Automation of Text-Based Economic Indicator Construction:

A Pilot Exploration on Economic Policy Uncertainty Index

Hsiu-Hsuan Yeh[1], Yu-Lieh Huang[23], Ziho Park[1], Chung-Chi Chen[4]

[1]Department of Economics, National Taiwan University
[2]Department of Quantitative Finance, National Tsing Hua University
[3]Center for Research in Econometric Theory and Applications, National Taiwan University
[4]National Institute of Advanced Industrial Science and Technology"

Results

Type	Y	Explainability					Predictability				
		Original	Simple Economist	Definition Economist	Definition Governor	Definition Minister	Original	Simple Economist	Definition Economist	Definition Governor	Definition Minister
Employment	Non-Farm	*	**	**	**	*	***	***	***	***	**
Price	CPI								*	*	
Production	IPI	**					**		*	*	*
Stock	Avg. Stock	***		*	*						

Motivations

- Constructing text-based indicators is labor-intensive, expensive and time-consuming as it requires either manually selecting keywords or annotating data.
- To what extent can LLMs aid in verifying the potential of nascent research?
- Can LLMs help break language barriers and make it possible to build multilingual indicators?
- Do indicators constructed by LLMs have some degree of interpretability and predictability?

Economic Policy Uncertainty Index

- Baker et al.[1] reviewed 12,000 new articles to define three sets of keywords
- It's been adopted by over 29 countries, each employing unique keyword sets
- Keywords:
  - economics: "economic" and "economy"
  - uncertainty: "uncertain" and "uncertainty"
  - policy: "congress", "deficit", "Federal Reserve", "legislation", "regulation", and "White House"

$$\text{EPU} = \frac{N_{\text{EPU}}}{N_{\text{ALL}}}$$

Comparison with Human Experts

Model	Task Description	Precision	Recall	F1
GPT-3.5	Simple	10.43%	30.75%	11.77%
	Definition	11.81%	38.67%	13.72%
GPT-4	Simple	9.01%	28.81%	10.31%
	Definition	10.38%	29.55%	11.44%
Claude 3 Sonnet	Simple	9.71%	30.01%	11.09%
	Definition	12.14%	41.42%	14.25%

Country	Model	Editor	Economist	Minister	Governor
All	GPT-3.5	13.63%	13.38%	13.88%	**13.99%**
	GPT-4	11.23%	**11.99%**	11.53%	11.00%
	Claude 3 Sonnet	13.71%	13.97%	14.43%	**14.91%**
Taiwan	GPT-3.5	14.72%	15.19%	**15.54%**	14.74%
	GPT-4	14.16%	**14.55%**	14.13%	12.03%
	Claude 3 Sonnet	11.25%	12.39%	11.44%	**13.96%**

Experiment Settings

We employ time series model from prior research [2]

- Interpretability:

$$y_t = \beta \text{EPU}_t + \sum_{i=0}^{2} \alpha_i y_{t-i} + \alpha + \varepsilon_t$$

- Predictability:

$$y_{t+1} = \beta \text{EPU}_t + \sum_{i=0}^{2} \alpha_i y_{t-i} + \alpha + \varepsilon_{t+1}$$

Denoise

Building on Chen et al.[3] observation that even expertly selected keywords yield 40% irrelevant content (noise).

Approach		Micro-F1	Macro-F1
Zero-Shot	w/o CoT	0.415	0.572
	w/ CoT	0.401	0.580
Few-Shot	w/o CoT	0.540	0.585
	w/ CoT	**0.672**	**0.674**
Fine-Tuned	w/o CoT	0.372	0.588
	w/ CoT	0.417	0.579
Supervised Model [3]		0.907	0.905

Y	Explainability		Predictability	
	Supervised	GPT-3.5	Supervised	GPT-3.5
Non-Farm	***	•	***	***
CPI	*		*	
IPI	*	•		
Avg. Stock	*	**	•	

References

[1] S. R. Baker, N. Bloom, and S. J. Davis, "Measuring Economic Policy Uncertainty," *The Quarterly Journal of Economics*, vol. 131, no. 4, pp. 1593–1636, Nov. 2016, doi: 10.1093/qje/qjw024.

[2] S. Sadique, F. In, M. Veeraraghavan, and P. Wachtel, "Soft information and economic activity: Evidence from the Beige Book," *Journal of Macroeconomics*, vol. 37, pp. 81–92, 2013.

[3] C.-C. Chen, H.-H. Huang, Y.-L. Huang, and H.-H. Chen, "Constructing Noise Free Economic Policy Uncertainty Index," in *Proceedings of the 30th ACM International Conference on Information & Knowledge Management*, 2021, pp. 2915–2919.