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Note Title

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The toilet roll trading agent can implement
(counsel) (updating)
its transaction by calculating the average
price of toilet rolls in this way;

$$(*) \text{ ave} := \text{ave} + \frac{\text{new} - \text{old}}{20}, \text{ where}$$

new is the current price of toilet rolls and
old is the price of toilet rolls 20 time units ago.

Say that p_{-i} is the price i units ago.

$$s_0, \frac{\overbrace{p_{-20} + p_{-19} + \dots + p_{-1}}^{\text{ave}}}{20} + \frac{p_0 - p_{-20}}{20} =$$

$$= \frac{p_{-19} + p_{-18} + \dots + p_{-1} + p_0}{20}$$

current average

⊛ requires maintaining 20 prices in the belief state, i.e., the agent needs to remember a lot of prices.

So, if the agent to save memory (size of belief space), it could approximate \oplus with

$$\textcircled{**} \text{ ave} := \text{ave} + \frac{\text{new} - \text{ave}}{20},$$

which requires saving in belief space only one number (ave).