of costs for processing CB communication

• Some households simply choose to be uninformed

$$C_{m,h,t} = F_m \frac{\mu_h}{\mathcal{T}_{ht}}$$

- 2. Introduce an easier to read form of communication  $(F_{IR} > F_L)$ 
  - Communicates the mean of the shocks at lower cost to the household
  - Cost is that the household underestimates the uncertainty around those forecasts  $\Rightarrow$  households can be surprised
- 3. Introduce a reduced-form, dynamically-evolving concept of trust
  - Engagement with the central bank  $\Rightarrow$  trust  $\uparrow$
  - Household surprises  $\downarrow$  trust

### Idiosyncratic Cost



Figure: Distribution of Household Processing Costs  $\mu_h$ 

### Trust

- Households begin with  $\mathcal{T}_h = 0.5$
- Trust evolves according to:

$$\mathcal{T}_{ht} = egin{cases} 0 & ext{if } \hat{\mathcal{T}}_{ht} \leq 0 \ \hat{\mathcal{T}}_{ht} & ext{if } \hat{\mathcal{T}}_{ht} \in (0,1) \ 1 & ext{if } \hat{\mathcal{T}}_{ht} \geq 1 \end{cases}$$

Where:

$$\hat{\mathcal{T}}_{ht} = \mathcal{T}_{ht-1} + \delta_c \mathbb{1}_{\text{engage}} + \delta_s \mathbb{1}_{\text{surprise}} S(\mathsf{a}_{t-1}, \mathsf{v}_{t-1}, \epsilon^{\mathsf{a}}_{t-1}, \epsilon^{\mathsf{v}}_{t-1})$$

Surprise Function

# Equilibrium with only traditional communication

#### Result

- In our alternative environment, when there is only the Inflation Report from the central bank, the equilibrium will be a steady state in which all households with zero idiosyncratic processing costs ( $\mu_h = 0$ ), and some households with positive processing costs ( $\mu_h > 0$ ), will read it.
- Trust is constant in the steady state with all readers of the communication having full trust. Those who don't read anything remain with trust at its starting value because they are, like the households in the baseline model, never surprised.

# Equilibrium when we introduce simplified communication

#### Result

- Some readers switch from IR to layered content.
- Simplified Communication initially increases trust as more households engage with the central bank.
- When a large shock arrives households are surprised, lose trust, and stop engaging. 

   Critical Value of Trust
- Not reading the simplified communication is an absorbing state, as there is no way for trust to increase once a household has stopped reading the communication.
- If trust starts out lower before the introduction of simplified communication, the initial gain in trust is larger, but the decay in engagement occurs more quickly.

## Time path of $\lambda_t$ and average trust $\mathcal{T}_t$



### Time path of $Var\pi$ and $Var\tilde{y}$



### Luck



#### Starting Levels of Trust Alternative



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### Environment | • Jump back

- 3-equation New Keynesian model with altered information:
  - Firms observe current shock realisations
  - Households observe shocks only after a one-period lag
- Notation:
  - $\mathbb{E}_t^F x$  is the expectation of x held by a fully-informed agent in period t,
  - $\mathbb{E}_t^H x$  is the expectation of x held by households in period t.
- 2 exogenous shocks:
  - Technology shock  $a_t \sim N(0, \sigma_a^2)$
  - Cost-push shock  $v_t \sim N(0, \sigma_v^2)$

## Environment II

• The Euler equation, written in terms of  $c_t^*$ , is:

$$c_t^* = \mathbb{E}_t^F c_{t+1}^* - \frac{1}{\sigma} (i_t - \mathbb{E}_t^F \pi_{t+1})$$

• The typical New Keynesian Phillips Curve (to keep things tractable):

$$\pi_t = \mathbb{E}_t^F \pi_{t+1} + \kappa \tilde{y}_t + \mathbf{v}_t$$

• The central bank follows a Taylor Rule:

$$i_t = \phi_\pi \pi_t$$

• A market clearing condition relating the output gap to aggregate consumption *c*<sub>t</sub>:

$$ilde{y}_t = c_t - y_t^n = \mathbb{E}_t^H c_t^* - rac{1 + arphi}{\sigma + arphi} a_t$$

### Communication and signals

• CB communicates imperfectly using 2 independent linear signals:

$$\begin{split} s_t^a &= a_t + \epsilon_t^a, \quad \epsilon_t^a \sim \mathcal{N}(0, \sigma_{\epsilon a}^2) \\ s_t^v &= v_t + \epsilon_t^v, \quad \epsilon_t^v \sim \mathcal{N}(0, \sigma_{\epsilon v}^2) \end{split}$$

• Households add idiosyncratic noise to make signals (RI):

$$\begin{split} \tilde{s}_t^a &= a_t + \epsilon_t^a + \varepsilon_{it}^a, \quad \varepsilon_{it}^a \sim N(0, \sigma_{\epsilon ia}^2) \\ \tilde{s}_t^v &= v_t + \epsilon_t^v + \varepsilon_{it}^v, \quad \varepsilon_{it}^v \sim N(0, \sigma_{\epsilon iv}^2) \end{split}$$

• Given these signals, households expectations about each shocks are:

$$\mathbb{E}_{t}^{H}(a_{t}|\tilde{s}_{t}^{a}) = \tau_{a}(a_{t} + \epsilon_{t}^{a} + \varepsilon_{it}^{a}), \quad \tau_{a} = \frac{\sigma_{a}^{2}}{\sigma_{a}^{2} + \sigma_{\epsilon a}^{2} + \sigma_{\epsilon ia}^{2}}$$
$$\mathbb{E}_{t}^{H}(v_{t}|\tilde{s}_{t}^{v}) = \tau_{v}(v_{t} + \epsilon_{t}^{v} + \varepsilon_{it}^{v}), \quad \tau_{v} = \frac{\sigma_{v}^{2}}{\sigma_{v}^{2} + \sigma_{\epsilon v}^{2} + \sigma_{\epsilon iv}^{2}}$$

where  $\tau_a$  and  $\tau_v$  are attention parameters.

# Welfare and Information Choice

- Paying more attention  $\equiv$  less idiosyncratic noise to signals  $\Rightarrow$   $\tau$  's  $\uparrow$
- Extra information costs  $\mu$  per bit of information
- Total information processing in terms of  $\tau_a$  and  $\tau_v$  is:

$$\lambda = \frac{1}{2}\log_2\left(\frac{1}{1-\tau_{\mathsf{a}}}\right) + \frac{1}{2}\log_2\left(\frac{1}{1-\tau_{\mathsf{v}}}\right)$$

- The expected utility loss from being less than fully informed about shocks is proportional to the variance of  $(c_t^* c_t)$
- Households therefore choose  $\tau_a$  and  $\tau_v$  to minimise:

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t (U_t^* - U_t + \mu \lambda) = \psi \operatorname{Var}(c_t^* - c_t) + \mu \lambda$$

# Twin Deficits of Understanding and Trust Jump back

Attitudes to Inflation Survey:

- Understanding:
  - Which group of people set Britain's basic interest rate level?
  - Which of these groups do you think sets the interest rates?
  - Which of these do you think best describes the Monetary Policy Committee?
- Trust Proxy
  - Rate your satisfaction with the way the Bank of England is doing its job to set interest rates to control inflation.
- 2017 contained a specific question on credibility

### Surprise Function Jump back

$$S(a_t, v_t, \epsilon_t^a, \epsilon_t^v) = (a_t - \mathbb{E}_t^L a_t)^2 + (v_t - \mathbb{E}_t^L v_t)^2 + (\epsilon_t^a - \mathbb{E}_t^L \epsilon_t^a)^2 + (\epsilon_t^v - \mathbb{E}_t^L \epsilon_t^v)^2$$
(8)

$$S(a_t, v_t, \epsilon_t^a, \epsilon_t^v) = 2(a_t(1 - \tau_a) - \tau_a \epsilon_t^a)^2 + 2(v_t(1 - \tau_v) - \tau_v \epsilon_t^v)^2 \qquad (9)$$

The extent of surprise expected by the policymaker is therefore:

$$\mathbb{E}_{t-1}S(a_t, v_t, \epsilon_t^a, \epsilon_t^v) = 2(1 - \tau_a)\sigma_a^2 + 2(1 - \tau_v)\sigma_v^2$$
(10)

### Critical Level of Trust • Jump back

The critical trust level at which a household with information cost  $\mu_h$  stops processing the simplified communication is given by:

$$\mathcal{T}_{h}^{*} = \frac{F_{L}\mu_{h}(\sigma + \kappa\phi_{\pi}(\underline{\lambda} + (1 - \underline{\lambda})(1 - e^{-\psi\mu_{h}})))^{2}}{\phi_{\pi}^{2}\left(\left(\frac{\kappa(1 + \varphi)}{\sigma + \varphi}\right)^{2}\tau_{a}\sigma_{a}^{2} + \tau_{v}\sigma_{v}^{2}\right)}$$
(11)

#### Alternative Starting Levels of Trust Return



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