جامعة امحمد بوقرة بومرداس

كلية العلوم الاقتصادية، التجارية وعلوم التسيير

يوم دراسي حول أهمية استخدام البرامج الإحصائية في التحليل الاقتصادي

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THE IMPACT OF FLUCTUATING OIL PRICES ON INFLATION RATES IN ALGERIA DURING 1970-2015 (NARDL Approach with EVIEWS)

Present by

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‘

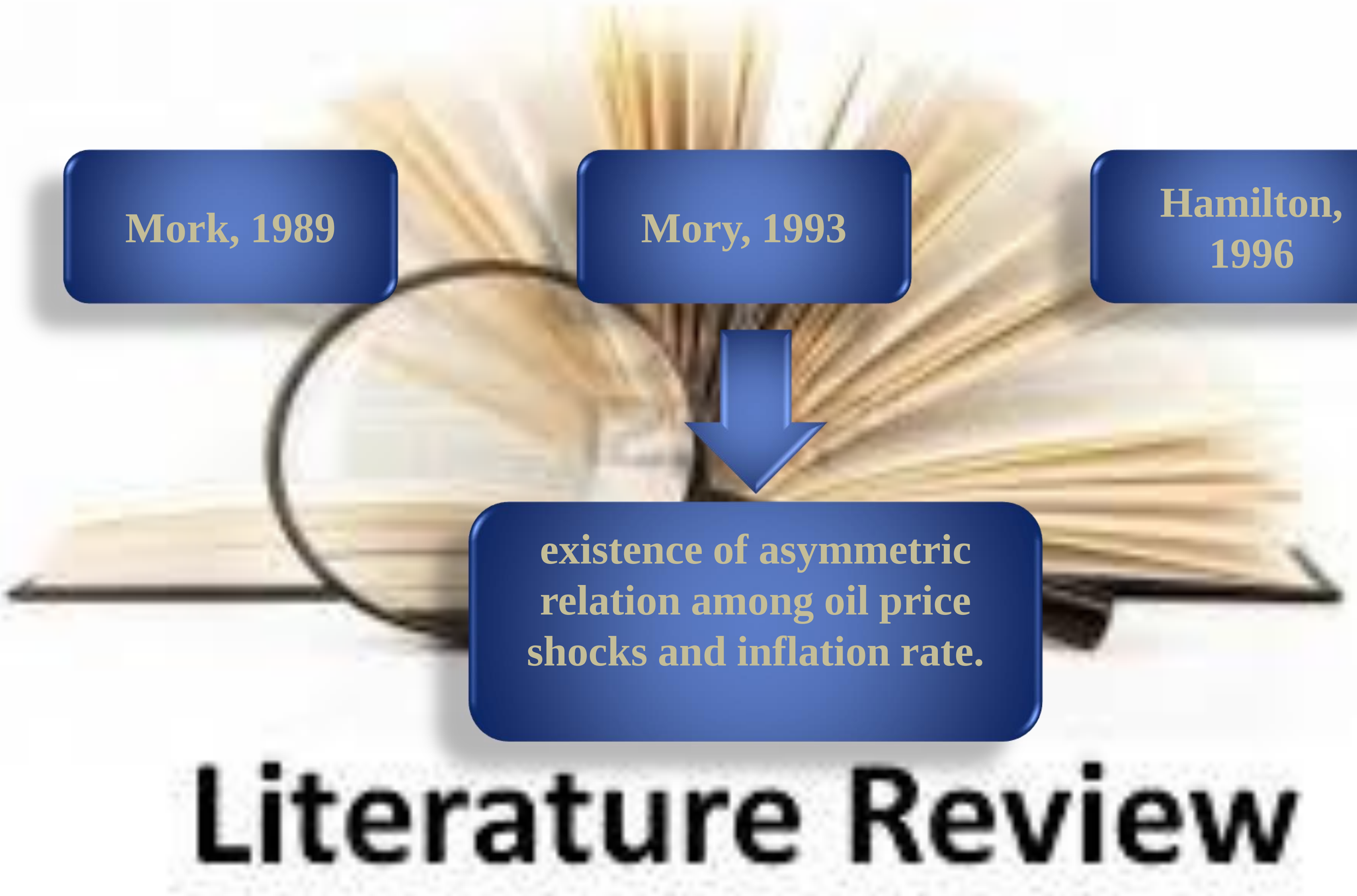
Leblanc and Chinn (2004)

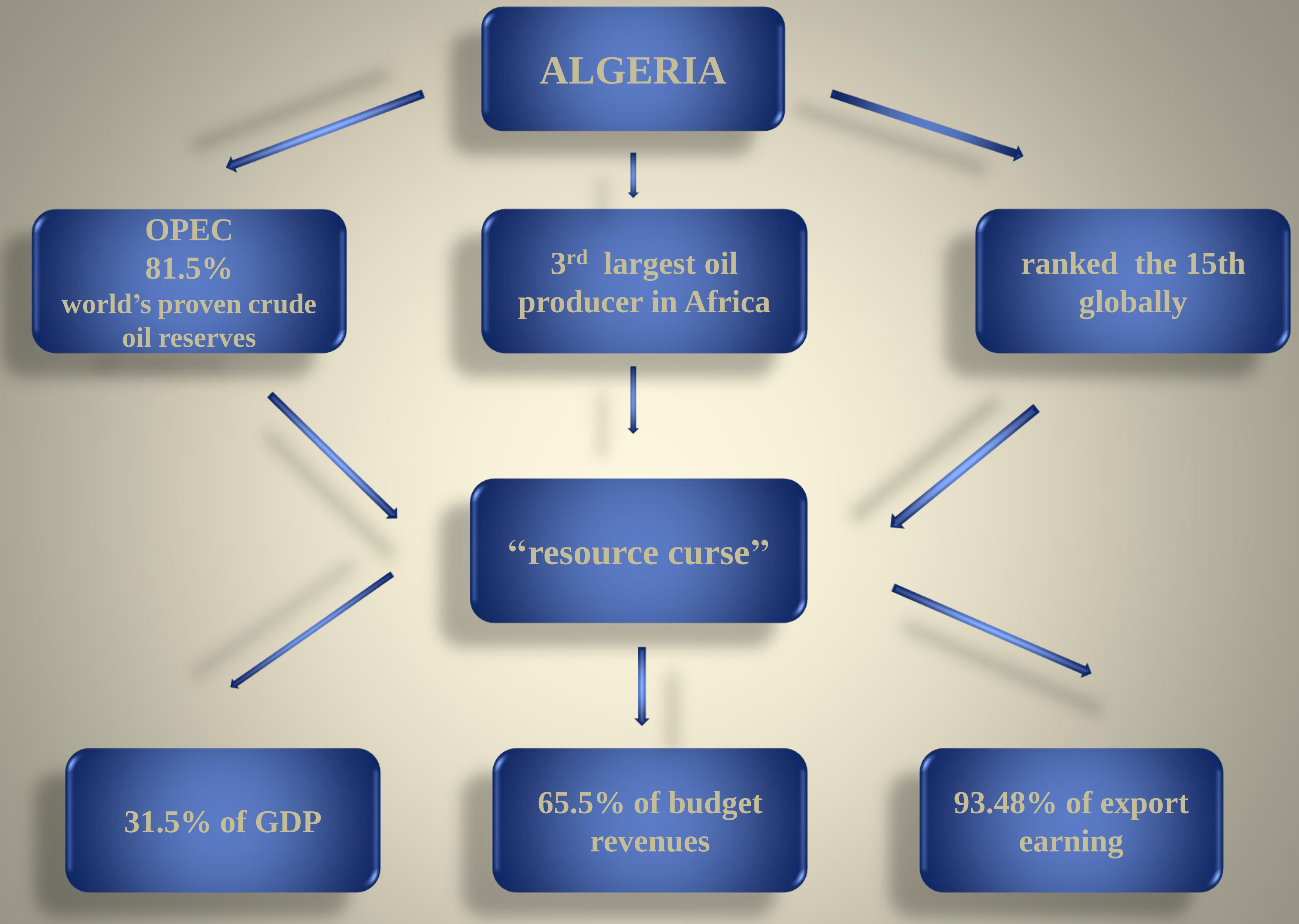
De Gregorio. (2007)

have confirmed the role of oil price fluctuations on consumer price index.

Nakov and Pescatori (2007)

Killian (2008)


Mork, 1989
Mory, 1993
Hamilton, 1996
existence of asymmetric relation among oil price shocks and inflation rate.
Literature Review


ALGERIA
OPEC
81.5%
world's proven crude
oil reserves
3rd largest oil
producer in Africa
ranked the 15th
globally
"resource curse"
31.5% of GDP
65.5% of budget
revenues
93.48% of export
earning

How do oil price fluctuations affect on inflation in Algeria?

Does similarly changes in oil price affects and inflation rates in Algeria?

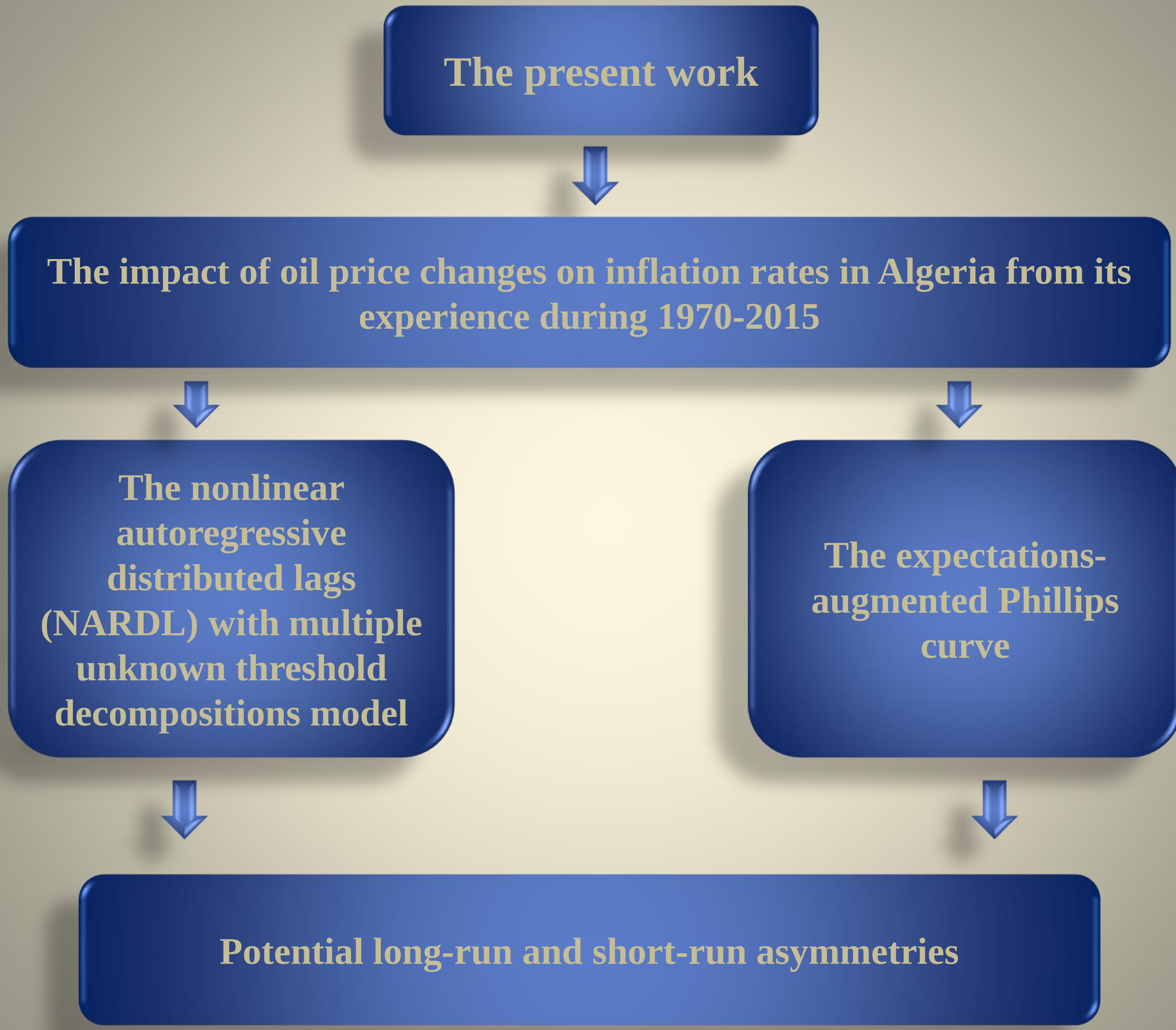
Where does the significant effect lie regarding the non-linearity of oil price impact?

Hypothesis

Fluctuating oil price has an asymmetric effect on inflation in Algeria.

The effect of oil price increase is considerably significant compared to oil price decrease.

High dependency on hydrocarbons and reliance on importation to satisfy the local demand are the main causes of inflation in Algeria.


The present work
The impact of oil price changes on inflation rates in Algeria from its experience during 1970-2015
The nonlinear autoregressive distributed lags (NARDL) with multiple unknown threshold decompositions model
The expectations-augmented Phillips curve
Potential long-run and short-run asymmetries

Why NARDL Approach?

Differences between linear ARDL and(NON LINIEAR ARDL)

Most of researchers ask a question what is difference between ARDL and NARDL?

- ARDL Model is linear Relationship and NARDL is non linear Relationship

linear relationship is one where increasing or decreasing one variable n times will cause a corresponding increase or decrease of n times in the other variable too.

. Each unit change in the x variable will not always bring about the same change in the y variable.

- NARDL This approach enables us to make a distinction between the positive and negative shocks of oil price effect on inflation

- Measure cointegration of nonlinear autoregressive distributed lag (NARDL) model in which short- and long-run nonlinearities are introduced via positive and negative partial sum decompositions of the explanatory variables.

- NARDL Model derive asymmetric dynamic multipliers that graphically depict the traverse between the short- and the long-run.

Steps for estimate NARDL Model

1. We must to check the stationarity of all variable in order to confirm that we don’t have any variable which stationary at second difference or follow TS processus .
2. Estimate ARDL Model
3. Test cointegration, using bound test
4. Run NARDL
5. Check the asymmetries with Wald test, even from the step 4 we understand either asymmetric relationship exist or not but we can check it for further confirmation via Wald test.

EVIEWS Video Presentation

Model specification

$$Inf_t = B_0 + B_1 Gdp + B_0\ Oilp + e_t$$

$$Oilp\_pos_t = \sum \Delta oilp\text{-}pos = \sum \max(\Delta oilp\text{-}pos, 0)$$

$$Oilp\_negt = \sum \Delta oilp\text{-}neg = \sum \min(\Delta oilp\text{-}neg, 0)$$

$$Inf_t = \alpha_0 + \alpha_1 Gdp + \alpha_2\ Oilp\_pos + \alpha_3 Oilp\_neg + e_t$$

$$\Delta Inft = \alpha_0 + \alpha_1\ Inf_{t-1} + \alpha_2\ Gdp_{t-1} + \alpha_3\ oilp\_pos_{t-1} + \alpha_4\ oilp\_neg_{t-1} + \sum^{p}_{i=1} \gamma_{1i}\, \Delta Inf_{t-1} + \sum^{q}_{i=1} \gamma_{2i}\, \Delta Gdp_{t-1} + \sum^{m}_{i=1} \gamma_{3i}\, \Delta Oilp\_pos_{t-1} + \sum^{m}_{i=1} \gamma_{4i}\, \Delta Oilp\_neg_{t-1} + u_t$$

short-run influences of oil price increases on inflation rates

short-run influences of oil price decreases on inflation rates

Unit root test (ADF)

H_0: existence of unit root (non stationary)
t-statistic > critical values ➔ accept H_0

Inf

Null Hypothesis: INF has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.201343	0.4773
Test critical values:	1% level	-4.175640	
	5% level	-3.513075	
	10% level	-3.186854	

Null Hypothesis: D(INF) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.277369	0.0000
Test critical values:	1% level	-3.588509	
	5% level	-2.929734	
	10% level	-2.603064	

Stationary

Gdp

Null Hypothesis: GDP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.765606	0.2171
Test critical values:	1% level	-4.180911	
	5% level	-3.515523	
	10% level	-3.188259	

Null Hypothesis: D(GDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.774259	0.0061
Test critical values:	1% level	-3.588509	
	5% level	-2.929734	
	10% level	-2.603064	

Stationary

Oilp

Null Hypothesis: OILP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.974526	0.5990
Test critical values:	1% level	-4.175640	
	5% level	-3.513075	
	10% level	-3.186854	

Null Hypothesis: D(OILP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.987277	0.0002
Test critical values:	1% level	-3.588509	
	5% level	-2.929734	
	10% level	-2.603064	

Stationary

Stationarity test (KPSS)

H_0: the serie is stationary

LM statistic > critical values → reject H_0

Inf

Null Hypothesis: INF is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.121733
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

→

Null Hypothesis: D(INF) is stationary
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.066585
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

Stationary

Gdp

Null Hypothesis: GDP is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.107145
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

Null Hypothesis: D(GDP) is stationary
Exogenous: Constant
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.186944
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

Stationary

oilp

Null Hypothesis: OILP is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.157185
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

Null Hypothesis: D(OILP) is stationary
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.076648
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

Stationary

Estimating the ARDL model

$$Inf_t = B_0 + B_1 Gdp + B_0\ Oilp + e_t$$

Dependent Variable: INF
Method: ARDL
Date: 07/14/17 Time: 16:52
Sample (adjusted): 1972 2015
Included observations: 44 after adjustments
Maximum dependent lags: 2 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (2 lags, automatic): GDP OILP
Fixed regressors: C
Number of models evalulated: 18
Selected Model: ARDL(1, 2, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
INF(-1)	0.698515	0.094436	7.396720	0.0000
GDP	-2.31E-08	2.51E-08	-0.920884	0.3629
GDP(-1)	-1.98E-08	4.33E-08	-0.456234	0.6508
GDP(-2)	4.80E-08	2.62E-08	1.829004	0.0753
OILP	-0.017115	0.026487	-0.646165	0.5221
C	2.294848	2.012842	1.140103	0.2614

R-squared	0.726108	Mean dependent var	9.312266
Adjusted R-squared	0.690070	S.D. dependent var	7.919383
S.E. of regression	4.408828	Akaike info criterion	5.931219
Sum squared resid	738.6351	Schwarz criterion	6.174517
Log likelihood	-124.4868	Hannan-Quinn criter.	6.021446
F-statistic	20.14820	Durbin-Watson stat	1.794532
Prob(F-statistic)	0.000000		

Bound testing

ARDL Bounds Test
Date: 07/14/17 Time: 17:06
Sample: 1972 2015
Included observations: 44
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	0.776989	2

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.63	3.35
5%	3.1	3.87
2.5%	3.55	4.38
1%	4.13	5

No co-integration

Estimating NARDL model

$$\Delta Inft = \alpha_0 + \alpha_1 Inf_{t-1} + \alpha_2 Gdp_{t-1} + \alpha_3 oilp\_pos_{t-1} + \alpha_4 oilp\_neg_{t-1} + \sum^{p}_{i=1} \gamma_{1i} \Delta Inf_{t-1} + \sum^{q}_{i=1} \gamma_{2i} \Delta Gdp_{t-1} + \sum^{m}_{i=1} \gamma_{3i} \Delta Oilp\_pos_{t-1} + \sum^{m}_{i=1} \gamma_{4i} \Delta Oilp\_neg_{t-1} + u_t$$

Method: Stepwise Regression
Date: 07/15/17 Time: 18:49
Sample (adjusted): 1977 2015
Included observations: 39 after adjustments
Number of always included regressors: 6
Number of search regressors: 23
Selection method: Uni-directional
Stopping criterion: p-value = 0.1

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
C	43.19066	8.987896	4.805425	0.0001
INF(-1)	-1.167674	0.172826	-6.756371	0.0000
GDP(-1)	-3.51E-08	1.12E-08	-3.143511	0.0049
OILP_POS(-1)	0.164095	0.047742	3.437144	0.0025
OILP_NEG(-1)	0.101796	0.076768	1.326020	0.1991
@TREND	-1.466189	0.340158	-4.310313	0.0003
DGDP(-3)	-9.75E-08	2.28E-08	-4.275107	0.0003
DGDP(-1)	-5.62E-08	2.14E-08	-2.629482	0.0157
DGDP(-4)	-8.48E-08	2.44E-08	-3.478508	0.0022
DOILP_NEG(-4)	-0.344471	0.147113	-2.341548	0.0291
DINF(-1)	0.468732	0.123456	3.796753	0.0011
DOILP_POS	0.270552	0.088689	3.050559	0.0061
DINF(-3)	0.289506	0.115434	2.507986	0.0204
DGDP(-5)	-1.02E-07	3.17E-08	-3.214332	0.0042
DGDP	-6.05E-08	2.34E-08	-2.586250	0.0172
DOILP_POS(-4)	0.413571	0.142980	2.892507	0.0087
DOILP_POS(-5)	-0.325544	0.128138	-2.540575	0.0190
DGDP(-2)	4.73E-08	2.36E-08	2.005694	0.0579

R-squared	0.845520	Mean dependent var	-0.121026
Adjusted R-squared	0.720465	S.D. dependent var	5.116635
S.E. of regression	2.705222	Akaike info criterion	5.132283
Sum squared resid	153.6827	Schwarz criterion	5.900080
Log likelihood	-82.07951	Hannan-Quinn criter.	5.407762
F-statistic	6.761167	Durbin-Watson stat	2.304615
Prob(F-statistic)	0.000037		

Residual diagnostics

↓

Serial correlation

↓

H_0: there is no serial correlation of any order up to *p*

p-value > 0.05 → accept H_0

↓

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.908869	Prob. F(2,19)	0.4198
Obs*R-squared	3.405353	Prob. Chi-Square(2)	0.1822

RESID(-1)	-0.396318	0.329515	-1.202733	0.2439
RESID(-2)	-0.238477	0.267895	-0.890189	0.3845

↓

There is no serial correlation

Heteroskedasticity ARCH

H_0: homoscedasticity, the variance of the errors is constant
p-value > 0.05 ➔ accept H_0

Heteroskedasticity Test: ARCH

F-statistic	0.712180	Prob. F(2,34)	0.4977
Obs*R-squared	1.487715	Prob. Chi-Square(2)	0.4753

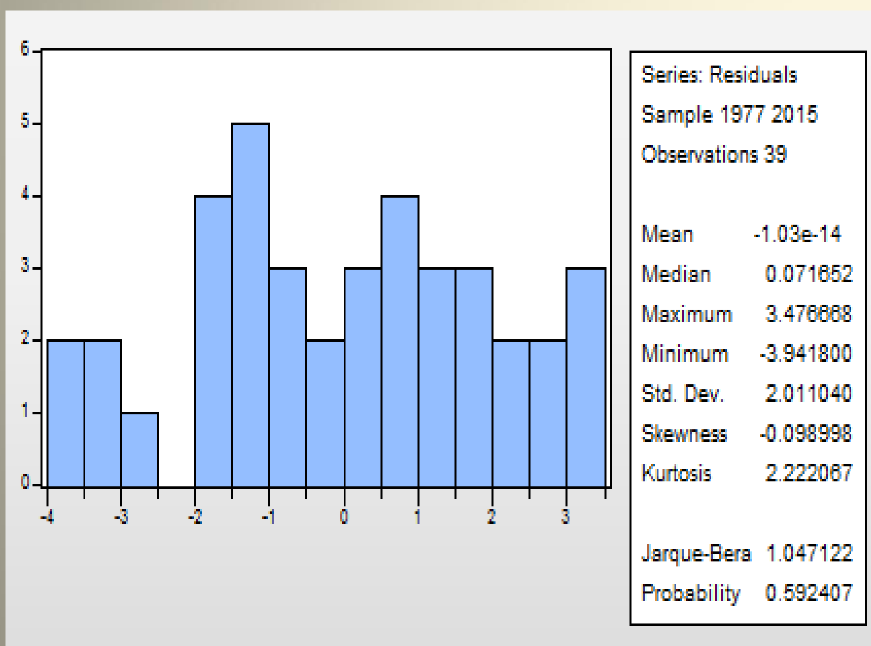
Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/15/17 Time: 20:19
Sample (adjusted): 1979 2015
Included observations: 37 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.762861	1.183330	2.334819	0.0256
RESID^2(-1)	0.086025	0.162742	0.528599	0.6005
RESID^2(-2)	0.172266	0.162751	1.058465	0.2973

The errors are homoscedastic

Normality test

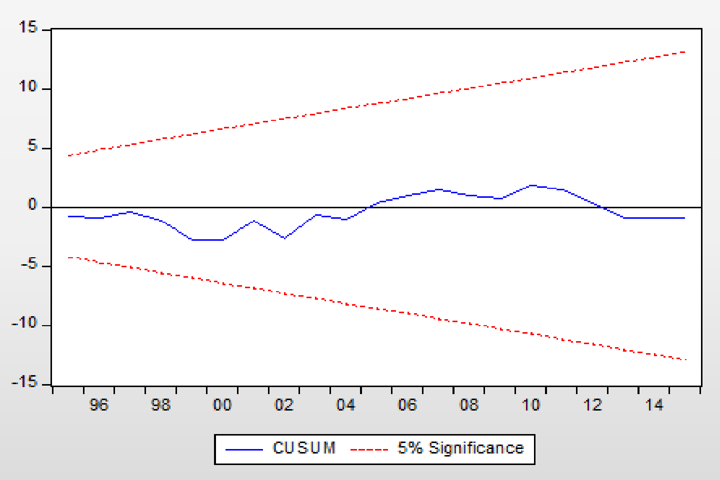
H_0 : the residuals follow a normal distribution
p-value > 0.05 → accept H_0

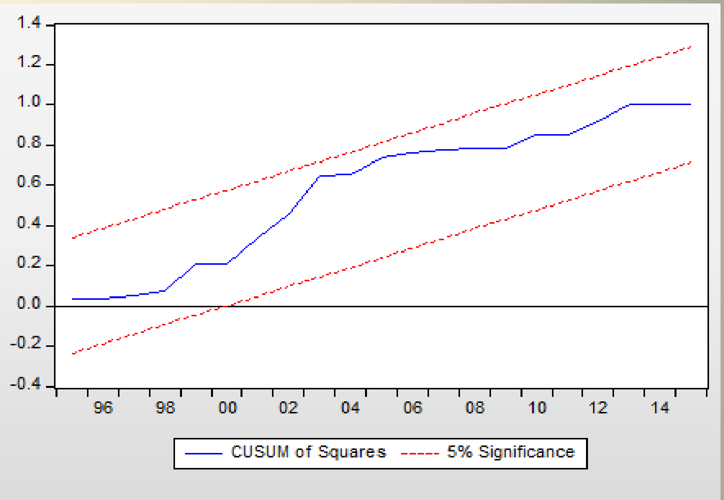


The residuals are normally distributed

Stability diagnostics

CUSUM and CUSUM of squares





The model is dynamically stable

Ramsey reset test

H_0: γ=0
p-value >0.05 ➔ accept H_0

Ramsey RESET Test
Equation: UNTITLED
Specification: DINF C INF(-1) GDP(-1) OILP_POS(-1) OILP_NEG(-1) @TREND DGDP(-3) DGDP(-1) DGDP(-4) DOILP_NEG(-4) DINF(-1) DOILP_POS DINF(-3) DGDP(-5) DGDP DOILP_POS(-4) DOILP_POS(-5) DGDP(-2)
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.113585	20	0.2787
F-statistic	1.240072	(1, 20)	0.2787
Likelihood ratio	2.346136	1	0.1256

The model is correctly specified

Coefficient diagnostics

Wald test

H_0: some parameter = some value.

p-value > 0.05 ➔ accept H_0

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
F-statistic	10.02830	(5, 21)	0.0001
Chi-square	50.14149	5	0.0000

Null Hypothesis: C(1)=C(2)=C(3)=C(4)=C(5)=C(6)
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(1) - C(6)	44.65684	9.312807
C(2) - C(6)	0.298515	0.238567
C(3) - C(6)	1.466189	0.340158
C(4) - C(6)	1.630284	0.377297
C(5) - C(6)	1.567985	0.336669

Restrictions are linear in coefficients.

0.010	
$I(0)$	$I(1)$
15.73	15.73
8.74	9.63
6.34	7.52
5.17	6.36
4.40	5.72
3.93	5.23
3.60	4.90
3.34	4.63
3.15	4.43
2.97	4.24
2.84	4.10

There is a co-integration between variables

Asymmetry test

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
t-statistic	-3.935321	18	0.0010
F-statistic	15.48675	(1, 18)	0.0010
Chi-square	15.48675	1	0.0001

Null Hypothesis: -C(4)/C(2)=-C(5)/C(2)
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
-C(4)/C(2) + C(5)/C(2)	-0.637186	0.161915

Delta method computed using analytic derivatives.

The existence of asymmetric effect of oilp

Significance of the variables

Gdp

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
t-statistic	-3.252380	18	0.0044
F-statistic	10.57798	(1, 18)	0.0044
Chi-square	10.57798	1	0.0011

Null Hypothesis: -C(3)/C(2)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
-C(3) / C(2)	-5.08E-08	1.56E-08

significant

Oilp_pos

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
t-statistic	4.220519	21	0.0004
F-statistic	17.81278	(1, 21)	0.0004
Chi-square	17.81278	1	0.0000

Null Hypothesis: -C(4)/C(2)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
-C(4) / C(2)	0.140532	0.033297

Delta method computed using analytic derivatives.

significant

Oilp_neg

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
t-statistic	1.325592	21	0.1992
F-statistic	1.757195	(1, 21)	0.1992
Chi-square	1.757195	1	0.1850

Null Hypothesis: -C(5)/C(2)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
-C(5) / C(2)	0.087179	0.065766

Delta method computed using analytic derivatives.

insignificant

Conclusion

This study analyze the impact of oil price changes on CPI, and to do so we adopt a nonlinear ARDL model for the analysis to capture both long-run and short-run asymmetric between CPI and oil prices. Estimated results confirm the existence of both long-run and short-run asymmetry behavior of CPI. Precisely, in the long-run, oil price increase tend to increase inflation level in Algeria. However, oil price decrease seems to be unrelated to inflation level.

Similarity, in the short-run, only oil price increase seems to increase inflation in Algeria.

THANK YOU

FOR YOUR ATTENTION