What drives firms' wage expectations? A text-based approach

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Fears of wage-price spiral also in Switzerland…justified?

WAGE GROWTH AND INFLATION IN SWITZERLAND

Lines indicate changes for current and past years. Crosses indicate one year ahead expectations.

Wage growth of interviewed firms — CPI
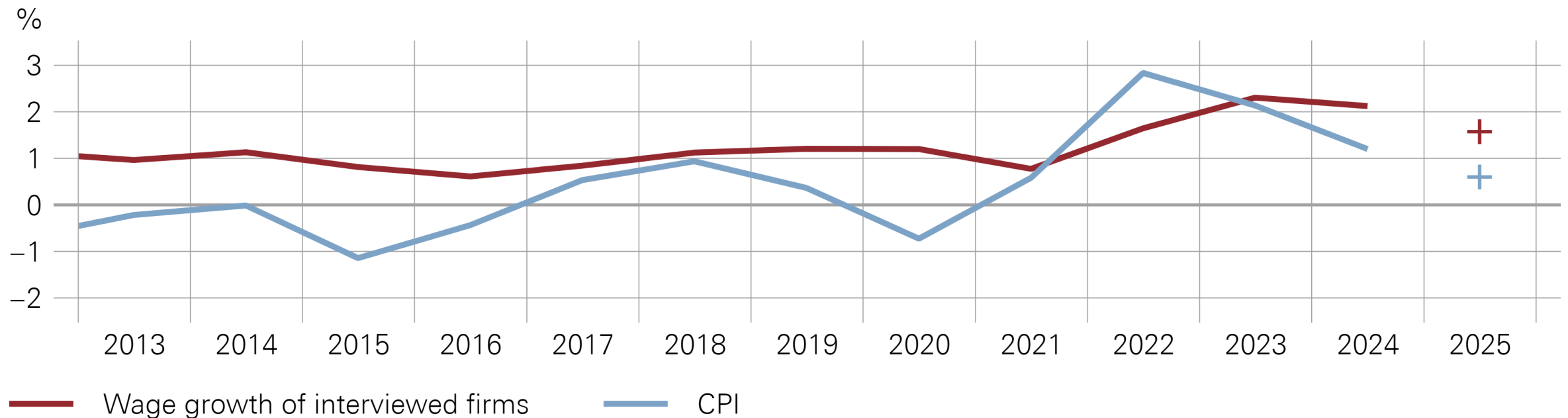
Inflation rate for 2024 calculated based on observed values until September and on the SNB's conditional forecast for the remaining months.
The inflation forecast for 2025 is based on the SNB's conditional forecast.
Sources: SFSO, SNB

What does our SNB Business Survey tell us?

− Roughly 240 interviews with CEO/CFO per quarter (since 2010)
− Questions business development, but also inflation and wage expectations
− Quantitative responses are supplemented by explanatory comments

Two different angles to look at the data

Regression analysis: statistical, but not necessarily causal relationships of wage expectations with

- Observed inflation (aggregate data)
- Expected inflation
- Business conditions, e.g. margins, recruitment situation, etc.

Text data: What explanations are put forward by the companies?

- Classification of comments into categories with Large Language Model (LLM)
- Compare frequency of categories

Agenda – mostly methodological challenges, some selective results

1. Very selective regression result
2. Text analysis
   - Procedure
   - Some words on the model choice and challenges when setting up model
   - Comparison with manual classification and keyword search
   - Results of classification
3. Summary of insights

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1. **Very selective and preliminary regression result**
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Wage expectations related to lagged inflation, more so than to inflation expectations (selective and preliminary results)

Expected wage increases next year	
Observed aggregate inflation	**0.28**
Expected inflation in 0.5-1 years	0.02
Shortage of staff	**0.12**
Profit margins	**0.10**
Expected change in purchase prices	0.06
Utilisation of technical capacities	0.05
Procurement situation	0.08
Sample period	Q1 2020 – Q4 2023
R^2	0.38
Adjusted R^2	0.35
Number of observations	1057

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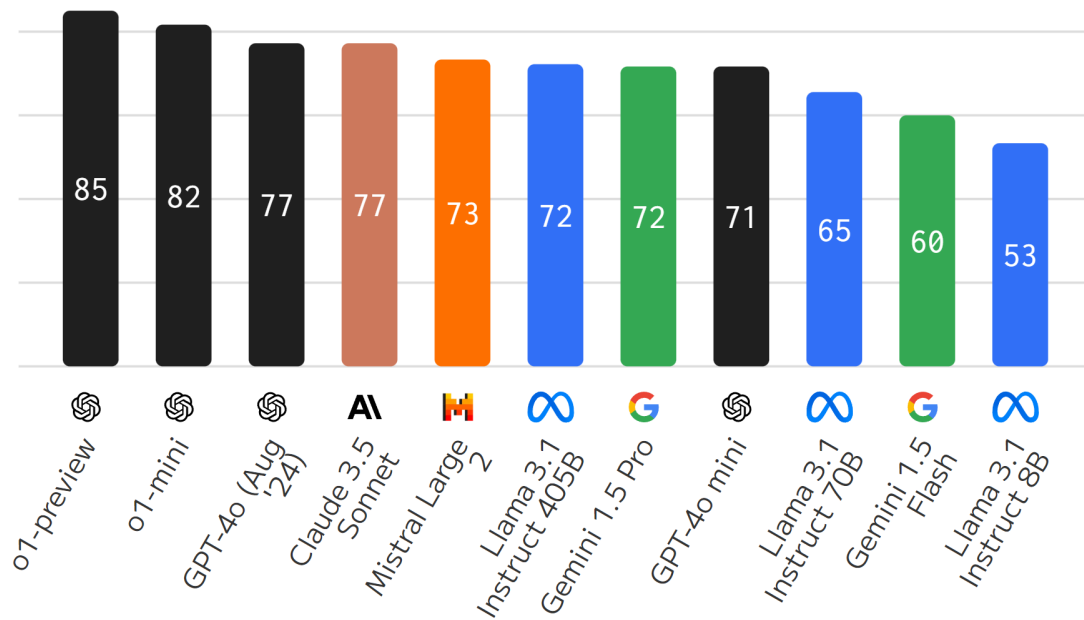3. Summary of insights

Procedure

1. We pre-define categories based on manual reading a subset of comments:
- inflation
- collective labour agreements
- labour market
- company results
- individual
- various

2. For each category, LLM classifies:
- «Yes», it is mentioned that category plays a role
- «No», it is mentioned that category plays no role
- «0», it is not mentioned

3. We compare frequencies of these categories based on LLM (and compare results to human and simple keyword)

LLM has to run locally (confidential data) and with a certain speed (depending on computing power)
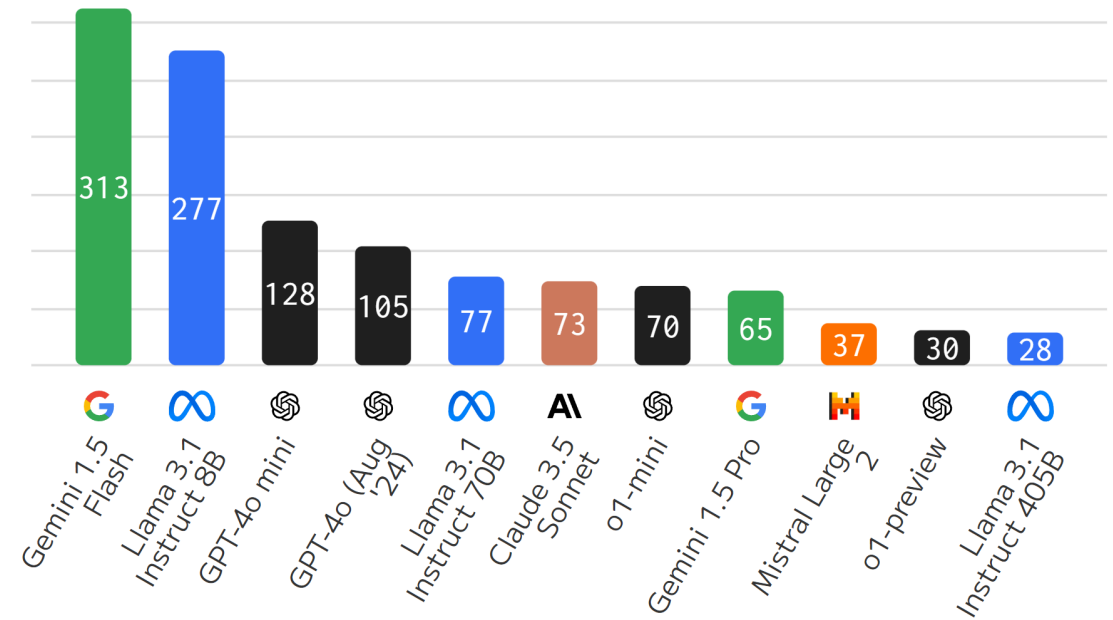
QUALITY

Artificial Analysis Quality Index; Higher is better

o1-preview	o1-mini	GPT-4o (Aug '24)	Claude 3.5 Sonnet	Mistral Large 2	Llama 3.1 Instruct 405B	Gemini 1.5 Pro	GPT-4o mini	Llama 3.1 Instruct 70B	Gemini 1.5 Flash	Llama 3.1 Instruct 8B
85	82	77	77	73	72	72	71	65	60	53

SPEED

Output Tokens per Second; Higher is better

Gemini 1.5 Flash	Llama 3.1 Instruct 8B	GPT-4o mini	GPT-4o (Aug '24)	Llama 3.1 Instruct 70B	Claude 3.5 Sonnet	o1-mini	Gemini 1.5 Pro	Mistral Large 2	o1-preview	Llama 3.1 Instruct 405B
313	277	128	105	77	73	70	65	37	30	28

artificialanalysis.ai

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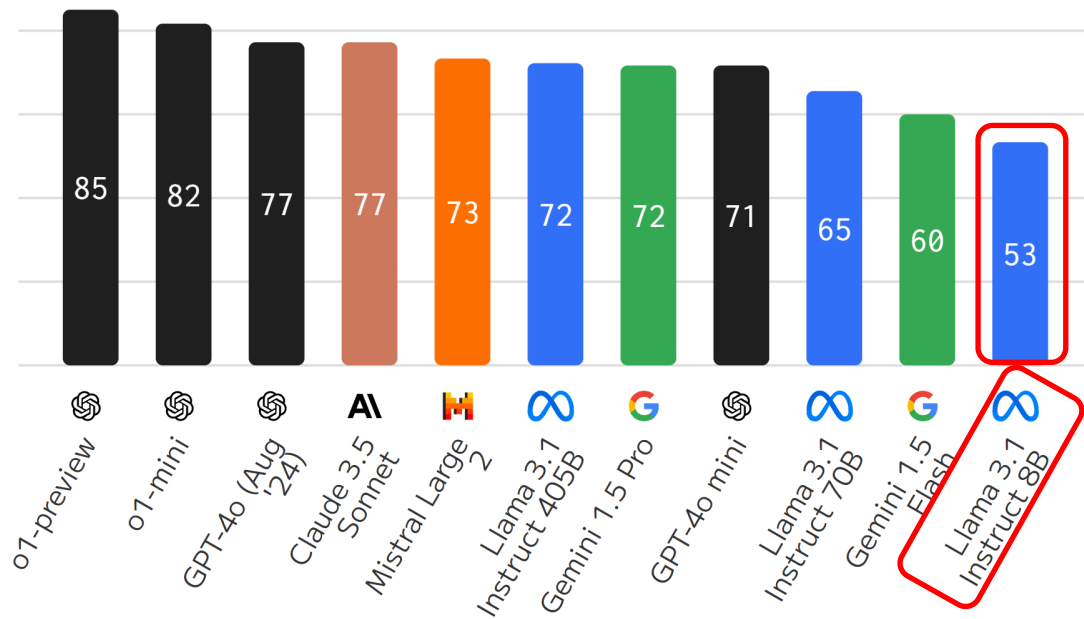
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Does the LLM reproduce human classification?

		Human	LLM	
1)	**Dependent on inflation** development. Wage costs: 10%	+	+	
2)	The company will be looking to offer non-wage benefits to its employees. Wage demands are low. It's worth noting that sales staff have a fairly significant variable component.	0	0	
3)	Between 2.5% and 3% to compensate for **the increase in prices** and to award increases based on merit.	+	+	
4)	Salaries are too high in finance, **inflation allows to bring them back to a more realistic zone**.	-	+	
5)	At this point in time, it's still difficult to make a prediction. Around 2%. **She does not believe that a full inflation compensation will be possible**.	+	-	

+ : inflation is mentioned as being an important factor
- : inflation is mentioned as not being important factor
1 : inflation is mentioned
0 : inflation is not mentioned

Do we need an LLM, or would simple keyword search suffice?

	Human	LLM	Keywords
1) **Dependent on inflation** development.	+	+	1
2) The company will be looking to offer non-wage benefits to its employees. Wage demands are low. It's worth noting that sales staff have a fairly significant variable component.	0	0	0
3) Between 2.5% and 3% to compensate for **the increase in prices** and to award increases based on merit.	+	+	0
4) Salaries are too high, **inflation allows to bring them back to a more realistic zone**.	-	+	1
5) At this point in time, it's still difficult to make a prediction. Around 2%. I do **not believe that a full inflation compensation will be possible**.	+	-	1

+ : inflation is mentioned as being an important factor
- : inflation is mentioned as not being important factor
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Inflation is a key driver of wage expectations - wage dynamics less important for inflation expectations.

CLASSIFICATION RESULTS WITH LLM: WAGES VS. INFLATION

Count

Legend:
- ■ "Inflation" in wage expectations remarks
- ■ "Wage" in inflation expectations remarks
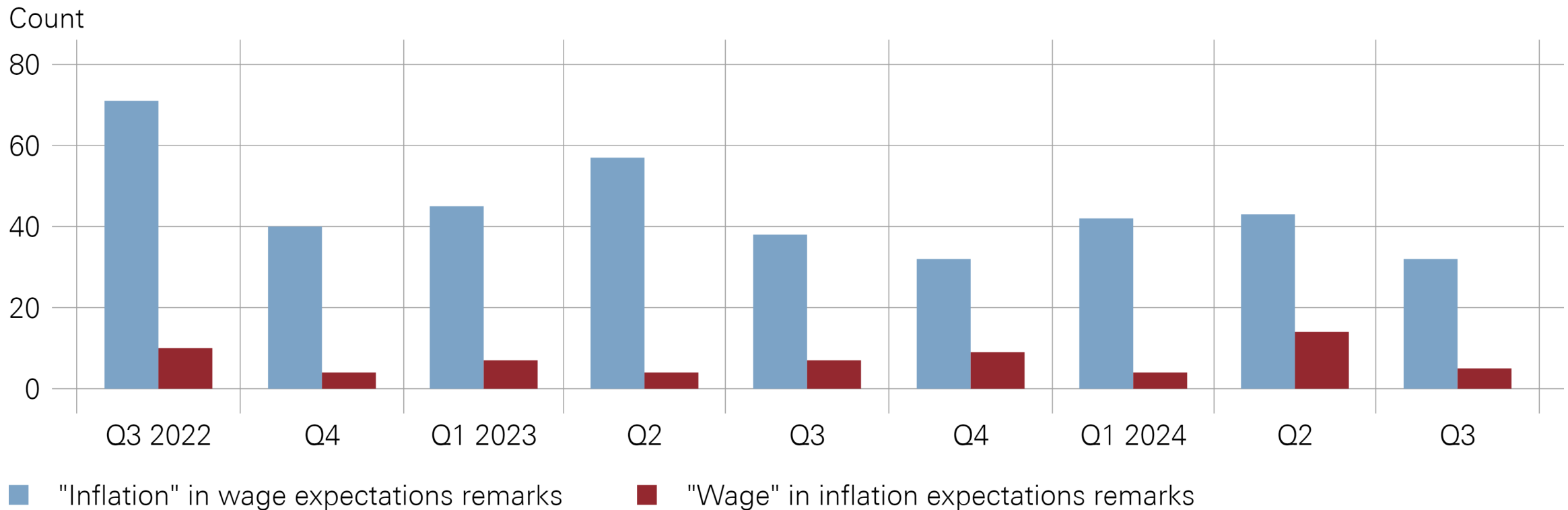
Source: SNB

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29/10/2024   Wage expectations | Gregor Bäurle, Sandra Hanslin Grossmann, Jérôme Hirschi | Preliminary results. Do not distribute. | © Swiss National Bank   SNB BNS ✛

Economic insights

- Inflation remains a central factor in shaping wage expectations
- Conversely, wage dynamics seem to exert limited influence on inflation expectations

- **Next Steps:**
  - Sharpen relationship between regression and LLM results
  - Investigate time variations in greater depth for a clearer understanding

Methodological insights

- Integrating quantitative and textual analysis opens new avenues for research
- LLMs will be instrumental in pushing the boundaries of this exploration
- Confidential data is a challenge, as the local infrastructure becomes important

- **Next Steps:**
  - Improve the precision of LLM outputs through better prompt engineering
  - Apply automated detection of categories to account for changing economic environments.

Thank you for your attention!

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