

Key Features of Inflation Expectations in Ukraine

Savolchuk Kateryna

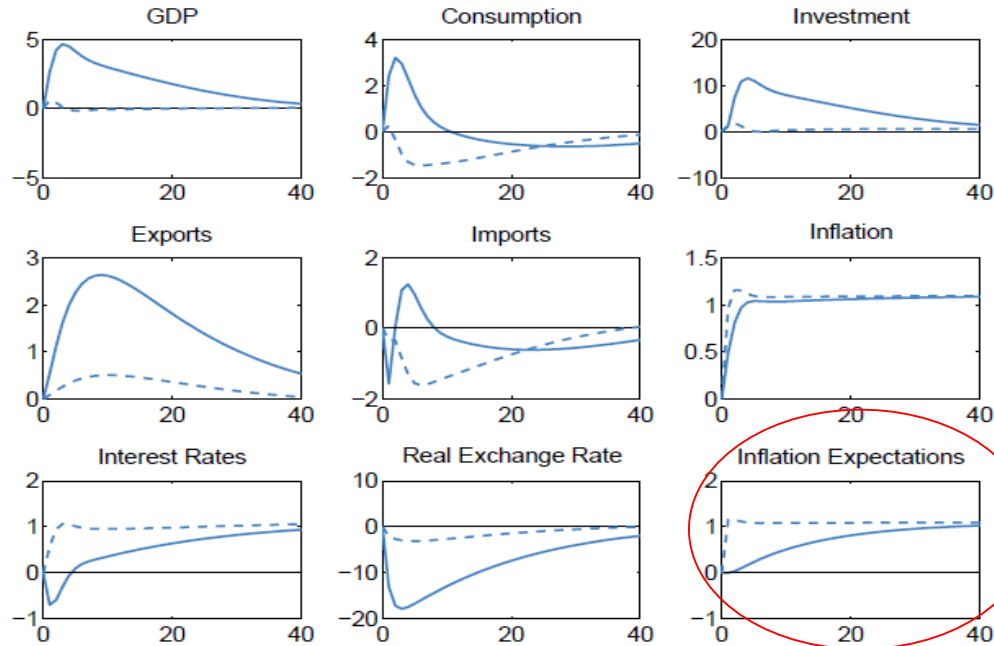
NBU, Kyiv, 2020

New Zealand's Experience with Changing its Inflation Target and the Impact on Inflation Expectations

Based on Reserve Bank of New Zealand's discussion paper

Effect of an inflation target increase in selected variables in DSGE model

- **The adaptive expectations scenario:** any change of the inflation target changes inflation expectations slowly.
- **The rational expectations scenario:** inflation expectations adjust immediately to changes in the inflation target.
- There are no long run changes to any real variable.



- **Solid:** inflation expectations are adaptive.
- **Dashed:** inflation expectations are rational.

Inflation expectation: $\pi_{t,t+1}^e = \rho_1 \pi_{t-1,t}^e + (1 - \rho_1)[\rho_2 E_t \pi_{t+1} + (1 - \rho_2) \pi_{t-1}]$

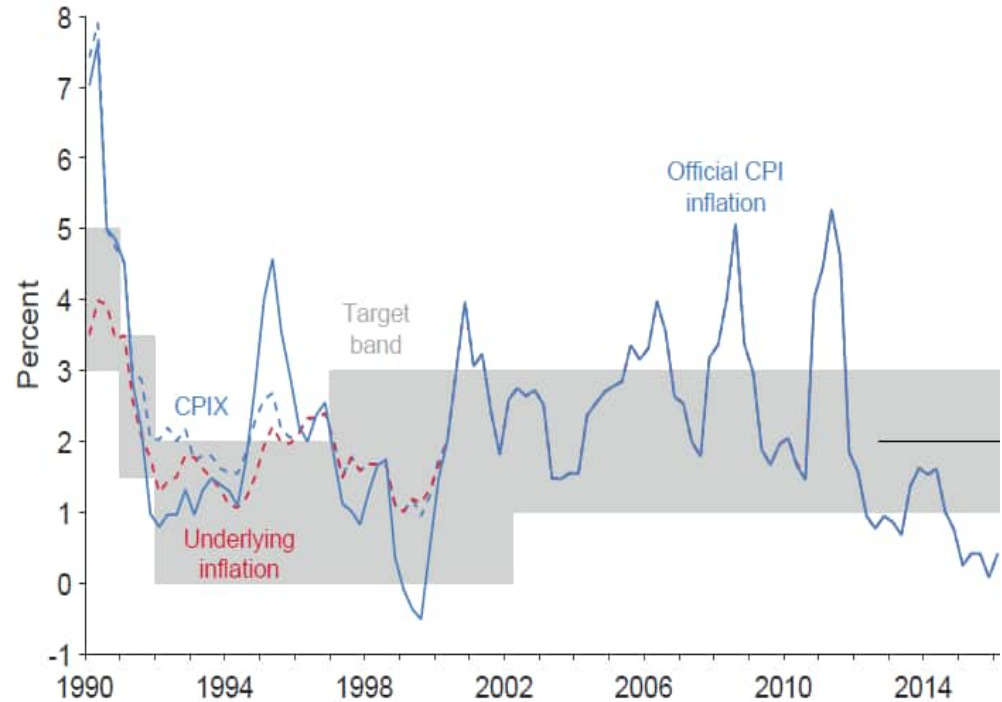
$\rho_1 = 0.92, \rho_2 = 0$ – adaptive expectations;

$\rho_1 = 0, \rho_2 = 1$ – rational expectations.

New Zealand's Experience with Changing its Inflation Target

Here we focus on three changes to the PTA (Policy Target Agreement):

- an increase of the target ceiling in 1996,
- an increase of the target floor in 2002,
- the introduction of an explicit reference to a midpoint in 2012.



New Zealand's inflation target and
CPI inflation since the start of the IT regime.

Estimation of inflation expectation curves

A forward representation of the Nelson-Siegel model was used:

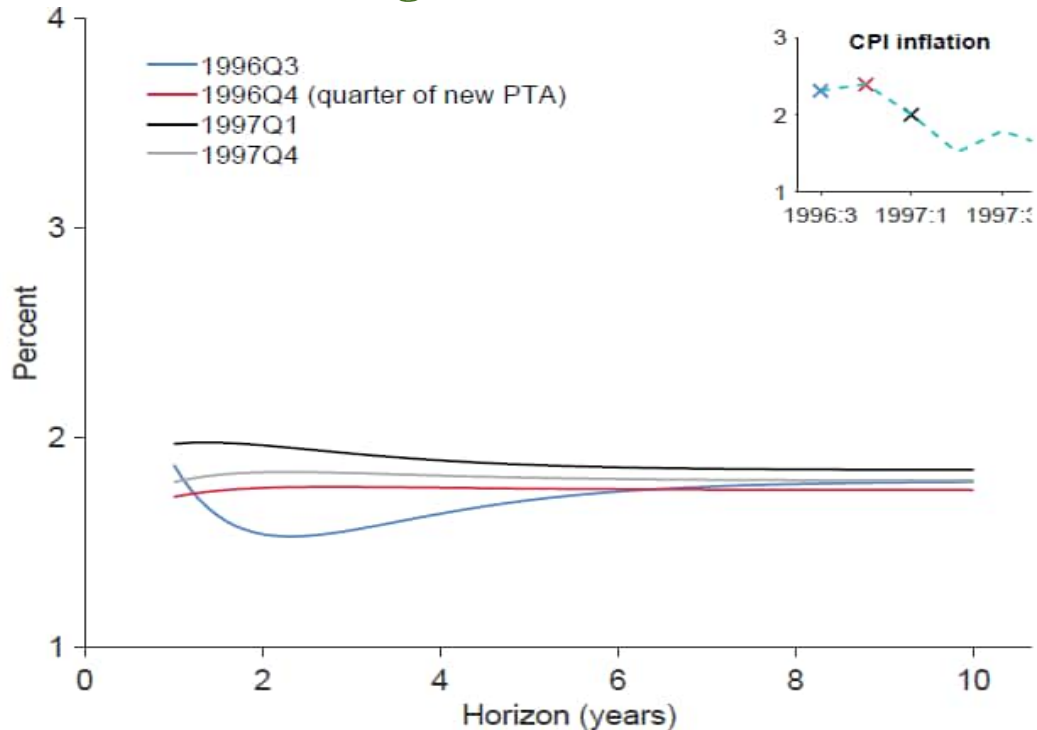
$$\pi^e(\tau)_t = \mathbf{H}\beta_t + e_t$$

- τ is the horizon of the expectation (years);
- β_t is the vector of expectation components (**Level, Slope and Curvature**) at time t:
 - **The Level:** a long-term inflation expectations;
 - **The Slope and Curvature:** the survey respondents' expectations of how fast the central bank plans to return inflation to target.
- e_t is the error term;
- \mathbf{H} is the sensitivity matrix.

Business's and economist's expectations (from 1 to 10 years ahead) were used.

Changing the Inflation Target in 1996

- The inflation target band was widened to 0 to 3 percent (from 0 to 2 percent).
- Inflation expectations increased **immediately** across short-to-medium horizons.
- Expectations shifted upwards, but not in a statistically significant way.
- The change at the 10-year horizon is small.

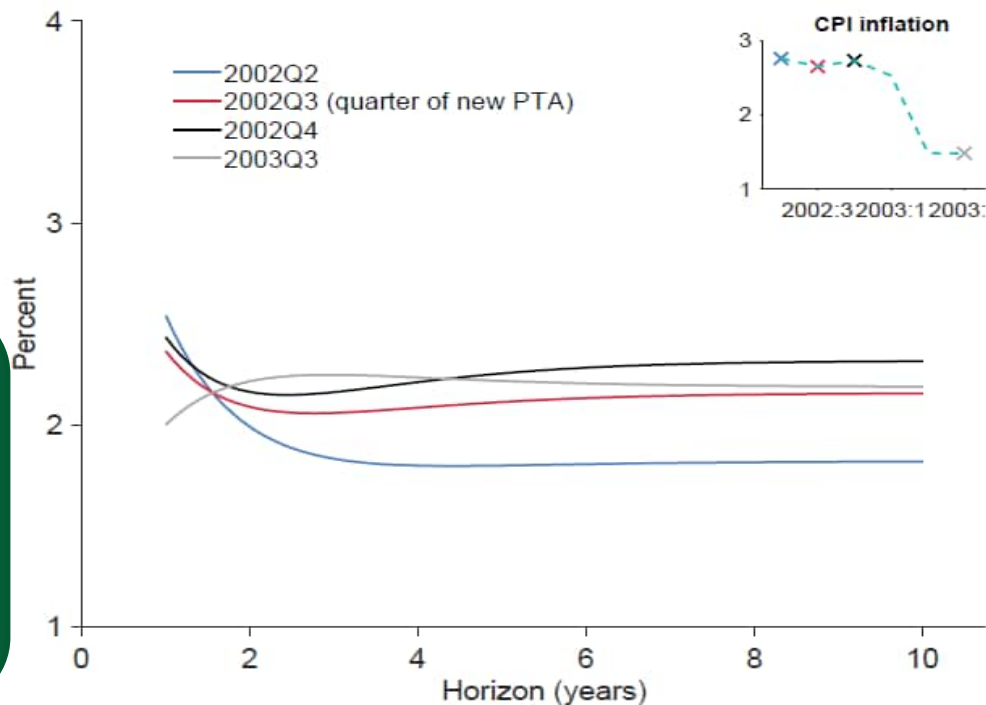


Estimated inflation expectations curve:
— one quarter before change;
— the quarter of the change;
— one quarter following change;
— one year after change.

Changing the Inflation Target in 2002

The target floor was raised from 0 to 1 percent, while the target ceiling remained at 3 percent.

- Inflation expectations increased immediately, particularly at long-horizons.
- Long-term inflation expectation = 1.8 % before the new PTA and jumps 0.34 pp. in the quarter the PTA was changed (statistically significant change).
- Long-term expectations move upwards towards the existing short term expectations.

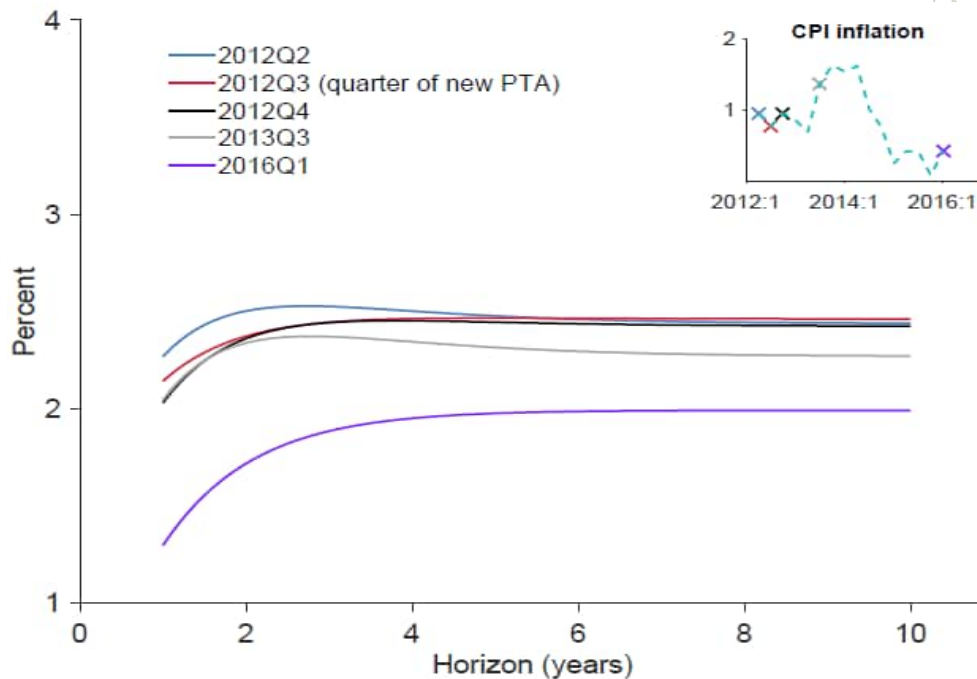


Estimated inflation expectations curve:

- one quarter before change;
- the quarter of the change;
- one quarter following;
- one year after.

Changing the Inflation Target in 2012

- **Explicit reference to the 2 percent midpoint .**
- The expectations curve fell slightly in the quarter of change and over time expectations have shifted lower in long-term.
- Movements at the short end reflects lower CPI inflation.
- The shift in the long end : participants have incorporated the Bank's focus on the midpoint into their expectations.



Estimated inflation expectations curve:

- one quarter before change;
- the quarter of the change;
- one quarter following;
- one year after.

Testing the Impact of PTA Changes on Inflation Expectations

- Changes to the inflation target DO affect inflation expectations in long run.
- BUT, changes in expectations may occur because of changes in past inflation.
- INDEED, inflation expectations do adjust adaptively to past inflation.

HOWEVER:

The 2002 PTA change:

- positive and statistically significant;
- inflation expectations immediately increased 0.19 pp. (when the target midpoint was increased 0.5 pp.);

The 2012 PTA change:

- negative and statistically significant;
- 0.04 pp. fall in inflation expectations.

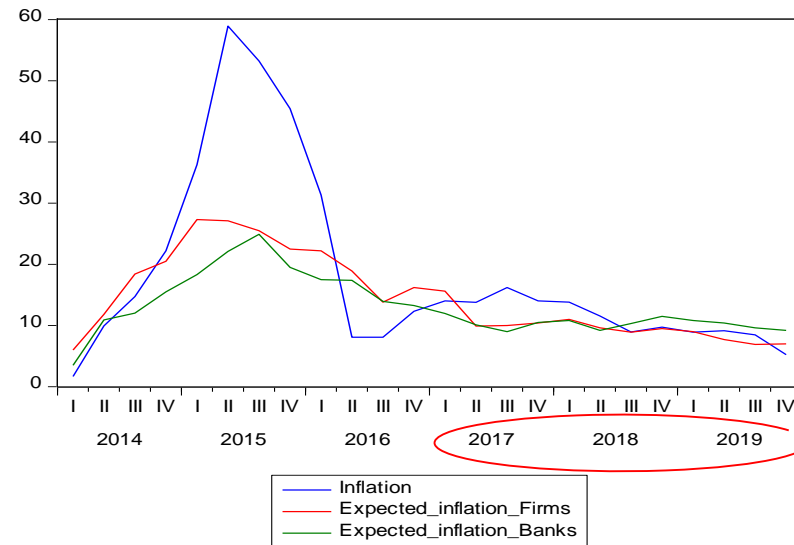
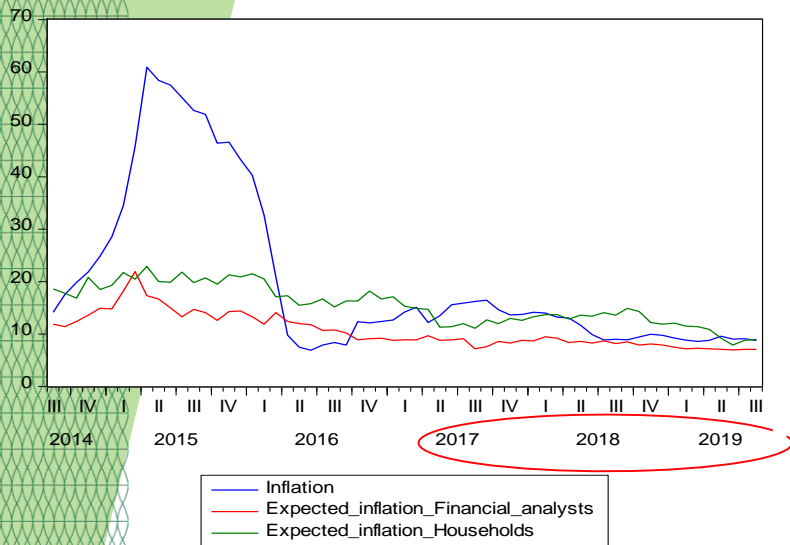
Conclusion

- Any change in target results in a corresponding change to inflation and inflation expectations in the long run.
- There are no long run changes to any real variable.
- The PUBLICLY ANNOUNCED changes to the inflation target are reflected in inflation expectations.

Key features of inflation expectations in Ukraine

Forecast ability

- Sample: 2017-2019
- Data of expected inflation at time t is 12 months ahead inflation expectation.



	Banks	Households	Firms	Financial analysts
MAE	2,76	2,43	2,09	3,50
BIAS	-0,86	0,94	-1,52	-3,07

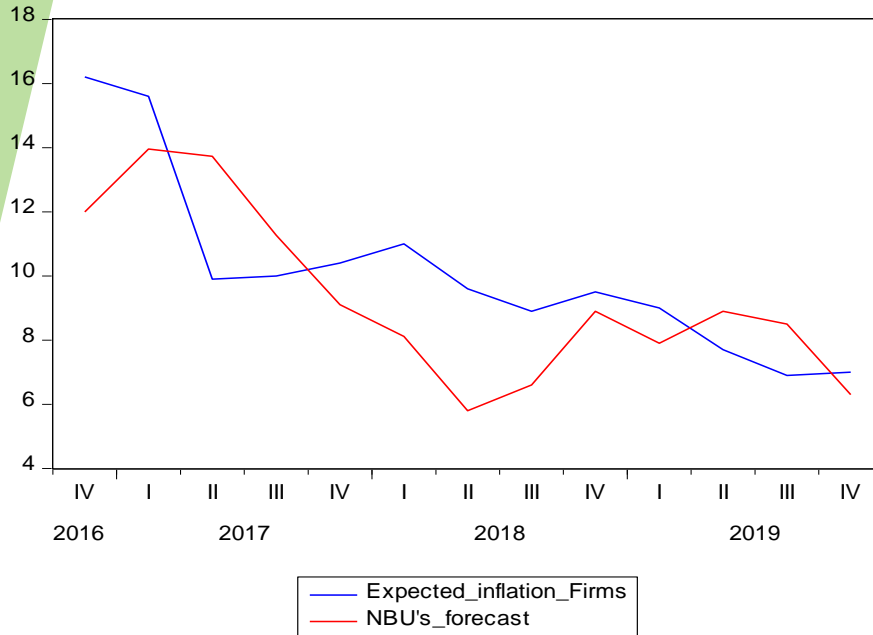
Firms have the best forecast ability in observed sample.

Following the NBU's forecasts

Firms

- Sample: 2016q4 -2019q4
- Correlation coefficient = 0.653

A positive association between NBU's forecast and Firm's expected inflation, as the value of one increases, so does the value of the other.



Covariance Analysis: Ordinary

Date: 02/05/20 Time: 11:13

Sample: 2016Q4 2019Q4

Included observations: 13

Correlation Probability	FORECAST...	EI_F
FORECAST_NBU	1.000000	-----
EI_F	0.652595 0.0156	1.000000 -----

Summary table

Following the NBU's forecasts

	Banks	Households	Firms	Financial analysts
Following the NBU's forecasts	0.467	0.430	0.653**	0.506*

Note: * - coefficient is significant at the 0,1 level

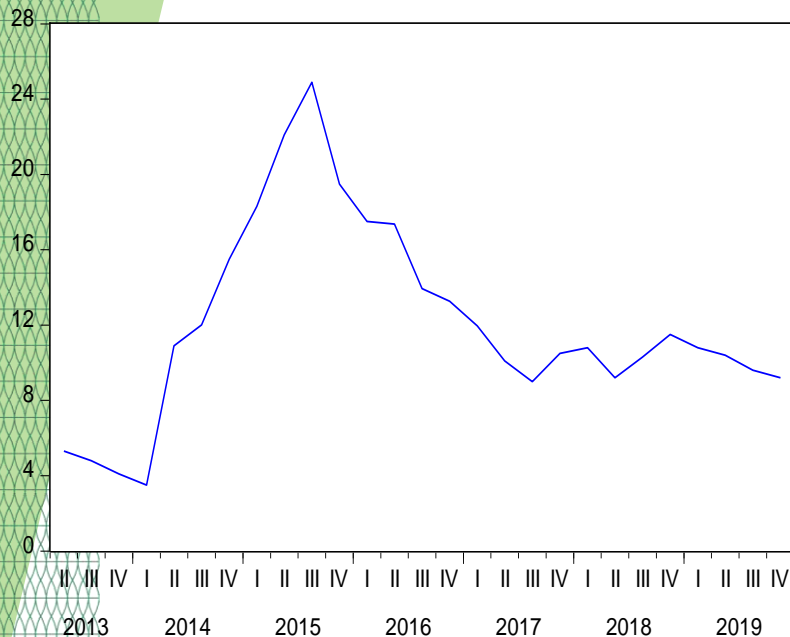
** - coefficient is significant at the 0,05 level

Persistency of expected inflation

Banks

- Sample: 2014q3 – 2019q4
- Bank's expected inflation persistence is strong (coefficient is statistically significant).

Expected_inflation_Banks



Dependent Variable: EI_B

Method: Least Squares

Date: 02/04/20 Time: 10:53

Sample: 2014Q3 2019Q4

Included observations: 22

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.410454	1.549886	0.910037	0.3736
EI_B(-1)	0.890683	0.108410	8.215847	0.0000

R-squared	0.771429	Mean dependent var	13.53199
Adjusted R-squared	0.760000	S.D. dependent var	4.545386
S.E. of regression	2.226774	Akaike info criterion	4.525492
Sum squared resid	99.17041	Schwarz criterion	4.624678
Log likelihood	-47.78042	Hannan-Quinn criter.	4.548858
F-statistic	67.50015	Durbin-Watson stat	1.210782
Prob(F-statistic)	0.000000		

Summary table

Persistence of expected inflation

	Banks	Households	Firms	Financial analysts
Persistence	0,891***	0,885*** (monthly 0,96)	0,929***	0,827*** (monthly 0,938)

Note: *** -coefficient is significant at the 0,01 level

Firm's expected inflation persistence is stronger than for other observed groups.

Markov Switching Regression

Households

- **Regime 1:** has downward trend . Change in expected inflation is sensitive to lag change in inflation and its own lag.
- **Regime 2:** has upward trend . Change in inflation expectations is not sensitive to lag change in inflation, but is sensitive to change in their own lag.

Dependent Variable: D_EL_HH

Method: Markov Switching Regression (BFGS / Marquardt steps)

Date: 01/29/20 Time: 15:05

Sample (adjusted): 2014M09 2019M07

Included observations: 59 after adjustments

Number of states: 2

Initial probabilities obtained from ergodic solution

Standard errors & covariance computed using observed Hessian

Random search: 25 starting values with 10 iterations using 1 standard deviation (rng=kn, seed=2134875557)

Convergence achieved after 13 iterations

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Regime 1				
C	-0.399362	0.236853	-1.686121	0.0918
D_INFL(-1)	0.091060	0.054714	1.664284	0.0961
D_EL_HH(-1)	-0.432906	0.149641	-2.892966	0.0038
LOG(SIGMA)	0.330245	0.117974	2.799302	0.0051
Regime 2				
C	0.421296	0.182444	2.309184	0.0209
D_INFL(-1)	0.120496	0.263507	0.457278	0.6475
D_EL_HH(-1)	-0.817648	0.177803	-4.598620	0.0000
LOG(SIGMA)	-0.829317	0.239841	-3.457786	0.0005
Transition Matrix Parameters				
P11-C	3.581201	1.290787	2.774432	0.0055
P21-C	-2.163867	1.098743	-1.969403	0.0489
Mean dependent var	-0.166102	S.D. dependent var	1.430785	
S.E. of regression	1.382654	Sum squared resid	97.49838	
Durbin-Watson stat	2.082499	Log likelihood	-92.40814	
Akaike info criterion	3.471463	Schwarz criterion	3.823588	
Hannan-Quinn criter.	3.608918			

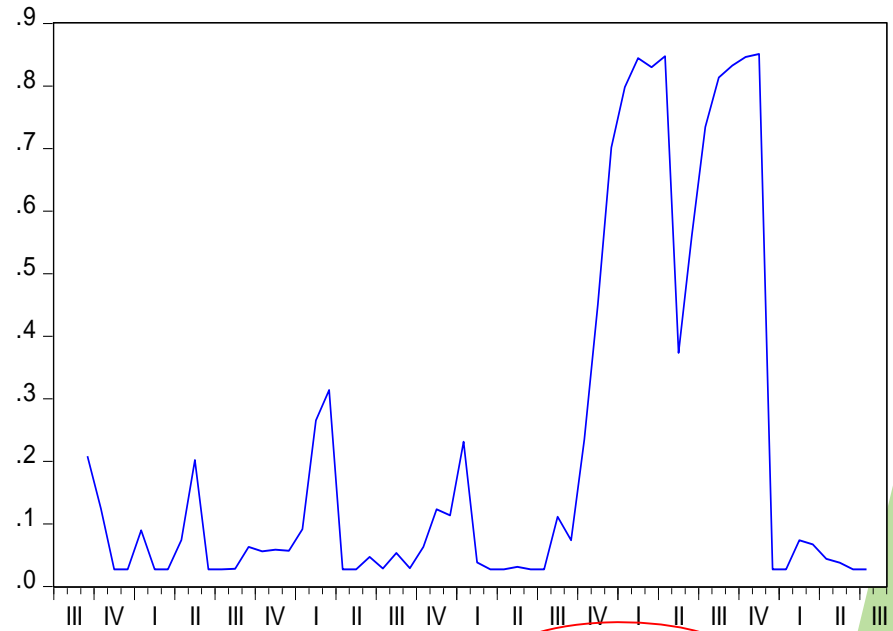
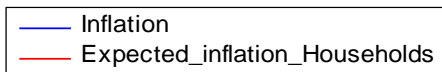
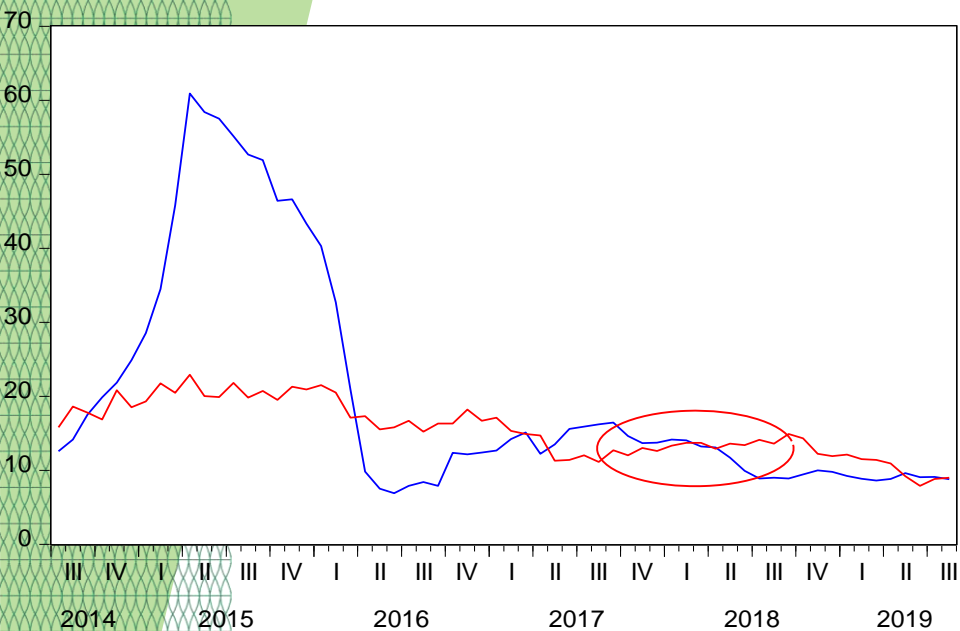
Markov Switching Regression

Households

In July 2017, inflation expectations regime changed to upward.

Loss of confidence to monetary policy (Regime 2)

PROBABILITY_OF_REGIME_2



Summary table MS Regression

	Banks	Households	Firms	Financial analysts
MS Regression	1 regime	2 regime (2017q3- 2018q3) “Loss of confidence to monetary policy ”	1 regime	1 regime

Nonlinearity

Firms

- Sample: 2013q3 – 2019q4
- $$\text{Dummy} = \begin{cases} 1, d(\text{inflation}(-1)) > 0 \\ 0, d(\text{inflation}(-1)) < 0 \end{cases}$$
- Change in firm's inflation expectations is not sensitive to upward inflation change (coefficient is not statistically significant).
- Downward changes in inflation increase changes in expectations.

But the result is contrary to our expectations.

Note: the opposite result was observed in sample from 2006q1 to 2019q1. In this case, the upward inflation persistence (0,234) is stronger than downward inflation persistence (0,089).

Dependent Variable: D_EI_F

Method: Least Squares

Date: 02/03/20 Time: 16:49

Sample: 2013Q3 2019Q4

Included observations: 26

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.563943	0.683991	0.824490	0.4185
D_INFL(-1)*DUMMY	-0.240373	0.168475	-1.426757	0.1677
D_INFL(-1)	0.217695	0.108071	2.014370	0.0564
D_EI_F(-1)	0.276270	0.214592	1.287418	0.2113
R-squared	0.271108	Mean dependent var		-0.003846
Adjusted R-squared	0.171714	S.D. dependent var		3.017480
S.E. of regression	2.746216	Akaike info criterion		4.998963
Sum squared resid	165.9174	Schwarz criterion		5.192516
Log likelihood	-60.98652	Hannan-Quinn criter.		5.054699
F-statistic	2.727600	Durbin-Watson stat		1.832337
Prob(F-statistic)	0.068531			

Summary table

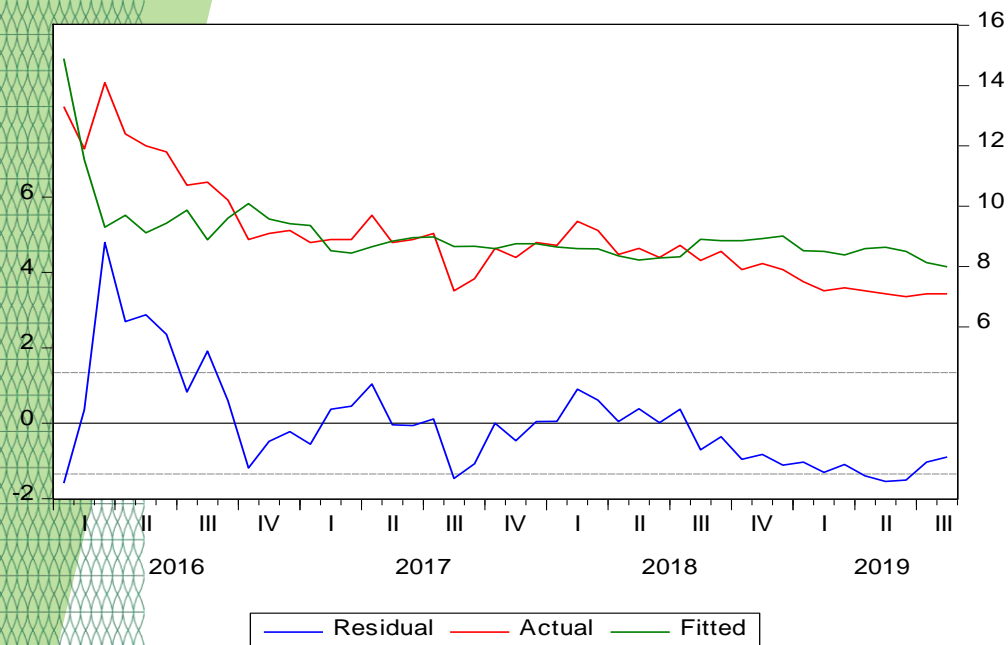
Nonlinearity

	Banks	Households	Firms	Financial analysts
Nonlinearity	not observed	not observed	not observed	not observed

Connection of expected inflation with EXPECTED devaluation

Financial analysts

- Sample: 2016m01 – 2019m08
- In case of financial analysts, connection of expected inflation with expected devaluation is statistically significant and estimated coefficient = 0.123 (weak connection).



Dependent Variable: EI_FA

Method: Least Squares

Date: 02/04/20 Time: 10:21

Sample: 2016M01 2019M08

Included observations: 44

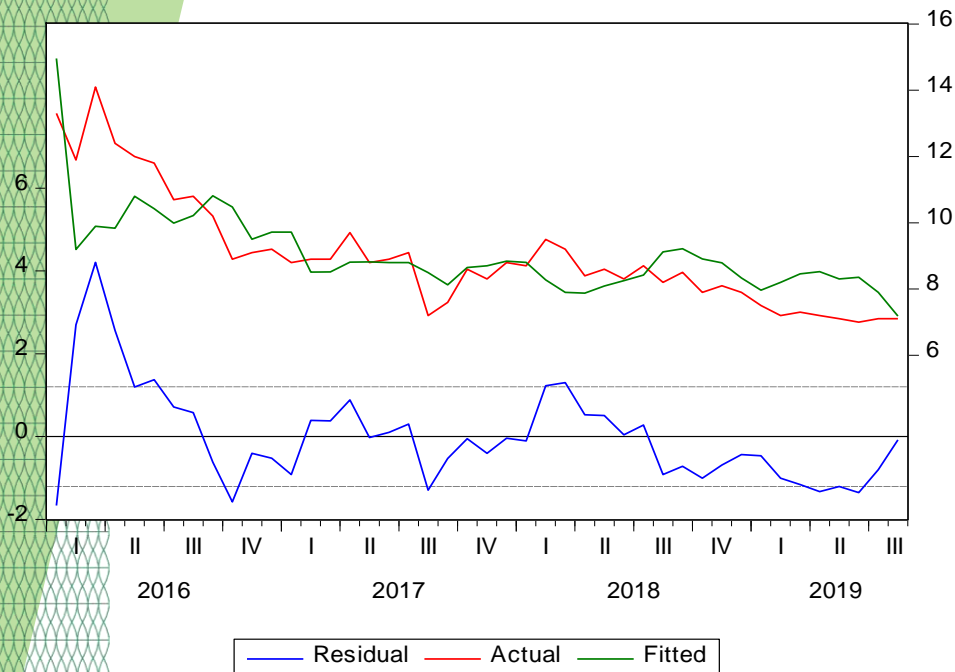
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.453787	0.229690	36.80513	0.0000
EDEVL_FA	0.122932	0.022970	5.351807	0.0000

R-squared	0.405451	Mean dependent var	9.034091
Adjusted R-squared	0.391296	S.D. dependent var	1.721538
S.E. of regression	1.343136	Akaike info criterion	3.472280
Sum squared resid	75.76859	Schwarz criterion	3.553380
Log likelihood	-74.39017	Hannan-Quinn criter.	3.502356
F-statistic	28.64184	Durbin-Watson stat	0.629240
Prob(F-statistic)	0.000003		

Connection of expected inflation with HISTORICAL devaluation

Financial analysts

- Sample: 2016m01 – 2019m08
- In case of financial analysts, connection of expected inflation with HISTORICAL devaluation is statistically significant and estimated coefficient = 0.126.



Dependent Variable: EI_FA

Method: Least Squares

Date: 02/04/20 Time: 10:39

Sample: 2016M01 2019M08

Included observations: 44

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.208615	0.219017	37.47933	0.0000
DEVL_EXCH	0.126439	0.018713	6.756765	0.0000

R-squared	0.520843	Mean dependent var	9.034091
Adjusted R-squared	0.509434	S.D. dependent var	1.721538
S.E. of regression	1.205773	Akaike info criterion	3.256507
Sum squared resid	61.06327	Schwarz criterion	3.337607
Log likelihood	-69.64316	Hannan-Quinn criter.	3.286583
F-statistic	45.65387	Durbin-Watson stat	0.693265
Prob(F-statistic)	0.000000		

Summary table

Connection of expected inflation with **EXPECTED** and **HISTORICAL** devaluation

	Banks	Households	Firms	Financial analysts
Connection with EXPECTED devaluation	0,220***	0,224***	0,354***	0,123***
Connection with HISTORICAL devaluation	0,304***	0,215***	0,494***	0,126***

Note: *** -coefficient is significant at the 0,01 level.

**Firm's expected inflation has strong connection with
EXPECTED and HISTORICAL devaluation.**

Summary table

	Forecast ability from 2017		Persistence	Connection with expected devaluation	Connection with historical devaluation	MS regression	Nonlinearity	Following the NBU's forecasts
	MAE	BIAS						
Banks	2,76	-0,86	0,891	0.220	0.304	1 regime	Not observed	0.467
Households	2,43	0,94	0,885 (monthly 0,96)	0.224	0.215	2 regime (2017-2018)	Not observed	0.403
Firms	2,09	-1,52	0,929	0.354	0.494	1 regime	Not observed	0.653
Financial analysts	3,50	-3,07	0,827 (monthly 0,938)	0.123	0.126	1 regime	Not observed	0.506