



*Economic, commercial and management institute
Economic sciences departement*

LME.LSPM Laboratory at university of Ain Temouchent, Algeria.

ECONOMIC
RESEARCH
FORUM



منتدى
البحوث
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ERF 26th Annual Conference

**Sustainable Development Goals (SDGs) as a Framework for
MENA's
Development Policy**

**Proposing the method to predict the break-even oil price for
hedging and sustainable finance in oil exporting countries
An empirical study in Algeria by using the Black-Scholes
model**

Realized by: PhD. Naima Bentouir and Dr. Ali Bendob

We aimed to proposing model for predicting the fiscal breakeven oil price for oil-exporting countries, based on an empirical study using the Black-Scholes model in. To achieve our examination we use the oil prices with daily data during the period of **2013 to 2019**, the fiscal breakeven oil prices and external breakeven oil prices from **2000 to 2020**, which are determined by the International Monetary Fund (IMF); in addition to the fiscal breakeven oil prices of Algeria.

Keywords: Financial sustainability, break-even price, options prices, Black-Sholes model, hedging, public budget.

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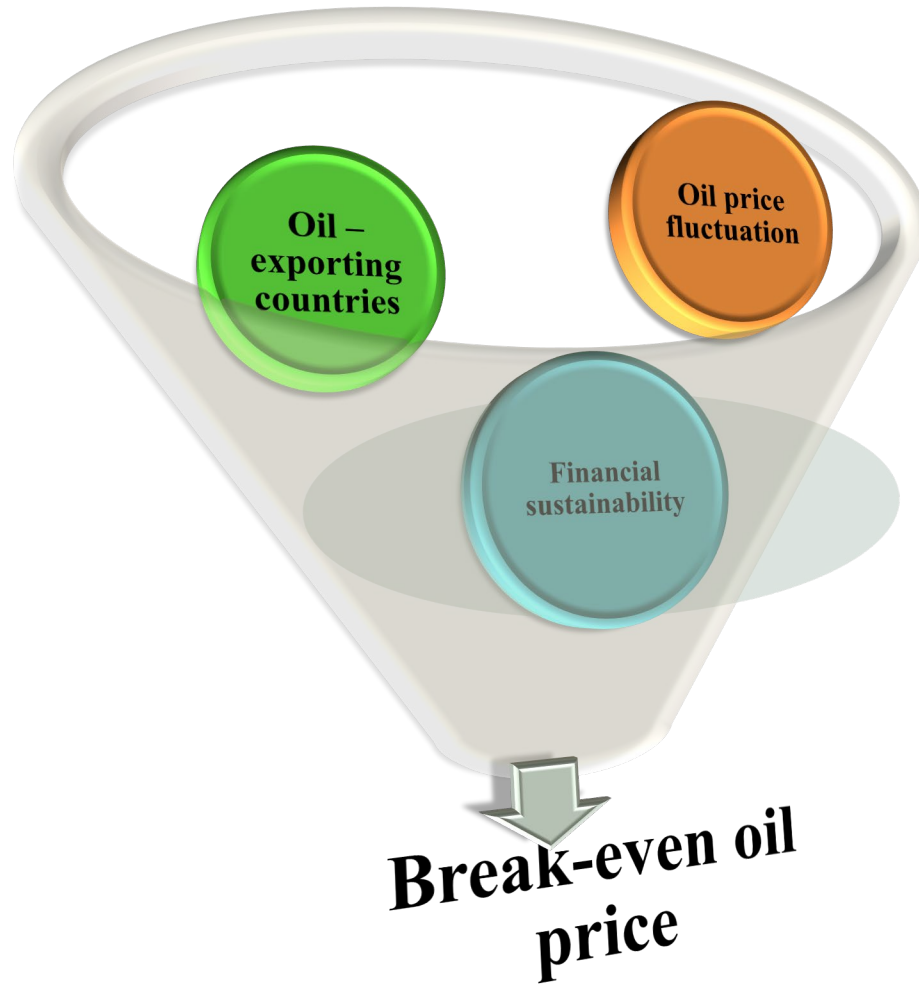
Literature Review

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Data and Methodology

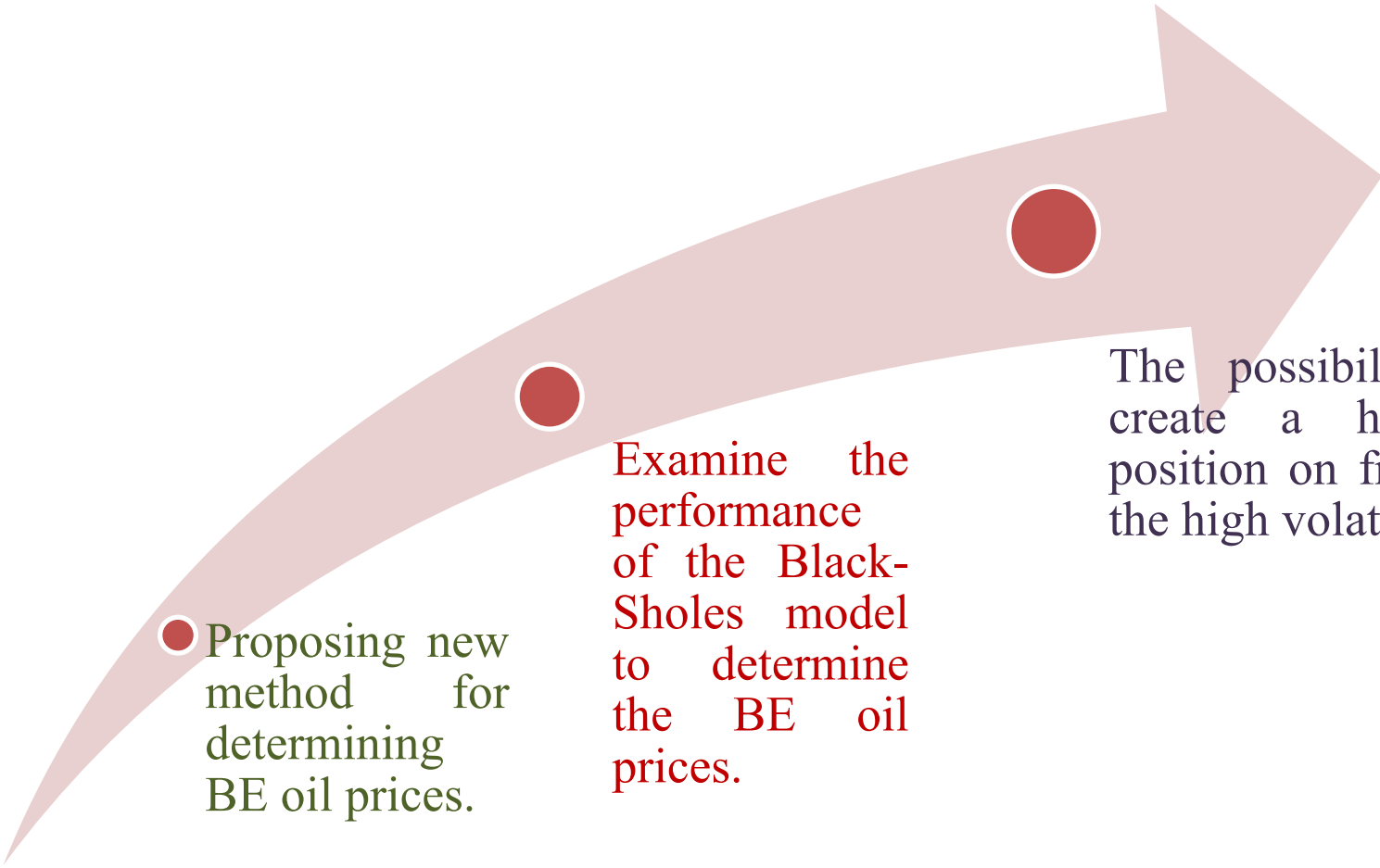
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Results



Does the Black-Scholes model valid to predict the reference price?





Proposing new method for determining BE oil prices.

Examine the performance of the Black-Sholes model to determine the BE oil prices.

The possibility to create a hedging position on front of the high volatility.

Brad and Col 2017

- BE calculation
- EBE importance
- The BE's calculations limits



Abdullah et al 2018

- Oil prices/domestic resource gap/BE.
- The BE in Saudi is high .
- Significant effect between BE and domestic resource gpas.



Jorge et Selim 2019

- BE can control the government's revunues and spending.
- Controling the oil production according the the oil variation prices.



Aissaoui Ali 2019

- Revising a model for BE calculation.
- Determined the main variables to calculate BE.
- Sowed the limit on the calculation when the exchange rate is ignored



Our paper aims to predict the fiscal Break-even oil prices using crude oil prices collected from *Thomson Reuter's* database from **02/01/2013** to **09/04/2019** with daily data. In order to achieve our hypotheses we will use the Black-Sholes model as a benchmark model to evaluate the options prices, in addition to the risk-free rate, which is collected from the Federal Reserve Bank, as well as the fiscal-external breakeven oil prices. The rest of the variables will be calculated based on our data.

The Break-even price for call option

$$BEP_c = C + K$$

The Break-even price for put option

$$BEP_p = K - P$$

The variables of study

1

Historical oil prices

2

External BE

3

IMF -BE

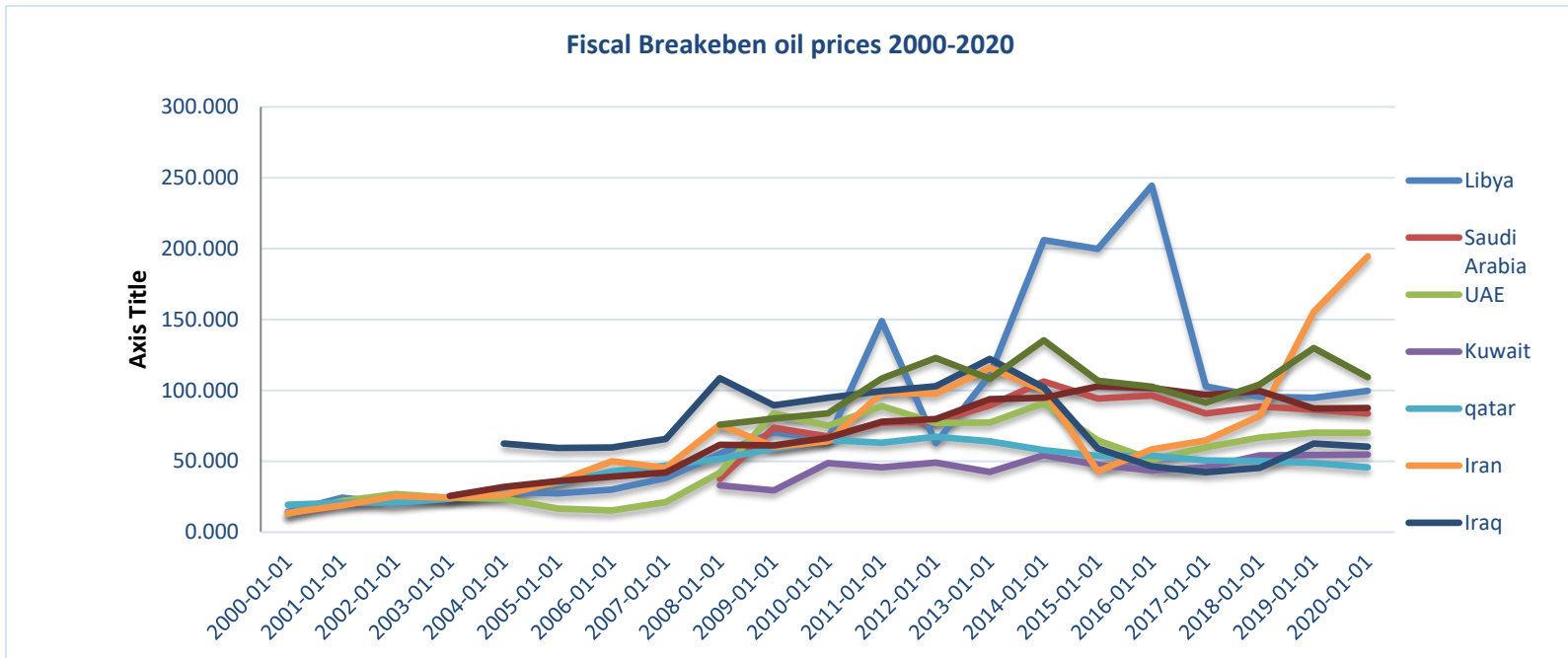
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Interest rates

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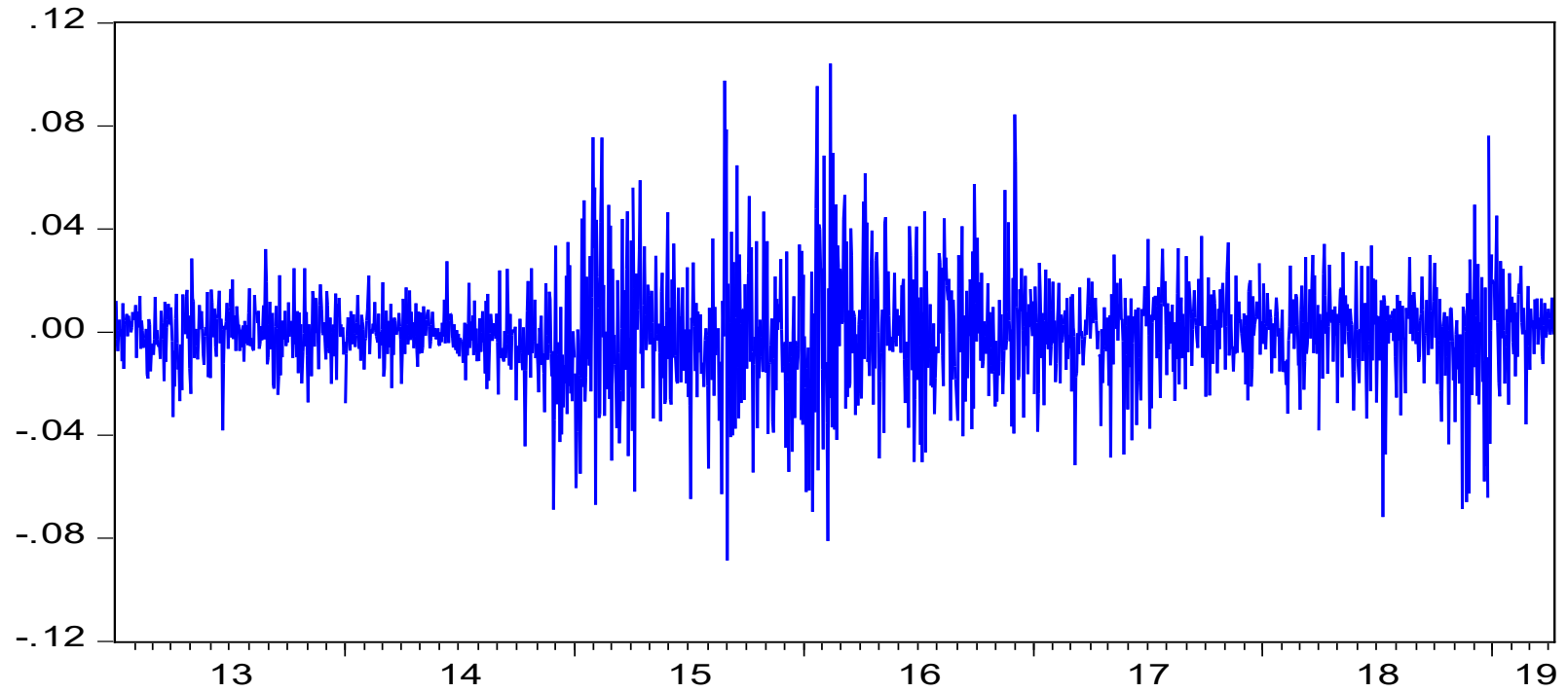
Reference oil price

Figure 01:The fiscal Breakeven prices for some oil exporting countries in the Middle East and North Africa.



Source: Authors using www.fred.stlouisfed.org. (IMF).

Figure: 02 the volatility oil returns during the period of study (2013-2019)
Returns



Source: Authors.

Table 01: The presentation of the different breakeven oil prices types

year	B-S Fiscal Breakeven oil price	Fiscal Breakeven oil prices (IMF)	External Breakeven oil prices	Fiscal Breakeven price In Algeria	Oil prices average
2013	105,059(*)			37	
		108,135	108,092		108,704
2014	95,423			37	
		135,327	115,489		99,449
2015	48,587			45	
		106,825	96,598		53,598
2016	39,684			45	
		102,506	89,081		45,131
2017	50,548			50	
		91,394	90,034		54,737
2018	67,226			50	
		98,933	101,684		71,692
2019	62,253			50	
		116,446	106,672		64,444

Source: Authors. (*), is the fiscal breakeven prices based on the B-S's variables; rf: the free-risk rate, S: market oil prices, K: the Strike price, σ : the volatility. Exp: $BEP_{2013} = \text{the average}(K_{2013} - P_{2013}) = 105.059$

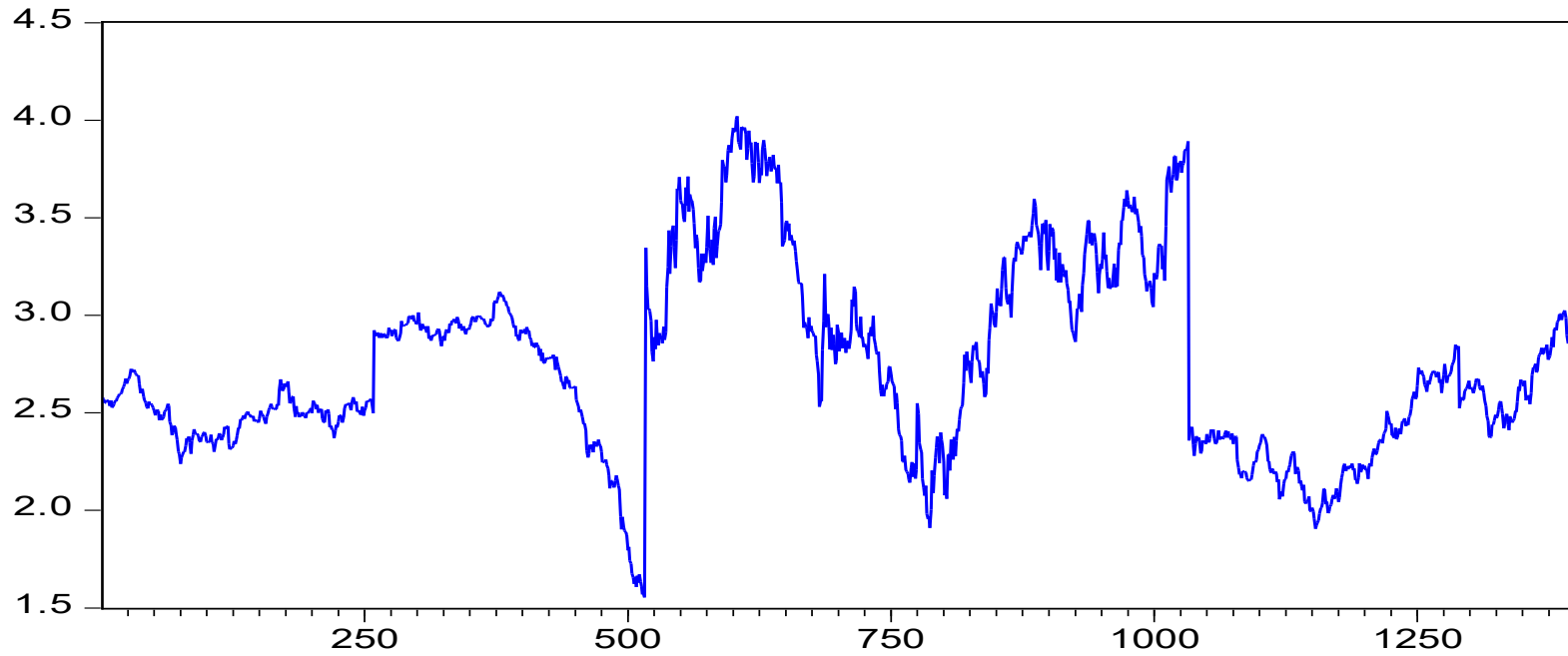
Table 02: the correlation between the different breakeven oil prices.

Correlations	B-S Fiscal Breakeven oil price	Fiscal Breakeven oil prices (IMF)	External Breakeven oil prices	Fiscal Breakeven price In Algeria
B-S Fiscal Breakeven oil Price	100,00%	56,59%	85,95%	-74,15%
Fiscal Breakeven oil prices (IMF)	<u>56,59%</u>	100,00%	83,02%	-61,73%
External Breakeven oil prices	<u>85,95%</u>	<u>83,02%</u>	100,00%	-57,30%
Fiscal Breakeven price In Algeria	<u>-74,15%</u>	<u>-61,73%</u>	<u>-57,30%</u>	100,00%

Source: Authors.

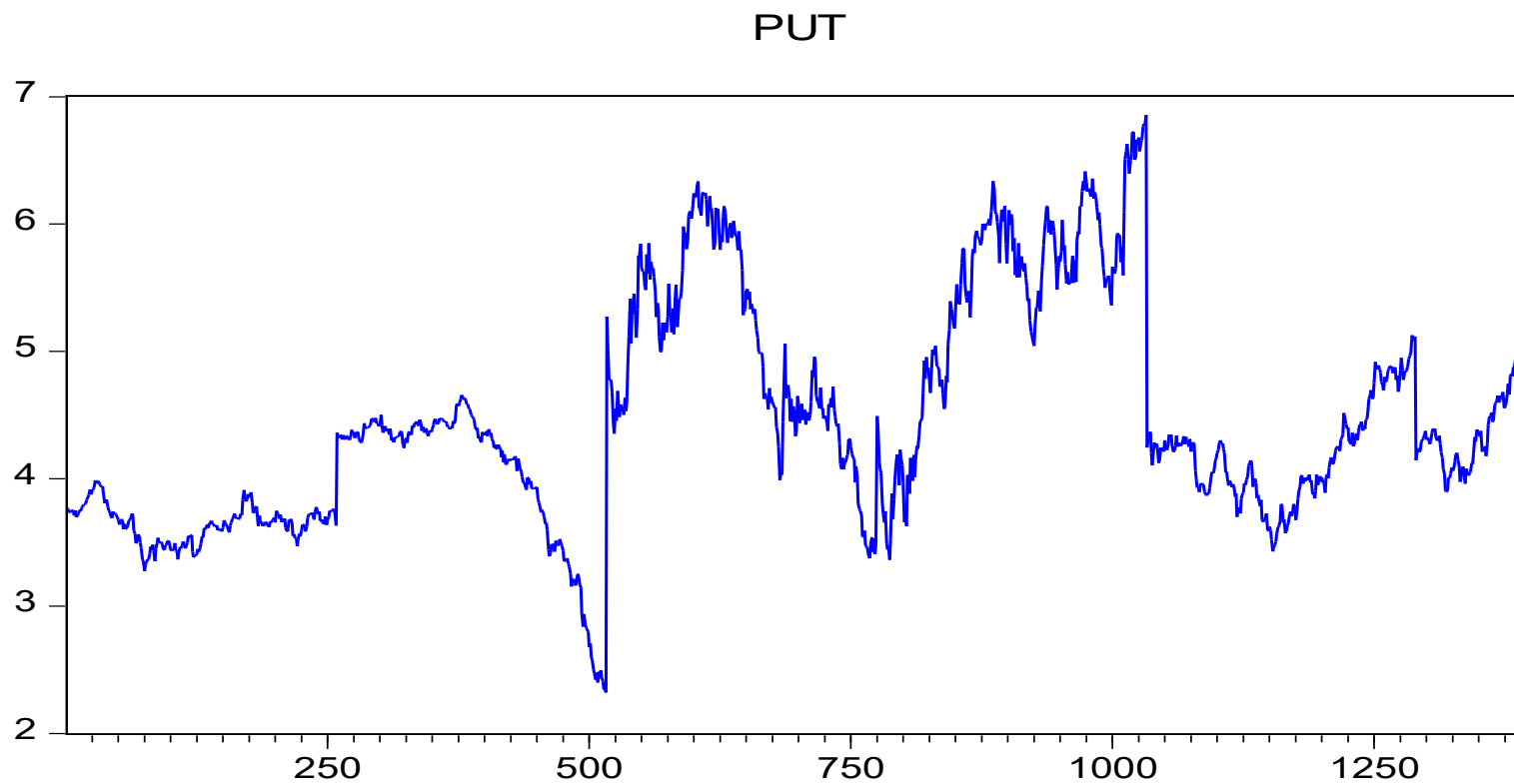
Figure 03: The cost of the put option in the case $BEP_{BS} = K$

PUT



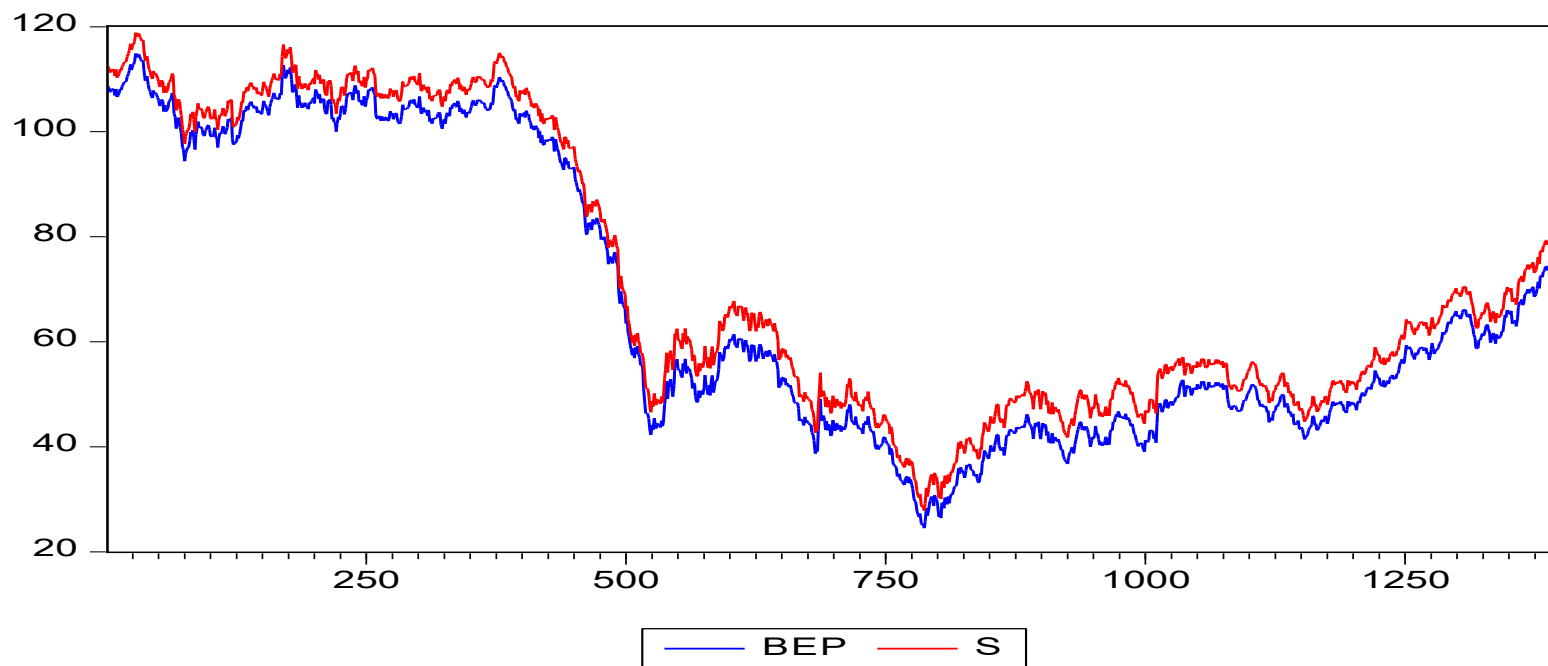
Source: Authors

Figure 02: The cost of the option in the case $S=K$



Source: Authors.

Figure 04: The performance of the Fiscal Breakeven price against the market prices



Source: Authors.

Main results

02

▪ Negative correlation between the B-S and the reference prices indicated in Algeria's public budge.

01

- Strong correlation between the fiscal breakeven prices based on the Black-Scholes model and the external breakeven price.
- Weak correlation with the IMF's fiscal breakeven prices



**THANK YOU FOR YOUR
ATTENTION**

07/09/2020

