Learning from News

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Combining two approaches

- This paper builds on the expectation-driven business cycle hypothesis (Pigou, 1927)
- The idea has been recently modeled in **DSGE frameworks** by using alternative approaches: **news shocks** and **bounded rationality** (adaptive learning, **AL**)
- This paper combines these two approaches by relaxing the rational expectation (RE) assumption through AL in analying the effects of news shocks

Why is this important?

- *In reality, the effects of news on the economy are hard to predict*. So, agents have to learn their effects and this learning process affects their transmission mechanism (**inducing higher persistence**)
- News shocks affect the macroeconomy through the expectations channel. Hence, expectations formation may impact the transmission mechanism of news shocks
- RE models might be seriously misspecified in the expectation-formation side and learning may help to reconcile the model with the data (e.g. Slobodyan and Wouters, 2012; Cole and Milani, 2019)

Why do we consider a financial sector?

- Financial variables are crucial in assessing the role of **TFP** news shocks in **VAR frameworks** (Beaudry and Portier, 2006)
- Görtz and Tsoukalas (2017), Görtz, Tsoukalas and Zanetti (2022), and Herrera and Vázquez (2023) highlight the importance of considering a financial sector for identifying **TFP** news shocks in **DSGE** models
- Financial markets may often overreact to news in reality. This may be viewed as a major deviation from the RE assumption (Shiller, 2015; Barberis and Thaler, 2003)
- We focus on news affecting only the **nonstationary** component of **TFP**. Why?

Empirical strategy

- We estimate a canonical DSGE model augmented with financial frictions:
  - Smets and Wouters (2007)
  - Gertler and Karadi (2011)
  - Non-stationary TFP news shocks
- Two alternative expectation hypothesis:
  - Rational expectations: Model-consistent expectations
  - Adaptive learning based on the MSV representation: Constant gain learning $y_t^f = \beta_{t-1} X_{t-1} + u_t$

Estimation - Data

- We estimate the model through Bayesian techniques considering 9 observables for the period 1987q1-2018q4

Output
Consumption
Investment
Hours worked
Inflation
Wage

} *Smets and Wouters* (2007)

Nominal interest rate $\rightarrow$ *Wu and Xia* (2016)
Interest rate Spread $\rightarrow$ *Gilchrist – Zakrajsek* (2012) *spread*
Banks' networth $\rightarrow$ *Total equity capital GT* (2017)

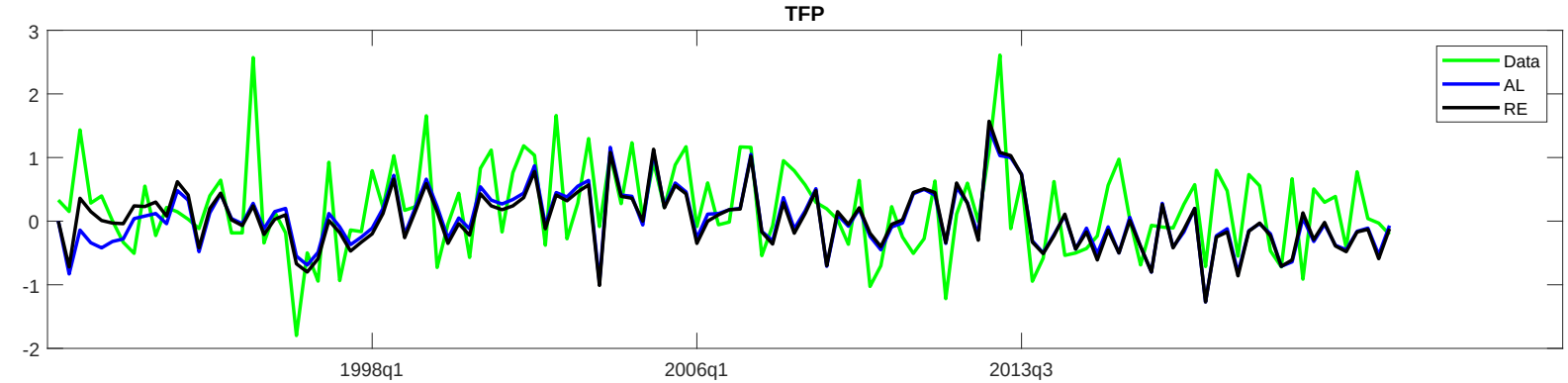
Model fit

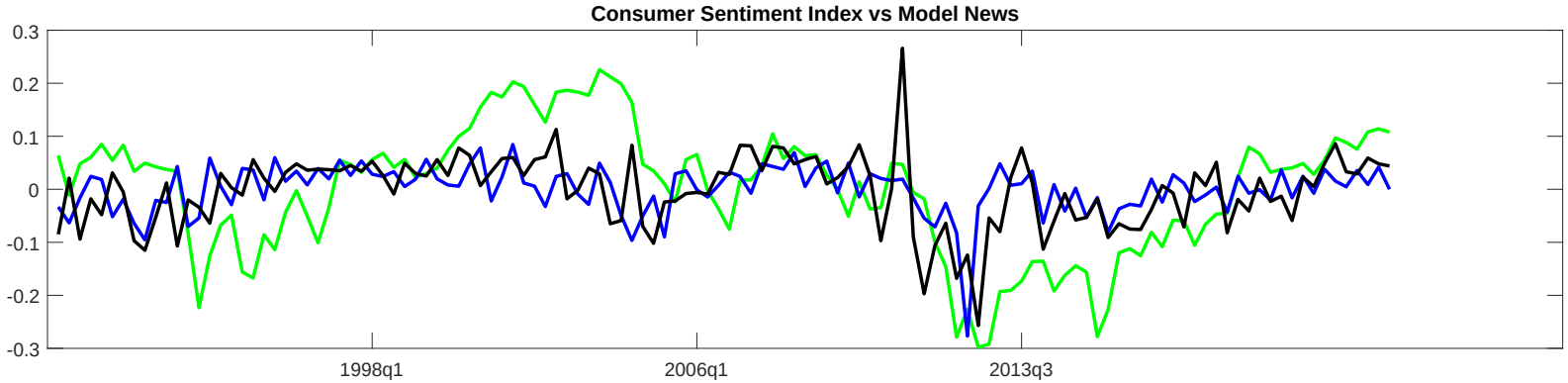
- Marginal Data Density (MDD)
- Root Mean Square Errors (RMSE)
- Second-moments matching
- Actual and model-based measures of TFP
- Estimated TFP news and the Consumer Sentiment Index

Model fit

	RE	AL
MDD	-856.37	-837.35

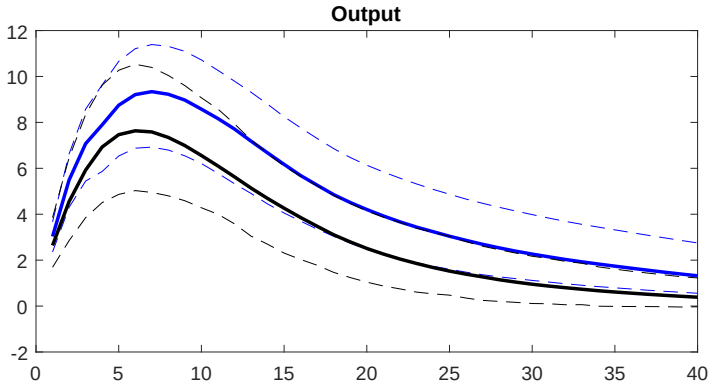
	RMSE to actual data			Standard deviation		
	RE	AL	SPF	Actual	RE	AL
Output growth	0.46	0.43		0.59	0.80	0.69
Consumption growth	0.36	0.27	0.49	0.55	0.72	0.64
Investment growth	0.85	0.84	1.49	1.86	3.20	2.94
Hours	0.34	0.28		4.44	2.53	2.29
Wage growth	0.90	0.88		0.90	0.98	0.93
Inflation	0.15	0.15	0.21	0.21	0.24	0.24
Spread	0.13	0.12		0.26	0.41	0.38
Interest rate	0.07	0.06		0.68	0.33	0.28
Net worth growth	1.96	2.52		1.57	7.73	6.57

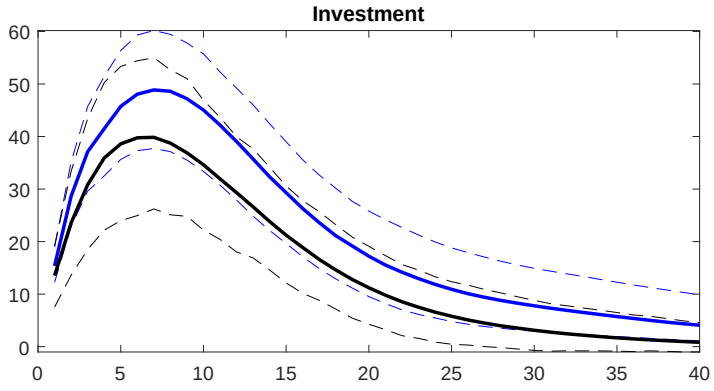

TFP
Data
AL
RE
3
2
1
0
-1
-2
1998q1
2006q1
2013q3

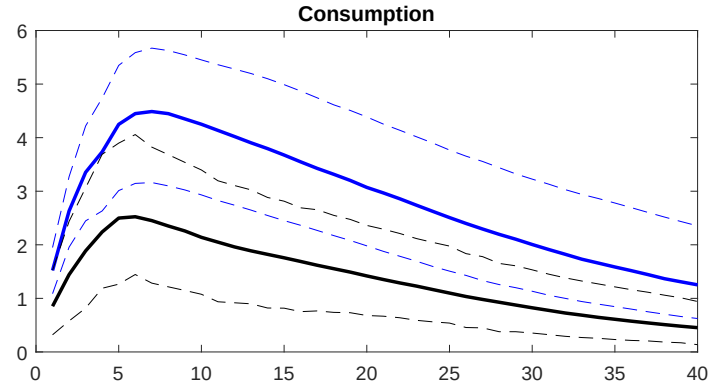

Consumer Sentiment Index vs Model News
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
1998q1
2006q1
2013q3

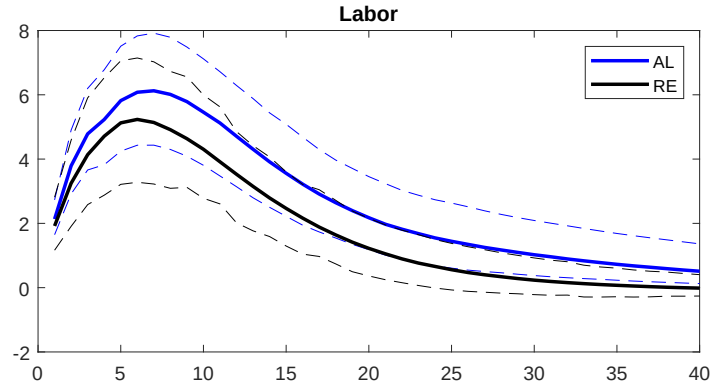
Transmission mechanism of news shocks

Results - Transmission mechanism (i)

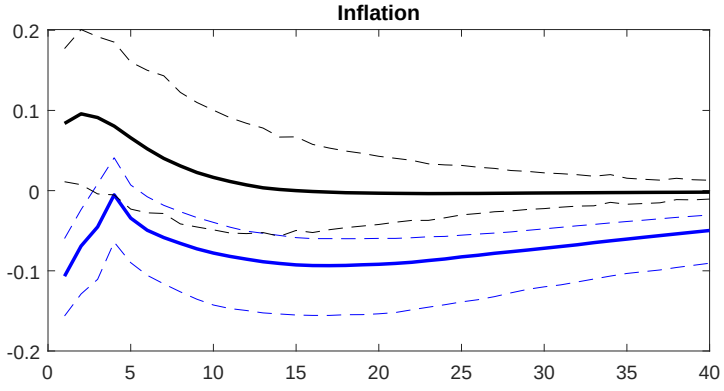


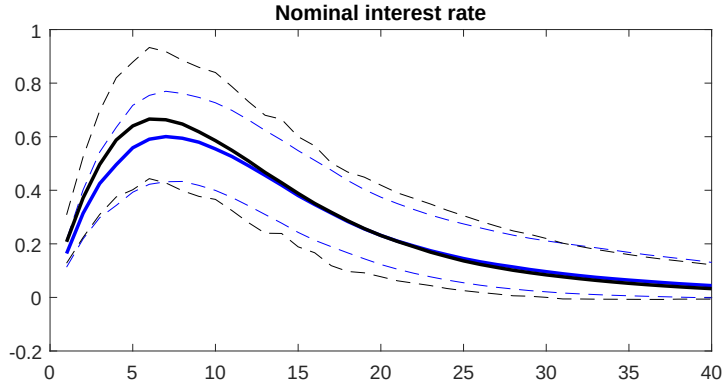


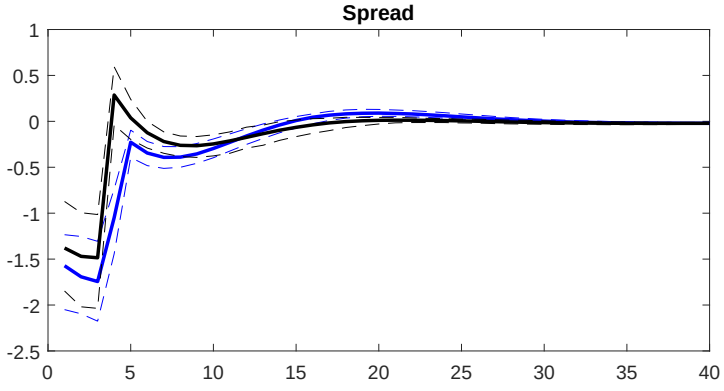


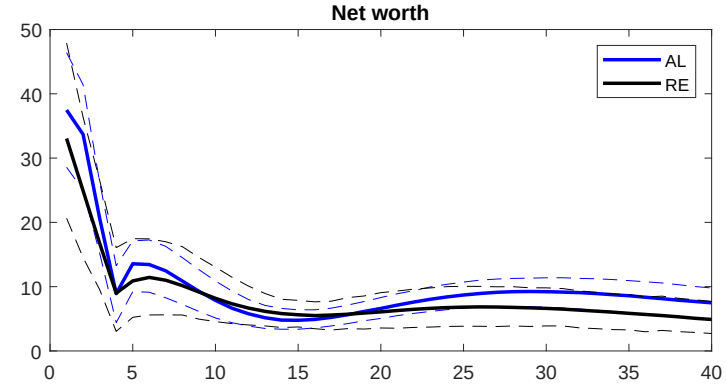


Results - Transmission mechanism (ii)









Transmission mechanism of news shocks

- Consumption: Stronger, more persistent response
- Credit spread: Smoother, more persistent response
- Deflationary response

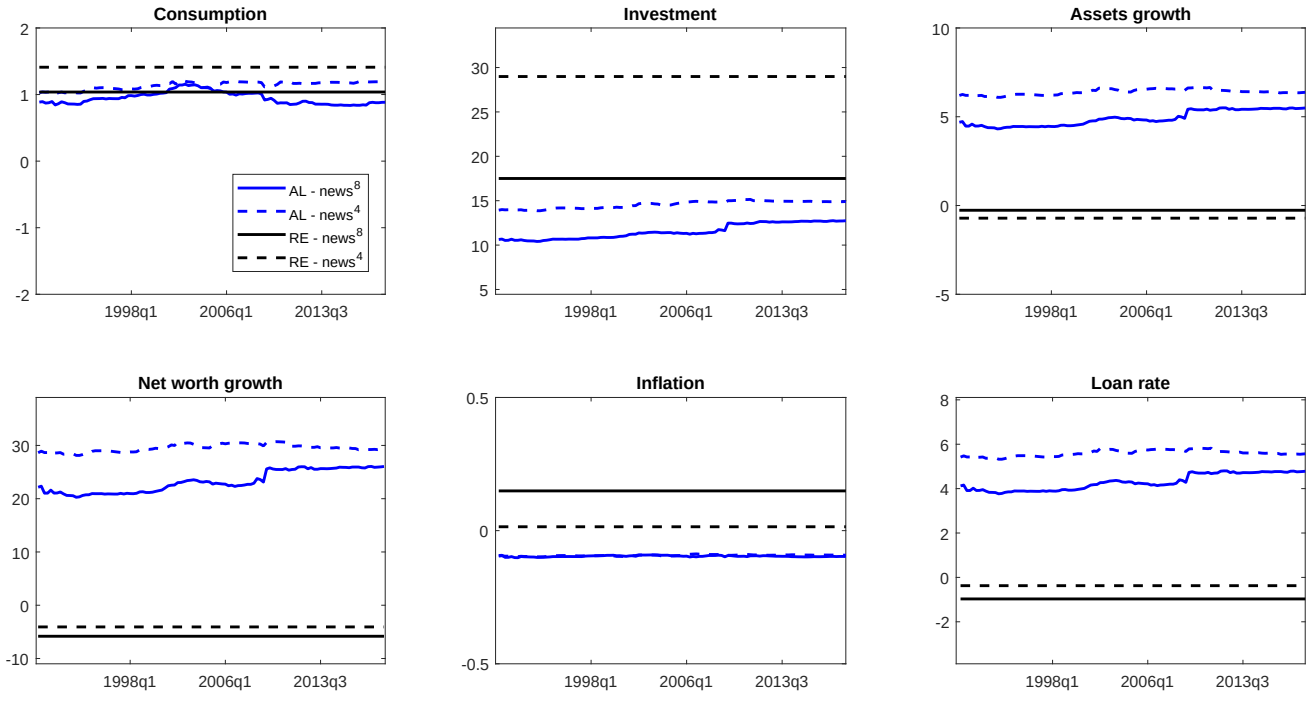
Results - Parameter estimates

Parameter	Prior distribution		Posterior Mean	
	Type	Mean/Std	RE	AL
Investment adjustment cost	Normal	4/1.5	1.87 [0.92,2.81]	1.71 [1.13, 2.42]
Habit formation	Normal	0.7/0.1	0.62 [0.50,0.75]	0.59 [0.52,0.66]
Calvo probability for wages	Beta	0.5/0.1	0.81 [0.76,0.89]	0.82 [0.78,0.82]
Calvo probability for prices	Beta	0.5/0.1	0.94 [0.93,0.95]	0.95 [0.94,0.95]
Indexation of past inflation in wages	Beta	0.5/0.15	0.39 [0.16,0.61]	0.26 [0.09,0.44]
Indexation of past inflation in inflation	Beta	0.5/0.15	0.19 [0.07,0.31]	0.18 [0.07,0.30]
Utilization adjustment cost	Gamma	0.5/0.15	0.86 [0.77,0.95]	0.89 [0.83,0.96]
Fixed cost in production	Normal	1.25/0.125	1.59 [1.44,1.74]	1.57 [1.42,1.71]
Capital share in production	Normal	0.3/0.05	0.16 [0.12,0.19]	0.14 [0.11,0.16]
Constant gain learning	Gamma	0.05/0.03	-	0.016 [0.01,0.03]
Interest rate smoother	Beta	0.75/0.1	0.77 [0.73,0.82]	0.78 [0.73,0.82]
Response to inflation	Normal	1.5/0.25	1.21 [1.00,1.44]	1.002 [1,1.01]
Response to output	Normal	0.125/0.05	0.09 [0.07,0.11]	0.08 [0.06,0.09]
Response to output growth	Normal	0.125/0.05	0.23 [0.12,0.30]	0.19 [0.12,0.27]
Persistence of TFP	Beta	0.5/0.2	0.92 [0.89, 0.96]	0.94 [0.92 , 0.97]
Std of unanticipated TFP shock	Gamma	0.1/2	0.06 [0.05, 0.08]	0.05 [0.04 , 0.06]
Std of TFP news shock - 4 quarter ahead	Gamma	0.1/2	0.05 [0.03, 0.06]	0.04 [0.03 , 0.05]
Std of TFP news shock - 8 quarter ahead	Gamma	0.1/2	0.08 [0.06 , 0.09]	0.06 [0.04 , 0.08]

Results - Beliefs

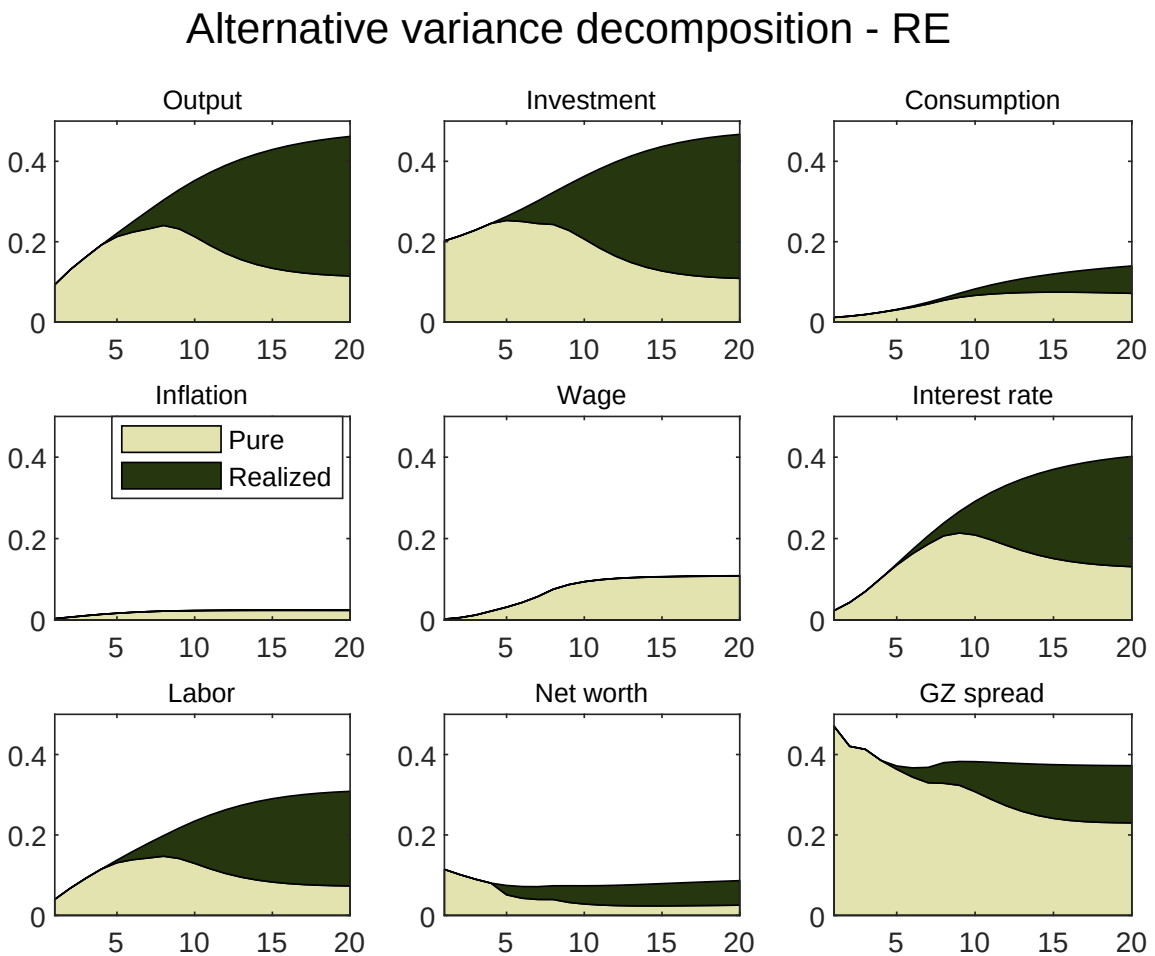
- Policy function coefficients associated with (4 and 8 periods anticipated) news shocks for different forward-looking variables

$$y_t^f = \beta_{t-1} X_{t-1} + u_t$$

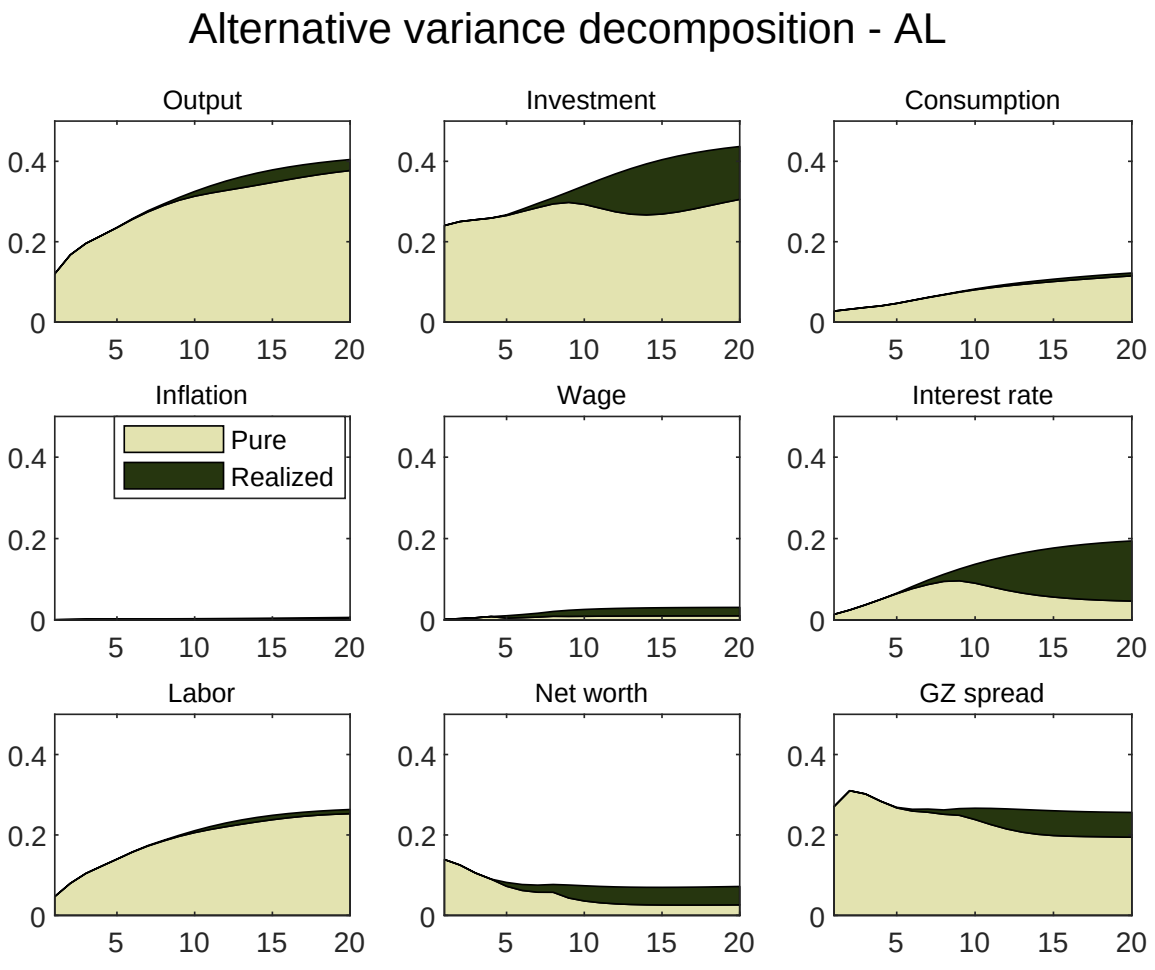


Variance Decomposition - Pure vs. Realized news

RE - Decomposition: Pure vs Realized News shocks (i)



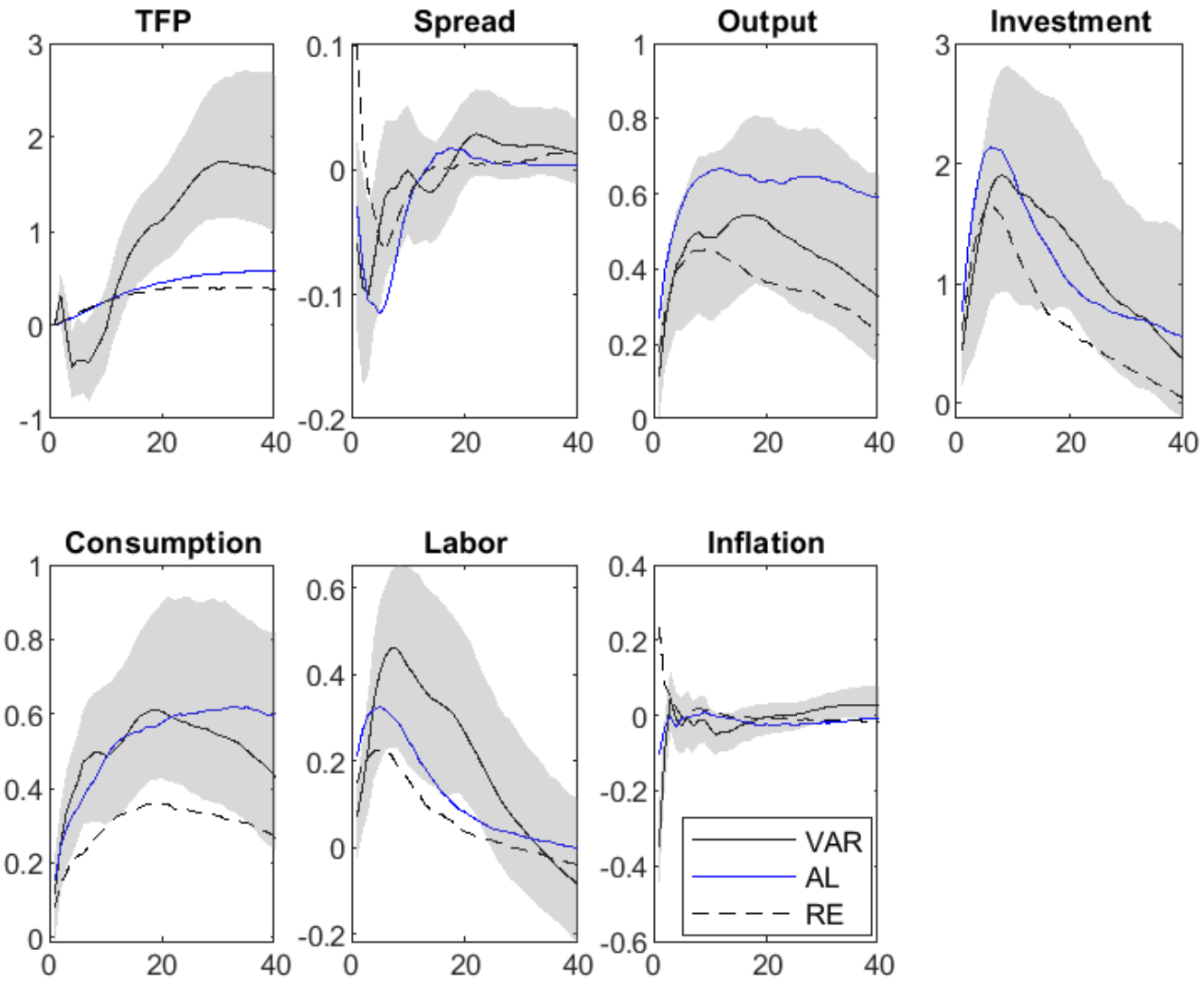
AL - Decomposition: Pure vs Realized News shocks (ii)



VAR results

- We use a 7-variable VAR approach to recover the IRFs of a TFP news shock from the data
- Observables: TFP, spread, output, investment, consumption, labor and inflation
- Francis et al. (2014) identification (Max Share): zero impact restriction and maximize the variance of TFP at a specific long but finite horizon
- We estimate the model using actual data and 500 simulated data from each model

VAR results


TFP
Spread
Output
Investment
Consumption
Labor
Inflation
VAR
AL
RE

Conclusions

- We find that relaxing the RE assumption via AL improves model performance
- Structural parameters are fairly robust under the two expectation hypotheses
- Differences in transmission mechanism are mainly due to the expectation channel:
  - Consumption responses are more persistent under AL
  - Credit spread dynamics are smoother under AL
  - The effects of news shocks on inflation are reversed.
- The importance of *pure* news increases under AL
- Responses of consumption, inflation and the spread to news shocks under AL are more in line with the VAR evidence

Thank you!