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TOURISM DEMAND AND EXOGENOUS EXCHANGE RATE IN CAMBODIA: A STOCHASTIC SEASONAL ARIMAX APPROACH

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Abstract:

Time series seasonally displays toward either an autoregressive or moving average process where persist in seasonality fluctuation. The paper examines the relationship of tourism demand with controlling an exogenous exchange rate using seasonal ARIMA model. The empirical results reveal that HEGY test for seasonal unit roots with lower and upper panel indicates the statistical significance which explains the failure of rejection of having unit roots at different frequencies. The estimated outcomes from tourism demand model specify that per capita income and exchange rate have the power in explaining tourism demand measured as tourist arrivals. In particular to forecasting model and due to the lower statistical value of RMSE and MAE displays that the SARIMAX $(4, 1, 1) - (1, 1, 1)_{12}$ model is the best accuracy model to perform the long run ex-ante forecasting of tourism demand. This suggests tourism policy maker to pay more reflection in formulating the policy toward the exogenous factors in line with the uncertainty and unobserved seasonality.

Keywords: seasonal unit roots test; seasonal ARIMAX model; tourism demand; exogenous exchange ratel Cambodia

JEL Classification: C15; C22; C53; Z32.

Introduction

In the first quarter of 2017, said Q1, the growth rate of Cambodia tourism statistics approximates 2.1% comparing to those of 2015 and 2016 about to 5% and 6.1% respectively. The tourism trend increases significantly due to the industry being considered as one of the crucial sectors in boosting economic growth and development. On the other hand, Tourism Development Strategic Plan 2012-2020 have been executed with the goal of attracting international tourists through the connectivity, safety and security, marketing and facilitation of tourist transportation. In 2000, tourist arrivals account for 2.51 million, the amount reaches to almost 5.01 million in 2016. The growth rate is approximated 11.9% in the first quarter of 2017/2016. According to the research, 80% have visited Cambodian land once per time and 20% are likely to return after the first enter.

Analysis the factors affecting tourism demand jumped to confirm the crucial function of social-economics and macroeconomics factors in determining the tourism flow to the host country. Within this, currency exchange rate has consistently been used in modelling international tourism demand (Song and Li 2008). Song and Li (2008) compiled more than 100 research papers on tourism demand modelling and forecasting has determined the most vital and popular tourism demand determinants such as income, prices, substitute prices, and exchange rates. Tourism price is a predominant factor in tourism demand literature travelers are sensitive to exchange rates (Crouch 1995; Dwyer *et al.* 2002; Önder, Candemir, Kumral 2009; Patsouratis, Frangouli, Anastasopouls 2005).

Most of the studies have focused on quantitative estimates the determinants of tourism demand function (Crouch, 1995; Johnson and Ashworth 1990; Lundberg, Krishnamoorthy, Stavenga 1995); (Lim 1997; Li *et al.* 2005; Song and Li 2008; Martin and Witt 1987).

In the empirical evidences, the relative price is normally employed in the tourism demand model is the ratio of the consumer price indexes (CPI) between the destination and origin countries, adjusted by the bilateral exchange rate. Empirically, an appreciation of the exchange rate, applying the higher of the exchange rate in favor of organizing country's currency resulted in an increasing number of tourists visiting the destination country from the country of origin. In this regard, the existing literature tends to confirm the negative link between relative prices and tourist arrivals; however, the magnitude of the effects is also reported to differ and is at times insignificant (Lim 1997). Therefore, in the case of Cambodia, how does exchange rate influence on the quantity of tourism demand due to seasonality trend?

The prime purpose of the study is to estimate and forecast tourism demand model with an exogenous exchange rate using seasonality approach. Secondly, it proposes to employ out of sample forecasting to quantum the measurement predictive accuracy. Therefore, the remainders of the study are structured as follows: 1st session is to present the introduction of the study whereas the 2nd one is to review some existing empirical research studies. The 3rd one is to design the empirical methodology and data collection. The 4th session is to interpret the empirical outcome and the last one 5th is to make the conclusion following by suggestions for the future research.

1. Reviewing Existing Empirical Studies

Time series usually establishes in the form of autoregressive (AR) and moving average (MA) or single trend of either AR or MA or the nonexistence. The so-called ARIMA models are, the most general models using to estimating or forecasting from which can convert to be "stationary" by differencing method. The class of methods is supplementary to nonlinear transformations such as logging or deflating. Particular attention is paid to explore the historical trends and patterns of the series such as random trend and walk, non-seasonality and seasonality in general. In particular, observed seasonality in economic and financial time series displays persistently and often changes in seasonal fluctuations (Breitung and Philip, 1998). This results in exhibiting the AR process with seasonal unit roots due to the observations periodically exhibit the seasonal patterns. Observation would appear seasonally if the spectrum of the process has peaks at certain frequencies, (Xiangli Meng, 2012). With this phenomenon, the seasonal unit roots of (Hylleberg, 1990) takes into account and detects the unit roots toward the seasonality trend. Time series models have been extensively employed in modelling and forecasting tourism demand with integrating between AR and MA, so-called an ARIMA model proposed by (Box and Jenkins, 1970). For the sake of the frequency, either simple ARIMA or seasonal ARIMA models can employ toward an increasing popularity over the last few years. Whilst the seasonality model is such a dominant feature of tourism analysis, decision makers are very much interested in the seasonal variation due to the presence of contradictory evidence. Xiaosheng Li (2013) confirmed that SARIMA model can perfectly fit the variation trend of the outpatient amounts.

In the line with tourism demand and exchange rate relationship, the empirical studies have suggested different evidences either the shock or volatility catalyst. The gap highlighted is important, although the number of the studies that actually examines the impact of exchange rate regimes on tourism demand can be counted, the evidence reveals the measurement of exchange rate plays an important role in determining international tourism flows. Some conversely find the non-impact of the exchange rate to tourism demand equally in various origin-destination scenarios (Zheng, 2011). In particular, there also exists the long run relationship between tourism demand and foreign exchange earnings, (Ruane, 2014), (Vita, 2014) and (Aktar, 2014). Multiple exchange rate regime effect and support the importance of maintaining a relatively stable price to attract tourism arrivals. The negative effect exchange rate of tourist inflows is detected as well (Agiomirgianakis, 2014). Thus, there is the broadband of either positive, negative or insignificant impact of the exchange rate to tourism demand.

To account for dynamism in tourism flows with a dynamic time series analysis, Seetanah (2015) employed the so-called vector autoregressive model (VAR) to study the impact of relative prices on tourism demand for Mauritius. The empirical outcomes reveal that relative price has a long run impact on international tourism flows which is indicated tourists are sensitive to price levels. The relative average cost in the different competing destination reports to be positive and significant. It is indicated that the impact of relative price changes in foreign destinations competing with Mauritius tourism matters. Tourism infrastructure, income of the origin country and the island's level of development are confirmed to be key factors in the tourist selection decision. Finally, overall, short-run estimates confirm the above results.

Martins, Gan and Ferreira-Lopes (2015) and Gan (2015) investigates the relationship between macroeconomic indicators and the tourism industry from 218 panel countries during the period of 1995 to 2012. Tourism demand is measured by the inbound visitors and the on-the-ground expenditure and the economic variables include exchange rate, relative CPI and the World GDP. Partial results confirm that a depreciation of the national currency and a decline of relative prices do help boosting the number of arrivals and the correspondent expenditure level. In particular, the exchange rate is not always positively related to tourism demand, which is not consistent to the previous researches. At the same time, the relative prices are always significant in the models and with the expected negative sign.

Quadri and Zheng (2010) using Italy's data to examine the connection between exchange rates and international arrivals suggests that exchange rates do not universally affect international tourism demand. It exhibits disparate levels of significance in determining international arrivals to Italy. In eleven of the nineteen nation pairs, exchange rates resulted in insignificance, contradicting previous studies (Crouch 1995) and prevailing assumptions.

Lee *et al*. (1996) estimates the demand from inbound tourism expenditures for South Korea from eight tourists-originating countries using annual time series data between 1970 and 1989. The log-log specification is applied and estimated by OLS estimation. Tourist income and prices and political unrest, economic recessions and mega events are considered as major determinants. The empirical results discloses that income has positive and significant influence, while prices have a negative and significant impact, and the exchange rates have positive signs for all the countries except for the UK. Conversely, the dummy variables turn to be insignificant connection.

2. Empirical Estimation Methodology

2.1. Data Calculation and Statistical Tests

To estimate the baseline specification equation in line with both simple OLS and seasonality model, the study employs tourist arrivals as the proxy of tourism demand, denoting as TD_t, per capita real GDP as tourism incomes. Yet, since per capita real GDP is extracted annually, to obtain the quarterly one though, the study applies the interpolation method to expand it to quarter data. Exchange rate as the proxy of tourism price and an exogenous factor in the study, indicating as EX_t. Indeed, TD_t is extracted from tourism statistic reports of Statistics and ICT Department, Ministry of Tourism, Cambodia. EX_t and tourism income are obtained from the Asian Development Bank (ADB). All variables are jumped from the 1st quarter of the 2000 to the 2nd quarter of 2017 and converted to the logarithm function. As the result, the descriptive statistics presents in table 1 as follows.

Table 1. Descriptive statistics of tourism demand and exchange rate

Description	With logarithm function		
	$lnTD_t$	$lnEX_t$	$lnIncome_t$
Observations	70	70	70
Percentiles (50%)	13.2069	8.3190	6.6043
Mean	13.0702	8.3160	6.4799
Standard Deviation (SD)	0.7688	0.0280	0.4861
Min	11.5436	8.2507	5.7061
Max	14.2232	8.3654	7.2368
Variance	0.5911	0.0008	0.23631
Skewness	-0.4023	-0.6666	-0.2052
Kurtosis	2.0611	3.1425	1.6766
Shapiro – Walk test	2.590 (0.0048)	2.700 (0.0035)	3.145 (0.0008)
Unit roots test with trend			
ADF test at level, I(0)	-4.542** (0.0013)	-2.652 (0.2568)	-0.455 (0.9006)
ADF test at first difference, I(1)	-8.275*** (0.0000)	-6.876*** (0.0000)	-10.536*** (0.0000)

*Source: Author's estimates and * p<0.05, ** p<0.01, *** p<0.001*

Table 1 indicates the total observations of all selected variables are 70, SD reports 0.7688, 0.0280 and 0.4861 for $lnTD_t$, $lnEX_t$ and $lnIncome_t$ respectively. This indicates that the disparity of the dataset from TD is higher rather than those of tourism income and price. Furthermore, $lnTD_t$, $lnEX_t$ and $lnIncome_t$ present 11.54,

14.22 and 5.7061 and 8.25, 8.36 and 7.24 for minimum and maximum value respectively. All variables have a negative value of Skewness statistics. This somehow suggests the non-normality of observation whereas Kurtosis flows in the gaps of 2.06, 3.14 and 1.68 for $\ln TD_t$, $\ln EX_t$ and $\ln Income_t$ respectively. The Shapiro-walk statistics for detecting normality assumption under the null hypothesis where the sample is normal distribution, can reject the null at 5% level of significance. It accordingly denotes that $\ln TD_t$, $\ln EX_t$ and $\ln Income_t$ are not come from the normal distribution. Moreover, to test whether data series is stationary at level, I(0) or first difference, I(1), Fisher unit roots based ADF with trend is employed. The results show that series at I(0) cannot reject at 5% level. It conversely rejects at 1% level of significant whereas it is transferred to I(1).

2.2. Baseline Regression Equation: Tourism Demand Model and Exogenous Exchange Rate

To estimate the relationship between tourism demand and exchange rate toward the seasonality trend, the study builds the baseline specification equation with respect to tourism demand model whereas tourism income and price is controlled as follows:

$$(\text{Tourism Demand}_t) = \alpha + \beta[\text{Income}, \text{Price}]_t^{(\frac{1}{T})} + \gamma \text{Seasonality}_t + \varepsilon_t \tag{1}$$

where, Tourism Demand_t indicates tourism demand, using total tourist arrivals and exchange rate respectively. $[\text{Income}, \text{Price}]_t$ refer to the tourism income and price. The subscribed of (1/T) refers to decomposing period in three different path. Equation (1) will estimate primarily by simple OLS estimator with robust standard error (SE). The dummy variables of seasonality are followed, (Jintanee *et al.*, 2011):

- $D_1 = 1, D_2 = D_3 = D_4 = 0 \Rightarrow Q_1 = \text{January} - \text{March}$
- $D_2 = 1, D_1 = D_3 = D_4 = 0 \Rightarrow Q_2 = \text{April} - \text{June}$
- $D_3 = 1, D_1 = D_2 = D_4 = 0 \Rightarrow Q_3 = \text{July} - \text{September}$
- $D_4 = 1, D_1 = D_1 = D_3 = 0 \Rightarrow Q_4 = \text{October} - \text{December}$

The decomposing period into three different path, namely the pre-global financial crisis (Pre-GFC), global financial crisis (GFC) and post-global financial crisis (Post-GFC). These three are decomposed by time length as follows:

- Pre – global financial crisis (Pre – GFC): 2000Q1 – 2007Q4
- Global financial crisis (GFC): 2008Q1 – 2009Q4
- Post – global financial crisis (post – GFC): 2010Q1 – 2017Q1

Theoretical and empirical time series models explain a variable toward either its own past or a random disturbance term. Sequentially, following the mathematical illusion of seasonal ARIMA with an kth matrix of exogenous factors and its parameters of SARIMAX (p, d, q) – (P, D, Q)$_s$ – (b). The seasonal ARIMA model equates as follows:

Let's first consider a series TD_t as tourism demand to Cambodia with an autoregressive of 2 lags, say $(t-2)$ as below:

$$TD_t = \emptyset TD_{t-1} + \varepsilon_t \tag{2}$$

$$TD_t = \emptyset(\emptyset TD_{t-2} + \varepsilon_{t-1}) + \varepsilon_t \tag{3}$$

$$= \emptyset^2 TD_{t-2} + \varphi\varepsilon_{t-1} + \varepsilon_t \tag{4}$$

Consequently, the equation (4) can be rewritten into an infinite process of p and q lag between AR and MA order of parameters as follows:

$$TD_t = \emptyset^p TD_{t-p} + \varphi^{q-1}\varepsilon_{t-q} + \cdots + \varphi\varepsilon_{t-1} + \varepsilon_t \tag{5}$$

From equation (5), it can derive the full equation of SARIMAX (p, d, q) – (P, D, Q)$_s$ – (b). In the study of (Box and Jenkins, 1970), SARIMAX (p, d, q) – (P, D, Q)$_s$ with controlling of exogenous variables as suspected that residuals may exhibit a seasonal trend or pattern. It is presented that, let's consider though a matrix set of the exogenous variables as bellows:

$$\omega_t = TD_t - \beta_1 x_{1,t} - \beta_2 x_{2,t} - \cdots - \beta_b x_{b,t} \tag{6}$$

Thus, we get sequentially the following equation:

$$\left(1 - \sum_{i=1}^{p} \emptyset_i L^i\right)\left(1 - \sum_{j=1}^{P} \Phi_j L^{j \times s}\right)(1 - L^d)(1 - L^s)^D \omega_t - \eta$$

$$= \left(1 + \sum_{i=1}^{q} \varphi_i \, L^i\right)\left(1 + \sum_{j=1}^{Q} \Omega_j \, L^{j \times s}\right)\varepsilon_t \qquad (7)$$

where,

- L is the lag operator
- D is the seasonal integration order of the time series
- s is the seasonal length, it is equaled to 4 as denoted as quarter within a year
- TD_t is the observed output at time t which is applied tourism demand to Cambodia
- $x_{k,t}$ is the kth exogenous input variable at time t which is used as dollarization variable
- β_k is the coefficient value for the kth exogenous (explanatory) input variable
- b is the number of exogenous input variables
- ω_t is the auto-correlated regression residuals
- p is the order of the non-seasonal AR component
- P is the order of the seasonal AR component
- q is the order of the non-seasonal MA component
- Q is the order of the seasonal MA component
- η is a constant in the SARIMA model
- ε_t is the innovation, shock or error term at time t and follow a Gaussian distribution, $\varepsilon_t \sim i.i.d \sim \Phi(0, \sigma^2)$

2.3. HEGY Seasonal Unit Roots Test

A stationary seasonal process can be denoted as an autoregressive model (Depalo, 2009). Therefore, the study denotes it in line with TD_t, EX_t and Income_t as follows:

$$\emptyset(L)[TD_t, EX_t, \text{Income}_t] = \varepsilon_t \qquad (8)$$

With all the roots of $\emptyset(L)$ outside the unit circle (but some come in complex pairs). If $s = 4$, then a stationary seasonal process is $[TD_t, EX_t, \text{Income}_t] = p(L^4)[TD_t, EX_t, \text{Income}_t] + \varepsilon_t$, where L is the lag operator and $(L^4)[TD_t, EX_t, \text{Income}_t] = [TD_{t-4}, EX_{t-4}, \text{Income}_{t-4}]$. If some of the roots lie on the unit circle, the process is an integrated seasonal process, (Hylleberg, 1990). According to Depalo (2009), the test is based on the following equation:

$$\emptyset(L)[TD_t, EX_t, \text{Income}_t] = \pi_1\big[TD_{1,t-1}, EX_{1,t-1}, \text{Income}_{1,t-1}\big] +$$
$$\pi_2\big[TD_{2,t-1}, EX_{2,t-1}, \text{Income}_{2,t-1}\big] +$$
$$\pi_3\big[TD_{3,t-2}, EX_{3,t-2}, \text{Income}_{3,t-2}\big] +$$
$$\pi_4\big[TD_{4,t-1}, EX_{4,t-1}, \text{Income}_{4,t-1}\big] + \varepsilon_t \qquad (9)$$

where

- $\big[TD_{1,t}, EX_{1,t}, \text{Income}_{1,t}\big] = (1 + L + L^2 + L^3)[TD_t, EX_t, \text{Income}_t]$
- $\big[TD_{2,t}, EX_{2,t}, \text{Income}_{2,t}\big] = -(1 - L + L^2 - L^3)[TD_t, EX_t, \text{Income}_t]$
- $\big[TD_{3,t}, EX_{3,t}, \text{Income}_{3,t}\big] = (1 - L^2)[TD_t, EX_t, \text{Income}_t]$
- $\big[TD_{4,t}, EX_{4,t}, \text{Income}_{4,t}\big] = (1 - L^4)[TD_t, EX_t, \text{Income}_t]$

And $\pi_i s$ are the coefficient for seasonal unit roots, for example:

$$\big[TD_{1,t}, EX_{1,t}, \text{Income}_{1,t}\big] = (1 + L + L^2 + L^3)[TD_t, EX_t, \text{Income}_t]$$
$$= (1 - L)(1 + L + L^2 + L^3)[TD_t, EX_t, \text{Income}_t]$$
$$= (1 - L^4)[TD_t, EX_t] \qquad (10)$$

It is worthy noted that at root $1 - L$ the test is on coefficient $\pi_1 = 0$, at seasonal root $1 + L$ the test is on coefficient $\pi_2 = 0$ and at seasonal root $1 + L^2$ the test is joint on coefficients $\pi_3 = \pi_4 = 0$.

2.4. Method of Measurement Predictive Accuracy

The most frequency adoptions of the measurement predictive accuracy are root mean squared error (RMSE), mean absolute error (MAE), mean absolute percentage error (MAPE) and Theil's inequality index (U). Let's assume therefore the forecast sample is $j = T + 1, T + 2, \ldots, T + h$, and denote the actual and

forecasted value in the period t as TD_t and $\widehat{TD}_t$ respectively. The forecast evaluation measures are defined as follows:

$$\text{RMSE} = \sqrt{\sum_{t=T+1}^{T+h}(\widehat{TD}_t - TD_t)^2/h} \tag{11}$$

$$\text{MAE} = \frac{1}{T}\sum_{t=T+1}^{T+h}\left|\widehat{TD}_t - TD_t\right| \tag{12}$$

$$\text{MAE} = \frac{1}{T}\sum_{t=T+1}^{T+h}\left|\frac{\widehat{TD}_t - TD_t}{|TD_t|}\right| * 100 \tag{13}$$

$$\text{Theil's U} = \frac{\sqrt{\sum_{t=T+1}^{T+h}(\widehat{TD}_t - TD_t)^2/h}}{\sqrt{\sum_{t=T+1}^{T+h}(\widehat{TD}_t)^2/h} + \sqrt{\sum_{t=T+1}^{T+h}(TD_t)^2/h}} \tag{14}$$

3. Empirical Estimated Results and Discussions

This session is to interpret the empirical outcomes from estimating and forecasting towards the baseline regression and SARIMAX model. The study primarily detects the seasonal unit roots followed the method of (Hylleberg, 1990) and (Depalo, 2009). Secondly, examining the effect of exchange, tourism price and seasonal dummy variables through the SARIMAX model of (Gerolimetto, 2010), (Kritharas, 2013) and Peiris (2016). Exchange rate and tourism price are assumed to be an exogenous.

3.1. Primarily Analysis of Seasonal Unit Roots Tests

The HEGY test for seasonal unit roots and HEGY Quarterly seasonal unit root test are employed using 4 lags. The results are reported in table 2, 3 and 4 as bellows. Table 2 indicates the HEGY test of tourism demand, income and price variables.

The table displays the component of frequency in two main pieces, say the empirical test in the upper panel and the regression results table in the lower panel as reported in table 3 for tourism demand variable and table 4 for exchange rate variable. The sample of interpretation of this method can be found in Depalo (2009). Based on the study of Depalo (2009) specifies that from the lower panel it is helpful to have a look at regression results because there are four important components. Therefore, the results from table 3 and 4 is estimated from those of table 2. The first four regressors are crucial for the test statistics. The second component is the set of lagged values, which are included in an attempt to remove serial correlation in ε_{it}. Third are the deterministic components, namely a trend and a set of seasonal dummies. The set of seasonal dummies automatically drops the last quarter because of multicollinearity. Fourth, there is the constant term. According to Depalo (2009) the test for unit roots at all seasonal frequencies and the test for unit roots at all frequencies are also F-type; thus, the decision is based on the same rule of the annual frequency. Therefore, from table 3 and 4 empirical result from HEGY test for seasonal unit roots at lag (4) for tourism demand and exchange rate series respectively. For table 3 indicate that for tourism demand series, there is no significance of almost four components for tourism demand series. The test cannot reject at both frequency 0 with p – value of 0.6970 and also at the annual frequency with p-value of 0.9030. Thus, the evidence indicates that Cambodia tourism demand has a unit root at frequency zero, as could be inferred from the classical Dickey–Fuller test.

Conversely, table 4 discloses that there exists few for exchange rate series of regression result. For the exchange rate series, at frequency 0 and 1, it shows the significance, say the p-value is 0.0180 and 0.0190 respectively. The annual components also show the significance at level and at lag 1, say the p-value is 0.0040 and 0.420 respectively. Thus, the evidence indicates that the Cambodia exchange rate does not contain a unit root at frequency zero and also one at frequency 1/2 (or biannual) and the other at annual frequency.

Hence, due to the HEGY test for seasonal unit roots for both tourism demand and exchange rate series with lower and upper panel indicate the statistical significance explains the failure of rejection of time series has unit roots at frequency 0 for tourism demand and succeed for the exchange rate at both frequency zero and one at frequency 1/2 (or biannual) and the other at annual frequency.

Next, the study employs seasonal unit roots test using the HEGY quarterly. The study detects the seasonal unit roots by 4 lags. The result in table 4 shows that 62 observations and the time seasonality as a matrix from P_{i1}, P_{i2}, P_{i3} and P_{i4} towards F[4-1] statistics are reported as well. Seasonality is a significant component in tourism data series. Hence, HEGY test in equation (4) applied to monthly international tourist arrivals in order to obtain an accurate estimate about the seasonal component. Due to the empirical data demonstrates a trend

component, trend variable is included in the estimation for the purpose of handling the deterministic trend. HEGY test though involves seasonal dummies, an intercept, lag and trend of the series.

Table 2. HEGY test for seasonal unit roots at lag(4)

Description	TA		EX		Income	
	Test statistics	5% critical	Test statistics	5% critical	Test statistics	5% critical
Z(t) – Frequency 0	-0.391	-3.53	-2.437	-3.53	-1.448	-3.53
Z(t) – Frequency 1/2	-1.378	-2.94	-2.428	-2.94	-0.803	-2.94
Z(t) - L.Annual	-0.367	-3.48	-0.738	-3.48	-0.902	-3.48
Z(t) – Annual	-0.122	-1.94	-3.015	-1.94	-0.745	-1.94
Joint Annual	0.076	6.6	4.943	6.6	0.689	6.6
All seasonal frequency	0.691	5.99	6.268	5.99	0.691	5.99
All frequencies	0.565	6.47	-2.437	-3.53	1.016	6.47
Number of observations	62		62		62	

Source: Author's estimates

Table 3. Estimated regression from seasonal unit roots test at lag(4)

Description	TD Estimated Coefficients	EX Estimated coefficients	Income Estimated coefficients
Frequency 0	-0.0151 (-0.39)	-0.0597* (-2.44)	-0.0239 (-1.45)
Frequency ½	-0.168 (-1.38)	-0.410* (-2.43)	-0.0560 (-0.80)
L.Annual	-0.0212 (-0.37)	-0.0910 (-0.74)	-0.0631 (-0.90)
Annual	-0.00705 (-0.12)	-0.368** (-3.02)	-0.0521 (-0.75)
LD.	0.529** (3.16)	0.408* (2.09)	0.738*** (4.88)
L2D.	-0.0770 (-0.41)	-0.154 (-0.78)	0.00831 (0.05)
L3D.	0.0432 (0.23)	-0.0367 (-0.20)	0.00973 (0.05)
L4D.	-0.215 (-1.39)	0.0412 (0.34)	-0.0558 (-0.39)
Trend	n/a	n/a	n/a
Q1	n/a	n/a	n/a
Q2	0.0477 (0.34)	-0.0211 (-1.51)	-0.0194 (-0.68)
Q3	0.0003 (0.05)	0.00001 (0.09)	0.0021 (1.31)
Constant term	0.866 (0.48)	1.988* (2.44)	0.561 (1.54)
Number of observations	62	62	62

*Source: Author's estimates * p<0.05, ** p<0.01, *** p<0.001, t – statistics in the parenthesis*

Table 4. HEGY Quarterly seasonal unit root test at lag(4)

Description	TA		Test statistics		EX	
	Test statistics	5% critical	Test statistics		Test statistics	5% critical
t[Pi1]	-0.76	-3.662	-2.422	-3.648	-1.165	-3.648
t[Pi2]	-3.96	-3.042	-3.984	-3.032	-4.416	-3.032
t[Pi3]	-2.947	-3.612	-2.386	-3.598	-4.506	-3.598
t[Pi4]	-3.146	-1.918	-6.115	-1.92	-4.274	-1.92
F[3-4]	12.063	6.563	26.463	6.567	29.122	6.567
F[2-4]	21.696	6.063	66.105	6.055	57.403	6.055
Number of observations	62		62		62	

Source: Author's estimates

3.2. Estimation of Baseline Specification Equation and Seasonal Model

Next, examination the correlation between tourism demand and exogenous exchange rate with an interaction of dummy multiplying of exchange rate towards three different periods is adopted using simple OLS with robust SE. Table 5 reports that model (1) to (5) estimate EX to TD with and without seasonality effect and control tourism price.

Table 5. Tourism demand regression with exchange rate

TA is an explained variable	Baseline regression model				
	(1)	(2)	(3)	(4)	(5)
Tourism income	1.461*** (23.33)	1.757*** (22.23)	1.537*** (36.23)	1.565*** (22.39)	1.460*** (36.93)
Exchange rate	2.157* (2.34)				2.296*** (3.84)
Exchange rate x Pre – GFC		0.0298*** (4.55)			
Exchange rate x GFC			-0.0120** (-3.30)		
Exchange rate x Post – GFC				-0.00495 (-0.77)	
Seasonality at D_1		-0.0617 (-1.80)	-0.0595 (-1.45)	-0.0587 (-1.38)	-0.0367 (-0.93)
Seasonality at D_2		-0.369*** (-7.27)	-0.367*** (-6.72)	-0.366*** (-6.54)	-0.352*** (-6.86)
Seasonality at D_3		-0.251*** (-7.79)	-0.251*** (-6.53)	-0.251*** (-5.92)	-0.257*** (-6.46)
Constant term α	-14.34 (-1.92)	1.746** (3.25)	3.295*** (11.61)	3.116*** (7.17)	-15.32** (-3.14)
F – statistic	417.97***	373.99***	313.84***	344.58***	408.24***
Adjust R^2	0.9356	0.9740	0.9700	0.9685	0.9731
Number of Observations	70	70	70	70	70

Source: Author's estimates
*Robust t statistics in parentheses and * p<0.05, ** p<0.01, *** p<0.001*

It is observed that tourism income and exchange rate still hold its statistical significance in explaining tourism demand even though the estimation considers with and without seasonality effect. F-statistic discloses that all proposed models are methodologically modified. More importantly, it is likely suggesting that for model (1), a 1% increase of EX and tourism income, making a change of TD by 2.16% and 1.46% respectively. The positive of EX to TD proposes that as income per capita is rising year-on-year, an increasing of exchange rate does not strongly affect to travel decision. Secondly, since Cambodia's exchange rate moves in the lower gap towards low inflation, this presents exceptionally perception. Moreover, the exchange rate has a high magnitude in both estimating and forecasting tourism demand. Thus, any fluctuation of exchange rate can result in increasing tourism demand to Cambodia. But it may take some time to consider before or once they affect to tourist flow in Cambodia during the period of economic or financial crisis as showed in model (3), EX does negatively affect to TD. It reflects that 1% increase of EX, make a change of reduction TD by 0.012%. Indeed, Ex after crisis does

not have any power in exerting TD. This somehow discloses the facts that after the crisis, the economy is recovered resulted of an increasing of tourist arrivals.

More importantly, closely capture to the regression with both seasonal and dummy, it indicates that the seasonality D1 does not affect TD whereas seasonality D2 and D3 do affect to TD. Seasonality D4 is dropped due to multicollinearity. It suggests the key policy between low and high season of tourist travel. Noteworthy, where the estimated regression interacted with seasonality, EX reveals insignificant impacts to TD.

Next, different SARIMAX models are employed. Herewith, the exchange rate is assumed to be exogenous. Parameter orders of AR and MA are detected differently toward the graphical method obtained from both ACF and PACF. The study estimates the seasonal trend at 12 lags resulting of 12 lags of seasonality containing in the models. From model (1) to (8), different orders of AR and MA parameter such as 1, 2, 3 or 4 are proposed.

Table 6. One-step ahead out of sample forecasting with seasonality model (>2013q4 – 2017q2)

Description	SARIMAX (p, d, q) – (P, D, Q, S)$_{12}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exogenous factor								
Tourism income	-1.038	-0.855	-0.914	-0.837	-0.711	-0.745	-0.721	-1.474
	(-0.95)	(-0.84)	(-1.41)	(-1.04)	(-1.09)	(-1.05)	(-1.00)	(-1.37)
EX	-0.460	-0.460	-0.277	-0.418	-0.217	-0.408	-0.429	0.0650
	(-0.53)	(-0.52)	(-0.42)	(-0.57)	(-0.41)	(-0.70)	(-0.69)	(0.10)
AR parameters								
$\emptyset_1$	-0.0602	-0.0268	-0.108	-0.0621	-0.192	-0.128	-0.0088	-0.93***
	(-0.49)	(-0.20)	(-0.81)	(-0.44)	(-1.28)	(-0.83)	(-0.01)	(-5.83)
$\emptyset_2$			-0.333*	-0.314	-0.380*	-0.343*	-0.334	-0.96***
			(-2.20)	(-1.82)	(-2.36)	(-2.02)	(-1.74)	(-4.90)
$\emptyset_3$					-0.239	-0.189	-0.153	-0.79***
					(-1.39)	(-0.98)	(-0.43)	(-4.26)
$\emptyset_4$								-0.405*
								(-2.31)
MA parameters								
φ_1	-1.000	-1.000	-1.000	-1.000	-1.000	-1.000	-1.124	
	(n/a)	(-0.00)	(n/a)	(-0.00)		(n/a)	(n/a)	
φ_2							0.124	
							(0.11)	
Seasonal parameters								
Φ_1	-0.67***	-0.379*	-0.68***	-0.45**	-0.71***	-0.51***	-0.51**	-0.71***
	(-10.58)	(-2.28)	(-10.76)	(-3.12)	(-11.90)	(-3.77)	(-3.21)	(-12.40)
Ω_1		-0.523		-2.234		-0.404	-0.412	
		(-1.53)		(-1.38)		(-1.28)	(-1.19)	
η	0.12***	0.115	0.12***	0.0492	0.11***	0.11***	0.107	0.12***
	(12.48)	(0.00)	(11.17)	(0.01)	(10.65)	(8.15)	(1.61)	(9.84)
Constant	-0.0011	-0.0013	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(-1.16)	(-0.81)	(-1.05)	(-0.86)	(-0.96)	(-1.19)	(-1.15)	(-0.35)
AIC	-51.55	-51.57	-54.60	-54.36	-55.03	-56.00	-54.04	-48.27
BIC	-39.39	-35.37	-40.43	-36.13	-38.83	-37.77	-33.79	-30.05
Log likelihood	31.77	33.79	34.30	36.18	35.52	37.00	37.02	33.14
Wald Chi(2)	126.85	24.18	147.52	17.34	184.37	62.51	61.57	238.86
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Number of Obs.	56	56	56	56	56	56	56	56

*Source: Author's estimates and t statistics in parentheses and * p<0.05, ** p<0.01, *** p<0.001 and the statistical value inside the bracket refers to the p – value.*

As the result, table 6 shows that the suggested models are correctly modified due to the statistical significance of the Wald chi(2) at 1% with the total observations of 56. Capturing from ACF and PACF graphics, it reveals that the parameter orders of AR and MA should flow from 1 to 4 and/or 1 to 2 respectively. Model (1), (2), (3), (4), (5), (6), (7) and (8) replace SARIMA (1, 1, 1) – (1, 1, 0)$_{12}$, SARIMA (1, 1, 1) – (1, 1, 1)$_{12}$, SARIMA (2, 1, 1) – (1, 1, 0)$_{12}$, SARIMA (2, 1, 1) – (1, 1, 1)$_{12}$, SARIMA (3, 1, 1) – (1, 1, 0)$_{12}$, SARIMA (3, 1, 1) – (1, 1, 1)$_{12}$, SARIMA (3, 1, 2) – (1, 1, 1)$_{12}$ and SARIMA (4, 1, 0) – (1, 1, 0)$_{12}$ respectively. It is undoubtedly that sigma reveals a statistical significance for all models. It conversely, most of the AR and MA coefficient parameters do not reveal

a significant explanation. It is as unexpected once exchange rate is assumed to be an exogenous, it discloses an insignificant explanation to tourism demand. Again, most of AR and MA coefficients of both non-seasonal and seasonal adjustment does not expose a statistical significance. More importantly, the study notifies that once AR and MA take place in order 1, the coefficient parameters reveal a significant relationship. Still, due to information criteria, namely AIC and BIC show that SARIMA $(4, 1, 0) - (1, 1, 0)_{12}$ is the best accuracy model. AIC and BIC report -48.27 and -30.05 respectively, for model (8). Shortly, to obtain measurement predictive accuracy, these models are employed in the next session.

3.3. Robustness Checking of Out of sample Forecasting

This session, the study adopts the post-estimation method of seasonal model from 2000Q1 to 2013Q4, and then applies an out of sample ex-post forecasting from 2012Q4 to 2017Q2. Due to an availability of post-estimation models, only model (1), (2), (5), (6) and (8) are employed. The results show in table 7 that RMSE reports 13.9766, 13.9740, 1.005, 54.0624 and 13.9766 of the model (1), (2), (5), (6) and (8) respectively. This suggests accordingly model (5) or SARIMA $(3, 1, 1) - (1, 1, 0)_{12}$ is the best fitted model due to the smallest value of RMSE. Therefore, to perform long run ex-ante forecasting of tourism demand toward an exogenous factor of exchange rate and tourism price, tourism policy modeler in the case of Cambodia is persuaded to apply a seasonal model due to AR and MA parameters such as SARIMA $(4, 1, 0) - (1, 1, 0)_{12}$ since it produced the small gaps of error from estimation and prediction.

Table 7. One-step ahead out of sample forecasting with seasonality model (>2013q4 – 2017q2)

Description	RMSE	MAE	MAPE	U Index
Model (1)	13.9766	13.9741	13.9787	13.9755
Model (2)	13.9740	13.9715	13.9761	13.9730
Model (5)	1.0005	1.0003	1.0006	1.0004
Model (6)	54.0624	54.0525	54.0685	54.0561
Model (8)	13.9766	13.9741	13.9787	13.9755

Source: Author's estimates
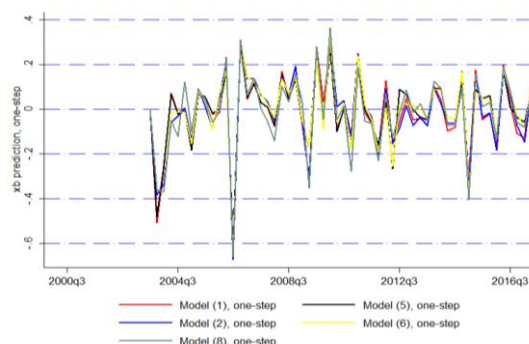
Source: Author's estimates

Figure 1. Residual prediction from one step ahead (elaboration from table 6)

Conclusion

Time series persistently contains a seasonal process in the orders of the parameters, say an autoregressive and moving average process. Using simple OLS and seasonal ARIMAX model to estimate the relationship between tourism demand and exchange rate in Cambodia during the quarterly period from 2000Q1 to 2017Q2, the empirical outcomes reveal the explanatory power of both tourism income and exogenous exchange rate in exerting tourism demand. The exchange rate in the period of the global financial crisis, on the other hand, is negative affected to tourism demand. This suggests tourist travelling to Cambodia is sensitive to currency valuation during the crisis. Furthermore, the estimated parameters have the sign expected, the magnitude is consistent to most of the empirical study due to the significance of F-statistics and a high level of a goodness of fit. Again, the results suggest that tourism demand in Cambodia can be described by the fluctuation of exchange rate. Simply, the empirical results reveal the uninfluenced of tourist arrivals change of previous seasonality on the present seasonality is negatively and statistically insignificance, this suggests there does not

exist the persistent effect of seasonality for tourism demand. The study comes up in providing some suggestions that tourism policy maker to focus on an uncertain factor which may affect to the past and current facts of tourism flows. On the other hand, modelling the seasonal ARIMAX with structural break, so far it will increase the accuracy of the model resulting in boosting the power of forecasting performance. More importantly, it should control more accuracy and conventional approach such as seasonal co-integration and seasonal VECM, (Hylleberg 1990) to analyses its long run equilibrium or relationship.

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16

WAGE INEQUALITY AND INNOVATIVE INTELLIGENCE-BIASED TECHNOLOGICAL CHANGE

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Abstract

In this paper, "innovative intelligence–biased technological change" (IIBTC) is examined as an alternative to the traditional concept of skill-biased technological change (SBTC) as a source of increases in wage inequality. The innovative intelligence of ordinary or average workers is an important element in productivity and can be heterogeneous across workers. Because technologies are heterogeneous in that they have different characteristics and are used in different situations, some technologies are "innovative intelligence-biased" and are advantageous for workers with relatively high innovative intelligence. If IIBTC prevails over a certain period of time, these workers become additionally advantaged and thereby wage inequality will increase during the period.

Keywords: wage inequality; innovative intelligence; technological change; total factor productivity; approximate effective production function

JEL Classification: D24; D63; J31.

Introduction

Until the early 2000s, the view that skill-biased technological change (SBTC) is the main cause of the recent increase in wage inequality was widely accepted (Katz and Murphy 1992; Autor *et al.* 1998, 2003). Explanations based on SBTC were often combined with the Stolper–Samuelson theorem (Stolper and Samuelson 1941). However, neither the original explanations nor those combined with the Stolper–Samuelson theorem have been sufficiently supported empirically (Leamer 1998; Card and DiNardo 2002; Goldberg and Pavcnik 2007).

It still seems likely that a change in the characteristics of technological change affects wages and wage inequality, although the mechanism behind the effect is most likely not SBTC. In many studies on wage inequality, there seems to be an implicit assumption that workers are differentiated only by skills that can be acquired by any worker at the same cost. That is, workers are heterogeneous only in whether they intentionally acquire skills or not. However, this view seems to be too simple and seems to neglect some important elements in worker heterogeneity. Under the assumption that the source of heterogeneity of workers is only acquirable skills, the number of skilled workers will be determined at equilibrium where the "net" income (income minus cost of acquiring skills) is equalized across workers. At equilibrium, the net incomes of skilled and unskilled workers become identical. Hence, the difference in wages between them must always be equal to the cost of acquiring skills, but this seems unrealistic. Therefore, it seems highly likely that workers are heterogeneous before they acquire skills; this scenario seems more realistic, because each individual worker is in fact different from all other

workers. In this paper, I focus on a different source of worker heterogeneity to examine wage inequality based on the model of total factor productivity (TFP) shown by Harashima (2009, 2016).

Harashima's model is constructed on the basis of ordinary or average workers' innovative intelligences, by which innovations for solving unexpected minor problems are created. The workers' innovative intelligences are an important element in TFP because the knowledge and technologies that humans currently possess are far from perfect; therefore, workers encounter many unexpected day-to-day and even minute-to-minute problems at production sites. Most of these unexpected problems will be minor, but they still have to be solved by creating innovations. TFP will vary depending on how many unexpected problems workers at production sites can solve. If workers' innovative intelligences are higher, they can solve more unexpected problems. That is, TFP depends on workers' innovative intelligences. An important point is that workers' innovative intelligences are naturally heterogeneous. In addition, workers' wages will differ depending on their innovative intelligences, because innovative intelligences are directly related to productivities. In other words, heterogeneity in innovative intelligences will generate wage inequality across workers.

Some technologies will be advantageous for workers with relatively high innovative intelligences and disadvantageous for workers with relatively low innovative intelligences. Therefore, the effectiveness of the innovative intelligences of workers will vary, and thereby their wages will vary depending on the types of technology used. If technologies that are advantageous for workers with higher innovative intelligence are introduced more frequently in a certain period of time, the wage inequality between workers with higher and lower innovative intelligence will increase during this period.

1. A Mechanism of Wage Inequality

1.1. Approximate Effective Production Function

In the TFP model of Harashima (2009, 2016), an essential element is the "approximate effective production function" (AEPF). This concept is based on ordinary or average workers' innovative intelligences—that is, the intelligences used to create innovations to solve unexpected problems. Innovative intelligence is essential for efficient production, as will be shown in Section 2.1.1.

The simplest form of AEPF is

$$Y = \bar{\sigma}\omega A^{\alpha}K^{1-\alpha}L^{\alpha} \quad , \tag{1}$$

where Y, A, K, and *L* are production, technology, capital inputs, and labor inputs, respectively; *ω* (> 0) is a parameter that indicates the productivity resulting from a worker's innovative intelligence and also represents the worker's ability to solve unexpected problems; $\bar{\sigma}(>0)$ is a parameter that indicates a worker's accessibility limit to capital with regard to location; and *α* (> 0) is a parameter that represents the experience curve effect. Because equation (1) has the same form as a Cobb-Douglas production function with regard to *α*, the parameter *α* can be interpreted as the labor share. In equation (1), let $T = \bar{\sigma}\omega A^{\alpha}$, which indicates TFP.

Suppose that there are two types of workers (HI and LI) who are identical except for their values of *ω*. Let ω_{HI} and ω_{LI} be the *ω* of HI and LI workers, respectively. HI workers have a higher innovative intelligence than LI workers and thereby $\omega_{HI} > \omega_{LI}$. HI and LI workers are not interchangeable with each other, and the numbers of them are exogenously given. Note that the reasons why workers have different values of *ω* and are not interchangeable are beyond the scope of economics and are the subject of studies in other fields. In this paper, I examine only what happens to wages when a technological change occurs to these exogenously given HI and LI workers.

Let L_{HI} and L_{LI} be the numbers of HI and LI workers, respectively, in an economy. Let L_S be a unit of the "size" of the economy, and initially $L_S = L_{HI} + L_{LI}$. In addition, let $S_{HI} = \dfrac{L_{HI}}{L_S}$ and $S_{LI} = \dfrac{L_{LI}}{L_S}$; thus, initially

$S_{HI} = \dfrac{L_{HI}}{L_{HI} + L_{LI}}$ and $S_{LI} = \dfrac{L_{LI}}{L_{HI} + L_{LI}}$. S_{HI} and S_{LI} can be interpreted as the sizes of the economies

composed of HI and LI workers, respectively. Capital inputs move perfectly elastically. By modifying the simplest form of the AEPF (equation [1]), the production function of the economy can be described as

$$Y = \bar{\sigma}AK^{1-\alpha}\left(\omega_{HI}L_{HI}^{\alpha}S_{HI}^{1-\alpha} + \omega_{LI}L_{LI}^{\alpha}S_{LI}^{1-\alpha}\right) \tag{2}$$

(see Harashima 2017). Equation (2) can be interpreted such that the economy is a combination of the economies composed of HI and LI workers. Let $\overline{L}_S$ be a unit of the size of the economy when the population density is optimal (thereby $\overline{L}_s$ is constant). In the long run, the population density is optimal (see Harashima 2017); therefore, by equation (2), the production function in the long run is

$$Y = \bar{\sigma}AK^{1-\alpha}\overline{L}_S^{\alpha-1}\left(\omega_{HI}L_{HI} + \omega_{LI}L_{LI}\right) . \tag{3}$$

The population density is assumed to be optimal initially; thereby, $\overline{L}_S = \overline{L}_{HI} + \overline{L}_{LI}$, where $\overline{L}_{HI}$ and $\overline{L}_{LI}$ are the initial values of L_{HI} and L_{LI}.

1.2. Inequality in Wages

Let w_{HI} and w_{LI} be the wages for HI and LI workers, respectively. Because $L_S = \overline{L}_S = \overline{L}_{HI} + \overline{L}_{LI}$ holds in the long run, w_{HI} and w_{LI} in the long run are, by equation (3),

$$w_{HI} = \frac{\partial Y}{\partial L_{HI}} = \bar{\sigma}\omega_{HI}AK^{1-\alpha}\overline{L}_S^{\alpha-1}$$

and

$$w_{LI} = \frac{\partial Y}{\partial L_{LI}} = \bar{\sigma}\omega_{LI}AK^{1-\alpha}\overline{L}_S^{\alpha-1} \ .$$

Hence, the following equation and inequalities are always true:

$$w_{HI} > 0 \ ,$$

$$w_{LI} > 0 \ ,$$

and

$$\frac{w_{HI}}{w_{LI}} = \frac{\omega_{HI}}{\omega_{LI}} > 1 \tag{4}$$

That is, in the long run, the ratio of w_{HI} to w_{LI} is constant and always equal to the ratio of ω_{HI} to ω_{LI}, and thereby

$$w_{HI} > w_{LI} > 0 \ .$$

2. Innovative Intelligence-Based Technological Change

2.1. A Model of Innovative Intelligence

2.1.1. Essential Role of Workers' Innovative Intelligences

The current state of knowledge and technologies is far from perfect and always will be. As a result, a large number of unexpected problems occur daily at every production site, although most of them are minor. These numerous unexpected minor problems must be solved by creating innovations, and it is the ordinary or average workers at production sites who do so. Therefore, ordinary workers' innovative intelligences are a significantly important element in TFP.

Workers also encounter, and have to fix, many unexpected minor problems, because it is impossible to provide workers with perfect manuals or to teach them everything about the technologies they use. Even if a manual for a technology is written in great detail, some parts of it will remain unwritten because it is too costly to make a perfect manual. The extent to which a manual is complete (or incomplete) depends on the balance between the cost of making the manual more complete and the increase in efficiency in production by making it more complete. The costs of producing a "thicker" manual include not only printing and other production costs, but also the cost of investigating the natures of an extremely large number of possible variations of rarely occurring minor incidents by experimenting with the problems the incidents generate. The cost of creating innovations to fix these problems individually will increase as the manual is made more complete. Therefore, a manual will be complete to the point where the marginal cost to enlarge it is equal to the consequent marginal increase in

productivity. As a result, a large part of the complete instructions to use any particular piece of technology will usually be left unwritten.

Because not only the technologies themselves but also their corresponding instruction manuals are imperfect, many unexpected minor problems are going to occur day by day and minute by minute at production sites, and ordinary or average workers at the sites must solve them. Workers' innovative intelligences (ω) therefore are essential for productivity.

2.1.2. The Model

Workers' innovative intelligences can be modeled on the basis of item response theory, which is widely used in psychometric studies (*e.g.*, Lord and Novick 1968; van der Linden and Hambleton 1997). In particular, the item response function is used to describe the relationship between abilities and item responses (*e.g.*, test scores or performances). A typical item response function is

$$\tilde{p}\left(\tilde{\theta}\right) = \tilde{c} + \frac{1 - \tilde{c}}{1 + \exp\left[-\tilde{a}\left(\tilde{\theta} - \tilde{b}\right)\right]} \; ,$$

where $\tilde{p}$ is the probability of a correct response (e.g., answer) to an item (e.g., test or question), $\tilde{\theta}$ ($\infty > \tilde{\theta} > -\infty$) is a parameter that indicates an individual's ability, $\tilde{a}$ (> 0) is a parameter that characterizes the slope of the function, $\tilde{b}$ ($\infty \geq \tilde{b} \geq -\infty$) is a parameter that represents the difficulty of an item, and $\tilde{c}$ ($1 \geq \tilde{c} \geq 0$) is a parameter that indicates the probability that an item can be answered correctly by chance.

As Harashima (2012) showed, on the basis of item response theory, the probability of a worker solving unexpected problems in a unit of time, $p(\theta)$, can be modeled as

$$p(\theta) = c + \frac{1 - c}{1 + \exp[-a(\theta - b)]} \; , \tag{5}$$

where θ ($\infty > \theta > -\infty$) indicates a worker's innovative intelligence, a (> 0) is a parameter that characterizes the slope of the function, b is a parameter that indicates the average difficulty of unexpected problems that workers have to solve, and c ($1 \geq c \geq 0$) is the probability that unexpected problems are solved by chance. As is evident from this function, the higher the worker's innovative intelligence (*i.e.*, the higher the value of θ), the higher the probability of solving unexpected problems in a unit of time.

Because ω in equation (1) indicates the worker's ability to solve unexpected problems by utilizing innovative intelligence, ω will be positively and monotonically correlated with $p(\theta)$; therefore, ω can be described as a function of θ. By equation (5), therefore, TFP in equation (1) (*i.e.*, $T = \bar{\sigma}\omega A^{\alpha}$) can be described as

$$T = \bar{\sigma}\omega A^{\alpha} = \left\{c + \frac{1 - c}{1 + \exp[-a(\theta - b)]}\right\}\bar{\omega}\bar{\sigma}A^{\alpha}$$

and thereby

$$\omega = \left\{c + \frac{1 - c}{1 + \exp[-a(\theta - b)]}\right\}\bar{\omega} \; , \tag{6}$$

where $\bar{\omega}$ is the unit of measurement and it is constant.

The innovative intelligence θ of each worker is assumed to be exogenously given and constant. Let θ_{HI} and θ_{LI} be θ of HI and LI workers, respectively, and $\theta_{HI} > \theta_{LI}$. Therefore,

$$\omega_{HI} = \left\{c + \frac{1 - c}{1 + \exp[-a(\theta_{HI} - b)]}\right\}\bar{\omega} \tag{7}$$

and

$$\omega_{LI} = \left\{c + \frac{1 - c}{1 + \exp[-a(\theta_{LI} - b)]}\right\}\bar{\omega} \tag{8}$$

Evidently, $\theta_{HI} > \theta_{LI} \Leftrightarrow \omega_{HI} > \omega_{LI}$.

2.2. Innovative Intelligence-Biased Technological Change

The parameter *c* (the probability of solving problems by chance) in equation (6) will be basically common to all workers and technologies, constant, and relatively small. The remaining parameters *a* and *b* will change with some types of technological changes. If their values are changed by a technological change, ω_{HI} and ω_{LI} will also change by equations (7) and (8), but they may change in different ways.

2.2.1. Effect of a Change in *a*

By equation (6),

$$\frac{d\omega}{da} = \frac{(1-c)\overline{\omega}(\theta-b)}{\exp[a(\theta-b)]+\exp[-a(\theta-b)]+2} \tag{9}$$

equation (9) indicates that $\frac{d\omega}{da}$ increases as *a* increases if $\theta > b$; conversely, $\frac{d\omega}{da}$ decreases as *a* increases if $\theta < b$. Because *b* is set at a level where most workers can use the technology properly, as discussed in Section 2.1.1, its value will be set relatively small, and thereby generally $\theta_{HI} > b > \theta_{LI}$. Therefore, as *a* increases, ω_{HI} increases but ω_{LI} decreases, which means that the importance of a worker's innovative intelligence (θ) in solving unexpected problems increases as *a* increases. Hence, an increase in *a* is advantageous for HI workers but disadvantageous for LI workers.

Note that if the value of *a* relative to the values of θ and *b* is sufficiently small, the effect of $\exp[a(\theta-b)]+\exp[-a(\theta-b)]$ in equation (9) is sufficiently smaller than that of $(\theta-b)$ in the numerator of equation (9) for a change in θ. In this case, if $\theta > b$, then for the larger θ, $\frac{d\omega}{da}$ increases to a greater extent as *a* increases. Conversely, if $\theta < b$, then for the smaller θ, $\frac{d\omega}{da}$ decreases to a greater extent as *a* increases. In this case, therefore, the property that an increase in *a* is advantageous for HI workers but disadvantageous for LI workers is amplified. Moreover, relatively small values of *a* are reasonable from the point of view of item response theory.

If the value of *a* is heterogeneous across technologies, therefore, the values of ω_{HI} and ω_{LI} vary depending on the characteristics of current technology *A* with regard to *a*. However, do technologies have heterogeneous values of *a*? They do, for the following reason. Suppose that there are 2 technologies; technologies 1 and 2. If technology 1 generates a larger number of varieties of minor unexpected problems than technology 2, workers' innovative intelligences will be more important for technology 1 than technology 2. That property means that technology 1 has larger values of *a* than technology 2 because the value of *a* is proportionate to the relative importance of worker's innovative intelligence. On the other hand, the number of varieties of minor unexpected problems a technology generates will not be common across technologies: that is, it will be basically heterogeneous across technologies. Therefore, the values of *a* will also be basically heterogeneous across technologies.

Regardless of the type of technology, a worker who has a relatively high innovative intelligence can use the technology more efficiently than a worker who has a relatively low innovative intelligence, so a worker with relatively high innovative intelligence is intrinsically in an advantageous position. In addition, if a technology has the property that it generates larger varieties of minor unexpected problems (i.e., has the larger value of *a*), the position becomes even more advantageous.

2.2.2. Effect of a Change in *b*

The level of difficulty in using a technology (*i.e.*, *b*) is set by the producer of the technology (or the producer of a machine or tool that embodies the technology), but *b* will not be set at a level where all workers can perfectly solve all unexpected problems generated by the technology because it is too costly to do so, as discussed in Section 2.1.1. The producer of the technology has to compromise and create an imperfect manual, which will be sufficiently useful for most, but not all, workers; therefore, some workers cannot use the technology sufficiently properly. Suppose that the difficulty *b* is set at a level at which the highest *h* (1 > *h* > 0) proportion of workers can solve unexpected problems at a rate above the probability *v* (1 > *v* > 0). Clearly, if *h* is smaller, *b* is larger, and

vice versa. The value of *h* will be smaller if the number of possible varieties of rarely occurring minor incidents generated by a technology is larger, because the manual becomes more imperfect (Section 2.1.1).

By equation (6),

$$\frac{d\omega}{db} = -\frac{a(1-c)\overline{\omega}}{\exp\,[a(\theta-b)] + \exp\,[-a(\theta-b)] + 2} \quad,$$

and thereby, for any *θ*,

$$\frac{d\omega}{db} < 0 \qquad\qquad\qquad\qquad\qquad (10)$$

Inequality (10) indicates that an increase in *b* decreases both ω_{HI} and ω_{LI}. In addition, by the extreme value condition

$$\frac{d\left(\frac{d\omega}{db}\right)}{d\theta} = -a^2(1-c)\overline{\omega}\,\frac{\exp\,[a(\theta-b)] - \exp\,[-a(\theta-b)]}{\left\{\exp\,[a(\theta-b)] + \exp\,[-a(\theta-b)] + 2\right\}^2} = 0 \quad,$$

when $b = \theta$, $\frac{d\omega}{db}(<0)$ is smallest (i.e., the negative effect of an increase in *b* is largest). As discussed in Section 2.2.1, because *b* is set at a level where most workers can use the technology properly, the value of *b* will be small. Hence, the value of *θ* when *b* = *θ* will generally be less than the average *θ* of all workers; furthermore it will be set close to *θ*, not to the average *θ*. Therefore, in general, the negative effect of an increase in *b* will be larger for LI workers than for HI workers. That is, as with *a*, the value of *b* is generally proportionate to the relative importance of a worker's innovative intelligence.

Because *b* and the importance of innovative intelligence are positively correlated, the values of *b* will be basically heterogeneous across technologies for the same reasons as for the case of *a*, and a technology that generates a relatively large number of varieties of minor unexpected problems will have a larger value of *b*. Therefore, as with *a*, the values of ω_{HI} and ω_{LI} will vary depending on the value of *b* corresponding to the current technology *A*.

In addition, because the effects of *a* and *b* have similar properties, it is highly likely that a technology that has a relatively large value of *a* also has a relatively large value of *b*.

2.2.3. IIBT and IIBTC

Because *a* and *b* are basically heterogeneous across technologies, technologies can be categorized depending on their values of *a* and *b*. However, as shown in Sections 3.2.1 and 3.2.2, a technology that has a relatively large value of *a* will probably also have a relatively large value of *b*. Hence, technologies can be categorized solely depending on their values of *a*. I call a technology an "innovation intelligence-biased technology" (IIBT) if the technology has a greater value of *a* than the average *a* of all technologies. In addition, I call an increase in the average *a* of all technologies in an economy an "innovation intelligence-biased technological change" (IIBTC).

What kind of technologies are IIBT? By its nature, IIBT generates a relatively large number of varieties of minor unexpected problems. The number of varieties of problems will increase as the number of possible different situations a technology will encounter becomes larger, because different situations will generally generate different varieties of problems. This implies that IIBTs are technologies that can be used in relatively more varied and diverse situations: that is, they are applicable to a relatively wide range of situations. Technologies that are closely related to information and communication technology (ICT) may be such technologies and thereby may belong to IIBT. The increasing prevalence of ICT throughout the economy in recent decades therefore may have caused IIBTC.

2.3. The Increase in Wage Inequality and IIBTC

If a new technology is IIBT and causes IIBTC, ω_{HI} increases but ω_{LI} decreases. Thereby, the ratio $\dfrac{\omega_{HI}}{\omega_{LI}}$ increases. As shown in Section 1, wages are determined in the long run at the point satisfying $\dfrac{w_{HI}}{w_{LI}} = \dfrac{\omega_{HI}}{\omega_{LI}}$ (equation [4]). Thereby, $\dfrac{w_{HI}}{w_{LI}}$ will also increase if IIBTC occurs; that is, the inequality in wages between HI and LI workers will increase. IIBTC therefore increases wage inequality.

If IIBTC prevails over a certain period of time, wage inequality will increase during the period. Increases in wage inequality in many countries in recent decades may have occurred because IIBTC prevailed during this time period. If ICT is really an IIBT as argued in Section 2.2.3, IIBTC caused by the development and prevalence of ICT in recent decades may have caused increases in wage inequality.

However, even if IIBTC prevailed in many countries in recent decades, there is no guarantee that IIBTC will always prevail. There are many kinds of technologies, and new technologies cannot always be used in relatively more varied and diverse situations. The recent decades, during which ICT was substantially improved, may be an exceptional period. If anything, technological changes may be neutral on average with regard to workers' innovative intelligences, and the ratio $\dfrac{w_{HI}}{w_{LI}} = \dfrac{\omega_{HI}}{\omega_{LI}}$ (equation [4]) may be constant in the very long run.

Conclusion

Explanations for recent increases in wage inequality based on SBTC have not been sufficiently supported empirically. In this paper, IIBTC was examined as a possible important source of increasing wage inequality. Workers' innovative intelligences are an important element in TFP, and they can be heterogeneous across workers. In addition, this heterogeneity will have great impacts on workers' wages. In this paper, I showed that the impacts on wages differ across heterogeneous workers depending on the characteristics of the technologies used for production. IIBT is advantageous for workers with relatively high innovative intelligences and disadvantageous for workers with relatively low innovative intelligence. Hence, if IIBTC occurs, inequality in wages will increase among heterogeneous workers.

If IIBTC continues to prevail over a certain period of time, the inequality in wages between workers with higher and lower innovative intelligences will increase during the period. Recent decades may have been such a period, possibly because of rapid development of ICT. However, it is also true that IIBTC will not necessarily prevail in any given period.

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TECHNICAL TRADING RULES AND TRADING SIGNALS IN THE BLACK MARKET FOR FOREIGN EXCHANGE IN SUDAN

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Abstract:

This paper aims to assess the level of departure of the actual black-market rate from its real level. Our finding indicates divergence of the actual black-market rate from the real level, ranging from 7% in October 2016 to about 38% in November 2017. This result implies 38% of the foreign exchange price in the black-market rate in November 2017 was due to manipulative trading strategies exerted by a few powerful traders in the market. The study concludes that in the very short term to curb increasing depreciation of the domestic currency rate in the black market, it is essential to control domestic liquidity expansion, and raise the cost (risk) of dealing in the black market by imposing higher penalty cost on dealers in this market.

Keywords: black market; foreign exchange; technical trading; volatility; Sudan.

JEL Classification: E52; G14; C54

Introduction

It became obvious to many economists in recent years that effective foreign exchange policy should take into account the link between the black market for foreign exchange and the rest of the economy, if viable economic planning is to set forth. Here in Sudan, since separation of oil rich South Sudan from the rest of country in July 2011, and loss of about 75% of oil revenue, the black-market rate premium over the official rate expanded rapidly due increasing demand for hard currencies. To control speculative effects on foreign exchange trading, the Central bank of Sudan decided to tighten control on exchange bureaux by enforcing additional restrictions on foreign exchange sales and often cracking down on black marketers for foreign exchange. The expanding gap between black market rate and the official exchange rate in the past few years became a major concern for the authorities in Sudan. Some basic questions we would like to answer in this paper includes: Is the black-market rate for foreign exchange in Sudan is a free exchange rate that reflect change in fundamental macroeconomic variables? What are the major factors that nurture the black market foreign currencies in recent years? and finally, what is the best predictor of the black-market rate? To answer the first question, we assessed profitability of technical trading rules, to see if speculative trading rules can gain significant profit to currency dealers. To answer the second and third questions we investigated the association between high powered money and change in black market prices.

The remaining part of the paper is structured as follows. Section two highlights literature review. Section three illustrates technical trading rules and shows how simple trading rules can attract significant gains to traders. The final section concludes the study.

1. Literature Review

Studying volatility in asset markets in general can help controlling asset markets irregularities and detecting volatility boundaries (Bollerslev *et al.* 2003). The increasing sensitivity of major economic indicators in underdevolpoed economies to volatility in black market for foreign exchange highlights the importance of modeling volatility in these markets. The literature on black market for foreign exchange takes two approaches: the first approach adapts specification of determinants of black market rate premium. A partial list of articles in this tradition includes Dornbusch *et al.* (1983), Fishelson (1988), Culbertson (1989), Phylaktis (1992), and Shachmurove (1999). The second approach focuses on the impact of black market rate volatility on macroeconomic indicators. Musila and Al-Zyoud (2012) following the latter approach assess the relationship between black market volatility and volume of international trade in sub-Saharan African countries and indicate that reducing volatility in the black-market rate increase (though insignificant) international trade flow to these countries. But findings by Makochekanwa (2007) show the black-market rate has significant impact on hyperinflation in Zimbabwe, during 1999 -2006.

Caporale and Cerrato (2008) investigate the long-run relationship between black market and official exchange rates in a number of Asian emerging economies to show weak evidence of long-run equilibrium relationship between the two market rates. In study of exchange markets in India and Sri Lanka, Emran and Shilipi (2010) show black market rates are weak indicators of equilibrium exchange rate. Jayaratnam (2003) investigates the impact of black market premium on FDI to show that reduction in black market premium has little impact on FDI flows in a number of developing countries.

2. Technical Trading Rules and Trading Signals

In recent years more, research results unveiled the predictive power of technical trading rules in emerging stock markets. A number of research studies (Besseminder and Chan 1995; Ratner and Leal 1999; Ito 1999; Kho 1996; Levich and Thomas1993), indicated that trading rules showed significant predictive power of profits in a number of Asian markets including Malaysia, Thailand, and Taiwan, but less predictive in more developed markets of Hong Kong and Japan. In a more comprehensive study including Indonesia, Mexico, Taiwan, Canada, and U.S., stock markets, Ito (1999) found trading rules captures quite strongly trading patterns (buy and sell signals) in all these markets with exception of the U.S., stock markets. Similar conclusion supporting relevance of trading rules analysis in Latin America stock markets concluded by Ratner and Leal (1999).

Since efficient market hypothesis imply, prices in efficient markets reflect all available information to the extent that excess returns generated from any additional information cannot exceed transaction costs of trading on that stock (Fama and Blume 1966), then evidence of profit generation in stock or currency market using past price behavior entails indication of market inefficiency. Thus, investigation of technical trading analysis may have important implications on a market regulation, in addition to its benefit to investors with respect to availability of potential opportunities.

In the following we investigate whether technical analysis can be exploited to predict significant profit returns in the black market.

2.1. Simple Technical Rules:

Technical trading rules assume price change follow predictable patterns that can be exploited for trading strategies. While there are different specifications of trading rules, the simplest and more often employed by practitioners are the variable length moving average (VMA), and the trading-range break. To explain these two rules, let

s_{it} $(t = 1,2......T)$ be the its daily stock price index, so that its return can be computed as: $r_{it} = \ln(s_{it}) - \ln(s_{i(t-1)})$. A buy and sell orders prescribed based on:

$$Buy\ if \quad S_t \geq \frac{1}{n}\sum_{i=0}^{n-1} S_{t-i}$$

$$Sell\ if \quad S_t < \frac{1}{n}\sum_{i=0}^{n-1} S_{t-i} \quad ,$$

where s_t is the stock price at time t.

Alternatively, to compute the variable moving average rule, a short-period moving average (SMA) and a long-period moving average (LMA) rules need to be computed, so that n is set equal to the number of trading days

in a week (*i.e.*, n = 3) for SMA, and n>10, for LMA. In this case a buy order can be signaled when $SMA_{it} > LMA_{it}$ by an amount larger than pre-specified band level; and a sell order when $SMA_{it} < LMA_{it}$ by an amount lower than the band. The trading-range break signals buy order when the price rises above its last local maximum (the resistance level), and a sell order when the price sink below its last local minimum (the support level).

The t-test statistics for the buys (sells) are defined as:

$$\frac{\mu_r - \mu}{\left[\dfrac{\sigma_r^{2}}{N_r} + \dfrac{\sigma^2}{N}\right]^{0.5}}$$

where μ_r, σ_r^{2}, N_r are the mean return, estimated variance, and the number of buy (sell) days; μ and N are the population mean and number of observations.

And the t-test statistics for the buy-sell are defined as:

$$\frac{(\mu_b - \mu_s) - \mu}{\left[\left(\dfrac{\sigma_b^{2}}{N_b} + \dfrac{\sigma_s^{2}}{N_s}\right) + \dfrac{\sigma^2}{N}\right]^{0.5}}$$

where μ_b, μ_s, $N_b \ and \ N_s$ are respectively the buy and sell mean returns and the number of days for the buys and sells. In the table the term (1,20,0.01) refer to the short period is one day, the long period is 20 days, and the band is 1%.

Results in table (1) indicate profitability of variable length moving average trading rule by currency traders. The findings in the table show positive profits can be gained if traders practice simple trading rule of buying at the low-price levels and selling at higher prices in periods ranging from one day to three weeks. Such practice of buying and selling at different prices also supported by figure (1), which indicates the buying periods by the upward arrows, and the selling periods by the downward arrows. On the other hand, table (2) indicate trading rules in the black market for foreign exchange do not support a positive profit gains when support and resistance trading strategies are assumed.

In tables (3) and (4), we simulated a hypothetical example of three traders who are able to coordinate among them self as in the oligopoly models, under two scenarios. The first scenario in table (3) shows sustainability of the coordinated trading when traders have a fixed amount of domestic currency balance and trade a fixed amount of foreign currency among themselves (US$10). In such case the trading in FX is not sustainable even when they have a market power to set price at the levels they want. This can be indicated by the declining amount of foreign currency balance from US$ 33 in the initial period 1 to US$19 in the final period. However, under the second scenario it is assumed that traders have the same fixed amount of foreign currency, but they have access to increasing domestic currency balance. In this case the trading of FX in the black market becomes sustainable, as their total balance in foreign exchange increase from US$44 in the initial period to about US$ 100 in the final period. These results imply as long as traders in black market for foreign exchange have access to increasing domestic currency, via smuggling activities or whatever, black market activities may not disappear even when foreign currency amounts traded in the black-market for FX remained fixed.

Given that growth in domestic liquidity (money supply) is fundamental driver of change in black market rate (figure 2), to assess the size of over-pricing of the black market rate due to speculative trading of foreign exchange in the black market, we estimated the black market rate consistent with the growth in money supply (M2), and refer to it as realistic rate of the black market rate. As reported in table (5), the excess of the actual black-market rate over the estimated rate indicates the size of over-pricing due to speculative trading activities in the black market. Results in table (5) show increasing divergence between the estimated and the actual rates. This imply that the size of over-price in the black market increased from 7% in October 2016 to 38% in November 2017. This result shows the effect of speculative motives, as opposed to fundamental drivers, were more dominant in 2017, albeit in the last four months of 2017.

Table 1. Variable length moving average rule

	FX Mean	Std.dev	Min/Max
[1, 15; 0.01] Buy-Sell t-stat	-0.86* -51.23	7.09	-8.0/8.2
[1, 20; 0.01] Buy-Sell t-stat	-0.16* -57.80	7.14	-7.9/8.2
[5, 15; 0.01] Buy-Sell t-stat	-1.44* -46.43	6.9	-8.0/8.2
[5, 20; 0.01] Buy-Sell t-stat	-0.36* -43.40	7.13	-7.9/8.2

*significant at 1% significance level.

Table 2. Trading Range Break (support & resistance)

	Fx Mean	St.dev	Min/Max
Buy t-stat	7.8* 31.5	0.13	7.6/8.2
Sell t-stat	6.4* -18.7	0.18	6.0/6.7
Buy-Sell t-stat	1.04* -38.1	7.13	-6.7/8.2

*significant at 1% significance level.

Figure 1. Buy and sell strategies (2016)
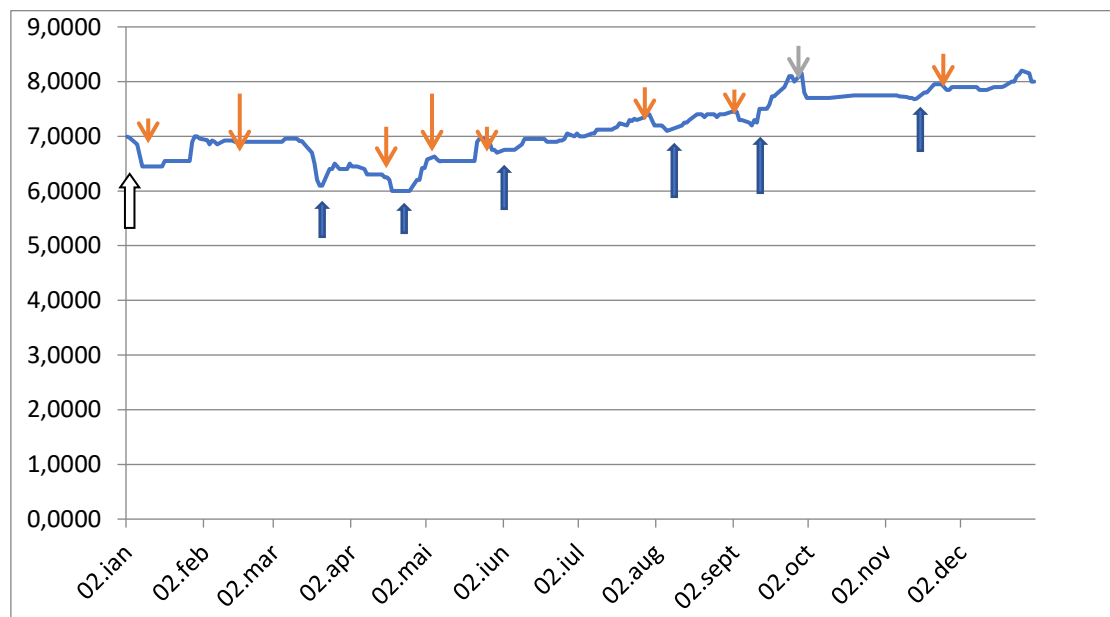
Table 3. Price setting and oligopolistic gains:

(Senario 1: restricted liquidity access)

Periods	FX Rate S£/ US$	Trader 1 S£	US$	Trader 2 S£	US$	Trader 3 S£	US$	Total balance For the 3 traders in US$
1	20	--	10	220	--	240	--	33
2	22	220	--	--	10	240	--	30
3	24	220	--	240	--	--	10	29
4	30	-80	10	240	--	300	--	25
5	40	320	--	240	--	-100	10	21
6	50	320	--	-260	10	400	--	19

Table 4. Price setting and oligopolistic gains:

(Senario 2: sufficient liquidity access)

Periods	FX Rate S£/ US$	Trader 1 S£	US$	Trader 2 S£	US$	Trader 3 S£	US$	Total balance For the 3 traders in US$
1	20	220	10	220	--	240	--	44
2	22	600	--	500	10	500	--	82
3	24	800	--	800	--	800	10	110
4	30	900	10	900	--	900	--	100
5	40	1020	--	1020	--	1020	10	86
6	50	1500	--	1500	10	1500	--	100

Figure 2. Prediction of the black market rate

29
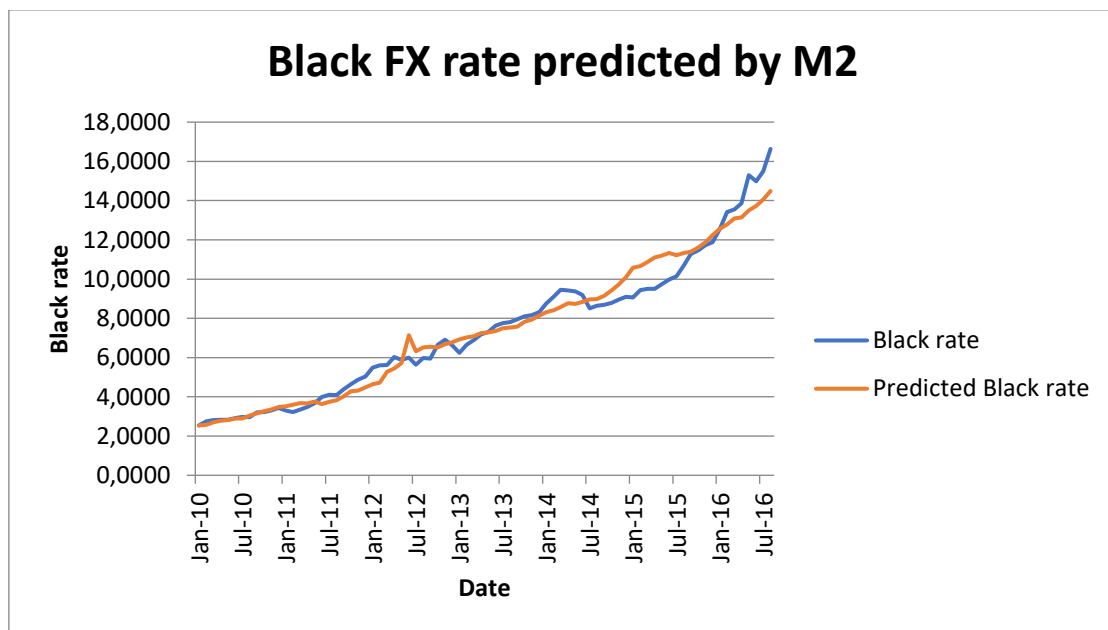
Table (5). Speculative trading effect

Date	Black FX Actual	Black FX (M2 based prediction)	Over-pricing (%)
Oct-16	15.49	14.47	7.02
Nov-16	16.63	14.30	16.26
Dec 16	16.98	14.51	17.05
Jan-17	17.50	14.64	19.52
Feb-17	17.67	14.81	19.31
Mar-17	17.89	15.02	19.08
Apr-17	18.40	15.24	20.75
May-17	18.90	15.46	22.29
Jun-17	19.41	15.67	23.84
Jul-17	19.69	15.89	23.89
Aug-17	19.98	16.11	23.99
Sep-17	20.12	16.34	23.15
Oct-17	21.89	16.56	32.17
Nov-17	23.23	16.79	38.37

Concluding Remarks

The findings in this research indicate profitability of variable length moving average trading rule by currency traders when traders practice simple trading rule of buying at low price and selling at higher price in periods ranging from one day to three weeks. However, such trading rule cannot support a positive profit gains when resistance and support trading strategies are assumed. To investigate further trading signals, we simulated a hypothetical example of three traders who are able to coordinate among themselves as oligopolistic, under two scenarios. The first scenario assumes monetary authority control domestic liquidity so that traders cannot increase their balance of domestic currency. In such case it is indicated that trading in foreign currency in a black market is not sustainable, as the balance of foreign currency declines over time, even when traders enjoy a market power to set prices. However, under the second scenario it is assumed that traders have the same fixed amount of foreign currency, but they have access to increase domestic currency balance, implying that monetary authorities unable to control domestic liquidity. In this case trading of foreign currency in the black market becomes sustainable, as trader's foreign currency balance increases continuously over time. These results imply as long as traders in black market for foreign exchange have access to increasing domestic currency, via gold smuggling, export under-invoicing, or import over-invoicing, then black market activities can not disappear if black market is controlled by a few powerful traders who set prices as oligopolistic.

Assuming growth in domestic liquidity (money supply) is fundamental driver of change in black market rate, we estimated the extent of over-price in the black-market rate due to speculative trading of foreign exchange. Our results indicate the size of over-price in the black market increased from 7% in October 2016 to 38% in November 2017, revealing expanding market power exerted by the black-market traders in the last four months of 2017.

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ASSESSING THE IMPACT OF INTEGRATION ON ECONOMIC GROWTH AND FOOD SECURITY IN ECOWAS

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Abstract:

This study analyzes the potential of regional integration through the culture of trade value chains in accelerating economic growth and achieving food security with a focus on ECOWAS. Some strategies that regional integration can promote to stimulate economic growth and increase food security are compared. The study examines whether countries must develop strategies to raise international trade through increasing openness degree or whether countries must develop policies to reinforce community or regional trade through the potential of value chains inside the regional integration. Three instruments are investigated (trade openness, intra-regional trade openness and the community insertion to value chains). Two models are estimated with panel fixed effects using data from 1995 to 2012. The findings support that regional integration needs to be strengthen and better promoted in order to stimulate the potential of each country to move from discontinuous growth to sustained growth. International trade is not a solution for ECOWAS countries to boost economic growth, but regional trade linked to creation of value chains among each country can be the engine of the region growth and food security.

Keywords: food security; economic growth; trade openness; regional integration; value chains.

JEL Classification: F15; F43; P33; Q18.

Introduction

Food security and economic growth constitute the two challenges of the contemporary economy particularly in developing countries. Despite the improvement of the performance of African countries these recent years, the economic growth rate is still low. In fact, the report of Africa Growth Initiative (2016) illustrates that low economic growth rate, weak industrial development and growing poverty characterize African countries due to poor human development, growing population living in urban slums with no access to elementary services, raise of corruption and disadvantage in global trade. In the case of ECOWAS countries, the GDP per capita increased very slowly ($954 in 2010, $1,051 in 2011, $1,057 in 2012, and $1,137 in 2014) but the economic growth gap among Africa and other regions is not new and started to be structural between 1970 and 2000. While all other developing countries and the world experienced remarkable progress in reducing extreme poverty, in African countries the percentage of the population under poverty increased. This lack of involvement was the starting point of the fundamental contrast between Africa and the rest of the world. Also, Ndulu and O'Connell (2006a) note that this divergence augmented sharply when the continent missed out on the economic structural transformation that took place in the developing world, making poverty in Africa mainly a growth challenge. The economic growth rate in African countries has always been too low to initiate the development process. Subsequently, Maddison (2007) identifies the erratic growth performance of African countries as the most important reason behind its lagging position in eradicating poverty.

Several approaches based on country case studies followed each other since the 1990s (World Bank 2005; Berthelemy and Soderling 2002; Azam *et al.* 2002) to investigate growth pattern and identify the constraints to implement sustained growth. This period, marked by the design and the implementation of various development program schemes and macroeconomic stability program failed to tackle poverty and generate a sustained growth. A summary of the large number of study on Africa's slow growth (Glaeser *et al.* 2004; Calderon 2009; Collier 2007; Ndulu *et al.* 2007; Chandra and Kolavalli 2006; Comin and Mestieri 2013) reaches the same conclusion that some factors (long distances from markets, geographical fragmentation, tropical climates and soils, small markets, demographic pressure, natural resource curse, aid, external economic shocks vulnerability, weak institutional capacity, low financial sector and information technology, risks and uncertainty of policies and political instability) are main dangers in achieving and sustaining growth. However, all these key factors influencing growth and channels through which these run, can be addressed by regionalism accompanied by transparency, innovation, sound policies and effective leadership. In fact, regional integration through the potential of community trade offers enormous opportunities to boost economic growth.

Regional integration by enlarging the size of the market stimulates the efficient allocation of resources, increases human capital and mobility of labor, develops agricultural research and development related activities, diversifies production and improves manufacturing sector, increases domestic saving and investment, improves infrastructure and reduce the need of foreign debt. Thus, regional integration directly affects economic growth by raising the competitiveness and accelerating industrialization, and by creating better employment opportunities which lead to poverty reduction in the region. However African economies are not strongly advanced in the insertion of global value chains which represent a crucial asset. Therefore, linking regional integration to global value chains can expand trade, create comparative advantage in world trade and strengthen partnerships opening the way to a faster economic growth rate.

In the same order, regional integration through its spill-over effects on agriculture, food prices and macroeconomic policies affects food security. FAO (2003) reports that "food security will be affected by international trade in general and agricultural trade in particular. Based on the ability of intra-regional trade to foster economic growth and increase employment prospects and the income-earning capacities of the poor, it will enhance access to food. The increased intra-regional agricultural trade could also promote food security by augmenting domestic food supplies to meet consumption needs and by reducing overall food supply variability". More specifically macroeconomic policies play significant roles in influencing food security directly or indirectly by affecting poverty, food production, prices, foreign exchange, employment, and wages. Reduce poverty among countries requires to raise food availability and at the same time food accessibility at national and household level. Integration is a better tool to address food security challenge because of the opportunities targeting trade and market integration, investment in agricultural resources, investment in agricultural and trade infrastructure, sophistication in improved agriculture technologies, reducing of domestic and foreign policy distortions, and economies of scale. It is well-established that integration substantially affects the agricultural sector performance by stabilizing food prices, strengthening regional market and reducing the dependence on International market, improving exports and decreasing imports which in turn influence the countries income distribution, rural development, employment

creation and competitiveness of the economy, and the development of technologies against bad harvests or natural disasters. Consequently, all these channels target malnutrition, hunger, and famine, create an enabling environment to increase consumption and improve population nutritional well-being which directly addresses poverty reduction. However, the impact of regional integration on food security goes beyond food and agriculture dimension and encompass non-agricultural economy that has various implications on countries trade policy.

Regional integration offers a space for "learning to compete" and for "self-discovery" to firms and organizes them for the greater rigor and competition in global value chains. Global value chains being in infant stage in most African countries, what can be the potential of a regional integration oriented on regional trade value chains promotion on food security? Several indicators assessing food security have been conceived, but per capita daily dietary energy supply is mostly used to measure national food security. Consistent with the literature, per capita dietary energy supply is used in this study as food security indicator.

This study analyzes the potential of regional integration in accelerating economic growth and achieving food security with a focus on ECOWAS. The study explores whether countries must develop strategies to raise international trade through increasing openness degree or must adopt policies to reinforce community or regional exchange. Three particular instruments are investigated in ECOWAS integration (such as each country international trade openness, each country intra-regional trade openness and the community insertion in value chains) to identify the best way for economic growth and food security raising.

The remainder of the paper is organized as follows. Section 2 presents the literature review on empirical research between regional integration, economic growth and food security. The model specification, methodology and data are described in section 3. Section 4 shows the empirical results, interpretations and evidence based on policy recommendation and section 5 concludes.

1. Literature Review

The literature presented in this study is organized into two main part. The first part investigates the research on regionalism, industrialization, and growth, and the second part explores food security aspects. The relation between trade liberalization and economic development are widely studied. Literature in international trade provides a lot of evidence on how trade liberalization positively influences the performance of economies which have liberalized trade to the world economy (Herath 2010; Leamer 1988; Dollar 1992; Sachs and Warner 1995). Trade liberalization is assumed to be a driving force of economic development in a country. Svatoš and Smutka (2010) show that international trade has become a vital instrument in building external economic links among world economies. Grossman and Helpman (1992) show that openness to international trade increases domestic imports of goods and services which include new technologies. Through learning by doing and the transfer of technology, the most open economies are growing at a faster pace than most protectionist. However, the authors add that these gains depend on several factors, including the initial situation. The latter determines the nature of the specialization of the country in the long run and therefore its growth rate. The openness of a small country may lead her to specialize in a low-growth sector, contributing instead to leave the Country in underdevelopment. In this case, the Country should adopt protectionist policies during the early stages of its development, then opt for appropriate opening policies.

According to Levine and Renelt (1991), the causal relationship between openness and growth is through investment. A country liberalizing its trade will attract foreign investment flows. However, they may cause a decline in domestic investment due to stronger international competition, and the net effect then remains ambiguous. Grossman and Helpman (1992) also argue that a country protecting its economy can stimulate growth, but only if government intervention encourages domestic investment according to the comparative advantages of the country.

Dollar (1992), Barro and Sala-I-Martin (1995), Sachs and Warner (1995), Edwards (1998) and Greenaway *et al.* (1998), using cross-sectional regressions, found that trade distortions due to the intervention of the State led to low growth rates. Ben-David (1996) has also shown that it is only in open economies that we could observe an unconditional convergence. Frankel and Romer (1999) use a method of instrumental variables including geographical features and confirm that international trade has a significant impact on growth. Harrison (1996) reaches similar conclusions using a variety of indicators of openness. By using different methods (cross-section fixed effects, five-year average, first differences), the results suggest a positive relationship between openness and growth. However, not all openness measures were significant, even though they were mostly a positive sign. Rodriguez and Rodrik (2000) criticize trade openness indicators. They find that the positive correlation between openness and growth was not robust and the methodology used by other authors lacked crucial control variables to have a decisive effect on growth.

Jin (2004) analyzes the co-movement between openness and growth in China. He checks if the relationship openness-growth was also valid at the provincial level and if we could detect a difference between the coastal provinces and those isolated. The results obtained are those expected: the effect for coastal region is significant and positive for four of them, and negative for the majority of landlocked provinces. Noguer and Siscart (2005) leading a study on a sample of 98 countries, find a positive relationship between international trade and economic growth which improves the income segments of the population who engage in production activities.

Hubert and Satoshi (2016) analyze East Asian trade and focus on global value chains effects on industrial networks. Using graph theory and input-output data to measure value-added, they show that trade value chains foster regional integration so that the inter-industry linkage moved from a simple hub-and-spokes cluster to a more complex structure with the rise of China and the specialization of several countries as secondary pivots. The intensification of value chains reduced variance among country tariffs duties and lowered transaction costs which promote export-led growth accompanied by industrialization based on domestic markets. It also improved logistics services and cross-border administrative procedures, lessened anti-export bias and enhanced the competitiveness of national suppliers. Their results prove the importance of global value chains in shaping industrial development based on trade.

Baldwin (2008, 2011b) examines the relationship between regionalism, trade, and industrialization in East Asia, and why building a supply chain is crucial. He demonstrates that compared to the past where successful industrial development (South Korea and Taiwan) took decades and involved a domestic supply chain, today intra-regional trade has the potential to bring countries in industrialization in only a few years by joining supply chains. He discusses that Emergence of the international supply chain has fundamentally reduced the complexity and time required for developing countries to industrialize. Therefore, it is much easier to join an existing supply chain than to build one from scratch domestically, as earlier industrializers like South Korea and Taiwan did.

ESCAP (2015) provides stylized facts on the participation of Asia-Pacific economies in regional and global value chains and explores the relationship between global value chains and regional integration processes, in particular, the linkages between different types of preferential trade agreements and the evolution of global value chains. The study found that expansion of global value chains has opened opportunities for strong integration in Asia and the Pacific by allowing countries to pursue the division of labor and specialization. Using gravity model, the impacts of regional integration on global value chain-related exports to the region are methodically investigated. The results confirm the potential of value chains. First regional trade agreements have a positive association with global value chain-related exports of Asia-Pacific countries. Second, the impacts on intraregional exports appear to be stronger than exports to the rest of the world. The reduction of trade barriers from the perspectives of both exporters and importers seem to be associate with an increase in value chain-related exports from Asia-Pacific countries. Third, trade facilitation through the improvement of ICT, logistics and transportation systems, and removing behind-the-border obstacles can enhance global value chain-related trade between nations and make them key players in global value chains.

If numerous studies can be find on regionalism, integration and their spill-over effect on economic growth, only a few empirical works are done on regionalism and food security. Most of the studies done are limited to statistical analysis (FAO 1996; Sen 1981; Maxwell 2001; FAO 2009; Kakwani and Son 2016). The links between regional trade, international trade, and food security are complex and multiple. The debate that whether trade liberalization improves food security is hypothetically ambiguous. Based on studies, the nature and magnitude of the food security effect of liberalization depends on various factors such as the extent of adaptability of the poor to changing economic conditions; the degree of exposure of the country to food imports; the presence of favorable initial conditions and accompanying measures; and the time horizon considered.

Chand and Jumrani (2013) explain the paradox of "hunger amidst plenty" prevailing in India and show that the income growth is a necessary but not a sufficient condition for reducing undernourishment and malnourishment because historical and cultural factors are linked to food security. Dorosh (2004) argued that trade liberalization contributed to enhance national food security of Bangladesh by increasing the level of available foods for domestic consumption during the production shortfalls and therefore stabilizing market prices benefitting poor consumers. Chen and Ducan (2008) report that an increase in real GDP resulting from trade in India improves the food security status of the poor. Herath *et al.* (2014) capture the effects of trade liberalization on food security in South East Asia. Their findings support that discriminatory trade liberalization policies have positively influenced food security. They found that after the formation of the Association of South East Asian Nations' Free Trade Agreement (AFTA), the level of per-capita daily dietary energy supply of the member countries has been increased moderately over time. Thomas and Morrison (2006) show that the food security outcomes of liberalization varied by Country and the food security indicator used.

Bezuneh and Yiheyis (2014) investigate whether trade liberalization has improved food security of developing countries. By applying multiple regression analysis on panel data, they found that trade liberalization exerted a negative short-run impact on food availability, but the overall results fail to support the view that from the medium to long run, the effect of trade liberalization on food availability is favorable. Their findings provide evidence on the ambiguity of the impact of trade liberalization on food security. Grant and Lambert (2005), Seck *et al.* (2010), Korinek and Melatos (2009), Nin-Pratt *et al.* (2008) show that regional integration has not led to substantial allocation effects and the expected decrease in food prices caused by efficiency gains. Hence, the direct impact of integration on food security seems to have been small. Taking into account that allocation effects have been small, accumulation effects have also been limited. The evidence on the mixed and inconclusive relationship between trade liberalization and food security is confirmed by McCorriston *et al.* (2013).

Maertens and Swinnen (2015) analyze the contribution of trade value chain in developing regions through the significant increase in foreign investment. The results show that the demand for high-value products raises rural incomes and creates opportunities for developing countries to realize economic growth through expanding and diversifying their agricultural exports. Jaud and Kukenova (2011) find similar results which are explained by the potential of labor-intensive production systems implemented. Xiang e*t al.* (2012) simulate the general equilibrium effects of the trade growth on household welfare. Their findings confirm the benefit of the value chain.

Beghin *et al.* (2015) and Maertens *et al.* (2011) explain that trade value chains, directly and indirectly, affect food security by impacting smallholder producers. Smallholders, when included in value chains through contract-farming schemes across sectors and countries, can increase their income, raise their production and improve their competitiveness and in the long term better insert themselves in the global market. Along with this process of insertion of smallholders in value chains, some authors (Negash and Swinnen 2013; Dries and Swinnen 2010; Minten *et al.* 2009) show that the improved access to inputs leads to a rise in technology transfer. This effect generates significant productivity increases both for the product itself and for other production activities at the farm level and has essential spillovers on household food security. In the same perspective, Mano *et al.* (2011) illustrate that value chains enhance labor market by creating substantial employment and diversifying off-farm employment opportunities for women. The implications of gender and rural poverty are the empowerment of women and more access to income which allow more spending on food.

2. Methodology

2.1. The Impact of Regional Integration and International Trade on Economic Growth

The theoretical frameworks used to assess the effect of integration and international trade on growth is drawn to the endogenous and neoclassical growth (Solow 1956) theories. Under neoclassical growth theory, institutional characteristics, policy regulations, and economic integration, are useless in disturbing the equilibrium growth rate, which is exclusively fixed by the exogenous degree of technological evolution. Changes in investment, institutional innovations or increases in efficiency succeeding regional integration have just transitory impacts on the growth rate. Transitory growth impacts occur as a result of changes in the overall level of productivity attributed to the formation, enlargement or extending of the regional integration agreement. The efficiency change induces faster physical capital formation that progressively decreases to the long run equilibrium. Therefore, integration is seen as any other crucial economic policy disturbing growth solely on the transition process leading to the steady state (Njoroge 2010). The endogenous growth theory (Walz 1997) on the contrary, by presuming increasing returns to the growth of capital considers long-term or permanent effects of regional integration. The long-term impact depends on the insertion of human capital which will maintain investment and disseminate knowledge. In turn, economic growth can accelerate due to the integration agreements extending technology on a large scale. The theory also explains how international trade fosters economic growth through human capital seeing as the engine of growth (Lucas, 1988).

Based on Bezuneh and Yiheyis (2014) and Herath *et al.* (2014), panel data with fixed effects is used. However, all preliminary tests and Hausman test are checked to validate if fixed or random effects are appropriate. The dependent variable is represented by real GDP per capita. The keys interest variables are trade openness which measures international trade, the intra-community export which measures intra-regional trade and per capita domestic value-added which measures global value chains performance. Per capita domestic value-added captures the gains associated with exporting which accrue to local labor and capital. Domestic value added is the share of exported products that are not finished product and will be imported from other countries to be processed before being exported.

According to literature (Andersen and Babulal 2008; Pam 2017; Yaya 2017), some control variables which are significant in determining economic growth are included such as gross capital formation, foreign direct

investment, and inflation rate. Gross capital formation and foreign direct investment measure the level of investment in the country. Both are used to dissociate the mitigating effect of investment in economic growth discussed in literature review. Gross capital formation appreciates domestic investment which is connected to the industrial development of the country and therefore stimulate growth. In contrast, foreign direct investment links to technology transfer, transport and infrastructure, the level of the country attractiveness and also has a crucial impact on growth. Inflation measured by consumer prices index indicates the economic stability of the country. The reduced model takes the following form:

$$\text{Log}(y_{it}) = \beta X_{it} + v_i + \varepsilon_{it} \qquad (1)$$

where y_{it} is the real GDP per capita, ε_{it} the stochastic error term, v_i the country-specific effect, X_{it} the set of explanatory variables such as trade openness, intra-community export trade, per capita domestic value-added, inflation as a proxy of monetary policy, gross capital formation, and foreign direct investment.

The data cover ECOWAS countries (Mali, Benin, Sierra Leone, Ivory Coast, Burkina Faso, Guinea-Bissau, Cabo Verde, Ghana, Togo, Niger, Guinea, Liberia, Gambia, Nigeria, and Senegal) from 1995 to 2012. Real GDP per capita, trade openness, inflation and gross capital formation come from the World Development Indicator. Intra-community trade and foreign investment come from UNCTAD database. Per capita domestic value added is provided by OECD TiVA.

2.2. The Impact of Regional Integration and International Trade on Food Security

Based on literature (McCorriston *et al.* 2013; Thomas and Morrison 2006; IFPRI 2006; Herath *et al.* 2014; Darshini 2012), direct and indirect channels are identified through which regional integration or trade influences food security. Food security can be affected by growth in national income and employment. It is widely accepted that economic growth is a required stage for sustainability of poverty reduction and food security, even if in the short-run, growth may not be fast enough to achieve food security. Economic growth raises incomes and the ability of the poor to gain access to food and health and can lead to improved food security. Economic growth also develops infrastructures, services, and opportunities for a raise in the overall level of income.

Secondly, food security is associated with regional integration's capability to rise global supply of the production (through a mixture of imports and domestic production) and to stabilize variations in food prices. Where the local charge of food was expensive compared to the rest of world due to trade barriers or tariffs, importing country will reduce domestic food at the same cost to increase the level of food consumed. However, the decrease in national commodity prices and cheaper imports would negatively affect domestic production and thereby the poor food security status whose key source of income and employment is food production. The third channel is through improved foreign exchange earnings. With the improvement of exports market access via multilateral liberalization and a more competitive production process based on comparative advantage, the export sector develops. The subsequent rise in foreign exchange gains improve the potential of the economy to expand domestic production and finance food imports. The fourth channel is reducing variability and uncertainty of food provision. Opening up the economy lessens the unpredictability of staple foods supply by helping offset undesirable domestic production shocks. Finally, market prices affect food accessibility and represent the purchasing power in the economy. The effect on the purchasing power is correlated to the magnitude of money supply which impacts local prices of goods and services and can also import inflation.

Per capita dietary energy supply is adopted to measure the food availability which approximates food security. The keys interest variables are trade openness, intra-community export trade and backward integration which assesses the extent to which a country is integrated and correspond to the country's place in the value chain. Backward integration is the share of the imported value added from foreign suppliers upstream that will be found in the country's exports. Increasing backward participation is associated with more competitive export, higher per capita domestic value-added in exports and growing income. A higher share of backward participation is also linked to access of competitive inputs and a more-sophisticated export bundle and greater diversification over time.

Including the direct and indirect channels through which trade influences food security (McCorriston *et al.* 2013; Thomas and Morrison 2006; IFPRI 2006; Herath *et al.* 2014; Darshini 2012), we introduce a set of variables such as real GDP per capita to measure growth, average value of food production to assess the overall supply of food, reserves to measure foreign exchange effect, political instability to assess uncertainty effect, domestic credit provided by financial institution to measure market price and purchasing power effect. Even though these variables are the most important used, agricultural land irrigated and population growth are added which influence African economies and their food security level.

$$Log(s_{it}) = \beta Z_{it} + v_i + \varepsilon_{it} \qquad (2)$$

where s_{it} is per capita dietary energy supply as a proxy of food security, v_i is the country-specific effect, ε_{it} is the stochastic error term, Z_{it} is the set of explanatory variables such as trade openness, intra-community export trade, backward integration, foreign direct investment, gross capital formation, real GDP per capita in logarithm, average value of food production in logarithm as a proxy of food variability, foreign reserves in logarithm, political instability, domestic credit provided by the financial institution, agricultural land irrigated in percentage, and population growth.

Data on political instability, agricultural land, per capita dietary energy supply and the value of food production (constant 1$ per person) come from FAO. Foreign reserves, domestic credit and population growth are provided by World Development Indicator. Backward integration is computed with OECD TiVA database.

3. Empirical Results and Discussion

The result of the Hausman test (Table 1) after the estimation with fixed and random effects for Model (I) and (II) rejects the null hypothesis that there is a no difference between the coefficients obtained by fixed effects and random effects. The correct specification for both Model (I) and (II) is the fixed effects.

Table 1. Specification test

Hausman Test		
Ho: difference in coefficients not systematic		
	Model (I)	Model (II)
Dependent Variables	Real GDP per Capita (log)	Per capita dietary energy supply (log)
chi2	9.43***	117.21***
Prob>chi2	0.0027	0.0000
Number of observations	270	270

*Note: *** significant at 1 %, ** significant at 5 %, and * significant at 10 %*

The estimation results for Model (I) and Model (II) are summarized in Table 2.

The coefficients for Model (I) are all significant except trade openness, and also have the expected sign according to theory. In the case of ECOWAS, trade openness which assesses the opening degree of each country to international trade does not affect economic growth. This result seems to be paradoxical but tends to support the viewpoint of some researchers (Noguer and Siscart 2005; Rodriguez and Rodrik 2000) who conclude after studies done in other developing countries that the relationship between openness and growth is inconclusive. Moreover, Grossman and Helpman (1992) and Levine and Renelt (1991) already discussed that the effect of trade openness on economic growth remains ambiguous. In ECOWAS, even if trade openness effects on growth, this effect is trivial which explains that in our estimation the coefficient is insignificant. Another explanation of this result in the specific case of ECOWAS is that countries trade more with world market than with regional market, and ECOWAS imports are not oriented to capital and industrial equipment which pulls economic growth. Trading with developed countries, the openness of ECOWAS countries which are small countries leads them to specialize in a low-growth sector, mainly the exports of primary products. The consequence is that the openness of each country to international trade is characterized by more imports than exports. International trade theory demonstrates that trade among countries with different levels of development does not benefit the poorest countries. For international trade to push countries, exchanges must be done among similar countries. Also, opening to international trade is not a necessary and sufficient condition to increase economic growth, other factors such as infrastructure, investment, comparative advantages, industrial development, protectionist policies, and technology progress need to be effective. However, in ECOWAS countries those factors are missing.

In contrast, intra-community trade and per capita domestic value-added positively influence economic growth. Even if ECOWAS intra-trade is low, it affects the economic growth of each country. This result shows that intra-regional trade is crucial for economic growth. The more regional exchange increases, the more per capita income rises, and the more economic growth can be boosted. This finding supports that regional integration needs to strengthen and better promoted to stimulate the potential of each country to move from discontinuous growth to sustained growth. In fact, intra-community trade within ECOWAS is estimated only at 9 percent in 2015. It is clear that if trade agreements are put in place to motivate countries to trade with each other, the impact will be different for producers and households in term of improving income, raise of investment and increase of consumption. Also, if the intra-regional trade is focused on the promotion of goods and services resulting from the consolidation of value chains among the different countries, economic growth can be exponential. An increase domestic value added is associated with high volume of trade which will raise the competitiveness and diversification of exports,

enhancing each country place in global value chains. Therefore, comparing the results, intra-regional exchange and per capita domestic value-added boost more economic growth than international trade (trade openness).

Table 2. Panel Fixed Effects Estimation

Variables	Model (I) Real GDP per Capita (log)		Model (II) Per capita dietary energy supply (log)	
	Coefficient	Prob	Coefficient	Prob
Trade Openness	-0.08306 (0.074609)	0.2668	0.036203** (0.017612)	0.0410
Intra-Community Trade	2.63028** (1.328243)	0.0489	0.37977 (0.334490)	0.2574
Per capita Domestic Value Added	1.386192*** (0.200369)	0.0000		
Backward			0.356052*** (0.126743)	0.0054
Foreign Direct Investment inflows	0.292824*** (0.094501)	0.0022	0.006791 (0.021624)	0.7538
Gross capital formation	0.543962*** (0.180456)	0.0029	0.140021*** (0.042331)	0.0011
Inflation	-0.3617*** (0.132363)	0.0068		
Real GDP per Capita (log)			0.041838*** (0.014330)	0.0039
Average value of food production (log)			0.244314*** (0.023328)	0.0000
Foreign reserves (log)			0.024421*** (0.004966)	0.0000
Domestic credits			0.03633** (0.014296)	0.0117
Agricultural land			3.180132*** (0.511387)	0.0000
Population growth			0.874901** (0.362402)	0.0166
Political instability			-0.00444** (0.002008)	0.0282
Constant	5.908543*** (0.043177)	0.00000	3.052991*** (0.114812)	0.00000
Number of observations	270		270	
F-test	222.9256	0.00000	65.3645	0.00000
R-squared	0.94807		0.878502	

Note: *** significant at 1 %, ** significant at 5 %, * significant at 10 %, standard errors in parentheses

International trade is not a solution for ECOWAS to boost economic growth, but regional trade linked to the creation of value chains among each country can be the engine of the growth.

An examination of other control variables shows that they significantly contribute to economic growth as indicated in the literature. Foreign direct investment has a positive and significant effect on GDP. Klasra (2011) finds the similar result in Pakistan. Ercakar (2011) shows that in African economies, openness cannot achieve economic growth without foreign direct investment. However, the gross capital formation is even more important than foreign investment for countries. It affects positively more economic growth, showing the crucial role of domestic investment in the development process. This effect of the domestic investment on economic growth is also highlighted by Pam (2017) in the case of sub-Saharan Africa.

Positive changes in inflation are associated with negative changes in economic growth, thereby suggesting that price volatility reduces growth because of the unpredictability of the macroeconomic environment and the challenge for the individual to have a rational expectation. This finding is in line with Kremer *et al*. (2009), Jafari *et al*. 2012) and Pam (2017) results.

In Model (II), all explanatory variables except foreign direct investment and intra-community trade significantly influence food security. International trade positively affects per capita dietary energy supply while the intra-regional is not significant. This finding has two main implications; (i) even if trade openness does not touch growth in ECOWAS countries, it significantly raises food security status because ECOWAS trade with developed and emerging countries is focused on imports of consumer goods. Therefore, an increase in trade openness improves food security. Trade between ECOWAS and the rest of the world is characterized by imports of primary products mainly agricultural goods and services, raw materials, imports of foods and foodstuffs coming from Asian countries such as Thailand, China, Vietnam, South Korea, Malaysia and Latin America (UNCTAD, 2016). By not importing more capital and industrial equipment, the degree of openness is unusual to draw economic growth; (ii) intra-regional trade which significantly improves economic growth does not influences per capita dietary energy supply due to the weakness of trade among ECOWAS countries. The findings are consistent with Ivica (2016) results which advocate that international trade improves food security. Nevertheless, backward integration has a positive effect on food security thereby suggesting that participation in the value chain has spillover effects on countries food security.

In fact, the strengthening of trade value chains among ECOWAS countries can organize the production and manufacturing of goods in chains and concentrate the retail sector, the demand for higher quality products will increase followed by the raising of prices in international food markets. Expansion and diversification of agricultural products generate opportunities for people in the region and raise rural incomes which will allow rural and urban households to access adequate and nutritious food. Consequently, a joint effect of integration and value chains boosts food security.

Similarly, positive changes in economic growth and domestic investment translate into increase in per capita dietary energy supply while a rising of political instability in ECOWAS is seen to have a negative impact on food security. Economic growth improves food security, showing that a rise of household income directly targets the consumption of foods. This finding in line with Timmer (2005) confirms that food security in ECOWAS is mainly a growth challenge contrary to others developing countries where economic growth alone does not solve the problem of food security. In ECOWAS countries, economic growth is essential for food security, and strategies at regional and national level need to be investigated. The promotion of trade value chains may be the bottom line to design these strategies because of the effectiveness of per capita domestic value added on sustaining economic growth. Value chains need to be implemented across countries and sectors, and the development program of ECOWAS must only target this goal. As expected, the incidence of political instability negatively affects food security. Political instability creates an unfavorable condition on food security through the decrease of investment and its impact on food supply from domestic production. Some researchers find similar results for ASEAN (Herath et *al.* 2014) and developing countries (Bezuneh and Yiheyis 2014).

Growth in food production is associated with an increase in national food security. An enabling environment needs to be created by ECOWAS countries to encourage producers by increasing domestic consumption, improving the areas of farm household, making them able to cope with risk, uncertainty and sources of technical change, and raise industrial development to make food cheaper. Also, some measures must be taken by governments to improve market efficiency such as communications, transportation and storage facilities, legal codes to enforce contracts, credit availability to finance short-run inventories and processing operations, a market information system to keep all market participants from farmers to consumers fairly and accurately informed about market trends.

Increase in domestic credits, population growth, foreign reserves and agricultural irrigated land are associated with rise in per capita dietary energy supply. Domestic credits increase the consumer purchasing power and allow to access various and qualities commodities (Baldwin 2011b). National food security can be improved if countries allocate more domestic credits for the segment of the population who needs it. It is well established that credits in most developing countries go directly into consumption and are used as an asset to smooth people's income (Ivica 2016). Furthermore, credits act on food production and prices which are linked to food security. The amount of foreign reserves in ECOWAS contributes to food security. Foreign reserves enhance the ability of food importation of countries and are a channel to buy the capital machinery to accelerate production to achieve self-sufficiency. Also, the development of the industrial sector is mainly correlated to the earning of foreign exchange and the ability of people to buy food staples. The percentage of land irrigated significantly contribute to food security

through its positive impact on domestic food production. The more households have access to land for growing crops the more food production and availability increase. An extension of agricultural land reduces prices and diversifies different cropping patterns that provide nutrient diversity and more stability of output.

Contrary to the findings of studies (Bezuneh and Yiheyis 2014) obtained for some region where population growth undermines food production, the results show that for ECOWAS countries, population growth affects positively per capita dietary energy supply. These results are explained by the fact that in African countries, most of the labor force is assigned to the agricultural sector. This sector employs more than fifty percent of the workforce. Therefore, a growing population raises food production, enlarges the variety of goods and improves the competitiveness of domestic market (Xiang *et al.* 2012). The final result is an increase of food security due to more availability of food. However, stable population growth is better than rapid population growth which constitutes a danger.

Conclusion

International trade of agricultural products appeared very early as an enrichment factor of Nations. Through the development of exports, the precursors have demonstrated the strength of international trade to drive the economic growth of a country. By the international division of labor, international trade relies on exchange liberalization. The promise of liberalization is that by creating incentives for producers from different States to specialize in the products or services in which they have a comparative advantage, it will benefit all the trading partners since it will lead to efficiency gains within each country and to an overall increase of world production. Therefore, comparative advantage suggests that economic growth and poverty alleviation may result.

However, international trade for African countries has not brought the expected results. This study focuses on ECOWAS and attempts to respond to the inconsistency of the economic policies in African countries that turn away from the regional integration for the benefit of foreign markets. Three particular strategies are investigated in ECOWAS integration (such as each country international trade openness, each country intra-regional trade openness and insertion to value chains) to identify the best way for economic development in term of economic growth and food security raising. Two models are estimated with fixed effects over the period 1995-2012.

The results show that the relationship between openness and growth is not robust, while intra-community trade and per capita domestic value-added appear to influence economic growth. This finding supports that regional integration needs to strengthen and better promoted to stimulate the potential of each country to move from discontinuous to sustained growth. International trade is not a solution for ECOWAS to boost economic growth but regional trade linked to the creation of value chains among each country can be the engine of the growth. Countries should move more to regional integration than international trade.

Furthermore, international trade positively affects per capita dietary energy supply while intra-regional trade is not robust. This irrelevance impact of regional trade on food security can be justified by the weakness of exchange among ECOWAS countries. Nevertheless, backward integration has a positive effect on food security, thereby suggesting that participating in the value chain has spillover effects on countries food security. A joint effect of intra-regional trade and value chains trade can boost food security. This strategy optimizes economic growth and food security.

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AGGREGATION WITH A NON-CONVEX LABOUR SUPPLY DECISION, UNOBSERVABLE EFFORT, AND RECIPROCITY ("GIFT EXCHANGE") IN LABOR RELATIONS

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Abstract:

The purpose of this note is to explore the problem of non-convex labour supply decision in an economy with reciprocity in labour relations ("gift exchange") a la Danthine and Kurmann (2010), and explicitly perform the aggregation presented in Vasilev (2017) without a formal proof, and thus provide - starting from micro-foundations - the derivation of the expected utility functions used for the aggregate household. We show how lotteries as in Rogerson (1988) can be used to convexify consumption sets, and aggregate over individual preferences. With a discrete labour supply decisions, the elasticity of aggregate labour supply increases from unity to infinity.

Keywords: aggregation; indivisible labour; non-convexities; reciprocity.

JEL Classification: E10; J22; J41; J46.

Introduction

The purpose of this note is to explore the problem of non-convex labor supply decision in an economy with reciprocity in labour relations ("gift exchange") a la Danthine and Kurmann (2010), and explicitly perform the aggregation presented in Vasilev (2017) without a formal proof, and thus provide - starting from micro-foundations - the derivation of the expected utility functions used for the aggregate household. We show how lotteries as in Rogerson (1988) can be used to convexify consumption sets, and aggregate over individual preferences. With a discrete labour supply decisions, the elasticity of aggregate labour supply increases from unity to infinity.

1. Model Setup

The theoretical setup follows to a great extent Vasilev (2017). To simplify the analysis, the model economy here is static, without physical capital, and agents will face a non-convex labour supply decision. Effort exerted by workers is a productive input in the final-goods sector, but unobservable, and thus not directly contractible. However, producers understand that while workers do not like exerting effort, they derive utility from returning the gift of a generous wage by supplying a higher effort level even in an environment of costly monitoring. This leads to the firm paying an efficiency wage. Since the focus is on a one-period world, the model abstracts away from technological progress, population growth and uncertainty. There is a large number of identical one-member households, indexed by *i* and distributed uniformly on the unit interval. In the exposition below, we will use small case letters to denote individual variables and suppress the index *i* to save on notation.

1.1 Households

Each household maximizes the following utility function:

$$U(c,e,n) = \ln c + \ln(1-h) - h[\, 0.5\, e^2 - R(e,.)] \tag{1}$$

where c denotes consumption of each household *i*, *h* is the fraction of time available to household *i* that is spent working, and *e* is the level of effort exerted. The total time endowment available to each household *i* is normalized to unity, thus leisure, $l = 1 - h$, is implicitly expressed as time off work. The novelty here is the $R(e,.)$ utility term, which is included to capture that workers may derive utility out of "reciprocal behavior towards their employer." As long as $R_e(e,.) > 0$, household *i* would be willing to reward a wage that is perceived to be above the competitive one (even in the absence of any direct material gain resulting from such an action) with a level of effort above the required minimum (say, zero).

As in Hansen (1985) and Rogerson (1988) household's labour supply is assumed to be indivisible, i.e. $h \in \{0, \overline{h}\}$. The problem faced by a household that decides to work full-time is then to set $h = \overline{h}$ and enjoy

$$U^w = \ln c^w + \ln(1 - \overline{h}) - \overline{h}[0.5(e^w)^2 - R(e^w,.)] \,, \tag{2}$$

where $c^w = w\overline{h} + \pi$ and e^w are the consumption and effort levels when working. Note that the effort level will be determined implicitly from its optimality condition $e = R_e(e,.)$, which does not depend on the other model variables. In contrast, a household that decides not to work chooses $h = 0$ and enjoy

$$U^u = \ln c^u \,, \tag{3}$$

where $c^u = \pi$ is the consumption level when the household is not working.

1.2. Reciprocity

As in Vasilev (2017), the reciprocity tem, $R(e,.)$, in the household's utility function is modeled as a product of the mutual "gifts" of an employed household and the representative firm:

$$R(e,.) = d(e)g(w) \tag{4}$$

where $d(e)$ denote the gift of the employed household towards the firm, expressed in terms of effort exerted, and $g(w)$ is the counter-gift of the firm to the worker in terms of the wage rate paid. Both terms are assumed to be concave in their respective arguments, *i.e.* $d_e(e) > 0$, $d_{ee}(e) < 0$, and $g_w(w) > 0$, $g_{ww}(w) < 0$. Hence, when a worker receives a wage offer that is perceived as generous (e.g. a wage above the competitive rate), *i.e.*, $g(w) > 0$, the household's utility increases if there is a reciprocal gift expressed in terms of higher effort, $d(e) > 0$. In addition, from the perspective of an atomistic worker, the wage rate is taken as given, that is why $d_w(e) = 0$. In addition, employed households do not take into consideration the effect of their (individual) effort on the firm's output, and hence on the gift made by the firm to the worker, *i.e.*, $g_e(w) = 0$ from the perspective of an employed household. Note that in defining the two gifts, both are expressed as deviations from some expected norm ("reference level"). To simplify the analysis, we will normalize the minimum acceptable effort level to be $e_{\min} = 0$. The worker's gift then can be expressed as:

$$d(e) = f(e) \tag{5}$$

where the functional form was intentionally chosen the same as the firm's production function. Next, we define the firm's gift as follows:

$$g(w) = \ln w - \varphi \ln f(eH) - \varphi \ln n \,,$$

where the first term on the right-hand-side, $\ln w$, is the utility benefit resulting from a higher consumption, which the worker attributes to the firm's wage offered. The remaining term has to do with rent-sharing considerations between the firm and the worker, as it represents the surplus to be shared (worker's product). In this case it represents a case where the firm distributes all the revenue to its workers. Plugging this expression into the optimal effort condition

$$e = R_e(e,.) = d_e(e)g(w) = f'(e)g(w) \,, \tag{6}$$

which does not have a closed-form solution. However, if we use $f(e) = e^{\alpha}$, $0 < \alpha < 1$, then we can express the wage rate as

$$\ln w = \frac{e^{2-\alpha}}{\alpha} + \varphi \ln \frac{(eH)^{\alpha}}{n}.$$

From this equation it follows that the wage rate set by the firm positively depends on the firm's revenue per worker ($\varphi > 0$), as it increases the total surplus/rent of the labor relationship; this is also referred to as a rent-sharing motive.

1.3. Stand-in Firm

There is a representative firm in the model economy. It produces a homogeneous final product using a production function that requires labor H as the only input. For simplicity, output price will be normalized to unity. The production function *f(H)* features decreasing returns to scale (for any effort level): $f'(eH) > 0$, $f''(eH) < 0$, $f'(0) = \infty$, $f(en\bar{h}) = 0$. The representative firm acts competitively by setting the wage rate *w* and choosing *H* to maximize profit by stimulating optimal effort:

$$\pi = f(eH) - wH \text{ s.t } 0 \le H \le \bar{h} \tag{7}$$

and

$$e = f'(e)g(w) \tag{8}$$

In equilibrium, there will be positive profit, which follows from the assumptions imposed on the production function.

1.4. Decentralized Competitive Equilibrium (DCE): Definition

A DCE is defined by allocations *{cʷ; cᵘ; e; H}*, wage rate *{w}*, and aggregate profit ($\pi = \Pi$) s.t.
(1) all households maximize utility;
(2) the stand-in firm maximizes profit;
(3) all markets clear.

2. Characterization of the DCE and derivation of the aggregate utility function

It will be shown that in the DCE, if it exists, only some of the households will be employed and work full-time, while the rest will be unemployed. Following the arguments in Rogerson (1988) and Hansen (1985), it can be easily shown that polar cases in which each household either, or a case in which nobody works, cannot not be equilibrium outcomes. Therefore, it must be the case that an only proportion of the agents in the economy are working. Denote this mass of employed by n. Workers will receive consumption cʷ, while those not selected for work will consume cᵘ. Note that n can be interpreted also as the probability of being chosen to work: This probability is determined endogenously in the model, as workers would seek for the optimal balance between the net return from working in terms of increased utility of consumption, which, however, comes at the expense of lower utility out of leisure. Note that no matter of the employment outcome, ex post every household enjoys the same utility level. Thus, in equilibrium $H = n\bar{h}$. As derived earlier, the wage is set equal to:

$$\ln w = \frac{e^{2-\alpha}}{\alpha} + \varphi \frac{\ln(e\bar{h}n)^{\alpha}}{n}.$$

Firm's profit is then

$$\pi = \Pi = f(ne\bar{h}) - wn\bar{h}, \tag{9}$$

which follows from the decreasing returns to scale featured by the production function. Next, to show that the DCE actually exists, it is sufficient to show the existence of a fixed-point *n* in the unit interval by analyzing a non-linear equation using the fact that in equilibrium utility is the same for all households. It is trivial to show that everyone working in the market sector (*n = 1*) is not an equilibrium, since then *w = 0*. From the ex-ante symmetry assumption for households, market consumption would be the same for workers and those not selected for work, while the latter would enjoy higher utility out of leisure, hence there is no benefit of working. Similarly, nobody working (*n =*

0) is not an equilibrium outcome either, since the firm would then offer a very high wage for the first unit of labour, and by taking a full-time job a marginal worker could increase his/her utility a lot.

Thus, if there is a DCE, then it must be that not all households would receive the same consumption bundle. If *n* in the unit interval is an equilibrium employment rate, then total utility for households that work should equal to the utility of households that do not supply any hours. This equation is monotone in *n*, as the utility function is a sum of monotone functions. Thus, we can explore the behaviour of that function (the difference between the utility of working and not working) as we let *n* vary in the (*0, 1*) interval. As *n* approaches *0*, the left-hand-side dominates (utility of working is higher), while when *n* approaches unity, the right-hand-side dominates (utility of not working is higher), where the results follow from the concavity of the utility functions and the production technology. In addition, from the continuity of those functions, there is an *n* in the unit interval, which is consistent with equilibrium. The unique value of equilibrium *n* follows from the monotonicity of the utility and production functions. Let c^w and c^u denote equilibrium consumption allocations of individuals selected for work, and those who will work in the informal sector.

Given the indivisibility of the labour supply, the equilibrium allocation obtained above is not Pareto optimal, as demonstrated in Rogerson (1988). More specifically, a social planner (SP) could make everyone better off by using an employment lottery in the first stage and choosing the fraction n of individual households to work in the market sector and give everyone consumption *$nc^w + (1-n)c^u$*. In order to show this, we need to check that such an allocation is feasible, and that it provides a higher level of total utility. Showing feasibility is trivial as total market labour input and total consumption are identical to the corresponding individual equilibrium values.

Next, we will show that the new allocation, which is independent of household's employment status in the market sector, makes households better o since it generates higher utility on average. This is indeed the case, where the strict inequality follows from the convexity of the CES aggregation and the concavity of the logarithmic function. Thus, the SP is indeed giving in expected utility terms an allocation that is an improvement over the initial equilibrium allocation. If households can pool income together and doing so, they will be able to equalize consumption across states, *i.e.*, $c = c^w = c^u$, so aggregate utility becomes:

$$U(c,e,n) = \ln c + n\,[\ln(1 - \bar{h}) - 0.5\,e^2 + R(e,.)],$$

which is the representation in Vasilev (2017). On the aggregate, when each household faces an indivisible labour choices, the representative agent obtained from the aggregation features different preferences of work: as in Hansen (1985), the disutility of work in the market sector is now linear.

Conclusion

The purpose of this note is to explore the problem of non-convex labour supply decision in an economy with reciprocity in labour relations ("gift exchange") a la Danthine and Kurmann (2010), and explicitly perform the aggregation presented in Vasilev (2017) without a formal proof, and thus provide - starting from micro-foundations - the derivation of the expected utility functions used for the aggregate household. We show how lotteries as in Rogerson (1988) can be used to convexify consumption sets, and aggregate over individual preferences. With a discrete labour supply decisions, the elasticity of aggregate labour supply increases from unity to infinity.

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THE CREDIT CHANNEL TRANSMISSION OF MONETARY POLICY IN TUNISIA

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Abstract:

The purpose of this paper is to evaluate the importance of the credit channel in the monetary policy transmission mechanism in Tunisia. Using a VAR approach, we attempt to empirically examine the responses of the major aggregates of the Tunisian economy to monetary policy shocks over the period 1965-2015. Our empirical results show that credit has a significant effect on investment and inflation. The cointegration relationship coupled with the weak erogeneity test shows that credit is an endogenous variable and therefore the long-term equation found is a credit equation. The crucial role of credit channel is argued by the goal of price stability expected by any monetary policy. The analysis of monetary shocks shows the importance of exchange rate policy and the local currency devaluation on the financing mode. It is seen that Tunisian economy is dominated by external conditions. This dominance is confirmed by extensive using of external debts and trade agreements with the dominant countries. The main findings suggest that policymakers should act on the level of economic activity and inflation, on two terms. The first is in short-term by acting on the interest rate and the second is in long-term by controlling the exchange rate.

Keywords: credit channel; monetary policy transmission; VAR approach; impulse analysis; monetary shocks.

JEL Classification: E43; E51; E52.

Introduction

The monetary policy transmission channels have been changed with the reforms and deregulation within the policy of monetary and financial liberalization that has been emerged since the late 1980s in most countries. If the interest rate channel now seems more direct, the effect of the monetary aggregates themselves on economic activity may have changed as their definitions evolved. This definition has undergone several modifications depending on the physical quality of the currency (degree of liquidity, maturity, immaterialization) and the theoretical view associated with money itself. In parallel, in the recent recession of United States that began in December 2007 and ended in June 2009, kept interest rates at very low levels have failed to revive economic activity in usual delays, because the distribution of credits has been inefficient (Barran *et al.* 1995). This has cast some doubts on the effectiveness of monetary policy transmission. To the interest rates channel, some authors have proposed to add a bank credit channel (*e.g.* Stephen and Glenn 1996, White 2009, Mishkin 2011).

If it is now theoretically established that credit rationing may exist, the balancing of this market may involve variables other than the interest rate. Moreover, this rationing, generally carried out by banks during the recession

periods, may certainly have macroeconomic impacts that deserve to be studied. If bank credit is not perfectly substitutable for other financing sources - this is the case for small firms that do not have access to other financing sources - the rationing constraint may have a restrictive effect on demand for goods and also on supply. The work initiated by Bernanke and Blinder (1988, 1992) in the United States raised the issue of monetary policy transmission specific to bank credit. To the interest rates channel and the money demand, we would add a credit banking channel. This latter would regroup the specific effects resulting from the repercussions of monetary policy on bank credit. We can therefore consider the mechanisms of *"financial propagation"*, resulting from the fact that a shock on monetary policy can affect the wealth of firms and thus their access to the main financing resource.

Our objective in this paper is to demonstrate the importance of the credit channel in the monetary policy transmission mechanism in Tunisia. Using a VAR approach, we attempt to empirically examine the responses of the main aggregates of the Tunisian economy to monetary policy shocks over the period 1965-2015. Especially, our exercise consists to simulate the reaction functions of the different variables and the variance decomposition for the different series. In this context, we are concerned with the dynamics of economic activity and inflation in a bank credit model.

The rest of this paper is organized as follows. Section 2 presents the theoretical framework of the credit channel in IS-LM model. Section 3 describes the methodology based on credit channel modeling. Section 4 discusses the results of co-integration, causality and the response functions of the selected variables to monetary shocks. Section 5 concludes and gives annotations on our future work.

1. Theoretical Framework

The transmission by the credit channel has been the subject of an abundant empirical literature since the 1980s, where the various authors have noted the weakness of the traditional relations of the money view and attempted to demonstrate the specific role of bank credit (see *e.g.* Lavoie 1984, Natke 1997, Eric Berr 1999, Rochon 1999, Mathias 2005, Ferreria 2009, Mishkin 2011). But their foundations do not form a truly unified theoretical corpus and the microeconomic explanations evoked may differ from one author to another. The approach is common to recognize the importance of banking assets, and therefore the credit, in the monetary policy transmission. According to Barran *et al.* (1995), the non-neutrality of money can result from the transmission by credit channel. The real effect of a monetary restriction can be reinforced by the decline in credit. Some businesses that do not have access to other forms of external financing are forced to reduce their investment.

1.1. The Credit Channel in IS-LM Model

Although the IS-LM model now seems outdated compared to the theoretical developments that followed it, the interpretation of the effects of monetary policy it proposes still serves as a reference. In the basic model, bank credit is not identified in its nominal term. There is only one financing source (bonds), which implicitly amounts to assuming perfect substitutability between securities and credit. In the case of monetary tightening or contraction of bank reserves, banks may react by increasing their requests for deposits not subject to compulsory reserves, certificates of deposit or term deposits, or well, possibly through the issuance of titles which leading to an increase in interest rates. This increase, by reducing investment, has a real effect. In this context, the behavior of banks, in response to an inflexion of monetary policy, therefore concerns only their liabilities. The asset composition does not appear to be affected. This hypothesis is called into question in the credit channel.

Two reasons could be causing that transmission by 'money channel' is less and less effective. First, a large proportion of bank deposits is today paid to the money market rates, which makes traditional substitutions between money and securities less likely. Second, the compulsory reserves on deposits tend to decrease or even disappear, in the majority of developed countries, which certainly makes the banks less attentive to managing their liabilities to avoid them. Blinder (1987) showed the consequences of credit rationing on an IS-LM model. He highlighted the real effects of the transition from the economy to a rationing stance and the resulting growth regimes. Bernanke and Blinder (1988) have incorporated, to the stock market, a bank credit market in IS-LM model, and suggest that the standard results have been greatly affected because shocks in the credit supply can lead to divergent effects on both interest rates. Notably, a shock reducing the credit supply, resulting for example from a rise in the risk on bank borrowers, can reduce credit, national income and the rate on government bonds whereas the credit rate rises.

1.2. Bank Credit and Monetary Policy Transmission

The monetary policy transmission study has oriented academic research towards the credit channel. This channel concerns all the implications that the variations of key rates can react on the credit supply. The economic

literature makes a distinction between two types of channels. The first channel is the strict bank credit channel – the key rate changes modify the refinancing conditions of the banks in the money and financial markets. In particular, a tightening of the conditions of banks refinancing weighs on their activity of monetary creation, on their production of credit to the economy and therefore on the business investment and households consumption –. The model of Bernanke and Blinder (1988) showed that, by reducing the banks access to lendable funds, open market operations limit the supply of bank loans.

The second channel is the broad channel of credit or balance sheet channel - as in the theory of the financial accelerator, the quality household's balance sheet structure is considered, but assuming nominal policy shock rather than real shocks on the external finance premium. A change in interest rates thus affects the structure of the balance sheets, hence the external finance premium. An increase in rates will then have significantly greater depressive effects when private agents are already heavily indebted and poorly solvent. Thus, the unfavorable impact of a monetary tightening on the ability of companies to repay their debts (the interest rate channel) and the cost of their capital (Q of Tobin) are reinforced by a recovery in the risk premium which banks are weighing on new borrowers. Behaviors in financial markets linked to a change in risk may accentuate the effects on monetary policy stances.

Since its introduction in the literature in the mid-1980s, the credit channel has been the subject of intense controversy. Several empirical studies (*e.g.* Stephen and Glenn 1996, Jordan 1999, Kalt 2001, Natal 2003, Ferreira 2009, Ioannidou *et al.* 2009, Bayangos 2010) have sought to assess its importance in relation to other channels of monetary policy transmission (*i.e.* interest rate channel, exchange rate channel). According to Curdia and Woodford (2010), the existence of the credit channel involves some conditions. First, companies' dependence on credit (in the case of the broad channel) and more particularly bank credit (in the case of the narrow channel). This implies an imperfect substitutability between titles and credits. Second, the banks are sensitive to their conditions of refinancing with the Central Bank and that they have little alternative possibilities of refinancing markets. Third, the activity of the banks is mainly oriented to the credit and contributes little to the economy by other types of receivables financing.

However, the acceleration of financial innovations and the concomitant development of capital markets, since the mid-1980s, have led many authors to believe that a movement of banking disintermediation of financing took place and followed many attempts of questioning of the credit channel (see Smant 2002). Admittedly, the emergence of capital markets has offered companies a wider range of financing substitutes for bank credit. On their side, banks have had to adapt to this boom. They have, at the same time diversified their sources of financing (deposits and market resources) and their assets (credit and securities).

1.3. The Post-Keynesian Demand for Credit Model

Certainly, effective demand plays a central role in economic thought. Keynes (1936) said that if the propensity to consume and the investment rate give insufficient effective demand, the actual level of employment will be less than the supply of potentially available labor. Estenson (1992) argued that when entrepreneurs decide to produce more goods and services, thus they need to call for more monetary units to the banking system. Insisting on the chronology of operations leading to income formation, Bouvet (1996) has indicated that all contemporary theorists of endogenous money accept the simplified scheme which represents the necessity of bank credit in the economic circuit[1].

Following the post-Keynesian approach, we can accept the following reasoning: an increase in the credit activity of banks, whether consumer credit granted to individuals or loans granted to companies for projects to increase their production, creates an additional demand. If the economy is underemployed, this demand can be met immediately by an increase in production equal to the additional demand. The increase in production gives rise to an equivalent increase in revenues. Indeed, the companies which have increased their production have evidently distributed the value of the additional output in the form of wages and profits. By creating ex-nihilo of the money by an increase of their credits, the banks create additional rights on the production. But when the economy is

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[1] In this regard, see the interesting contribution of Eric Berr (1999) and the thesis of Rochon (1999). It should be noted that Rochon (1999) used the horizontalistic view by offering a historical overview of endogenous money approaches such as that of the circuit and post-Keynesians. He started with the Franco-Italian circuit school. He first insisted on the early writings of Minsky, Kaldor and Tobin in the 1950s and Davidson (1988) and later Rousseas post-Keynesians followed by the interesting deepening of Joan Robinson and Richard Kahn in the theory of money-credit. Rochon (1999) then compared the present post-Keynesians contemporary structural theory with the new Keynesian monetary thought. He developed an innovative theory of banking on the basis of Keynesian uncertainty and in line with the horizontalist tradition taking into account credit restrictions, liquidity crisis and solvency.

underemployed, this has the effect of increasing production and incomes. These rights are therefore immediately validated, that is to say they can be satisfied without any other rights already created on production having to be reduced.

Our approach is inspired by the idea of Natke (1997). The author sought to integrate the motive of financing[2] into a function of demand for liquidity of the firms. He conducted a micro-econometric study of firms in Brazil to assess the importance of the funding motive in their liquidity demand function and its relationship to the transaction motive. His findings conclude that these two motifs are distinct and significant. Natke (1997) based on the work of Laumas (1980), which argued that the pattern of financing is more important in developed countries because of the liquidity lack in the public sector caused by the inefficiency of capital markets and major dependence on banks. However, to obtain an appropriate measure for the transaction motive, Natke (1997) proposed the value of sales made more than the current investment spending. The motive for financing in the post-Keynesian logic is introduced only when there is an increase in planned investment spending.

2. Methodological Approach and Data

Specify the variables in credit channel model returns to determine the indicative variables of monetary policy with an explanatory and significant power in relation to an indicator of real economic activity. The central variable in this model is represented by domestic credit that plays a crucial role in the economy of debt. In our case of Tunisia, this variable is defined as the sum of net claims on the government and the lending to the economy. The latter consists of credit to the economy and the securities portfolios. Thus, domestic credit is the credit in a broad sense in the financing of the economy. The credit channel model is empirically analyzed by several economists (see *e.g.* Paquier 1994, Barran *et al.* 1995, Goux 1996, Payelle 1996).

In order to cope with capital spending, entrepreneurs use credits. The investment amounts and sources of financing are mainly short-term bank credits[3]. In financing demand function, it is necessary to introduce the interest rate that is, in basically theoretical, linked to the behavior of the banking system and to the mechanisms for creating appropriations intended to cover the needs of economic activity.

In this study, our specification model which integrates the credit into a macroeconomic aggregate system taking the following form:

$$LSTC_t = \beta_0 + \beta_1 LINV_t + \beta_2 MMR_t + \beta_3 RER_t + \beta_4 LPCI_t + v_t \qquad (1)$$

where, *STC* is short-term credit, *INV* is investment, *MMR* is money market rate, *RER* is real exchange rate; *CPI* is consumer price index, and v_t the error term. The data are taken from the Central Bank of Tunisia (CBT) database and covering the period of 1965-2015. All the variables are transformed in logarithmic form, with exception of *MMR* and *RER*.

In order to carry out an impulse study and analyze the shocks, we begin by highlighting the dynamism that exists between the variables. The aim here is to know the order of causality between these different variables that is necessary in the study of the decomposition of variability forecasts. It is known that each production flow requires a surge of a new credit or a renewal of a former credit (Lavoie 1984, Wray 1991, Natke 1997). Borrowers are the cause factor, and then the banks decide whether or not to make the production possible. We see as well that credit creation precedes production. Without this creation, production becomes impossible, or at least restricted. Thus, when one has at time t, the credit for this period is for the identification of the anticipated investments in (*t*+1) and therefore the production. In a political sense, the preferred instrument affecting the amount of credit granted. In addition, the exchange rate can be constituted as an intermediate target for monetary policy in an open economy.

Therefore, the order of dynamism in the VAR analysis is as follows:

$$MMR \longrightarrow RER \longrightarrow LSTC \longrightarrow LPCI \longrightarrow LINV$$

However, Barran *et al.* (1995) used this order in their estimates of the credit channel by adding the aggregate broad money supply (M2) among the exchange rate and the credit. In our case study, we eliminated M2 because it is higher correlated with the credit variable. Since, the linear correlation coefficient between M2 and STC in logarithmic form is about 0.98 in our sample period.

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[2] Indeed, this motive is considered at the heart of the idea of the endogeneity of money and the monetization of production (Lavoie 1984, Rochon 1999).

[3] The choice of short-term credit is justified by the importance of its proportion compared to other medium- and long-term credits (more than 70% of total bank credit, data source: CBT).

3. Empirical Results

To check the stationary properties of variables, we use the specification of the augmented Dickey-Fuller (ADF) unit root test. Table 1 reports the results of the ADF unit root test. This test is performed on both level and first difference of variables. The null hypothesis of non-stationarity is rejected at the 1% level of significance, confirming that all variables are stationary in their first difference form with intercept. This implies that the series may exhibit no unit root problem after one differentiation and then we can use these series of variables to analyze the long-run relationship between the variables.

Table 1. Augmented Dickey Fuller (ADF) Unit Root Test Results

Variables	Level		First difference	
	t-Statistic	Prob.	t-Statistic	Prob.
MMR	-1.291	0.626	-6.477***	0.000
RER	-1.946	0.615	-5.603***	0.000
LSTC	-2.346	0.402	-6.875***	0.000
LPCI	-1.100	0.708	-4.211***	0.001
LINV	-1.089	0.712	-5.032***	0.000

Note: *** indicates the rejection of the null hypothesis at the 1% significance level.
Source: Authors' estimation based on the CBT database

3.1. Graphical analysis

Figure 1 gives us an idea on the evolution curves of MMR, RER, LSTC, LPCI, and LINV used in Eq. (1) during the study period (1965-2015). The RER is defined as the price of the Tunisian dinar in terms of U.S. dollars. We can conclude an extraordinary depreciation of the RER during the study period. The LPCI has been growing steadily, reflecting the purchasing power of Tunisian citizens, which has continued to deteriorate. LSTC and LINV have positive trend despite some passing feedback.

Figure 1. Evolution Curves of MMR, RER, LSTC, LPCI and LINV from 1965 to 2015
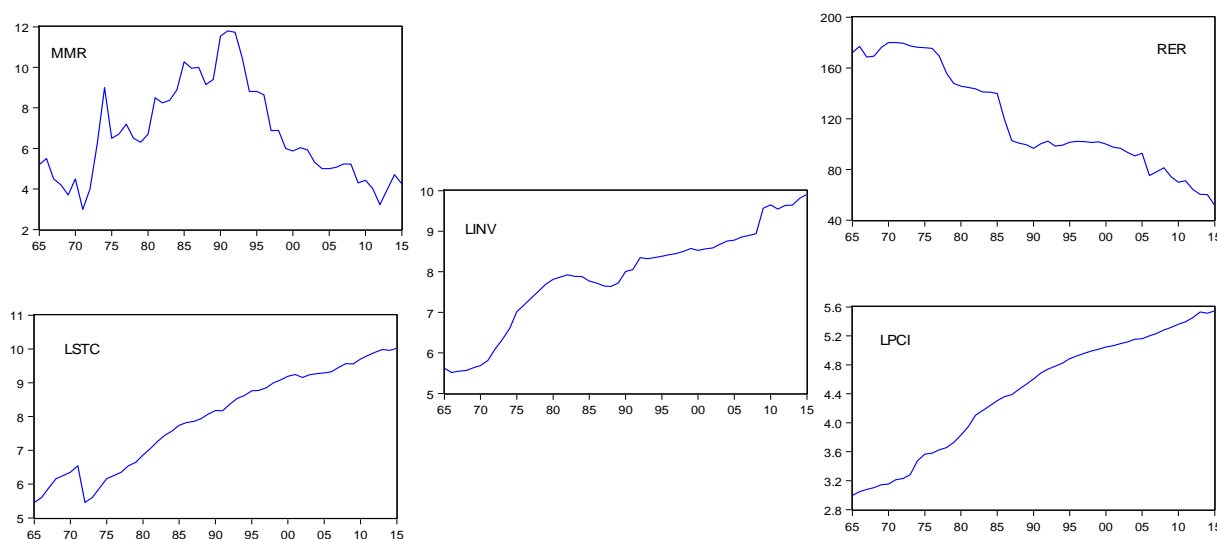
Source: Authors' estimation based on the CBT database

For the MMR, the statistics release significant peaks on the rise on the eve of the implementation of the structural adjustment plan. However, this increase is under control and the MMR is gradually returns to its initial level. The MMR curve reflects clearly that this rate is administered.

The lag length in our VAR mode is assessed by using four criteria of information, *i.e.* Final Prediction error (FPE) criterion, Akaike information criterion (AIC), Schwarz information criterion (SIC) and Hannan-Quinn information criterion (HQC). However, from the tests results of these four criteria, only SIC and HQC indicated the presence of one lag in our VAR model (see Appendix A1). The other criteria are considered overestimating the order of the VAR for our case. Therefore, we accept that our model is VAR (1) that is expressed as follows:

$$Y_t = A + BY_{t-1} + \varepsilon_t$$

where $Y_t = (MMR,\ RER, LSTC, LPCI, LINV)^T$ is the vector of our main five variables; $A = (a_i)$ is the vector of constants of the 5 equations which express the current variables (at time *t*) in function of their period lags.

$B(b_{ij})$ is the (5 x 5) matrix of coefficients associated with first lag variables. ε_t is the error term vector. The error terms $\varepsilon_{i,t}$ represent the innovations that will be explored after in the impulse analysis.

3.2. Cointegration Test Results

Since the stationary results from ADF unit root test confirm that the time series of the variables are integrated of order one, I(1) The Johansen maximum likelihood technique for cointegration has been applied in order to determine the cointegration rank and the number of cointegrating vectors. Table 2 reports the Johansen cointegration tests results. However, the null hypothesis of no cointegration (r = 0) based on both the Trace statistic and Max-Eigen value statistic is rejected against the alternative hypothesis of r = 1 at the 5% level of significance. This implies that there exists one cointegrating relation among the variables.

Table 2. Cointegration Test Results

Hypothesized No. of CE(s)	Trace Statistic	CV 5%	Max-eigenvalue statistic	CV 5%
r = 0	98.7017**	76.9727	56.3110**	34.8059
r = 1	42.3906	54.0790	22.6705	28.5880
r = 2	19.7201	35.1927	9.8092	22.2996
r = 3	9.91096	20.2618	6.27810	15.8921
r = 4	3.63286	9.16454	3.63286	9.16454

Notes: r is the number of cointegrating vectors.
** denotes rejection of the hypothesis at the 5% level of significance. CV is the critical value.
Source: Authors' estimation

However, the cointegrating relation found by the Johansen tests, normalized with respect to LSTC, is as follows:

$$LSTC_t = 5.187 - 0.029\,MMR_t - 0.013\,RER_t + 0.558\,LPCI_t + 0.347\,LINV_t \qquad (2)$$

The general levels of prices and investment have positive effects on the amount of credit granted. This relationship presented in Figure 2 is characterized by an enormous upward peak at the beginning of the period, apparently caused by the increase in inflation during the first oil crisis (1973). In addition, the coefficient of inflation in Eq. (2) is higher in the long-run relationship. Another peak, but less important, is observed during the start year of the implementation of the Structural Adjustment Plan (1986). Afterwards, we noticed a certain stability that characterizes the rest of the study period.

Figure 2. Long-run Relationship Curve from 1965 to 2015
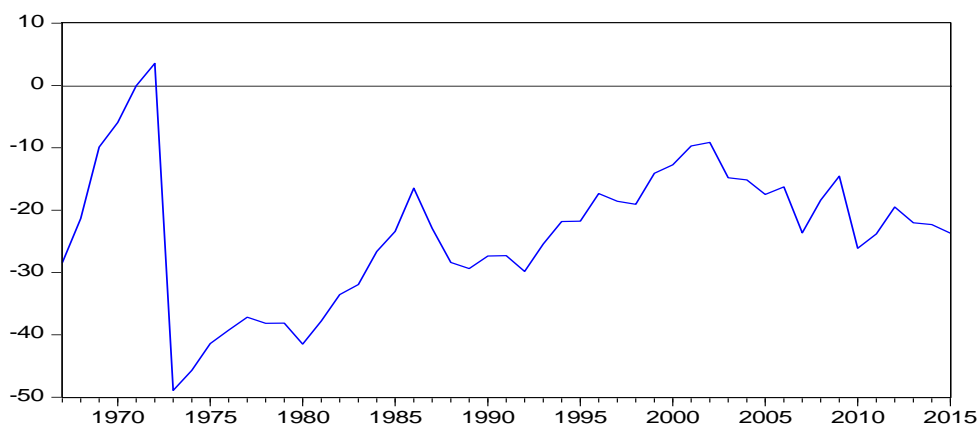
Source: Authors' estimation based on the CBT database

Moreover, the results of the weak exogeneity test show that LSTC and LPCI variables are strongly exogenous at the 1% level of significance. But the other considered variables i.e. MMR, RER and LINV are weakly exogenous (see Appendix A2). Therefore, we can deduct from the results of the weak exogeneity test the importance of the credit (LSTC) and its linkage to inflation (LPCI). This evidence indicates that Eq. (2), normalized in LSTC, is well accepted because the hypothesis that the variable LSTC can be considered as endogenous is accepted according to this test. Inflation (LPCI) is also influenced by the other variables. Indeed, the monetary

authorities appear to have two policy instruments: the interest rate (MMR) and the exchange rate (RER). This fact needs to be examined by the causality test with VECM.

3.3. Causality Analysis

We adopt the VECM model under the constraint of one cointegrating relation and we applied the Wald causality test on the variables in their first difference. Table 3 reports the result of causality test with VECM. The number of lags is that of the VAR (1). The short-term effect of the interest rate (MMR) on credit (LSTC) and inflation (LPCI) can be derived from this causality test. The latter was highly influenced by the MMR variation, since the associated *p*-value is less than 1% level. The credit, on its part, influences only inflation in short-term. Inflation is affected also by MMR. We conclude the importance of the MMR as instrument and the bidirectional causality between inflation and credit.

Table3. Results of Granger Causality Test

Dependent variable: D(MMR)			
Excluded	Chi-square	df	Prob.
D(RER)	0.030765	1	0.8608
D(LSTC)	2.579291	1	0.1083
D(LPCI)	0.235134	1	0.6277
D(LINV)	0.213319	1	0.6442
Dependent variable: D(RER)			
Excluded	Chi-square	df	Prob.
D(MMR)	0.200106	1	0.6546
D(LSTC)	0.032625	1	0.8567
D(LPCI)	0.222312	1	0.6373
D(LINV)	1.620572	1	0.2030
Dependent variable: D(LSTC)			
Excluded	Chi-square	df	Prob.
D(MMR)	3.957491	1	0.0467
D(RER)	1.426395	1	0.2324
D(LPCI)	3.163684	1	0.0753
D(LINV)	1.517700	1	0.2180
Dependent variable: D(LPCI)			
Excluded	Chi-square	df	Prob.
D(MMR)	14.80417	1	0.0001
D(RER)	0.677022	1	0.4106
D(LSTC)	4.159233	1	0.0414
D(LINV)	0.931298	1	0.3345
Dependent variable: D(LINV)			
Excluded	Chi-square	df	Prob.
D(MMR)	0.234040	1	0.6285
D(RER)	2.686443	1	0.1012
D(LSTC)	0.072846	1	0.7872
D(LPCI)	0.391211	1	0.5317

Source: Authors' estimation

As already mentioned, the short-term causality test did not yield much to the interdependence between the considered variables of our system with the investment rate. To better refine our analysis, in the next section, we examine through an impulse analysis the reaction functions among the different variables to monetary policy shocks.

3.4. Impulse Response Function Results

In this sub-section, we attempt to simulate the reaction functions of the main aggregates to monetary policy shocks represented by MMR, RER and LPCI as well as the variance decomposition of the prediction error for the

different series. Indeed, these three instruments may be controlled by the monetary authorities. The influences of these variables are registered by the reaction functions of the different variables following positive shocks on these instruments.

Figure (3a) presents the impulse response functions of MMR following to shocks on the above three indicators (MMR, RER, LPCI). We can observe that MMR is self-explanatory. In the short-term, the effects of RER and –with a lower level- the inflation rate are negative. In the medium-, and long-term, these effects fade. Figure (3b) presents the impulse response functions of RER. It is observed that the effect of MMR is positive in the short- and medium-term. But, in the long-term, this effect begins to disappear. Similarly, LPCI has a positive impact in the short-term. We noticed that after four years, this impact becomes significantly negative.

Figure (3c) presents the impulse response functions of inflation rate according to monetary indicators. A close look at this figure shows that inflation is positively affected by the MMR and negatively by the RER. It can be concluded that inflation is extensively increased with MMR and currency depreciation. These phenomena are two faces of the economic crash. Indeed, highest interest rates can lead to real economic degradation thought the "*inflation channel*". This act due to the preceding American financial crisis which has engulfed the most developed economies. In its part, currency depreciation can affect local inflation by raising the importation prices for commodities.

Figure (3d) traces the impulse response functions of LSTC. The impact of MMR shock is observed to be negative in the short-, medium- and long-term. Therefore, the monetary authorities can act on the volume of credit by their action on MMR (credit rationing policy). The inflation rate, on its part, has a negative impact in the short- and medium-term. This effect vanishes and becomes positive after five years. In the long-term, the credit reaction becomes higher. The influence of the external exchange rate pressures positively in the short-term. However, monetary appreciation plays a restrictive role on the amount of domestic credit. For investment, there is an immediate negative effect of MMR (Figure 3e). After two years, this effect becomes positive, grows and becomes more stable in the long-term. Similar to its effect on credit, the RER influences positively in the short-term, but in the medium- and long-term its effect becomes significantly negative. However, it is seen that there is certain coherence between the responses of the investment and the financing resources. Exchange rate policy is important in this regard. Thus, the devaluation of the local currency may have an adverse role on investment in the short-term, but in the long-term this effect is reversed and becomes profitable.

Figure 3. Impulse Response Functions
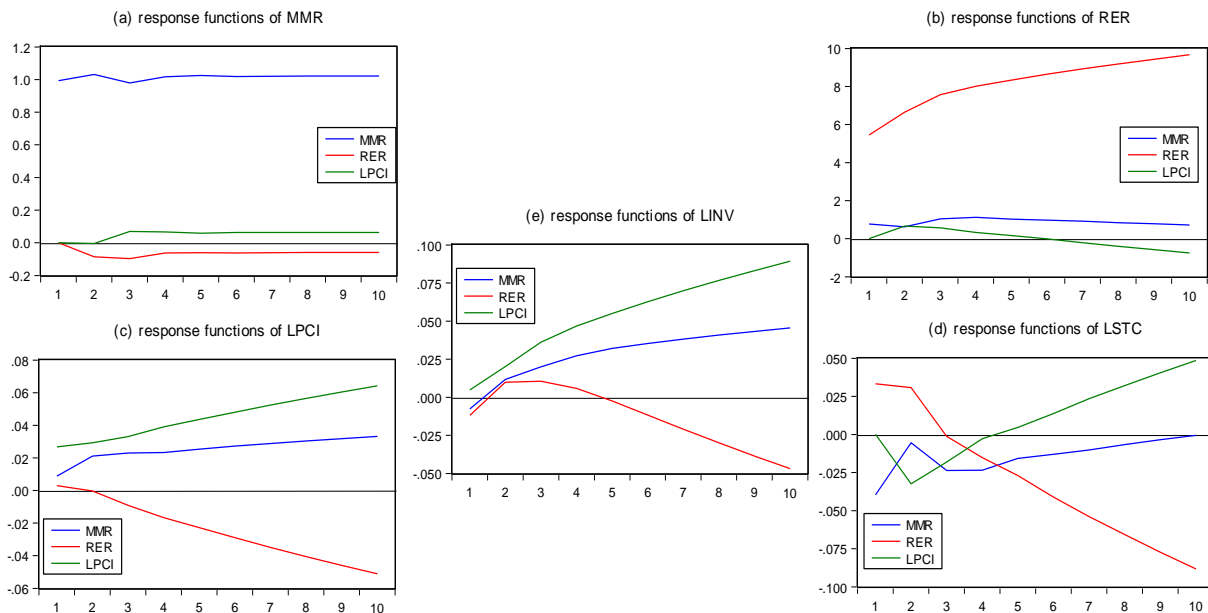
Source: Authors' estimation based on the CBT database

3.5. Variance Decomposition

On the variance decomposition of MMR, it is observed that MMR is characterized by an important self-explanatory power (see Table 2a). Indeed, even at 10-year horizon, the MMR yields only 10% of its variability. The ceded part is captured by the credit (7.67%). This result shows that the interest rate is too much administered in

Tunisia. In addition, it leaves a small portion of interdependence with the amount of credits granted. From the result of the variance decomposition, RER is also observed self-explained (see Table 2b). It can be concluded that this variable is not explained by the domestic economic aggregates. The Tunisian economy is clearly dominated by international circumstances. Indeed, the value of local currency is a quantity which internal sizes cannot play a significant role in its determination.

For the variance decomposition of LSTC (see Table 2c), the credit does not have the same attitude as the two previous variables (MMR and RER). Indeed, it ceded its explanatory power to other variables, notably the RER. After 10 years, the credit keeps only 50% of its explanatory power. The most important variable contributing to LSTC variability is RER. The latter maintains about 35% of this variability. The rest is not large enough, is subdivided between MMR with about 6% and LINV with about 7%. This result confirms the previous idea of the importance of exchange rate policy in determination of long-term internal aggregates. To these effects, monetary policy, on long horizons, must take into account exchange rate expectations.

According to the monetarists, inflation is a monetary phenomenon. This fact is found to be true regarding the Tunisian's economy case. Indeed, in the short- and medium-term an important part of the variability of LPCI is caused by MMR (see Table 2d). In medium- and long-term the contribution of credit (LSTC) becomes more and more important. The RER receives its share of 17.5% in this long-term contribution. These three factors summarize the monetary and financial situation inside and outside the country. The variance decomposition of LINV reflects a certain increasing contribution over time of the credit amount in the investment activity (see Table 2e). It can be concluded, from this result, the utility of the credit in the determination of the volume of domestic investments. This contribution reflects the importance of the credit channel in the transmission of the effects of monetary policy actions through its classical instruments.

Table 4a. Variance decomposition of MMR

Horizon	S.E.	MMR	RER	LSTC	LPCI	LINV
1	1.000869	100.0000	0.000000	0.000000	0.000000	0.000000
2	1.478666	94.64043	0.232210	4.708409	0.093045	0.325908
3	1.796489	91.64202	0.372699	6.971937	0.090509	0.922833
4	2.077893	91.32538	0.314322	7.112150	0.101292	1.146857
5	2.334627	91.12522	0.268147	7.259031	0.089897	1.257703
6	2.562531	90.83526	0.242437	7.474233	0.084597	1.363472
7	2.770870	90.68408	0.220730	7.572442	0.082817	1.439927
8	2.965276	90.60762	0.202237	7.618836	0.080298	1.491007
9	3.147425	90.54973	0.187470	7.654514	0.077865	1.530422
10	3.319186	90.51311	0.175120	7.674406	0.075874	1.561490

Source: Authors' estimation

Table 4b. Variance decomposition of RER

Horizon	S.E.	MMR	RER	LSTC	LPCI	LINV
1	5.608409	1.327843	98.67216	0.000000	0.000000	0.000000
2	8.881208	0.748194	98.11750	0.184145	0.135399	0.814764
3	11.88864	0.849410	97.10090	0.919685	0.130472	0.999536
4	14.59837	0.935029	96.36012	1.613011	0.092047	0.999796
5	17.10208	0.919427	95.68489	2.389802	0.067069	0.938809
6	19.49789	0.885416	94.89452	3.326763	0.055506	0.837790
7	21.82042	0.845912	94.01944	4.348650	0.058783	0.727217
8	24.09039	0.799593	93.08754	5.414048	0.075139	0.623681
9	26.32815	0.751227	92.10451	6.509717	0.102122	0.532424
10	28.54610	0.703878	91.08602	7.616844	0.137992	0.455270

Source: Authors' estimation

Table 4c. Variance decomposition of LSTC

Horizon	S.E.	MMR	RER	LSTC	LPCI	LINV
1	0.167708	6.282025	2.540715	91.17726	0.000000	0.000000
2	0.218248	3.734585	2.608287	90.94083	2.260370	0.455926
3	0.234956	5.027578	2.528445	88.99350	3.030407	0.420069
4	0.247363	6.600174	3.579454	86.30125	2.870186	0.648940
5	0.256146	7.226630	5.936996	83.08092	2.702028	1.053430
6	0.265527	7.653442	10.37963	77.59842	2.518687	1.849823
7	0.279139	7.770471	16.49051	70.32104	2.392885	3.025094
8	0.298418	7.427113	23.26735	62.55998	2.386880	4.358679
9	0.324623	6.734136	29.71530	55.40751	2.490850	5.652213
10	0.358067	5.870732	35.05502	49.63695	2.683072	6.754230

Source: Authors' estimation

Table 4d. Variance decomposition of LPCI

Horizon	S.E.	MMR	RER	LSTC	LPCI	LINV
1	0.024579	16.79018	2.054930	1.445882	79.70901	0.000000
2	0.042610	37.84844	0.689987	5.413961	56.04704	0.000576
3	0.062907	32.52027	3.189751	22.00056	41.69807	0.591347
4	0.086832	24.04904	6.790449	33.61361	33.97724	1.569654
5	0.113284	18.84125	9.632517	40.31274	28.94924	2.264253
6	0.142543	15.16805	11.95199	45.04375	25.05537	2.780845
7	0.174257	12.41839	13.83046	48.39557	22.16002	3.195558
8	0.207875	10.40784	15.32010	50.74900	20.00381	3.519239
9	0.243143	8.907946	16.51400	52.47252	18.33310	3.772431
10	0.279864	7.752954	17.48757	53.77569	17.00780	3.975991

Source: Authors' estimation

Table 4e. Variance decomposition of LINV

Horizon	S.E.	MMR	RER	LSTC	LPCI	LINV
1	0.130574	0.512907	1.154508	12.11155	0.752413	85.46862
2	0.217999	0.340735	0.576578	17.27194	1.614962	80.19579
3	0.299360	0.448679	0.417055	21.08573	2.330118	75.71842
4	0.375369	0.586767	0.278586	24.22181	2.867024	72.04581
5	0.448310	0.690403	0.207392	27.10979	3.268104	68.72431
6	0.519678	0.751800	0.243952	29.76498	3.592181	65.64708
7	0.590260	0.788318	0.388347	32.17198	3.863171	62.78819
8	0.660633	0.809644	0.624273	34.35207	4.091039	60.12297
9	0.731176	0.820227	0.931684	36.32394	4.284742	57.63941
10	0.802086	0.823670	1.290844	38.10299	4.451143	55.33135

Source: Authors' estimation

Table 5, which based on the impulse response functions, summarizes the role of the policy instruments in our empirical analysis. We thus suggest the importance of the three instruments (i.e., MMR, RER, and LPCI) and their short-term influences, for the case of MMR, and long-term for the case of the RER.

Table 5. Role of Policy Instruments

Response variables	MMR			RER			LPCI		
	ST	MT	LT	ST	MT	LT	ST	MT	LT
MMR	+	+	+	-	-(*)	0	-	0	0
RER	0	+	0	+(*)	+(*)	+(*)	0	0	-
LPCI	+	+(*)	+(*)	0	-(*)	-(*)	+	+	+
LSTC	-	-(*)	-	+	-	-(*)	-(*)	-	+ (*)
LINV	-	+	+	-	+	-	+	+(*)	+(*)

Notes: ST, MT, LT denote short-, medium-, and long-term, respectively.
(*) denotes the importance of the linked effect, (0) denotes the absence effect.

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Figure 4. Long-run Causal Relationships
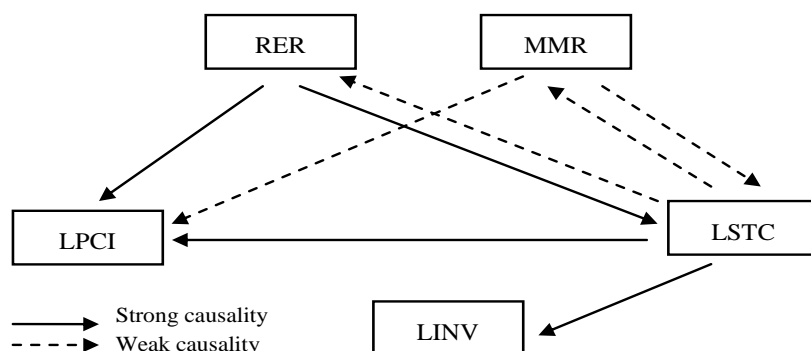
In addition, Figure 4, which based on the variance decompositions, provides a recapitulation of the long-term causal relationships. We can conclude the effectiveness of the credit channel in the determination of the volume of investments and its key role in the transmission of the effects of monetary policy actions based on the MMR and the RER. Inflation, as we have already seen, is as a consequence of monetary factors and expansionary credit policies.

Conclusion

In this study, we examine the importance of the credit channel in the transmission mechanism of monetary policy in Tunisia. Our contribution is to analyze the responses of the main aggregates of the Tunisian's economy to monetary policy shocks during the period of 1965-2015 by using a VAR approach. Our empirical findings show that the credit has a significant effect on investment and inflation. Indeed, the cointegration relationship, coupled with the weak exogeneity test, shows that the credit is an endogenous variable and therefore the long-term equation found is a credit equation. The crucial role of credit channel is argued by the goal of price stability expected by any monetary policy.

The empirical analysis of monetary shocks shows the importance of exchange rate policy and the local currency devaluation on the financing mode. It is observed that the Tunisian's economy is extremely dominated by external conditions. This dominance is confirmed by the recourse to external debts and trade agreements with the dominant countries. Moreover, our policy of instrument has its effectiveness due to credit channel to overall horizons. However, for short horizons, the interest rate occupies the first place. For medium and long horizons, it leaves its place to the exchange rate. The importance of the latter reflects that the Tunisian's economy is dominated by external conditions. This dominance is confirmed by extensive using of external debts and trade agreements with the dominant countries. Ultimately, our main findings suggest that policy makers should act on the level of economic activity and inflation, on two ways. The first is in short-term, by acting on the interest rate and the second is in long-term, by controlling the exchange rate. The latter should be stable to protect the local currency against devaluation and its serious risks. In the future research it is anxious to make an empirical examination on the key role of the interest rate within the CBT's reaction function according to the Taylor's rule in its dynamic approach.

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Appendices

Appendix A1. VAR Lag Order Selection Criteria

Lag	FPE	AIC	SIC	HQC
0	0.612415	13.69900	13.90175	13.77419
1	1.24e-05	2.881661	4.098154*	3.332795*
2	1.08e-05	2.702939	4.933176	3.530019
3	7.12e-06*	2.161963	5.405944	3.364987
4	7.55e-06	1.973875	6.231600	3.552845
5	8.01e-06	1.572454*	6.843923	3.527369

Notes: * indicates lag order selected by the criterion.
Source: Authors' estimation

Appendix A2. Weak Exogeneity Test

Variable	Likelihood Statistics	Deg. of freedom	Prob.
MMR	0.719283	1	0.396379
RER	3.158376*	1	0.075538
LSTC	13.37786***	1	0.000255
LPCI	27.17474***	1	0.000000
LINV	1.713580	1	0.190522

Notes: * and *** indicate significance at the 10% and 5% levels, respectively.
Source: Authors' estimation

FORECASTING INFLATION IN SIERRA LEONE USING ARIMA AND ARIMAX: A COMPARATIVE EVALUATION. MODEL BUILDING AND ANALYSIS TEAM[4]

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Abstract

The study has provided empirical investigation of both ARIMA and ARIMAX methodology as a way of providing forecast of Headline Consumer Price Index (HCPI) for Sierra Leone based on data collected from the Sierra Leone Statistical Office and the Bank of Sierra Leone. In this, the main research question of addressing outcomes from in and out-of-sample forecast were provided using the Static technique and this shows that both methodologies were proved to have tracked past and future occurrences of HCPI with minimal margin of error as indicated in the MAPE results. In a similar note, the key objective of identifying whether the ARIMAX methodology or the ARIMA methodology is a better predictor of forecasting future trends in HCPI. However, on the whole, both ARIMA and ARIMAX seem to have provided very good outcome in predicting future events of HCPI, particularly when Static technique is used as the option for forecasting outcomes, with the ARIMAX marginally coming out as the preferred choice on the basis of its evaluation outcomes.

Keywords: ARIMA; ARIMAX; Box-Jenkins; HCPI; NEXR; Sierra Leone

JEL Classification: C32; C52; C53.

Introduction

Inflation and its dynamics is a topical concept in Sierra Leone and more so, a primary objective of the central bank in maintaining stability to general prices of goods and services in the country. In this situation, it is part of the culture by senior management to continuously track dynamics of inflation [Year-on-Year and Month-on-Month], both as a univariate element and jointly with some explanatory variables which are key in influencing inflation movement in the country as a whole. Given the emphasis on the need to monitor inflation dynamics, staff in the Model Building and Analysis Section [MBAS] are regularly assigned the responsibility of using appropriate methodologies and for which Box-Jenkins Autoregressive Moving Average and Autoregressive Integrated Moving

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[4] **Disclaimer**: Views expressed in this article are those of the authors and nothing to do with the named institution.

Average [ARIMA] seemed popular in forecasting inflation dynamics relevant for short-term policy formulation at the Bank of Sierra Leone [BSL].

The graphs below provide a snapshot of key variables like HCPI [normally used as a proxy for inflation in Sierra Leone] and Nominal Exchange Rate [NEXR] as an explanatory component in forming part of the model forecast for this study.

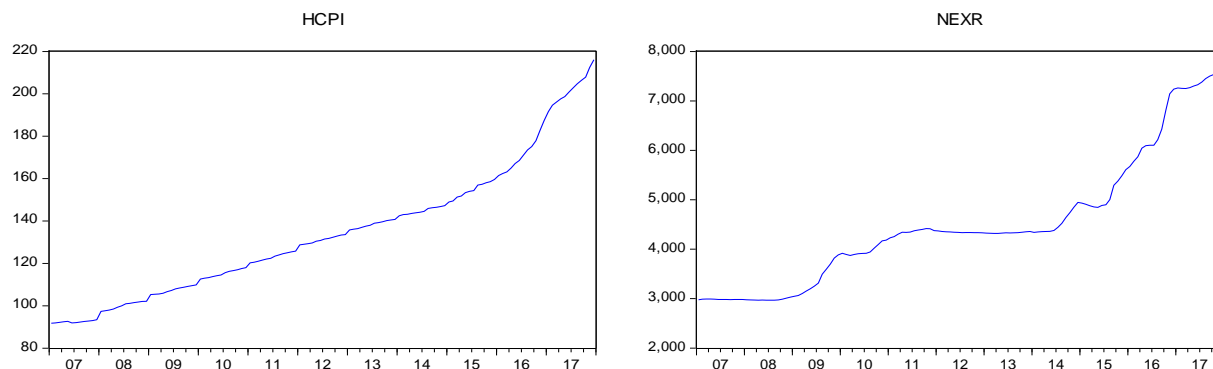**Figure 1.** Graph Showing Seasonal Adjusted HCPI and NEXR Trends

Figure 1 above shows the seasonally adjusted trends for both HCPI and NEXR over monthly periods from 2007M1 to 2017M12. The pattern for HCPI seemed more deterministic, while that of NEXR seem quite interesting in terms of break pattern, more so around 2008. Some researchers like Theil (1954), Grunfeld and Griliches (1960) and more lately, Hubrich (2005) are convinced in some way about the efficiency of the use of both models, but more so when an explanatory variable is used as dictated by the quality of data.

The main question that is set to be answered here is: ***Does ARIMAX provide a better forecast outcome than that of a normal ARIMA model***? In this vein, the main objective here is to investigate the accuracy of in-sample and out-of-sample forecast for both ARIMAX and ARIMA approaches using HCPI for the ARIMA and NEXR as an explanatory variable for the ARIMAX.

The rest of the paper is structure as follows: Section two present the Literature Review, which is further divided into Theoretical and Empirical review. Section three addresses the Methodological Framework and Data Collection, also sub-divided by looking at details of Time series models for both ARIMA and ARIMAX approaches, Methodology and Data usage. Section four addresses the Empirical Analysis and Discussion, section five discuss the interpretation for the Sierra Leone economy, while section six provide conclusion on the outcome, with some salient points for policy recommendation in terms of model evaluation.

1. Literature Review

This section addresses both theoretical and empirical literature on works carried out on both ARIMA and ARIMAX output by various authors.

1.1. Theoretical Literature Review of ARIMA Modelling

The use of ARIMA and ARIMAX seemed to be quite popular given the fact that as time series data, their future predictability can be easily determined through their past occurrences (Paul *et al*. 2013 and Dash, 2017). In her master's thesis, Green (2011) used the ARIMA models with attention focused on Box-Jenkins Approach - in this, she found out that ARIMA model is the most appropriate for classifications of time series data sets on the basis of their behavior.

While ARIMA only looks at the Univariate component of past events of the same variable, its counterpart, ARIMAX make it possible to track moment or shocks to the variable with independent predictor(s). According to Kravchuk (2017), the ARIMAX model is considered to be a form of multivariate regression model which allows to take advantage of autocorrelation that may be present in residuals of the regression to improve the accuracy of a forecast.

As emphasised by Nosedal (2016), univariate forecasting methods (including ARIMA methods) are based on the same logic - firstly, the expected value of the time series process is calculated, while secondly, the expected value is extrapolated into the future. In this case, with the current time series observation being Y_t, our forecast model equation for predicting future events can be expressed as $Y_{t+1}, Y_{t+2}, . . . , Y_{t+n}$.

1.2. Empirical Literature Review of ARIMA Modelling.

As a way of finding out best practice on the output of empirical study on ARIMA, Jackson *et al.* (2018) carried out an investigation on the Box-Jenkins ARIMA methodology using univariate HCPI data. This study provided evidence on which the use of Static approach to the methodology was seen as the best outcome, with MAPE and other statistical evidences showing very close outcome for both the within and out-of-sample forecast results. In the same token, another more specific output was provided by Jackson (forthcoming) in which the Static output coming out as one of the best means of forecast when compared to that of the Dynamic technique. In this, the author stressed the fact that both techniques (Static and Dynamic) can be very good, but the best judgment for policy outcome can be more determined when various forecasting methodologies are applied.

Kongcharoen and Kruangpradit (2013) provided an investigation on the use of ARIMA(X) studies where they showed that the forecast with exogenous exports to countries like China, European Union and the USA provided a better forecast outcome than that of a normal univariate outcome. Their outcome, more so that of the Out-of-Sample result was considered more like a policy response to relevant ministries. On a similar note of methodological investigation, empirical findings produced by Andrews *et al.* (2013) demonstrated that both autoregressive integrated moving average (ARIMA) and autoregressive integrated moving average with exogenous variables (ARIMAX) methodologies have the ability to produce accurate four-quarter forecasts. This was perceived as a way of forecasting outcomes of disability insurance based on the past occurrences of disability data and backed by exogenous variable / components.

Adebiyi *et al.* (2014) examines the forecasting performance of ARIMA and artificial neural networks model with published stock data obtained from New York Stock Exchange as against model like GARCH. Their empirical findings revealed that superiority of neural networks model over ARIMA model - this also resolved and clarify contradictory opinions reported in literature over some level of superiority of neural networks and ARIMA model and vice versa.

Peter and Silvia (2012) pursued studies to compare ARIMA models with ARIMAX models, and in order to facilitate the comparison, they took GDP per capita, considered as a more popular macroeconomic variable. The modelling of time series data set made use of both ARIMA and ARIMAX, and on the basis of the results of the study, they were able to conclude that ARIMA is a better model choice than ARIMAX. This shows that exogenous variable influence did not play much of an impact in deciding best choice of model, for which it is mostly expected that ARIMAX would come out as a better option.

Williams (2001) carried out model forecast using ARIMA and also an extension of exogenous factor to determine external influences on traffic flow in France. The results show that ARIMAX models exhibit better forecast performance over its univariate counterpart which is the ARIMA models. Most importantly on this study, Williams also, provide outline of issues that needs addressing prior to carrying out ARIMAX models for intelligent transportation system (ITS) forecasts. Such issues as highlighted include increased complexity of model specification, estimation, and maintenance; model consistency; model robustness in the face of interruptions in the upstream data series; and variability in the cross-correlation between upstream and downstream observations. It is worth noting the importance of the last issue because ARIMAX models assume constant transfer function parameters, while the correlation between upstream and downstream observations vary with prevailing traffic conditions, especially traffic stream speed. In such a case, Williams (2001) suggested the need for further research to investigate model extensions and refinements as a way of enabling outcome of generalizable, self-tuning multivariate forecasting model which can be implemented than cognizance of varying upstream to downstream correlations.

2. Time Series Basics, Methodological Framework and Data Source

2.1. Time Series Basic

Time series model is more common in using past movement of variable as a way of predicting future values/events. Unlike structural models which relates to the model at hand to forecast, time series models are not necessarily rooted on economic theory, while the reliability of the estimated equation is normally based on out-of-sample forecast performance as first observed by Stock and Watson (2003).

Times series are mostly expressed by Autoregressive Moving Average (ARMA) models which was first produced by Slutsky (1927) and Wald (1938) as expressed in the following equation:

$$Y_t = e_t - \theta_1 e_{t-1} - \theta_2 e_{t-2} - \theta_3 e_{t-3} - \dots\dots - \theta_q e_{t-q} \tag{1}$$

Such a series is referred to as a moving average of order **q**, with the nomenclature **MA(q)**; where Yt is the original series and e_t as error term in the series. As Yule (1926) suggested, the autoregressive process of the moving average series can be expressed as:

$$Y_t = \varphi_1 Y_{t-1} + \varphi_2 Y_{t-2} + \varphi_3 Y_{t-3} + \ldots\ldots\ldots + \varphi_p Y_{t-p} + e_t \ . \qquad (2)$$

It is assumed that t, is independent of $Y_{t-1}, Y_{t-2}, Y_{t-3}, \ldots Y_{t-q}$.

In this model, we are trying to fit the Box-Jenkins Autoregressive Integrated Moving Average (ARIMA) model, which is the generalised model of the non-stationary ARMA model represented by ARMA(p,q) and this can be written as:

$$Y_t = \varphi_1 Y_{t-1} + \varphi_2 Y_{t-2} + \varphi_3 Y_{t-3} + \ldots + \varphi_p Y_{t-p} + e_t - \theta_1 e_{t-1} - \theta_2 e_{t-2} \ldots.. - \theta_p e_{t-p} \qquad (3)$$

where, Y_t is the original series, for every t, we assume that is independent of $Y_{t-1}, Y_{t-2}, Y_{t-3}, \ldots, Y_{t-p}$.

Autoregressive Integrated Moving Average with an External Regressor [ARIMAX] Model

An ARIMA model with external regressor, that is, ARIMAX model with d=1 can be written as:

$$\mathbf{W_t = \varphi_1 W_{t-1} + \varphi_2 W_{t-2} \ \ldots.. + \varphi_p W_{t-p} + e_t - \theta_1 e_{t-1} \ \ldots\ldots - \theta_p e_{t-p} + \beta_1 X_{t-1} + \ldots\ldots + \beta_r X_{t-r}} \qquad (4)$$

where X's are regressor variables and β's are the coefficients of regressor variable.

According to Hamjah (2014, 170-171), the following steps are worth considering when auctioning the Box and Jenkins approach to ARIMA[X] forecasting:

▪ *Preliminary analysis:* create conditions such that the data at hand can be considered as the realization of a stationary stochastic process.

▪ *Identification:* specify the orders p, d, q of the ARIMA model so that it is clear the number of parameters to estimate. Recognizing the behavior of empirical autocorrelation functions plays an extremely important role.

▪ *Estimate:* efficient, consistent, sufficient estimate of the parameters of the ARIMA model (maximum likelihood estimator).

▪ *Diagnostics:* check if the model is a good one using tests on the parameters and residuals of the model. Note that also when the model is rejected, still this is a very useful step to obtain information to improve the model.

▪ *Usage of the model:* if the model passes the diagnostics step, then it can be used to interpret a phenomenon, forecast.

2.2. Methodology

The research approach for this study is modelled on the Box–Jenkins methodology (Box and Jenkins 1976), which is normally attributed to short-run forecasting of time series events. It is a form of algebraic model, usually used in forecasting outcomes of events, with an ascribed name of Autoregressive Integrated Moving Average (ARIMA) model; the model seems to have enjoyed great successes in academic research, and particularly in discourses pertaining to methodological preferences for time series studies (Bigovic 2012; Coshall 2005; Huang and Min 2002; Kulendran and Witt 2001 and Law 2004).

The ARIMA and ARIMAX models applied in this study are expressed in equations 3 and 4 above in the expressed time series specifications identified as (*p,d,q*); where *p* is the order of the autoregressive (A.R.) process, *d* is the number of differences or integrations and *q* is the order of the moving average (M.A.) process, with short-run estimations characterised by annual, quarterly, monthly, weekly, daily and hourly data usage.

2.3 Data Usage and Source

Data used were extracted from the Statistics Sierra Leone database source for HCPI and also the methodical calculation of NEXR based on other data sources like the World Bank Data source from 2007M1 to 2017M12. In order to smoothen out data series, the de-seasonalised process was used for only the HCPI variable but not for the NEXR variable. When the NEXR variable was de-seasonalised, its model was not good because of its high AIC, the inverted AR and MA roots lies outside the unit circle and also the MAPE for the forecast was also large. The EVIEWS application package has been used throughout to estimate values and carrying out test procedures.

3. Empirical Analysis and Discussion

The objective here is to present model comparison that accurately predict both the within and out-of-sample forecast for ARIMA and ARIMAX methodologies. The research is based on the available data provided by the

Central Statistical Office [CSO] and the Bank of Sierra Leone [BSL] of HCPI and NEXR data respectively between the period 2007M1 – 2017M12. In order to carry out the analysis, the EVIEWS 9.0 application was used with and with initial diagnostic test of Unit Root produced to assess stationarity of the variables concerned and this was done after the Hcpi variable has been de-seasonalised.

Table 1. Augmented Dickey-Fuller [ADF]

Variable	Augmented Dickey-Fuller [ADF]		Phillips-Perron [PP]	
	Level	**1st Difference**	**Level**	**1st Difference**
HCPI	1.871934 (0.9998)	0.233398 (0.9737)	-5.370101 (1.0000)	-6.890669*** (0.0000)
NEXR	0.636092 (0.9902)	-4.570829*** (0.0002)	1.859240 (0.9998)	-4.346651*** (0.0006)

Note: *** = 1% significance, ** = 5% significance, * = 10% significance [with no trend and Intercepts]
Source: Own Estimates

From the above (Table 1), variables in the parenthesis are the probabilities of both HCPI and NEXR which depict their level of significance when the test Unit Root was conducted. This indicate that the PP test is the best for both HCPI and NEXR at 1st Difference. Using the PP test, both the HCPI and NEXR do not appear to be significant at Level but are significant at1st difference which means that ARMA is not possible and the option is to resort to ARIMA model estimation.

Figure 2. Automatic ARIMA Estimation

Akaike Information Criteria (top 20 models)
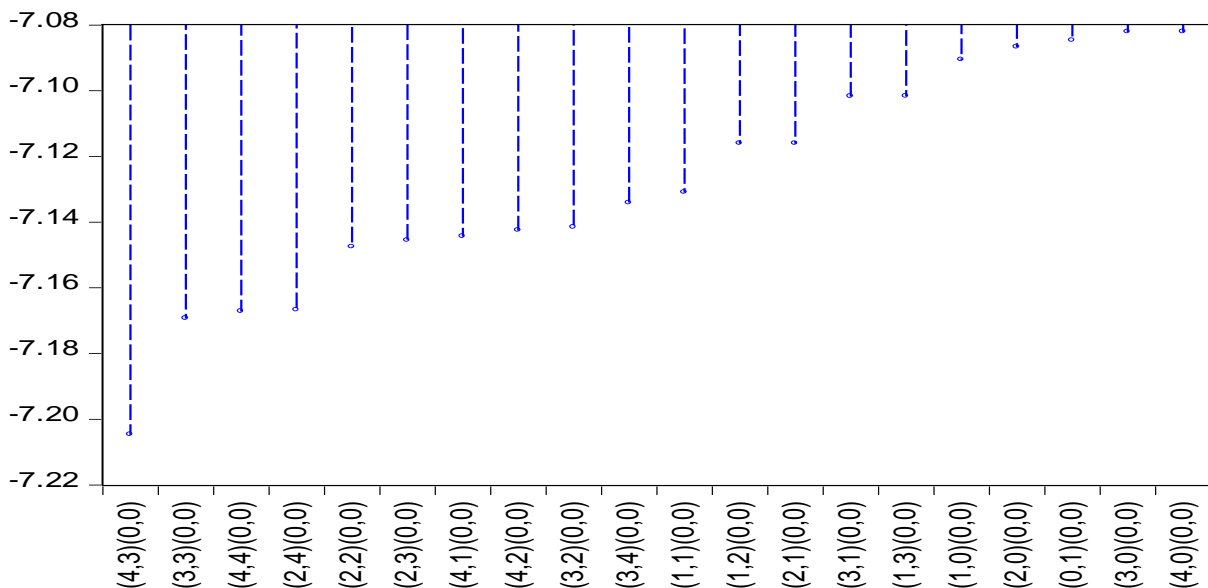
Figure 2 above shows the outcome of an automatic forecast process that was used to decide on the best model outcome for estimating the model. Based on the table, it shows that (4,0) (0,0) is the best out of series of models which then gives use the mandate now to proceed by determining the order of the AR and MA processes and the suitability of best model iteration that will bring about the best forecast outcome given the nature of data used.

The estimation was divided into ARIMA with HCPI as the only variable used and the second is based on the ARIMAX process but utilizing NEXR as an explanatory to help determine the outcome of the best estimation, particularly in relation to both within and out-of-sample forecast [see steps as provided below in sections *4.1.1 and 4.1.2*].

3.1. Model Estimation Outcomes: ARIMA and ARIMAX

3.1.1. ARIMA OUTCOMES

This is based on the use of a single variable, which is HCPI and for which the lag of it is used to determine future occurrences. The estimation output below is considered the best with the lowest AIC value and an Inverted AR Root value <1. Using the automated ARIMA forecast process, EVIEWS have made the best model selection of (4,0)(0,0).

Figure 3. Model Estimation Outcome for ARIMA

Dependent Variable: D(HCPI_SA)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 02/15/18   Time: 16:31
Sample: 2007M02 2017M12
Included observations: 131
Convergence achieved after 34 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.231242	0.834946	1.474637	0.1428
AR(1)	1.248852	0.119903	10.41556	0.0000
AR(3)	-0.256953	0.107329	-2.394056	0.0181
MA(1)	-0.838229	0.124104	-6.754264	0.0000
SIGMASQ	0.241332	0.018841	12.80888	0.0000
R-squared	0.651898	Mean dependent var		0.953822
Adjusted R-squared	0.640847	S.D. dependent var		0.835831
S.E. of regression	0.500908	Akaike info criterion		1.506380
Sum squared resid	31.61449	Schwarz criterion		1.616121
Log likelihood	-93.66791	Hannan-Quinn criter.		1.550973
F-statistic	58.99080	Durbin-Watson stat		1.972399
Prob(F-statistic)	0.000000			
Inverted AR Roots	.98	.66	-.40	
Inverted MA Roots	.84			

Given the process involved in iteration as shown in Figure 3 for the best model that will support theoretical principles where the Inverted AR and MA roots are within a define range, that is less than ONE or within the root circle and also satisfying the condition of the probability values been significant.

Table 2. Correlogram for ARIMA

Date: 02/19/18   Time: 20:03
Sample: 2007M01 2018M01
Included observations: 131
Q-statistic probabilities adjusted for 3 ARMA terms

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.|.		.|.		1	0.006	0.006	0.0045	
.|.		.|.		2	0.002	0.002	0.0054	
.|.		.|.		3	0.020	0.020	0.0576	
*|.		*|.		4	-0.068	-0.068	0.6874	0.407
.|*		.|*		5	0.138	0.139	3.3128	0.191
*|.		*|.		6	-0.171	-0.179	7.4117	0.060
.|.		.|.		7	0.006	0.019	7.4167	0.115
.|.		.|.		8	-0.045	-0.062	7.7096	0.173
.|.		.|.		9	-0.019	0.013	7.7636	0.256
*|.		*|.		10	-0.092	-0.147	8.9772	0.254

			AC	PAC	Q-Stat	Prob
.|. |	.|. |	11	-0.041	0.026	9.2230	0.324
.|* |	.|. |	12	0.076	0.030	10.073	0.345
.|. |	.|. |	13	0.021	0.047	10.137	0.429
.|* |	.|. |	14	0.084	0.050	11.182	0.428
.|. |	.|* |	15	0.049	0.082	11.540	0.483
.|. |	.|. |	16	0.038	0.002	11.755	0.548
.|. |	.|. |	17	0.063	0.053	12.366	0.577
.|* |	.|* |	18	0.098	0.109	13.842	0.538
.|. |	.|. |	19	-0.009	-0.020	13.854	0.610
.|* |	.|* |	20	0.108	0.125	15.675	0.547
.|. |	.|. |	21	0.005	0.011	15.680	0.615
.|* |	.|* |	22	0.136	0.198	18.615	0.482
.|. |	*|. |	23	-0.052	-0.090	19.047	0.519
*|. |	*|. |	24	-0.176	-0.082	24.063	0.290
.|. |	.|. |	25	0.004	-0.039	24.065	0.344
*|. |	*|. |	26	-0.129	-0.068	26.844	0.263
.|** |	.|* |	27	0.223	0.207	35.185	0.066
*|. |	.|. |	28	-0.069	-0.034	35.986	0.072
.|. |	.|. |	29	-0.038	-0.008	36.229	0.088
.|. |	.|. |	30	0.056	-0.016	36.779	0.099
.|. |	.|. |	31	-0.060	-0.007	37.396	0.110
.|. |	*|. |	32	0.043	-0.089	37.726	0.129
.|. |	.|. |	33	-0.035	0.026	37.938	0.151
.|. |	*|. |	34	0.031	-0.087	38.114	0.177
.|. |	.|. |	35	-0.005	-0.023	38.118	0.211
.|. |	.|. |	36	0.006	-0.037	38.125	0.248

Date: 02/19/18   Time: 20:03
Sample: 2007M01 2018M01
Included observations: 131
Q-statistic probabilities adjusted for 3 ARMA terms

The efficiency of this process is also tested against the sample autocorrelation function [shown in Table 2], as depicted in the Correlogram values of either one of AC, PAC, Q-Stat or Prob values; in this case the outcome was judged using the Prob values which clearly satisfies the condition of the model consistency.

Figure 4. Forecast Estimation output for ARIMA

Forecast: HCPI_MAR
Actual: HCPI_FEB
Forecast sample: 2007M01 2018M03
Adjusted sample: 2008M01 2018M03
Included observations: 122
Root Mean Squared Error   0.925004
Mean Absolute Error   0.585098
Mean Abs. Percent Error   0.395167
Theil Inequality Coefficient 0.003224
    Bias Proportion   0.001103
    Variance Proportion   0.036088
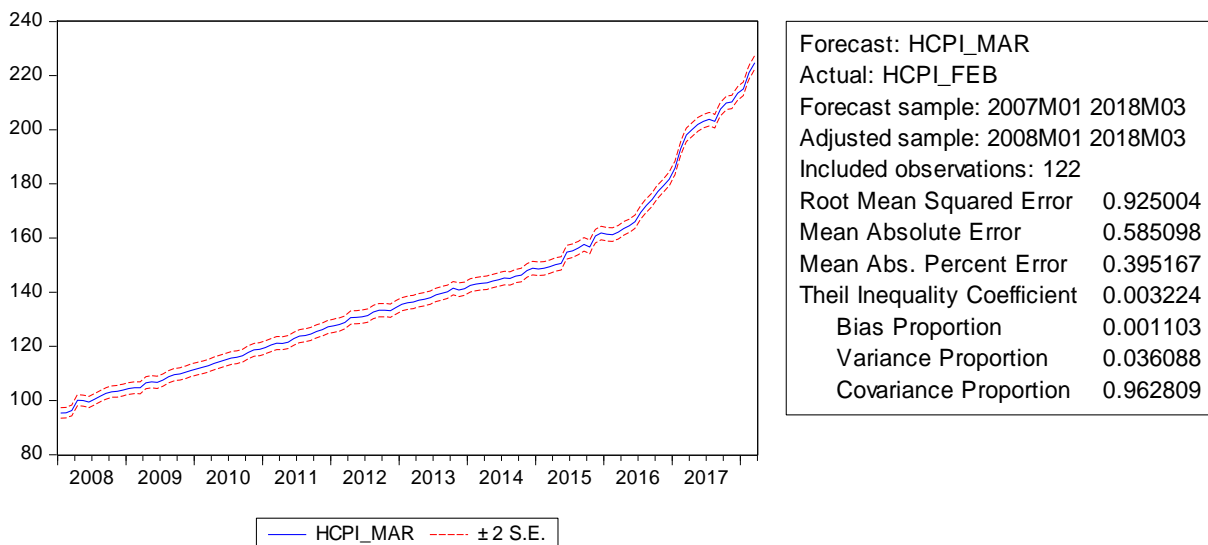   Covariance Proportion   0.962809

Figure 4 above presents the forecast graph of the estimation of the ARIMA models of HCPI in Sierra Leone for the period 2007M1 – 2018M03. The diagram clearly shows that the ARIMA specification produced closely track the actual values of the time series, both for the within and out-of-sample forecast performance

Table 3. Evaluation Outcome for ARIMA

Year	Linear Model		
	Forecast HCPI	Forecast Y-O-Y [%]	Monthly Change
Jan. 2018	218.8628	14.23498	0.01273
Feb. 2018	221.8779	13.99985	0.01377
Mar. 2018	224.7666	14.58914	0.01301
R²	0.651		
MAPE	0.395		

The accuracy of the model prediction can be determined through analysis of information provided in Table 3 for HCPI during the period Jan – Mar. 2018. This shows an increase for the three months forecasted for the Hcpi variable. In a similar note, the percentage forecast for Year-on-Year [Y-O-Y] in the three months for Sierra Leone indicate both decrease an increase, which from an economic interpretation shows that the value of people's potential of living standard is fluctuating and economically unstable. The specifics of the model evaluation can also be determined through comparative information provided for R^2 and also the Mean Absolute Percentage Error [MAPE] values. The high R^2 shows that the model is very good and fit for purpose, with a rather small MAPE value.

3.1.2. ARIMAX Outcomes

With this, NEXR is incorporated as an explanatory variable to help track future processes of inflation, given the high dependency rate of the Sierra Leone economy on the importation of goods, which also add a lot of pressure on exchange rate hike in the country.

Figure 5. Estimation outcome for ARIMAX with NEXR as Exogenous variable

Dependent Variable: D(HCPI_SA)
Method: Two-Stage Least Squares
Date: 02/16/18   Time: 16:07
Sample (adjusted): 2007M05 2017M12
Included observations: 128 after adjustments
Convergence achieved after 36 iterations
MA Backcast: 2007M04
Instrument specification: D(NEXR)
Constant added to instrument list
Lagged dependent variable & regressors added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.888623	2.261696	0.835048	0.4053
AR(1)	1.128064	0.246710	4.572422	0.0000
AR(3)	-0.143428	0.219193	-0.654347	0.5141
MA(1)	-0.698270	0.314996	-2.216755	0.0285

R-squared	0.652592	Mean dependent var	0.965739
Adjusted R-squared	0.644187	S.D. dependent var	0.841745
S.E. of regression	0.502101	Sum squared resid	31.26113
Durbin-Watson stat	2.015281	J-statistic	8.282272
Instrument rank	5	Prob(J-statistic)	0.004003

Inverted AR Roots	.98	.47	-.32
Inverted MA Roots	.70		

The outcome from Figure 5 shows that after iteration from the automatic estimation that was given as a starting point [(4,0)(0,0)] now leaves the model with AR(1), AR(3) and MA(1) and with an indication of a clearly stable Inverted Roots value which typically fall under ONE, indicating that the model is stable.
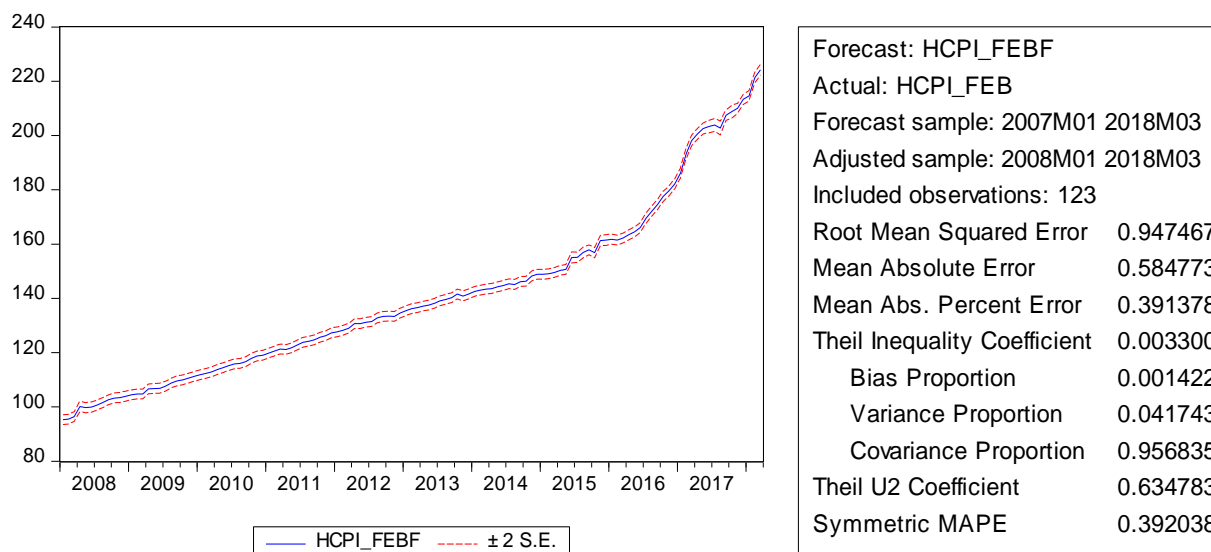
Table 4: Correlogram Output for ARIMAX

Date: 02/19/18   Time: 20:06
Sample: 2007M01 2018M03
Included observations: 120
Q-statistic probabilities adjusted for 3 ARMA terms

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
.|. |	.|. |	1	0.007	0.007	0.0055	
.|. |	.|. |	2	0.001	0.001	0.0058	
.|. |	.|. |	3	0.016	0.016	0.0387	
*|. |	*|. |	4	-0.128	-0.128	2.1013	0.147
.|. |	.|. |	5	0.012	0.014	2.1192	0.347
*|. |	*|. |	6	-0.079	-0.081	2.9296	0.403
.|* |	.|* |	7	0.151	0.160	5.8676	0.209
.|. |	.|. |	8	0.025	0.002	5.9471	0.311
.|. |	.|. |	9	0.017	0.027	5.9839	0.425
.|. |	*|. |	10	-0.053	-0.088	6.3584	0.499
.|. |	.|. |	11	-0.051	-0.006	6.7128	0.568
.|. |	*|. |	12	-0.053	-0.067	7.0960	0.627
.|. |	.|. |	13	-0.041	-0.002	7.3270	0.694
.|* |	.|. |	14	0.083	0.046	8.2750	0.688
.|. |	.|. |	15	0.065	0.066	8.8708	0.714
.|. |	.|. |	16	0.026	-0.007	8.9639	0.776
.|. |	.|. |	17	0.026	0.035	9.0600	0.827
.|* |	.|* |	18	0.081	0.097	10.007	0.819
*|. |	.|. |	19	-0.075	-0.052	10.817	0.821
.|* |	.|* |	20	0.111	0.141	12.614	0.762
.|. |	.|. |	21	-0.024	-0.050	12.695	0.809
.|* |	.|* |	22	0.140	0.169	15.632	0.682
.|. |	*|. |	23	-0.045	-0.118	15.935	0.721
*|. |	*|. |	24	-0.187	-0.131	21.248	0.444
.|. |	.|. |	25	0.033	-0.029	21.418	0.495
*|. |	.|. |	26	-0.125	-0.039	23.846	0.412
.|* |	.|* |	27	0.167	0.157	28.259	0.249
.|. |	.|. |	28	-0.007	-0.020	28.267	0.296
.|. |	*|. |	29	-0.029	-0.073	28.398	0.339
.|. |	.|. |	30	0.050	0.019	28.800	0.371
.|. |	.|. |	31	-0.029	0.061	28.940	0.416
.|. |	*|. |	32	-0.061	-0.082	29.562	0.436
.|. |	.|. |	33	-0.039	0.027	29.823	0.475
.|. |	.|. |	34	0.031	-0.056	29.982	0.518
.|. |	.|. |	35	-0.018	-0.021	30.039	0.566
.|. |	.|. |	36	0.020	-0.058	30.106	0.612

*Probabilities may not be valid for this equation specification.

The efficiency of the model estimation for ARIMAX was also tested through outcomes from the Correlogram data and for which effort is dedicated to the Prob (Table 4). Values which clearly shows that the model is a perfect choice for forecasting outcomes for HCPI, with NEXR as the exogenous variable.

Figure 6. Estimation Outcome of ARIMAX [Based on Static Forecast]

Forecast: HCPI_FEBF	
Actual: HCPI_FEB	
Forecast sample: 2007M01 2018M03	
Adjusted sample: 2008M01 2018M03	
Included observations: 123	
Root Mean Squared Error	0.947467
Mean Absolute Error	0.584773
Mean Abs. Percent Error	0.391378
Theil Inequality Coefficient	0.003300
Bias Proportion	0.001422
Variance Proportion	0.041743
Covariance Proportion	0.956835
Theil U2 Coefficient	0.634783
Symmetric MAPE	0.392038

The estimation outcome for ARIMAX in Figure 6 clearly shows that the model is a good choice which perfectly tracks both the within and out-of-sample forecast result for HCPI, where NEXR is used as exogenous variable.

Table 5. Evaluation Outcome for ARIMAX

Year	LINEAR MODEL		
	HCPI Forecast	**Y-O-Y [%] Forecast**	**Monthly Change**
Jan 2018	218.8010	14.20272	0.01245
Feb 2018	221.6423	13.87881	0.01298
Mar 2018	224.1955	14.29799	0.01151
R^2	0.652		
MAPE	0.391		

The efficiency of the models is determined through evaluative outcomes as shown in Table 5 above, where monthly inflation for the periods Jan – Mar. 2018 have shown continual increase in the Hcpi forecast. The Y-O-Y percentage forecast seem to show some levels of fluctuation where it fell from Jan to Feb. 2018 and rose again from Feb. to Mar. 2018.

4. The Interpretation for the Sierra Leone Economy

This section outlined both the upside and downside risk to the inflation forecast values in this paper and also, emerging circumstances that might cause these forecast values to be different from the actual inflation.

4.1. Identified Upside Risk to the Forecast

Given the time of the empirical study was carried out, it is with the view that economic agents' expectations around the election period would heightened worries and which may resulting in a hike in general price level of (essential) goods and services, mostly due to people's tendency hoard items and also backed by anticipated fear in the minds of people about international organizations withholding donor funds.

In addition, given the state of the country's finances which is tied to external donor funds from the IMF, there is fear that adherence to removal of fuel subsidy will also prompt some level of price increase at fuel-pump after the general elections, which is likely to have a pass-through effect to consumers, and eventually an upward trend in inflation. Finally, restructuring of the import duty on rice and other essential imported commodities during post-elections may also be a catalyst to inflationary pressure.

4.2 Anticipated Downside Risk to the Forecast

Over considerable period of time, exchange rate tends to have direct correlation with inflation and given its relatively stable state over the past months, there is the tendency that the outcome from this (inflation) forecast might not be feasible during the first quarter of 2018. In other words, continued stability of the foreign exchange

rate, amidst tight monetary policy stance will likely witness a downward trend on inflation. In a similarly token, continued tightness in monetary policy rate by the Bank of Sierra Leone (currently at 14.5%, up from 15% for February 2018) will also witness downward inflationary pressure, holding all other factors constant. If aggregate demand continues to be low, it is then likely that inflationary pressures will take a downward trend.

Evaluation of Model Forecast Results and Conclusion

Both ARIMA and its extension ARIMAX have been proved to be good forecast for future occurrences when the univariate variable is used as a predictor for future events, particularly for time series data. The difference in the results did not show significant variance between ARIMA and ARIMAX, which actually means that both are reasonably accurate in predicting future state of inflation in the country.

In view of the forecast outcomes for both ARIMA and ARIMAX (Reference to Tables 3 and 5), it seems very obvious that ARIMAX is a better choice of model given its relatively low values of monthly HCPI results and also, the Year-on-Year (Y-O-Y) forecast for the three given months [Jan - March 2018]. Evaluation of the models result for MAPE, Mean Absolute Error [MAE], Thiel Inequality Coefficient [TIC] and Bias Proportion [BP] seem to prove that ARIMAX is a better choice of model outcome than the ARIMA model. In the same vain, the ARIMAX model has a slightly higher R^2 value than that of the ARIMA and also lower MAPE than of the ARIMA based on comparison between Tables 3 and 5 above. This actually shows that the chosen exogenous variable also has great influence in determining the state of inflation in an economy as shown in the case when NEXR is used.

The outcome of the result shows that both the '***within and out-of-sample***' forecast for static forecast technique provide low level of error margin in the forecast results [Figures 4 and 6]. In as much as outcome from ARIMAX model seem to have shown a higher percentage of R^2 than that of the ARIMA (as identified in the research question), it is not a certainty that this will the case for all forecast results in future occurrences / model specification. The way forward is to ensure effort is used to provide trials with different suite of models, for example, the case with VAR and more so as part of the long-term objective with DSGE model.

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MONETARY POLICY OF GEORGIA IN XI-XII CENTURIES AND ITS INFLUENCE ON THE INTERNATIONAL FINANCIAL AND ECONOMIC RELATIONS

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Abstract

This works we have researched the matters of formation of monetary policy of feudal age and their effect on development of foreign trade, methods of money formation important for the present world, which correct choice may provide increase of production volume and economic activity. Currency policy, geopolitical and geostrategic localization proved the country to turn into one of the economically strong economic states with high standard of life, developed system of socioeconomic relations approached to the international standards and democratic institutions

Keywords: monetary policy; monetary system; Europe: pre-1913; Asia including Middle East; economic development

JEL Classification: E42; E52; N13; N15; O23.

Introduction

As is known, Georgian feudal state in Tamara epoch achieved the highest level of its political, socioeconomic and cultural development. Multiethnic Georgia stretching for the wide territory of 505 000 sq.km was one of the few strongest civilized countries of that period determining progress of mankind.

Of course, it would be naively to tell of capitalism in Tamara epoch Georgia, but it is obvious, that the country was developing just in this direction and the appropriate tends in the life of the country were evident.

Politically integrated and economically strengthened foreign policy of the Georgian feudal state of Tamara's epoch aimed protection of the economic interest of the country. General direction of its Caucasian and Middle East policy was conditioned by the economic factors as well, as necessity of entering and capture of the main trade routes. The throne took control over the East and West Transcaucasian trade routes, namely, Dvin-Erzurum and Damuban-Shamakhi trade routes which played the important role in general economic development of Georgia. These routes were the main arteries connecting Georgia with the neighboring and other countries.

So, overland, river and sea routs have formed foreign trade routes since ancient times. Georgia was not only transit basin for western and eastern goods but participated in the foreign trade both inside and outside its territory maintaining brisk trade with the other courtiers. Both domestic and foreign trades were developed, that is proved with finding of the foreign coins of that period.

Resulted archeological excavations, a part of the Georgian coins, the Tamara's epoch Arabian-Armenian, Byzantine, Orthikidian, Halibi Atabags', Anatolian Seljuk Sultanate silver dirhams and Trebizond aspres were found.

It is also important that Georgian coins were spread beyond the territory of Tamara's Georgia. They have been found southward, in the former kingdom of Armenia and northward, up to Kuban lowland, eastward - in Sharvan with which Georgia had the tight economic and political relations (Abuselidze 2004, 31).

The large-scale merchants in the Tamara's kingdom took active part in the political and economic life of the country. Just from their circle were elected city envoys who were aware of the routs directions, owned transportation means and funds. Apart of trading, the large-scale merchants were good in diplomacy.

That epoch Georgia maintained the brisk trading with the Arabia, Iran and Greece. From the East they imported expensive cloths: strings, gold cloths, fragrances, aromas, sweets, rock crystal etc. From Greece and Byzantium, they imported icons, pictures, dishes, parchment books, writing tools etc. In the Tamara epoch wool was imported from such far-located places as Alexandria.

According to this information, it becomes clear that sale of handicrafts and generally, agricultural products was maintained both in the domestic and foreign markets. Sale of handicrafts, generally, agricultural products and their monetary or natural incomes played the significant role in the trading relations of the population and increase of families' budgets. Foreign marketing and seasonal domestic markets promoted establishing of cultural and economic relations between concrete regions and their further development and stabilization.

It shall be noted, that Georgian money circulated in the market. In the reign of Queen Tamar (1184-1214) copper coins were produced. On one side they bore writing "Tamar", on the other – "Queen of Queens, Glory of the World and Faith, Tamar, daughter of George, Champion of the Messiah."

First of all, it shall be noted, that this period Georgia had a money control system. The feudal government produced money, determined metal, money unit, standard of price, weight of pure metal and alloy for the moment, order of money production and collection.

Existence of money control system is unshakably proved with founding of the foreign coins in this epoch excavations.

No legislative act related to money circulation control has come down to us. This complicates solving of the matter of money system of Queen Tamar epoch. We may discuss of money circulation system only based on coins and literary monuments of that epoch. Besides, we shall remember that "factual system of money circulation does not often coincide with the formal system proclaimed by government" (Koiava 1938, 89).

1. Literature Review

The well-known Georgian Historian Ivane Javakhishvili wrote: "In ancient Georgia foreign golden money had circulated, until in III-IV centuries Sasanian kings started to produce silver coins in Persia. After that Georgia began to use silver money, it even produced silver coins of the same appearance as Persian ones. From V century to the period of reign of David the Builder silver money was spread in Georgia. In the period of sway of Arabians Arabian silver dirhams, i.e. drams were spread. David the Builder started to produce cooper coins and after that, during XII and earlier XIII century, in the periods of reign of George III, Tamar the Great and Lasha-George silver coins were not produced. Change of money unit was undoubtedly caused with some deep economic reasons. It shall be noted that in the other Eastern countries in the same period silver money was gradually replaced with the cooper coins. That is why, disappearing of silver money shall be considered general phenomena for the whole Middle East and must be caused with the same reason in all those countries. Unfortunately, this matter has not been thoroughly researched (Javakhishvili 1925, 48-49).

Opinion by the other researcher, E. Pakhomov is also remarkable. He wrote in his book, that "before XII century we dealt only with silver coins and no cooper ones made by Georgians or Muslims before XII century have been found. But from earlier XI century this condition sharply changed and during one hundred years we find only cooper coins. Before XII century cooper money might be produced, but probably much less… We cannot tell the same about silver money in XII century: we cannot even hope, that we find silver coins, as in that period silver money was not produced not only in Georgia, but in many other countries of the Western Asia" (Pakhomov 1910). Then he writes: "In the first years of XI century, when Seljuks attacked Persia and neighboring regions, exportation of Muslimanic dirhams northward sharply ceased, resulted this, amount of silver money circulating in the Muslimanic East did not increase. In opposite, we observe that in the second half of XI century silver coins are gradually rejected: coins become smaller and of low standard and in earlier XII century even low standard silver coins are found very rarely. At the same time, in the first half of XII century very original types of cooper coins appear… on these new types of coins the Arabic word "fels", which before that period meant copper money missed and instead appears "dirham", which earlier was used only for silver. Naturally, the new cooper "dirham" was a credit coin which circulated at much higher price, than real cost of its metal and which might replace the missed silver coins (Pakhomov 1910, p.79-80).

In respect of Georgia Pakhomov writes: "Georgia did not escape silver crisis and we can see such sequence: Sasanian-Georgian drachm weighted approximately 3 grams. Imeidian, Abasilian and Jafasidian dirhams with rare exceptions did not exceed 2.75-3.50 grams, David Kuropalates's coins weighted 1.78 g. His successors, Bagrat IV

and George II brought it down to almost 1 g, but silver coins produced in the reign of David II did not achieve even such weight (0.82-0.87g). In the earlier XII century, similarly to neighboring countries, Georgia stopped to produce silver coins and began to produce cooper ones." (Pakhomov 1910, 79-80).

Such conditions lasted during the whole XII century. Only in 1230, in the reign of Queen Rusudan production of silver coins was recommenced.

Georgian coins of XI century and the first quarter of XII century are very rare. Especially remarkable is one coin kept in the British Museum, which was published by the English scientist D. Lang in the hard-to-reach organs (Lang, D., 1957). As this coin inscription require some explanations, it shall be published repeatedly.

This coin is made of silver, its weight is 10.73g, diameter – 35mm. According to Acad. N. Berdzenishvili, it bears the following inscription: "Christ! David, King of the Abkhazians, Kartvelians, Arranians, Kakhetians and Armenians", what shall be considered due, as the royal pot (kept in the State Museum of Georgian Art) bears almost the same writing, namely: "Holy Cross! Magnify Unconquerable David, King of the Abkhazians, Kartvelians, Arranians, Kakhetians and Armenians" … (Abuselidze 2004, 40)

As we think, we will not make a mistake connecting the time of production of this coin with liberation of Ani city from sway of Seljuks. After the king liberated Ani, the capital of Armenians in 1123 and joined it to Georgia, he assumed the title of king of Armenians. As David died in 1125, it becomes clear that this remarkable coin was produced during the last two years of the reign of David.

Upon beginning of XII century, type, appearance and shape of coins sharply changed; they lost their regular shape – roundness; from that time, they began to produce money in kind of cooper plates of casual form and shape. That is why, in often cases, due to small size of this plate, siki (side inscription) cannot fit into it. First, Qina was intriduced in the other neiboughring eastern countries and this order became firmly established in Georgia as well. David the Builder's cooper coins have been found and it may be declared that this order was introduced in the reign of Demetre the First. From the period of reign of Demetre the First to the money reform implemented in the reign of Queen Rusudan, *i.e.* for more than one century such "irregular shape" coins were permanently being produced in Georgia.

Images and inscriptions of that period Georgian coins were changing: first, there were mainly Arabic inscriptions and the Georgian ones occupied inconsiderable place, later images were replacing with the ornaments etc.

2. Survey

From these cites it is clear that in XI century deficient coins were produced, but their nominal value was much higher than the real value. Besides, such difference between nominal and real values was growing more and more. In XII century they began to produce copper coins. Were such cooper coins of full value or not? Was transfer to production of cooper coins caused with the intention of issuing of full value coins, even cooper ones? No! In this respect Iv. Javakhishvili wrote: "It is interesting that the governors of that period fixed for such cooper coins the price of silver money of previous period. Cooper coins bore inscription: "This is dirham". As usually, dirham or dram were made of silver and they became synonyms of silver money, such inscription meant that a cooper coin shall have silver dram price. Georgian government did the same… As the Georgian government named cooper money "silver", it wanted to point that cooper money producing by it had the price of silver money, or dram. So, such way the government fixed the obligatory   price for cooper money." (Javakhishvili 1925, 99).

Cooper coins had enforced rate (Kapanadze 1947). These coins functioned as credit money. As K. Marx explains, "Money based upon credit implies on the other hand conditions, which, from our standpoint of the simple circulation of commodities, are as yet totally unknown to us. But we may affirm this much, that just as true paper money takes its rise in the function of money as the circulating medium, so money based upon credit takes root spontaneously in the function of money as the means of payment" (Marx 1887, 83).

So, we can confirm that cooper money produced in XII century instead of silver money had not full value, its nominal exceeded its real.

So, in the golden age of Georgia copper money circulated. Then how can we explain that in XI-XIII centuries Georgia stopped production of silver money and cooper coins took the place of silver ones, but at silver's obligatory rate?

"It is clear that the strong and progressing economic potential of Georgia required substantial change of existing money. Money was needed to operate not only in Georgia, but abroad as well. Just that is why, in XI-XIII centuries monetary type significantly changed. Surface finish and content of inscriptions changed" (Metreveli 1990).

So, as we can see, in the first quarter of XII century the royal court implemented the significant financial arrangements, namely: changed coin type, exchange rate was fixed simultaneously with change of coin type.

Some historians explain replacing of silver coins with cooper ones with exhaustion of Asia Minor silver mines.

Proceeding from this, the question arises: could exhaustion of Asia Minor silver mines cause disappearing of silver money in Georgia and the whole Western Asia or not? No, it could not. Why? Because silver was mined not in Asia only, but in Europe. Exhaustion of silver mines would be compensated with intensification of its mining in Europe and it was just done so. "In XI-XII centuries in Europe the new mines opened for exploitation, namely in Maasmunster, Schwarzwald, Mansfeld. In XII century Freiburg mines started to work as well" (Lexis, W., VII).

Intensification of silver mining in Europe was, of course important for Western Asia and Georgia, as these latters maintained brisk trade with the European countries. Resulted such trade, silver would have started to overflow from Europe to Asia.

At the same time, "existence of silver money circulation in a country does not require existence of silver mines therein or even in the vicinity thereof. Whole history of money circulation clearly proves this principle. Many great countries maintained silver money circulation, but they did not have silver mines at all or have such mines, which produced less silver than it was required for money circulation" (Koiava 1938, 95).

Queen Tamar did not produce silver money due to certain political reasons. Due to crusading wars, the neighboring Muslim countries did not produce silver money for fear of exportation of silver stocks to the foreign countries. Georgia did not produce silver money due to the same reason, although, it had great stock of silver and precious metals, what is proved with plenty of silver icons, church dishes and precious jewelry of Tamar's period.

At the close of XII century and at the beginning of XII century Georgia was very rich: there were plenty of jewels and pearls; royal treasury was full of gold. The Georgian Chronicle (Kartlis Tskhovreba) tells that, no silverware was used in the royal palace, but only gold and crystal ones (Kartlis Tskhovreba, II, 1959).

So, there was no deficit of silver. Absence of silver money in XII century cannot be explained with silver deficit.

The reason may be quite different. Namely, in XI-XII centuries paper money was not known neither in Europe, nor in Asia. It appeared in Europe only in XVIII century, in Asia - even later. That is why, in this epoch the wars were not financed with paper money. It was not produced for covering of treasury deficit, increasing of state incomes, gaining of emission taxes, but this period the way for increase of royal incomes was already found. It was the easy way for financing of the endless mediaeval wars, covering of deficit, for filling of incomes which were very insufficient for covering of treasury costs; such way included falsification of coins. It was known in the antique world and restored in the mediaeval centuries. The coins which real value was less than nominal circulated. The difference made the state income, because such money was the legal mean of settlement of unlimited quantity. It has forced exchange rate, due to which state gained significant incomes. "Falsification of coins, if they have not forced exchange rate is pointless. Deficient money is a symbol of money, *i.e.* token money (Koiava 1938, 100).

The information of historians and numismatists cited by us proves that in Western Asia and, namely, in Georgia just token money circulated.

"In XI-XII centuries in Georgia, as well as in the European and Western Asia countries we deal with coins falsification, mainly as a financial arrangement aiming enrichment of feudal lords" (Koiava 1938, 100) As for Marx, in respect of value he writes as follows: "… Name and substance, nominal weight and real weight, begin their process of separation. Coins of the same denomination become different in value, because they are different in weight. The weight of gold fixed upon as the standard of prices, deviates from the weight that serves as the circulating medium, and the latter thereby ceases any longer to be a real equivalent of the commodities whose prices it realises. The history of coinage during the middle ages and down into the 18th century, records the ever-renewed confusion arising from this cause" (Marx 1887, 82).

Georgian wars in XI-XII centuries, consolidation of Georgia in XII century required great means and such means were found by the way of falsification of coins.

In the period of circulation of full value silver coins, the contaminated silver money was produced. Such contaminated silver coins had compulsory exchange rate; compulsory rate did not guarantee constancy of commodity prices.

Marx writes: "The natural tendency of circulation to convert coins into a mere semblance of what they profess to be, into a symbol of the weight of metal they are officially supposed to contain, is recognized by modern legislation, which fixes the loss of weight sufficient to demonetize a gold coin, or to make it no longer legal tender. The fact that the currency of coins itself effects a separation between their nominal and their real weight, creating a distinction between them as mere pieces of metal on the one hand, and as coins with a definite function on the other – this fact implies the latent possibility of replacing metallic coins by tokens of some other material, by symbols serving the same purposes as coins" (Marx 1887, 82-83).

Involuntarily a question arises, if in XI century we deal not with falsification of coin, but change of prices scale or decrease of such scale or monetary unit without any gap between nominal and real values? As Prof. N. Koiava thinks, we shall rule our such version, as constant change of scale from king to king and in the whole Western Asia during over one hundred years would be impossible. No, the situation of the named period in whole proves that we deal with falsification of coin by the above way (Koiava 1938).

David the Builder introduced the new method of falsification of coins. He mobilized copper money which declared as silver money. Simultaneously with starting production of cooper coins the last contaminated silver coins vanished from circulation. Cooper money circulation caused all the related inconveniences: large volume of small value, low portability of money, rejection of cooper money from international circulation, drop of money value and, thus, of its purchase power etc.

Prolong falsification of coins should have the following results: taxation was unsuccessful, price raised, this caused long worsening of economic state of workers; it worsened state of the persons who had fixed earnings, made the additional profits for creditors, circulation flooded with contaminated, deficient money; falsification of money caused messing of trade relations, complicated international trade. State could not constantly deceive and rob its population such way. Georgia was the important trading country, taking active part in the international trade. But trading interests required return of coins of full value which would be used in the international circulation. Return of the coins of full value, *i.e.* silver ones became required. Just in 1230 we can see return to the silver coins of full value in Georgia (Koiava 1938).

So, we can tell that falsification of coins was caused not with deficit of silver, but on the contrary, falsification of coins caused removal of silver from circulation. Falsification of coins financed the arrangement aiming consolidation of Georgia, powerful wars of Georgia. That is why, circulation of cooper coins coincides with full blooming of feudal Georgia.

According to the sources, in the Rustaveli epoch cooper money circulated with representation value of silver money. In the Rustaveli's poem "drachm" is mentioned (quatrains 585, 918, 1078, 1097). Our poet represents his present-day reality and it is clear that in his poem "silver money" means cooper one. There are no place therein which directly proves existence of silver money, except 157-163th quatrain, where the author writes:

"...Give to the poor my treasure--gold, silver and copper." (Rustaveli 1912, v. II, p.27).

We should think that precious metals were mainly imported to Georgia from the other countries. Just in "The Knight in the Panther's Skin" we can see the indication thereof:

"…They set up a couch of gold, of red of the Occident..." (Rustaveli 1912, v. XXXV, quatrain 1166, 189)

"Occident" means "western" (Koiava 1938, 103). So, gold was imported from the west or not only from the west. Precious metals were imported to Georgia before Rustavelian epoch and even during the same. Gold and silver were transported from the places of their production to various countries including Georgia.

Precious metals were imported to Georgia and transited through it resulted international trade, as the riches were exported in form of precious metals.

So, we may think that in the named period the considerable part of silver was exported from Georgia, what is quite possible to be the reason of introduction of cooper money.

In the first fourth of XII century money reform played the important role in the economic strengthening of Georgia.

It is the accepted truth that money plays the important role in a country's economy. Money expresses spirit of the epoch and life of society.

Coins of Queen Tamar epoch really correspond to political and economic state of this period. Besides, such type of coins was achieved that due to the economic strength of the country (money had real value) and shape of coins (Arabic and Persian inscriptions) they were freely convertible in the whole Middle East. The country was rich and money exchange rate – stable. It provided stable and intensive circulation of money. Active financial policy provided successful development of economy and all above mentioned rose Georgia to the high level of cultural life.

In short, in XII century Georgia was in the brilliant economic state. Its population fully protected from foreign enemies greatly upsurged, state treasury had large revenues, trade and industry expanded and grew, people became rich, a good deal of money circulated in Georgia.

In this period the kingdom income consisted from state taxes, military duty and tributes of conquered countries.

External duties and internal taxes formed total revenue of the kingdom.

Numerous fiscal staff was employed for the purpose of tax collection and belonged to the officers entitled to enter king's hall and finely reported to the concrete departments viziers.

The concrete names of the fiscal officers are described in part 2 of "Favnelta Sigeli", which proves that the list of fiscal officers entitled to enter king's hall included casher, equerry etc.

All villages or larger administrative units had their tax-collectors reported to each other in the same hierarchy as the respective administrative units.

General names of the fiscal officer originated from the respective kinds of taxes they collected (Megrelishvili 1963, 131-132).

The main state tax included tributes and they were collected by the tribute-collectors. Such position is referred in several documents of XIII century, namely in "Istorian and Azman". Queen Tamar exempted church from tributes and taxes" (Zordania 1986, 63). This tribute reflected natural tax, *i.e.* tax of land.

Save the land tax, there were activity taxes, namely urban population tax. These people - traders and craftsmen - were considered villeins of state and were obliged to pay a part of their earnings in favour of state. That is why, the state gained large revenues from towns.

But tax revenues were not always equal. The king exempted from taxes some monastery lands or concrete feudal lords, so tax-originated revenue paid to state treasury reduced. Besides, something Georgian kings exempted the conquered states from tribute (Kartlis Tskhovreb, 1959).

In XII-XIII centuries Georgia received enough large annual tributes from many conquered countries, approximately:

- from Gurgan – 4.000.000 dirham;
- from Kazvan (Zanjan) – 1.628.000 dirham;
- Azerbaijan (Masaga, Ardavel) – 4.500.000 dirham;
- from Gilan – 5.000.000dirham;
- from Armenia (Karnu town, Erzurum, Gelakun) – 9.100.000dirham;
- from Iraq – 13.000.000dirham;
- from Khiorasan – 38.000.000 dirham.
- Totally 75.228.000dirham (Javakhishvili 1930, 51-52).

The tributes also provided the great revenue. Although its size depended on the wars and riches of the conquered countries, such way our country gained large number of valuables, goods and wood. The fifth part of tributes belonged to the king, the rest part was divided between the warriors.

The largest amount was spent for maintenance of the army and wars, as power of feudal monarchy based thereon. Besides, wars provided rich booty a part of which was taken by the kings, but the rest part was divided between the warriors. That is why, just the warriors were interested in wars being always ready to attack far countries.

But integrity and strengthening of the Georgian feudal monarchy was possible not by the booties in wars and attacks, but development of monetary economy what economically and social-politically united all parts of the state.

Conclusion

So, as we see, the Georgian monarchy in the reign of the XI-XII centuries implemented the significant financial arrangements, namely: change of type of coins; contemporarily with change of coins the rate became stable.

It is general truth that money plays important role in economy of country. Money reflects sole of epoch and social life.

Coins of XI-XII centuries reign really reflected political and economic state of the epoch. Besides, the coins were of such type, that due to economic strength of Georgia (money had real value) and coins appearance (Arabic and Persian inscriptions) they were freely converted all over the Middle East. The state was rich, its money rate - stable. This provided stable and intensive circulation of money. Active financial policy preconditioned successful development of economy and all above rose Georgia to the high level of political and economic life.

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CREATIVE ECONOMY DEVELOPMENT BASED ON TRIPLE HELIX IN INDONESIA

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Abstract

Creative economy is an economy based on skills development, creativity, and individual talents to create the creativity and inventiveness of individuals that have economic value that focuses on the development of ideas in generating value added. One approach that can be done to make a calculation of the value added generated creative economy is industry approach. This study aims to analyze the creative economy development in Indonesia based on Triple Helix -which involving universities, companies, and governments. Using to NVivo program and ANOVA (mixed research), this study uses to the triangulation -the combination of methodologies in the study of the same phenomenon. The results of this study indicate that there are significant differences i) inter-industries gross value added creative, ii) inter-industries creative employment, and iii) the problem in supporting the development of Indonesia's creative industries but there are no significant differences iv) in gross value added creative industries Indonesia from year to year, (v) in employment creative industry Indonesia from year to year, and (vi) the problems in supporting the development of creative industries throughout Indonesia.

Keywords: creative industry; NVivo; triangulation; triple helix.

JEL Classification: C81; O31.

Introduction

The world economy continues to evolve with the emergence of new economic potential that is able to sustain the life of the community's economy. At first, the community's economic activity is based on an economy resources - agriculture and mining, then shifted to the economy based on human resources -industrial and information technology. This is in line with the thinking of the world economy experts Alvin Toffler that divides the development of civilization of the world economy into three waves of the economy, which is the first form of economic waves economy dominated by agricultural activities; The second economic wave form of the economy dominated by industrial activities; and the third economic wave form of information technology-based economy. Alvin Toffler also estimated after the third economic wave will appear fourth economic wave or waves also called creative economy, the economy based on ideas or creative and innovative ideas. This fourth economic tide has now started to be seen writhing in Indonesia (Pusat Komunikasi Publik Kementerian Perindustrian, 2015).

The development of creative economy in Indonesia have an impact on the development of the Indonesian economy sectorally. It is apparent from the economic value of the creative contribution to the value of Gross Domestic Product (GDP). The greater contribution of the creative economy, the greater contribution of the creative industries to the national economy. With other words, the more important role of creative industries in the structure

of national production. It is apparent from the Creative Industries sector's contribution to GDP is still higher than the Financial sector, Real Estate, and Business Services, Transportation and Communications; and Electricity, Gas, and Water. Creative Industries sector's contribution to GDP amounted to 7.05% in 2013. This contribution is relatively large compared to the Financial sector, Real Estate, and Business Services; Transportation and Communication; and Electricity, Gas, and Water, each of which contributed only 7.02%; 6.93%; and 0.80% (Kementerian Pariwisata dan Ekonomi Kreatif, 2016:91). In 2014, the creative economy capable of contributing Rp700 billion to the GDP of Indonesia, is able to export Rp70 billion, and is able to provide employment for 12 million people.

The contribution of the creative industries value added to GDP of Indonesia through arts and cultural base and base media, design, and science and technology. The contribution of the creative industries value added to GDP through arts and cultural base of 49.78% are through the base media, design, and science and technology by 50.22%. Industry groups that contribute to the creation of value-added industries based creative arts and culture are a group of culinary industry and culinary craft, the culinary industry (32.51%), industry (14.44%), movies, video, and photography (1.31 %), music (0.82%), performing arts (0.46%), and the art market (0.31%). Industry groups that contribute to the creation of value-added media-based creative industries, design, and science and technology, namely the fashion industry (28.29%), publishing and printing (8.11%), design (3.90%), computer services group and software (1.57%), interactive games (0.75%), and advertising (0.58%). Data Indonesian creative industry contribution to the Indonesian economy are presented in Table 1.

Table 1. Contribution to Gross Value Added in the Creative Industries Indonesia to GDP at Current Market Prices, 2013 - 2016 (%)

Creative Industry	2013	2014	2015	2016
1. The Art Market	0.02	0.02	0.02	0.02
2. Handy craft	1.13	1.07	1.02	1.02
3. Movies, Video, and Photography	0.09	0.09	0.09	0.09
4. Music	0.06	0.06	0.06	0.06
5. Performing Arts	0.03	0.03	0.03	0.03
6. Culinary	2.40	2.29	2.27	2.29
7. The Creative Economy (1 to 6)	3.74	3.55	3.48	3.51
8. The Others of Creative Economy	3.60	3.55	3.54	3.54
9. The Creative Economy (7 to 8)	7.34	7.10	7.02	7.05
10. The Non Creative Economy	92.66	92.9	92.98	92.95
11. GDP of Indonesia	100.00	100.00	100.00	100.00

Source: Kementerian Pariwisata dan Ekonomi Kreatif, 2016: 93.

Based on Table 1, contribution of gross value added based creative industries and the arts and culture-based media, design, and science and technology during the years 2013-2016 tended to decrease from 3.74% (2013) to 3.51% (2016) for the creative industries based arts and culture as well as from 3.60% (2013) to 3.54% (2016) to industry-based media, design, science, and technology.

Creative industries-based arts and culture in 2016 is able to provide employment for 7.06 million people are more creative economy sector is only able to absorb as many as 4.8 million people. Data on employment of creative industries in Indonesia in 2013-2016 are presented in Table 2.

Table 2. Employment Absorption Creative Industries Indonesia, 2013-2016

Creative Industry	2013	2014	2015	2016
1. The Art Market	14,956	15,163	15,237	15,269
2. Handy craft	2,909,574	2,988,101	3,077,099	3,109,047
3. Movies, Video, and Photography	56,937	60,006	62,495	63,755
4. Music	50,612	53,127	55,030	55,958
5. Performing Arts	72,010	75,494	78,131	79,258
6. Culinary	3,707,894	3,732,961	3,735,019	3,736,968
7. The Creative Economy (1 to 6)	6,811,983	6,924,850	7,023,011	7,060,254
8. The Others of Creative Economy	4,681,892	4,737,050	4,776,557	4,812,173
9. The Creative Economy (7 to 8)	11,493,875	11,661,900	11,799,568	11,872,428

Source: Kementerian Pariwisata dan Ekonomi Kreatif, 2016: 99.

Based on Table 2, employment-based creative industries and cultural arts during 2013-2016 tended to increase from 6,811,983 people (2013) to 7,060,254 people (2016) are based creative media industries, design, and science and technology tend to rise from 4,581,892 people (2013) to 4,812,173 people (2016). This condition indicates that the creative industry still faces various problems in making a positive contribution to the Indonesian economy. Thus, if the creative industry still faces various problems, the economy creative case. Therefore, the solution of problems in the creative industries are the ultimate solution to the problems in the creative economy.

This study aims to analyze how the development of the creative economy in Indonesia based on the Triple Helix which requires synergy between institutions, namely universities, governments, and companies in the perspective of the three institutions in connection mutuality symbiotic relationship. The strength of this study are in a new topic about the creative economy, a new methodology for collecting data with NVivo, and use the triangulation -the combination of methodologies in the study of the same phenomenon.

Creative economy is an ecosystem that has a symbiotic relationship between the creative value chain (creative value chain); development environment (nurturance environment); market (market) and archiving (archiving) (Kementerian Pariwisata dan Ekonomi Kreatif 2016, 23). Creative industries producing creative work to be consumed directly by households, companies and other economic entities that are not only produce work that meets the aesthetic value of the function but also can improve the happiness of consumers who eat them. Creative economy is closely related to the creative industries, but the creative economy has a broader scope than the creative industries. Creative economy is not only related to the creation of economic value added, but also the creation of added value in social, cultural and environmental (Supanto and Fristin 2017).

Creative industries are part of the creative economy or subsystem consisting of a core creative industry, forward and backward linkage creative industry. Core creative industry is a creative industry is the main added value creation by leveraging creativity creative people. In the process of value creation, the Core creative industry requires the output of other industries as inputs. Industries that becomes the input for the creative core is referred to as backward linkage industries creative industry. The output of the Core creative industry can also be an input for other industries, which is referred to as forward linkage creative industry. Creative industries is driving the creation of economic value in the era of the creative economy. In the process of value creation creative, creative industries not only create economic transactions, but also social and cultural transactions. The general process that occurs in the creative value chain is the creation production-distribution-commercialization, but each group of creative industries have different creative value chain. Based on this understanding, the creative industries are defined as industries which produce output from the utilization of creativity, expertise, and individual talents to create value-added, employment, and improved quality of life.

1. Literature Review

According to Kadiman (2005, 69), the development of creative economy can be done by taking into account the perspective of the three institutions linkages with the commitment and the real work of the three institutions known as the Triple Helix (Figure 1), which includes the A (academician), B (businessman), and G (government). Triple Helix is one of the solutions of the constraints faced by economic actors and facilitate the creation of a "symbiotic mutualism" between the three institutions involved in it. A more open relationship and mutual expected to be among the academia (universities) with government, academia (universities) with employers, and employers with the government in a wedge between the third relationships.

Tri Dharma College lecturer mentioned that the obligation is to do the teaching and education, research, and community service. At Tri Dharma first, education and teaching activities is the transfer of knowledge of science that has been developed through research at universities ranging from education undergraduate, master degree education, education doctoral program in a discipline, education and vocational pathways or non-degree.

At Tri Dharma second, research activities have an important role in the context of advances in science and technology. Without research, the development of science and technology will be hampered. Research related to development in the broad sense, because research is needed or can be used directly by the public at the time and should be viewed with the needs of the future. In other words, research in universities is not only directed to applied research, but also carry out research of basic sciences that the new benefit was important for the future.

Figure 1. Creative Economy Development Model with Triple Helix
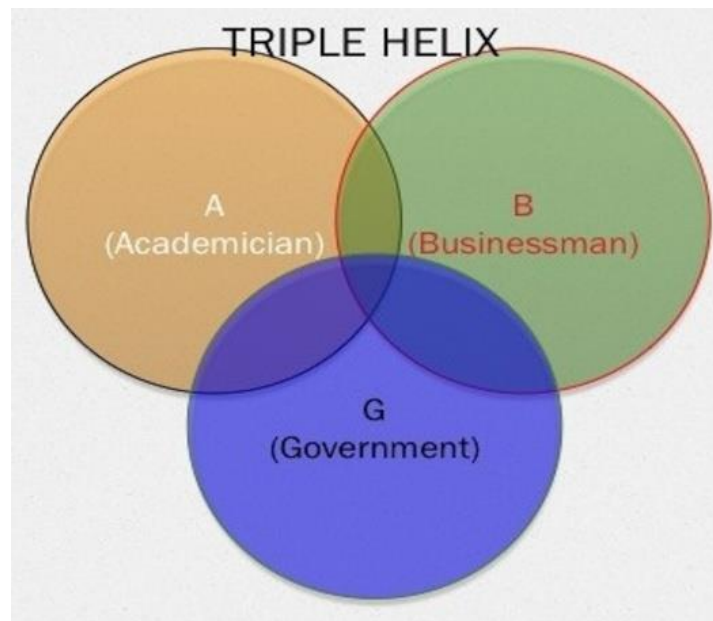
Source: Kadiman 2005, 79.

At Tri Dharma third, community service activities are the application of science and technology that has been developed in college. Community service activities is a series of activities in order to contribute to the community college that is both real and perceived benefits directly. Based on community service activities, is expected to have feedback from the community to the college so that it can be used as materials science and technology development further.

The industry has an obligation to contribute in creating a good business climate, such as implementing business ethics, is committed to corporate social responsibility (CSR), and government partners to support national economic growth. Kotler and Nancy Lee (2004) explained that CSR is an essential component in supporting the company's strategy to fulfill the vision, mission, and goals of the company. Therefore, the implementation of CSR should be consistent and support the company's business activities. According to Kotler and Nancy Lee (2004), there are six CSRs, which cause promotion, cause related marketing, corporate social marketing, corporate philanthropy, community volunteerism, and social responsible business practices (Elisawati 2008). Six CSRs has been selected to run by companies in Indonesia.

Cause promotion. Companies do CSR in the form of support to a social activity that are of concern to the community to improve the image of a company. For example, the implementation of fun walk, fun bike, green movement, endemic bird flu, the telecommunications company that provides free telephone facility in natural disaster areas, PT. Unilever supports green campaign, and PT. Djarum do CSR in badminton; established schools badminton, making the club, providing scholarships, and routinely perform various competitions and sponsoring various events both national and international badminton.

Cause-related marketing. Companies do CSR in the form of donation or donation based on a percentage of sales revenue. Such CSR is the most frequent of companies in Indonesia. For example, giving donations based on a percentage of the results of short message service (SMS) customers during the period of time for the purposes of education. The purpose of this program is to develop the emotional relationship between manufacturers and customers, through the involvement of both the social program.

Corporate social marketing. Companies do CSR through a campaign to change people's behavior such as raising awareness of healthy living, environmental preservation, and others. Movement of hand washing is done by a soap manufacturer, aims to familiarize society wash hands before performing various activities. Corporate philanthropy. Companies do CSR in the form of donations to the community in need. That is, philanthropy is done to support the company's business objectives. For example, an information technology company to make a donation in the form of free internet facility to a village.

Community volunteerism. Companies do CSR based on the amount of time (hours or years) of working hours of employees for social work. This activity is calculated in key performance indicators of each employee. Employees can work as a volunteer. Social responsible business practices. Companies do CSR by adopting

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business practices in accordance with the social issues that occur. For example, retail companies (retailers) who started using recycled paper for packaging products.

Six of these approaches can be a reference company that wants to include CSR program as part of its business operations. Obviously, CSR chosen should fit with the vision and mission of the company. According to Kotler and Nancy Lee (2004), the CSR benchmark of success is the ability to support the achievement of the strategy and objectives of the company. CSR becomes a vehicle that can be used to achieve the goals of sustainable development. By doing so, CSR will not be abused or be positioned just a marketing gimmick to deception corporate image (corporate green wash) alone. The success of CSR, according to various sources is determined by a partnership approach between the program companies, governments, and civil society organizations mentoring program. Partnership approach is the most decisive element in the successful implementation of CSR (A + CSR Indonesia, 2010).

Creative economy requires working across government sectors as industrial development chain. Ministry of Education and Culture in charge of improving the quality of human resources of creative ranging from curriculum to teachers. Ministry of Communications and Information Technology is responsible for providing the infrastructure for the content industry. Ministry of Industry and Trade Ministry in charge of fostering creative economic actors who are mostly small and medium industries. Ministry of Law and Human Rights in charge of the management of patents and copyrights.

According to Badrudin (2017, 29), there are three things the government function, namely the allocation, distribution, and stabilization. Function in the allocation of public policy is a function of the provision of public goods or the allocation of resources to be used as a personal item or public goods and how the composition of public goods specified. Judging from the allocation function, a public goods cannot be provided through market mechanisms as inefficient. The relationship between producers and consumers is happening in the market mechanism does not exist and the government must be willing to produce public goods. Distribution functions in public policy an adjustment to the distribution of income and wealth to ensure equity and fairness. Judging from the distribution function, distribution function has properties more difficult to solve than the allocation function and is a major problem in determining public policy. Distribution function has an important role in the tax and transfer policies. Without policy intervention, the distribution of income and wealth will depend on the availability of natural resources and wealth ownership.

The problem lies in the aspect of equity and justice. It was then taken into account in designing the distribution policy. Stabilization function of public policy is the use of budgetary policy as a tool to maintain the level of employment, economic stability, and economic growth, taking into account the result of policies on trade and balance of payments. A public policy, such as taxation and public spending, can be simultaneously directed towards these objectives. The main problem is to design a budget policy so that these objectives can be achieved in a more integrated, so as not to experience fluctuations in the economy, unemployment, and inflation.

Base on Kementerian Pariwisata dan Ekonomi Kreatif (2016, 96), some of the problems that arises is the uneven growth in all types of creative industries-based arts and culture and media-based, design, and science and technology; limited support from government; and limited access to financing and marketing. To overcome the problems, it is necessary synergy between institutions, namely universities, government, and the company in relation perspective the three institutions with the commitment and the real work of the three institutions known as the Triple Helix which includes A (academician), B (businessman), and G (government). This is an interesting writer to conduct creative economic development in Indonesia by Triple Helix.

According to Suparwoko (2010), the synergy between the creative economy with tourism sector is a model of economic development potential to be developed in Indonesia, including in Purworejo. To develop the creative economy as a driver of tourism sector needed connectivity to create product creative outlets at strategic locations with the support of government, human resources skills enhancement crafters, access to technology, and capital. Satria and Ayu (2011) showed that the distributions clothing industry as one form of creative industries not get to support from the government and other institutions in the city unfortunate that the development of creative industries is not maximized in enhancing the competitiveness of the local economy in the city of Malang.

Pusparini (2011) using the SWOT analysis indicates that the development of creative industries need the support and commitment of the government, expanding the cooperation and business links with local another (search for potential markets), utilizing public consumption patterns by making various kinds of innovations in products, entered into a collaboration with the government, higher education institutions, and businesses to organize a festival of culture and customs, improve product quality, more creative in colors, patterns and styles and motifs products

Pangestu (2012) concluded that i) the development of creative economy impact on job creation through the establishment of centers of creative industries and the creation of added value for poverty reduction and ii) inter-agency coordination and integration is still a weakness. Priyatmoko (2012) concluded that the approach was instrumental in the development of banking Micro Small Medium Enterprises (SMEs) in Indonesia. This is in accordance with one of the problems of SMEs in the development of creative industries, namely banking limitations in supporting the development of creative industries in Indonesia. Setiadi *et al.* (2012) using the factor analysis approach and creative worker characteristics index (the Creative Worker Characteristics Index or CWCI) concluded that the development of the creative economy is influenced by five factors, namely neurotic, extraversion, awareness, friendliness, and openness.

According to Wasito (2013), to develop the printing and publishing industry, the good aspects of the author's creativity, design books, and the expansion of markets, including the development of bookstores in the district/city to be seen as a potential key to encouraging development of national literary world. In addition, protection and respect for the copyright of the products of the products of creativity including printing and publishing needs to be done by the government to avoid the rampant piracy that undermine the spirit of creative printing and publishing community. Protection of copyright or intellectual property rights will provide a sense of justice, including economic justice for the perpetrators of the creative industries sector. Justice is the key to increasing incentives for work and trigger the growth of the creative industries in Indonesia.

According to Hasibuan (2013) there are two factors that lead to low public interest in the products produced by learners is the lack of creativity to generate innovative products and less variation of raw materials used to produce a product. Andri *et al.* (2015) explained that i) Pekanbaru city government plays an active role in the developing of the creative industries and ii) the development of creative industries requires a synergy between the parties, namely universities, companies, and governments.

Ayu and Eko (2013) using descriptive approach, Delphi, and multidimensional scaling to determine the typology of the creative industries in the distribution of the location of the craft subsector result that i) four factors that influence the spread of the location of the creative industries in the subsector craft is a) factors of production costs, b) the location advantage, c) expansion of the market, and d) the internal conditions of the community and ii) typology established location is a) typology I, namely the creative industries in the village handicraft, bags, shoes, and a mask formed from the attributes of the internal condition society, labor, and the benefits of agglomeration and b) typology II, namely Centre Crafts Furniture Antique Wood and formed of attributes specific features of the area. Sumardiningsih *et al.* (2013) explained that i) the teaching syllabus and teaching materials in the form of creative economic education including the development results into either category and can be used as well as ii) the educational model of assessment instruments creative economy development outcomes assessment instruments syllabus, materials teaching, assessment of student creativity and feasibility assessment models including both categories.

According to Diah (2013) using a descriptive approach and path analysis result that i) capital, investment, and technology a significant effect on the amount of production but not indirect effect on employment in the apparel industry in Denpasar City and wages no significant effect to total production in the apparel industry in Denpasar City; ii) the level of wages and investment and direct significant effect on employment and capital, technology, and production quantities are not significant effect on employment in the apparel industry in Denpasar City; and iii) the level of wages positive effect on employment and capital, investment, technology, and production quantities of negative effect on employment of the apparel industry in Denpasar City. Mellita and Dean (2014) concluded that government agencies do not support the development of creative industries optimally because still minimal level of knowledge of the relevant agencies on the creative industries.

2. Methodology

This study uses triangulation, which is a combination of methodologies in the study of the same phenomenon. According to Shauki (2014), triangulation methodology is checking the consistency of the findings generated by different data collection methods such as incorporation of quantitative or qualitative methods to complement the interview data with observational data. Benefits of triangulation is to increase the confidence of research, creating innovative ways to understand the phenomenon, the findings reveal a unique, challenging or integrate theory, and gives a clearer understanding of the problem.

The qualitative data in this study were obtained by using NVivo program to collect research materials. NVivo program contains special ability to store various types of files such as text files, pdf, photos, and videos and helps analyze the results of a collection of various types of files. Based on data obtained from various types of files are then classified by the type of problems and types of creative industries. Furthermore, the data obtained with NVivo

program will be processed and analyzed by ANOVA statistical test model. This is to answer the problems that hinder the development of creative industries in Indonesia.

3.   Results and Discussion

Based on previous research, the problems in the development of creative industries in Indonesia are grouped into three factors, namely the lack of government regulation, financing, and marketing. Based on NVivo program, conducted a search of data obtained from various types of files, and then classified by the type of problems and types of creative industries as shown in Table 3.

Table 3. Problems Faced by the Creative Industries in Indonesia, 2013-2016

Creative Industry	The Lack of Government Regulations		Financing		Marketing	
The Art Market	292	1.43%	934	2.61%	1076	4.76%
Handy craft	176	0.86%	244	0.68%	284	1.26%
Movies, Video, and Photography	532	2.60%	974	2.72%	934	4.14%
Music	19,270	94.24%	32,350	90.25%	19,224	85.11%
Performing Arts	82	0.40%	490	1.37%	366	1.62%
Culinary	96	0.47%	852	2.38%	702	3.11%

Source: Search Engine via Google, Yahoo, Bing, Amazon with NVivo Program April-October 2017.

Based on the data in Table 1 and Table 2, it can be tested statistically whether the research hypotheses H1a, H1b, H2a, and H2b and proved significant or not. The results of the research hypothesis testing H1a, H1b, H2a, and H2b with ANOVA statistical test model are presented in Table 4. Testing research hypotheses H1a, H1b, H2a, and H2b corroborated by the results of the research hypothesis testing H3a and H3b the data obtained from NVivo program. Results of testing hypotheses H3a and H3b study are presented in Table 4.

Table 4. Research Hypothesis Testing Results

Hypothesis	P_*value*
H1a: There are a differences between the gross value added of Indonesia's creative industries.	0,0001 *)
H1b: There are a differences in gross value added creative industries Indonesia from year to year.	0,1151
H2a: There are differences between the employment Indonesia's creative industries.	0,0001 *)
H2b: There are differences in employment creative industry Indonesia from year to year.	0,2227
H3a: There are differences between the problems in supporting the development of Indonesia's creative industries.	0,0001 *)
H3b: There are differences in problems in supporting the development of creative industries throughout Indonesia.	0.3256

Source: Adapted from Table 1, 2, and 3.
    *) Significant at α 5%.

Based on the results of the research hypothesis testing in Table 4, H1a is supported. That is, there are significant differences among industries gross value added creative Indonesia. H1b is rejected, meaning there are no differences in gross value added creative industries Indonesia from year to year. H2a is supported, meaning that there are significant differences among industries creative employment Indonesia. H2b is rejected, meaning there are no differences in employment creative industry Indonesia from year to year. H3a is supported, meaning that there are significant differences among industries problems in supporting the development of creative Indonesia. H3b is rejected, meaning that there are no differences in problems in supporting the development of creative industries throughout Indonesia.

Based on H1a and H2a, meaning there are differences in government support in the form of regulation, the level of difficulty in accessing capital to financial institutions, and the level of difficulty of marketing products in developing creative industries like art market; crafts; film, video, and photography; music; performing arts; and culinary. This is demonstrated by H3a that there are significant differences among industries problems in supporting the development of creative Indonesia. Based on Table 3, it appears the problem complained of most major regulatory support on the type of music the creative industries (94.24%) and the smallest on the type of performance art creative industries (0.40%). Of capital financial institutions become the biggest problem on the type of music the creative industries (90.25%) and the smallest on the type of creative industries craft (0.68%). Likewise, marketing factors become the biggest problem on the type of music the creative industries (85.11%) and the smallest on the

type of creative industries craft (1.26%). The literature review in this study support the research hypothesis H1a, H2a, and H3a.

Based on H1b and H2b showed that during the observation period 2013-2016, Indonesia's creative industries are not able to increase contribution to gross value added and employment. It shows that a variety of programs that run has not been able to improve the performance of the creative industries. This is due to the problems that hinder the development of creative industries such as the art market; crafts; film, video, and photography; music; performing arts; and culinary. Barriers in the form of non-optimal government support in the form of regulations, limitations in access to capital with financial institutions, and product marketing barriers. This is demonstrated by H3b that there are no differences in problems in supporting the development of creative industries throughout Indonesia. That is, the problems that hinder the development of Indonesia's creative industries from year to year is always the same, which is not optimal government support in the form of regulations, limitations in access to capital with financial institutions, and barriers to the creative industry products marketing. Thus, from year to year cannot be solved solution.

The results of the research hypothesis testing is supported by Suparwoko (2010) which states that for the development of the creative economy as a driver of connectivity needed tourist sector by creating outlets creative products in a strategic location that is supported among others by government policies and capital; Satria and Ayu (2011) which states that the creative industries do not get support from the government and other institutions in Malang so that the development of creative industries is not maximized in enhancing the competitiveness of the local economy in Malang; Pusparini (2011) which states that the development of creative industries in West Sumatra with case studies of creative industry sub-sectors craft: embroidery industry/embroidery and weaving requires the support and commitment of the government.

Likewise, the findings of Pangestu (2012) which states that the slow development of the creative economy that impact on job creation through the establishment of centers of creative industries and the creation of added value for the alleviation of poverty due to inter-agency coordination and integration that there are still weaknesses; Priyatmoko (2012) which states that one of the problems of SMEs in the development of creative industries as banking limitations in supporting the development of creative industries in Indonesia; Wasito (2013) which concluded that the development of the printing and publishing industry is not optimal due to the lack of security and respect for copyright on creativity including products for printing and publishing products from the government; Diah (2013) which states that the investment of capital and significant effect on the creative industries in Denpasar City; and Mellita and Dean (2014) which states that government agencies do not support the development of creative industries optimally because still minimal level of knowledge of the relevant agencies on the creative industries.

Marketing factors are also an issue in the development of creative industries Indonesia routine from year to year. This is supported by Pusparini (2011) which states that the strategy of development of creative industries in West Sumatra with the creative industry sub-sector case studies of industrial craft embroidery / embroidery and weaving requires cooperation and business links with other areas to look for potential markets; Wasito (2013) which states that the development of the printing and publishing industries require expansion of the market, including the development of bookstores in the district / city; and Ayu and Eko (2013) which states that the distribution of the location of the creative industries in the subsector craft requires the expansion of the market.

According to Kadiman (2005, 69), the development of creative economy can be done by taking into account the perspective of the three institutions linkages with the commitment and the real work of the three institutions known as the Triple Helix, which includes A (academician), B (businessman), and G (government). A more open relationship and mutual expected to be between academia (universities) with government, academia (universities) with employers, and employers with the government in a wedge between the third relationship.

This is consistent with the findings of Suparwoko (2010) which states that the development of the creative economy in Purworejo supported by government policy, an increase in HR skills of craftsmen and access technology Tri Dharma activities of the college, and the capital of financial institutions through the company's CSR activities; Satria and Ayu (2011) which states that the development of creative industries in Malang not get support from the government and other institutions (universities and companies); Pusparini (2011) which states that the development of creative industries in West Sumatra with the creative industry sub-sector case studies of industrial craft embroidery/embroidery and weaving requires the support and commitment of the government, making a wide range of product innovations in cooperation with higher education institutions, and organize a cultural festival and customs cooperation with the company's CSR activities; Setiadi *et al.* (2012) which concluded that the development of the creative economy is influenced by five factors, namely neurotic, extraversion, awareness, friendliness, and openness; Andri *et al.* (2015) and Ayu and Eko (2013) which states that the development of creative industries requires a synergy between the universities, companies, and governments.

Conclusions

The conclusions of this study are (i) there are significant differences among industries gross value added creative Indonesia, (ii) there are no differences in gross value added creative industries Indonesia from year to year, (iii) there are significant differences among industries creative employment Indonesia, (iv) there are no differences in employment creative industry Indonesia from year to year, (v) there are differences between the problem in supporting the development of Indonesia's creative industries, and (vi) there are no differences in problems in supporting the development of creative industries throughout Indonesia. To solve routine problems in the development of creative industries in Indonesia from year to year due to limited government regulation, financing, and marketing needs commitment and the real work of the three institutions known as the Triple Helix, which includes A (academician), B (businessman), and G (government).

Limitations of this study to analyze the development of the creative industries only of the six types of creative industries, namely the art market; crafts; film, video, and photography; music; performing arts; and culinary. Suggestions for the next research is to add the type of creative industries in accordance with the sixteen types of creative industries in order to obtain a more complete study results.

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INVESTMENT ATTRACTION, COMPETITION AND GROWTH; THEORETICAL PERSPECTIVE IN THE CONTEXT OF AFRICA

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Abstract

Examination in both theoretical and empirical prospective of the Capital market, deduce that the major indicators of modern economic growth, depends on the extent of economic financialization, commonly defined as capital stock, industrialization and Technological Advancement. The focus of this paper is to theorize investment attraction mechanism for a national economy in a global competitive arena, taking a posteriori perspective of Africa politico-economic climate.

Keywords: investment attraction; investment theory; macroeconomics; policy; economic growth; industrialization

JEL Classification: E22; E63; F43; O31.

Introduction

Over the years, the various popularly accepted mainstream economic schools, had battled in difficulty to clearly distinguish in it taxonomy records, the word "Capital" and "Investment" in it theoretical composition and analytics, as a result, both words are used interchangeably, as a required aggregate input toward output of production, without necessarily referring to monetary content of analysis. It is observed, in very exceptional cases and instances, which an attempt was made by few economists, to analyze the effects of the value of money on overall economic performance in both short and long-run, took cognizant of investment theory in nominal prospective. One of such great example is the argument of Lugwig Von Mises (1953 [1912]), who was credited for using the marginal utility analysis to account for value of money, and also the first to recognize the significance of credit creation in the context of a decentralized, time-consuming production process. Which forms the axiom of Hayekian Triangle analysis of the relationship between Savings and Economic growth, the very tenet of Austrian Business Cycle theory. To achieve capital accumulation in a decentralized economy measured in nominal content, for the purpose of investment to production, requires a sacrifice in consumption-savings perversity, the essence of the Heinleinian principle (Heinlein1966). Which attracted Leijonhufvud (1968) to argue that, Saving-Investment perversity, in fact was central to Keynesian vision of the macro economy. Snowdon and Vane (2005) posit that, Austrian Economics interest in macroeconomic theorization within the framework of monetary effects towards economic growth, led to the interpretation of the word "Loanable funds" and it theoretical effects, which I quote "*They are, all the ways, that the investment community takes command of the unconsumed resources. Further taking command, has to include retaining command-in the case of the undistributed earnings of the business firm, in other to expand its own productivity capacity, and is to forego some of the market rate of return on its retained earnings, a rate that it could obtained through the financial sector*". This excluded consumer loans as income earned by individuals and spent on consumption. Their theory further exposed that, in the market economy, there are

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different financial instruments like Bank Deposits, Passbook account, bonds and equity shares. Garrison (2001) in his debate of Austrian economic school, on the prospective of capital-based macroeconomic framework, argued, the economy production possibilities frontier, is determined by the loanable funds market, in which the rate of interest reflects the savings preference of the market participants, while the corresponding consumption preferences are accommodated by the output of the final stage of production in the Hayekian Triangle. (Hayek 1933) predicate, resources are being allocated among the stages of production on the basis of the cost of investment funds, such that the rate of return in the real sector, as reflected in the slope of the triangle's hypotenuse corresponds to the rate of return in the financial sector. Then emerged, Harrod-Domar growth model, within the development economic literature. (Easterly 1999, 2001a, and Chapter 11) posit, the model was to foster high rate of accumulation as a key to economic growth, in the absence of substantial inflows of foreign capital, a country must generate the necessary resources through high rate of domestic savings. And expect that, it will come with a cost of inequality-in-income because without adequate incentives, investment rates would remain insufficient to generate sustained growth. (Kuznets 1955) hypothesized that a country to develop, inequality will increase before declining. Even though in the later years (Aghion *et al.* 1999) debunked the preposition of Savings and Inequality of income in any growing economy in the face of empirical evidence. (Alesina and Rodrik 1994; Persson and Tabellini 1994) pose that, redistribution of income, by raising the tax burden on potential investors, reduces investment and consequently economic growth. Olson (2001), postulate, there are two key requirements for any society to grow economically, first establishment of secure and well-defined individual rights with respect to property and impartial enforcement of contracts, as capitalism is first and foremost a legal system and second, the 'absence of predation of any kind'. Then Murphy *et al.* (1989b) reinvigorated version of the Big Push theory, which propound that, industrialization requires a large market in terms of domestic demand in other to make increasing-returns-technologies, profitable. Historically, theoreticians has focused in the development of investment theory and it effects towards economic growth, which the theoretical focus of this paper will put forward model required for "Investment-Attraction" in a modern economy, operating in a global competitive market, towards economic growth, especially in the prospective of developing economies

1. Labour Wage Contract and Savings

Austrian Business Cycle theory is established on the axiom of Individual Savings in micro economy, contributing to capital accumulation, which augment macroeconomic production frontier. This uphold the assumption that, Wage negotiators aim for constancy of their real wage for effective budget planning towards savings. This concur to Fischer's (1977) model, that nominal wage increases should be set equal to expected inflation

$$\dot{P}_t^e = E\left(\dot{P}_t \middle| \Omega_{t-1}\right)... \tag{1}$$

$$\dot{W}_t = \dot{P}_t^e \tag{2}$$

Then;

$$\dot{W}_t = E\left(\dot{P}_t \middle| \Omega_{t-1}\right) \tag{3}$$

where $\dot{W}_t$ - Real Wage

$\dot{P}_t^e$ - Expected rate of Inflation
$\dot{P}_t$ - Actual Inflation
E - Rational Expectation of Agents

This consolidate the empirical facts, such that in reality, there is the necessity of a corporate firm in a perfect market competition, to structure it real wage in correspondence to expected inflation and labour efforts. This is also in consonance to Solow (1979) postulation, that wage enters a firm short-run production function in a labour-augmenting way, therefore a cost minimizing firm, favours real wage rigidity, which is demonstrated by the equation as,

Q = AF [e (w) L], e (w)> 0 (4)

where Q - Firms Output
A - Productivity Shift Factor
e - Real Wage

L - Labour Input

I therefore postulate, *"Savings is expected to rise to the optimum, to act as Investment- Capital Capacity to any Economy, when such economy approaches the theoretical positioning expressed by Fischer's model"* as

$$\dot{W}_t = \dot{P}_t^e \qquad (5)$$

$$\frac{\dot{W}_t}{\dot{P}_t^e} = 1.0 \ \ or > 1.0$$

This theoretical positioning of an economy to trigger investment through Savings, in *ceteris paribus*, should be held in efficient Investment policy framework, which is expressed in an equation below as

$$\dot{S}_{t+1}^e = F\left[\left(\frac{\dot{W}_t}{\dot{P}_t^e}\right)\epsilon_p\right] \quad (6)$$

where $\dot{S}_{t+1}^e$- Expected Savings over-time

F- Industrialization factor of an economy

$\dot{W}_t$- Real Wage

$\dot{P}_t^e$- Expected rate of Inflation

ϵ_P - Efficient Investment Policy Instrument

It is assumed that, in such status of an economy, the issue of capital deepening capacity, in large extent will be addressed endogenously, towards industrialization optimal in developing economies. Expressed in a panel form as Figure 1.

Figure 1
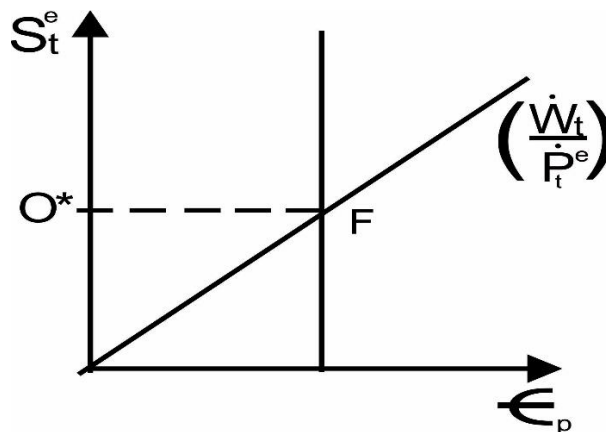
Source: Senzu T. E. (2018)

It is a graph of Savings-Incentive Economy versus efficiency policy framework for economic industrialization and growth

O* ----- Represent an Optimal level of industrialization of an economy, on Panel Fx. Model

Efficient in Investment Policy, under this model means, Policies, which are 'Savings-Incentive driven'. This invoke workers, as the acting agents of the economy to become Savings bias, responding perfectly to the consumption equation of Solow's (2000, 2002) model of growth as

Y = C + S   (7)

where Y - Aggregate Income of Worker

C - Consumption components of Wage

S - Savings Components of Wage

2.   Transnational Corporate Investment in Performance Effects

In every endogenous competitive market, corporate performance and profit is largely dependents on the following

- Labour efforts, which corresponds to effective wage
- Technology and Innovations

The ultimate objective of every corporate firm is to perform, to attract larger market shares and satisfy aggregate demand. It is posteriori argued, the driving indicators of such efficient performance is largely dependents on Labour efforts, Technology and Innovation. Therefore, will theoretically expose the patterns below,

2.1. Labour Effort

It is theoretical postulated by (Yallen 1984, Katz 1988), any firms that aims to maximize it profits (π) depending on it labour efforts, could be presented in the equation below as

$$\pi = AF\left[\,e(w)L - wL\right] \tag{8}$$

where π - Firms Profits
      A - Productivity Shift factor
      C - Effort per worker
      L - Labour inputs
      w - Real Wage

This predicate, is in consensus with Marshall (1920), Akerlof and Yallen (1986), transnational corporate firms in the spirit of competition will pay higher wages to attract best workers. Secondly, to reduce the cost of labour turnover. Which also agree to Salop (1979) mode of labour market equilibrium. It is priori argued further, if the economy reaches the theoretical positioning of (Eq|2.0) above, such higher wages will have a great impact in the Savings Capacity of the Economy. Analyzing the nature of international competition among firms (Fujimoto and Shiozawa, 2011[2012] Sect.b) asserts, international competition among firms of multi-national enterprise is a game with wage rates as handicaps. This exceptionally places, emphasis on the relevance of wages efficiency to both domestic and transnational firms towards performance in a perfect competitive market that characterized the global arena of trade, which is assumed to have theoretical effects on Savings, on an Investment-incentive-policy driven environment.

2.2. Technology and Innovations

Technology and Innovations, observed to have the capacity to attract Investment to an Economy by firms, whether national or transnational, was theoretically modeled by P. Romer (1990), He argued that, accumulation of knowledge as the outcome of a purposeful acts by Entrepreneurs seeking to maximize private profits; that is, technological progress is endogenized. Advancing the postulation of P. Romer, I therefore argue that, *"Any economy that places relevance in knowledge accumulation attract transnational firms into such economy, with the ultimate objective to tap into it skilled labour market, available at a liberal wage, to address the efficiency of delivering in a perfect competitive global market. This becomes a general situation when firms realize the cost efficiency in such a stylish labour out-sourcing than labour mobility programme"*. The after-effects of such a postulation is, it causes quality transnational firms to relocate to such economy or Invest in Research & Development Centers as extension of their offices in such economy to augment their global competitive performance. In P. Romer's (1986) model for endogenous growth economy, through production function, it was expressed in an equation as

$$Y_j = F\left(K_j, L_j, A\right) \tag{9}$$

He argued at the micro level, the output of any individual firm (j), depends on its own inputs of Capital (K_j), Labour (L_j) and the Economy wide state of knowledge (A). In his formulation, growth of knowledge is assumed to depend on the growth of capital, lacking a well-defined mathematical relation. However in a posteriori argument in the context of developing economy, I postulate that *"Aggregate growth of Knowledge is directly proportional to the Growth of Capital in such economy"*

$$A_N \propto K_N \tag{10}$$

$$A_N = FK_{jN} \tag{11}$$

$$F = \left(\frac{A_N}{K_{jN}}\right) \tag{12}$$

where A_N - Economy wide state of Knowledge
      K_{jN} - Capital Investment of Firms in such Economy
      F - Industrialization factor of the Economy

In reference to Eq. 13

$$S_{t+1}^e = F\left[(\frac{\dot{W}_t}{\dot{P}_t^e})\epsilon_P\right] \tag{13}$$

Deriving the current equation as,

$$s_{t+1}^e = \frac{A_N}{K_{iN}}\left[\left(\frac{\dot{w}_t}{\dot{P}_t^e}\right)\epsilon_p\right] \tag{14}$$

Based on Eq. 14, we could therefore theoretically predicate that, high-Savings attraction of any developing economy to compliment the deepening of it capital stock, is highly dependents on the following:
- Economy wide state of Knowledge
- Efficiency of Investment Policy
- Savings of the Workers
- The ratio between real wage and Expected inflation
- Capital Investment of firms in such Economy

This establishes the Economic danger caused to an endogenous economy, when a firms engages in 'Capital Flight'. This causes a distortion to the smooth functioning of the five leading indicators stated above, as the drivers to a national economy, in becoming a conduit to investment attraction and accumulation of capital, for Economic growth in a competitive global market. Therefore "Capital Flight" as an economic event, should be seen as the leading "enemy" to the sustenance and success of Investment attraction model of an economy and growth.

3. Economic Growth Theory

Since from the 18th Century, growth economic theorists, has formulated different models, using different indicative variables for an economy. But the most recent was Adelman (1958), who analyzed growth of an economy based on capital stock, natural resource, labour and stock of applied knowledge, then followed by
- Harrod-Domar model of Growth (Domar 1946, 1947; Harrod 1939, 1948)
- Solow- Swan Model of Growth (Solow 1956, 1957; Swan 1956)
- Romer-Lucas Endogenous models of growth (Romer 1986, Lucas, 1988)

The variance of my model from the above recognized models, is it focus on Investment attraction towards economic growth and theoretically, represented by the equation

$$e^* = F\left[\left(A_N, K_{jN}\right) + (S_{t+1}^e)\right] \tag{15}$$

and graphically represented below as Figure 2

Figure 2
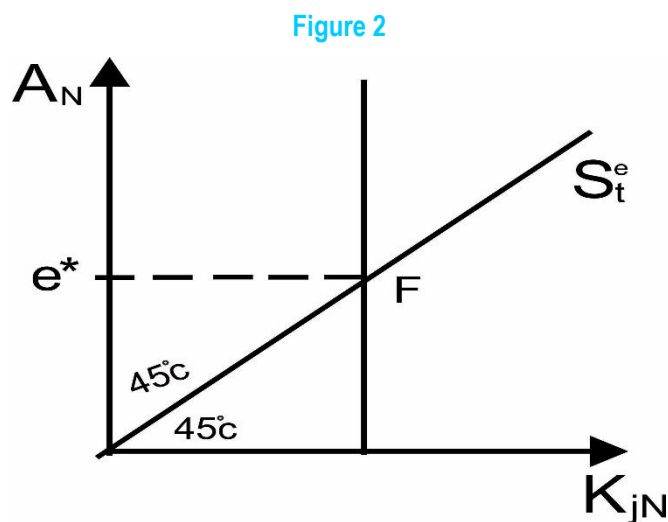
Source: Senzu, T.E. (2018)

It is a graph of Economic wide state of knowledge versus the capital investment of Firms from both exogenous and endogenous economy to promote savings-incentive-capital as a foundation to sustainable economic growth in developing economy.

e^*- Economic growth

This conclude that, any developing economy (e^*) is expected to grow when it meets the following requirement
- A high industrialization factor of the economy
- Economy wide state of knowledge
- Capital Investment of firms into such economy
- Expected Savings Over-time

4. Institutional Requirement and Policy Credibility for Investment Attraction Economy

Policy according to Merriam-Webster (2018), state, it is a set of guidelines or rules that determine a course of action. Wiki-Foundation (2018) further define it as a deliberate system of principles to guide decisions and achieve rational outcomes. The focus of the paper under this topic is to establish theoretically, what it means as policy credibility and indicators that measures and evaluate it as well as institutions required to achieve it. The ultimate aim is to establish the character of a credible policy that promote Savings-Incentive environment of a national economy. Merriam-Webster (2018b), define Credibility as the quality or power of inspiring belief. While Wikipedia (2018) argue, as the objective and subjective components of believability of a source. I therefore posit that, Policy Credibility is *a layout system of principles to guide decisions to achieve a rational outcomes, with it designed framework highly objective and subjective in a quality to inspire belief.*

Tinbergen (1952), Inspired that, policy makers must:

(I) Specify the targets or goals of economic policy given a social welfare function, which the policy maker is attempting to maximize.

(II) The policy maker should set out the policy instrument, which will be used to achieve the targets.

(III) The policy maker, must make use of an economic model so that the instrument may be set at their optimal values.

Chow (1975) asserted that, normative approach to economic policy is concerned with how policy makers should act and, within the context of optimal control theory. Economists sought to identify the optimal policy in order to reach the best outcome, given the decision of takers preference.

4.1. Monetary Policy Credibility

Central Banks are designated with the duty to designed credible policy instrument within quantitative theory of demand for money in any national economy. Under the quantitative theory of money, Friedman (1956) postulated that, the demand for money yields a flow of service to the holder and depends on three main factors: (i) The wealth constraint, which determines the maximum amount of money that can be held. (ii) The return or the yield on money in relation to the return on other financial and real assets in which wealth can be held. (iii) The asset-holder's tastes and preference. And it was presented by the equation as:

$$\frac{M_d}{P} = f\left(Y^p : r, \dot{P}^e ; u \right) \tag{16}$$

where Y^p - Represent permanent income, used as a proxy for wealth, the budget constraint

r - Represent the return on financial assets

$\dot{P}^e$ - Represent the expected rate of inflation

u - Represent individuals' taste and preference

In *Ceteris paribus,* the theory predicts that, the demand for money will be greater under the following conditions (i) When the level of wealth in holding money raises (ii) When the yield on assets decline (iii) When expected rate of inflation decline or approaches zero. It also observed as a natural principle that, utility maximizing individuals will reallocate wealth between different assets, whenever marginal rates of return are not equal.

I therefore, propound that, *any national economy that seek to grow it capital stock beyond quantitative easing but rely on investment attraction through the following factors*
- *Industrial growth and Investment*
- *Savings from Wages*
- *Technology and Innovations*

Should have a Central Bank positioned with the responsibility to design policy instrument, to address the following conditions

1.Policy that increases yield in money Savings in a national economy. And such could be achieved in a policy environment that promote a high return in treasury rate with respect to time, represented by the equations as;

$$S_t^e = \dot{T}_t^{r+1} \tag{17}$$

This policy is possible, only under a small size government with low expenditure budget and active in economic managerial role as a market regulator rather than a market player in a developing economy.

2.Stabilization policy of inflation, with expected inflation seen as equal to real inflation rate for a long-run; with real inflation rate operating within 0-3.0 in a developing economy as appropriate to attract quality foreign industrial investment. And this could be represented by the equation as;

$$\dot{P}_t^e = \dot{P}_t \tag{18}$$

3.Finally, an economy that operate under a low interest rate, governed by interest stabilization policy, generate effect of a low cost in capital renting, with a stabilized general output prize of goods represented by the equation as;

$$C_{Ki} = [P_{Ki} \ (r_i + \delta_i)] \tag{19}$$

where C_{Ki} - Cost of Capital nominal
$\quad\quad P_{Ki}$ - Cost of purchase of capital nominal
$\quad\quad r_i$ - Real interest rate nominal
$\quad\quad \delta_i$ - Rate of depreciation nominal

[Profit] = [Revenue] – [Cost of Capital]
† [Revenue] = [Profit] + [Cost of Capital]

$$R_K = [P_{TK} + C_K] \tag{20}$$

where R_K - Revenue of Capital
$\quad\quad P_{TK}$ - Profit return on Capital
$\quad\quad C_K$ - Cost of Purchased Capital

$$R_K = P_{TK} + [\ P_K \ (r_k + \delta_k)] \tag{21}$$

At the condition, when real Inflation rate is equal to zero, in *ceteris paribus;* the equation will be represented below as;

$$R_K = [P_{TK} + (P_K r_K)] \tag{22}$$

At the condition, when Interest rate is stabilized, in *ceteris paribus*; price of goods will be stabilized, hence; Revenue will be equal to price of goods

$$R_K = G_P \tag{23}$$

where G_P - Price of Goods from purchased capital

$$† \ G_P = [(P_K r_k) + \ P_{TK}] \tag{24}$$

Therefore, monetary policy Instrument for investment attraction economy could be represented by the equation

$$\dot{M}_{Pj} = [(G_P)(\dot{T}_t^{r+1})(\dot{P}_t)] \tag{25}$$

This theoretically deduce that, in any developing economy that seek to attract investment, should have a monetary policy instrument that has the target to achieve the following
1.Policy that stabilized price of goods
2.Policy that promote high rate of return in treasury bill
3.Inflation policy rate aspiring to zero
The impact is to increase profitability of investment, thereby attracting foreign direct investment through industrialization, innovation and technological advancement.

4.2. Fiscal Policy Credibility

The effect of how Corporate income tax has on investment behaviour depends on how the Law define's 'profit' for taxation. Corporate income tax is a tax on corporate profits. Therefore if the Law define corporate tax as the Rental price of the Capital minus the cost of Capital, in this case, even though firms would be sharing a fraction

of their profits with the government, it would be rational for them to invest. In a situation whereby the Rental price of Capital fall below the cost of Capital, it will result in disinvestment. A corporate tax measured in this way, would not alter investment incentive and affect investment decisions in such economy. The second instance is how the law treat depreciation of capital, which is observed to be contrary to theoretical economic approach. Economists treat current value of depreciation as a cost in the profit, whereas the law measure the corporate tax on firms by deducting depreciation using historical cost. This methodical approach will cost disinvestment especially during the period of inflation because replacement cost becomes greater than historical cost. This kind of corporate taxation turns to understate the cost of depreciation and overstate profit. In any economy which has unstable inflation rate and high interest rate, need to set a correct policy definition for it corporate taxation, if it aspire to attract investment into it economy, using the equation as stated below;

$$C_T = \left(\frac{x}{100}\right)(P_{TK}) \tag{26}$$

$$† P_{TK} = R_K - [P_K(r_k + \delta_k)](\tag{27}$$

$$C_T = \left(\frac{x}{100}\right)[R_K - \{P_K(r_K + \delta_K)\}] \tag{28}$$

While
C_T - Corporate Taxation measurement
X - Corporate Tax rate

Therefore Eq. 28 is the appropriate theoretical measurement of corporate tax on corporate profit in a developing economy aspiring to attract investment.

Hayashi (1982), further argued that, Firms base their investment decisions on the Tobin's q, established by the formula

Tobin's q   =   Market Value of Installed Capital
                        Replacement Cost of Capital

The numerator of "q" is the value of the economy's capital determined by the stock market. While the denominator is the price of that capital, if it were purchased today.

If Tobin's q is greater than 1.0 then the market value is greater than the value of the company's recorded assets. This suggests that, the market value reflects some unmeasured or unrecorded assets of the company. High Tobin's 'q' values encourages companies to invest more in capital, because they are 'worth' more than the price they paid for. On the other hand, if Tobin's 'q' is less than '1' the market value is less than the recorded value of the assets of the company. This suggests that the market may be undervaluing the company. John Mohaljevic points out that, no straight forward balancing exists in the case of low q-ration. When 'q' is less than parity, the market seems to saying that, the deployed real assets will not earn a sufficient rate of return and that, therefore, the owners of such assets must accept a discount to the replacement value, if they desire to sell their assets in the market. Summers (1981), also argued, the advantage of Tobin's 'q' as a measure of the incentive to investment is that, it reflects the expected future of profitability of capital as well as the current profitability. The higher the expected profits raises the value of stock, which then raises Tobin's-q and therefore encourages investment. Thus, Tobin's-q theory of investment emphasizes that, investment decisions depend not only on current economic policies but also on policies expected to prevail in the future.

I therefore postulate theoretically, *any national economy that seeks to engineer an environment that achieve Tobin's q=1.0 or > 1.0 of its investment market, require to meet two major conditions*

i. It stock market should be 'sensitive', meaning highly liquid, with policies that respond favourably to all kind of intellectual properties

ii. It corporate tax policy, should treat all kinds of capital depreciation as cost

5. Institutional Requirement for Investment Attraction Economy

For the entire theoretical bases of investment attraction to survive the realistic dynamics of the market depends on quality institution and operational independence. I therefore concur with the report of (Brown 1997), when a new monetary policy framework was set for UK economy on the 6th May, 1997; establishing operational independence for the Bank of England. Chancellor Gordon Brown, in an official statement, provided the following rational for the government's strategy. Which I quote "*We will only build a fully credible framework for monetary*

policy in the long-term needs of the economy, not short-term political considerations guiding monetary decision-making. We must remove the suspicion that short-term party-political considerations are influencing the setting of interest rates." I therefore submit that, most of the developing economies seeking to attract Investment towards growth requires institutional reforms. It Central Banks should be capable of conducting monetary policy in a manner free from opportunistic and partisan influences. In addition, fiscal policy should be subjected to harder budget constraint with the Central Bank not obliged to monetize deficits. The developing economies should prioritize the developing of it fiscal system as a matter of an agency because it is central to economic industrialization that causes growth.

6. Required Political Environment for Investment Attraction Theory to Hold

I do theoretically postulate that, the ideal political environment that could easily attract investment and engineer rapid economic growth in developing economy as represented by the panel below as Figure 2; shown by angle 45°C to both X-axis and Y-Axis is an indication of a mixed economy, as the least fertile ground for the theoretical applicability and at most is a capitalist economy. The higher (S_t^e) line continue to rise far away from the X-axis and increases the angle of elevation from $50°C$ to $60°C$ and so on, indicate the economy changing hands to a Capitalist economy
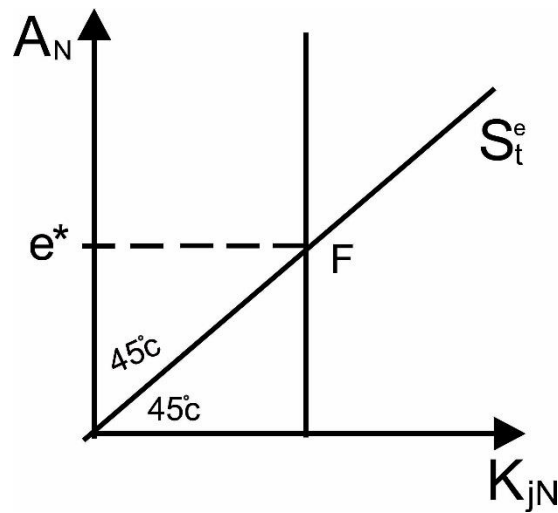
Source: Senzu, T. E. (2018)

Conclusion

I do therefore hypothesize that, for a developing economy to be well positioned as an investment attraction nation, it efficient Investment policy instrument represented by(ϵ_p), could be mathematically justified below as;

$$F_{Pj} = (q^h, C_T) \tag{29}$$

$$\dot{M}_{Pj} = [(G_P)(\dot{T}_t^{r+1})(\dot{P}_t)] \tag{30}$$

where
F_{Pj} - Fiscal Policy Goal
$\dot{M}_{Pj}$ - Monetary Policy Goal
Therefore, Efficient Policy Instrument $(\epsilon_p)$for Investment Attraction Theory is represented by the equation

as:

$$\epsilon_p = [F_{Pj} + \dot{M}_{Pj}] \tag{31}$$

In reference to Eq. 6, it states that any economy with Saving-Incentive is represented by the formula

$$S_{t+1}^e = F[\left(\frac{\dot{w}_t}{\dot{P}_t^e}\right)\epsilon_p]$$

Therefore, to measure (ϵ_p) of a national economy is represented by the equation as

$$\epsilon_p = [\{(q^h)(C_T)\} + \{(G_P)(\dot{T}_t^{r+1})(\dot{P}_t)\}] \tag{32}$$

100

$$\dagger \; S_{t+1}^{e} = \frac{A_N}{K_{iN}} \left[\left(\frac{\dot{W}_t}{\dot{P}_t^e} \right) \left\{ (q^h X C_T) + (G_P X \dot{T}_t^{r+1} X \dot{P}_t) \right\} \right]$$ This is the *final derivation*

While the symbol (X) in the equation represent multiplication Sign arithmetically.

This theoretically implies that, for any investment-attraction economy to have effective investment policy framework depends on the following

       1.High value of Tobin's-q of the Economy

       2.Corporate Tax measurement

       3.Stabilize price of public good from purchase capital

       4.High treasury rate of return with respect to time

       5.Real inflationary aspiring to zero rate

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EVOLUTION OF INTERNATIONAL TRADE IN ROMANIA BETWEEN 2016 - 2018 WITH FORECASTS FOR 2019-2021

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Abstract

In the introduction, the author focuses on a problem, in the past, present and future, eternal actually – globalization. Next, Romania's commercial policy is directed mainly towards the European Union, the largest economic bloc in Europe in 2017 compared to the 2016 or 2018 years, with forecasts for 2019-2021

Keywords: globalization; international trade; economic forecast; European Union.

JEL Classification: B17; F17; F63; O24.

Introduction

Any retrospective look at the world economy in the post-war period will reveal a totally out-of-date dynamic of international economic relations. Although "the rules of the game" may have changed from one year to the next, and some measures approved by the implicit states were sometimes contractive or proved to be useless, not even archaic, approaching quite much what some would call "orderly clutter." … The entire post-war period can be considered as a huge campaign to remove barriers of any kind. Concluding, we have so far witnessed the difficult birth of a new trading system, fundamentally everything that has been known to mankind until today. Far from being opposable, the two major trends characterizing the new global trading system, globalization (Rădescu 2008, 2010, 2002) and regionalization (Rădescu 2015) have acted complementarily by developing international trade to a level not so far anticipated by the world classics of the world economy.

As any form of "newborn" organization, multilingualism (Rădescu 2015) did not delay showing its limitations and defects. At the moment it becomes obvious that the new organization of world trade is far from perfect.

Globalization is recognized as a fact of life, a reality, exists and cannot be ignored, as a phenomenon, "always eternal", with a very complex historical and objective character, without being a "beneficent and unforgiving process", with an aura of virtue. It was one of the foundations of the astounding, unprecedented development of technical and scientific knowledge that exploded beyond any economic prediction: new technologies, information networks, ultra-modern technical means, ideas, knowledge, experiences which mankind has never disposed of in the past. In turn, technical progress has been one of the driving forces of globalization reaching the unpredictable proportions of today.

The process of globalization, which has gradually developed and has evolved distinct stages of evolution, crosses today a controversial period because it can no longer be explained and controlled by the old classical and non-classical economy theories. Globalization must be recognized as a reality and cannot be ignored in any way; as a phenomenon with a historical and objective character, complex, without being, however, a "beneficial and unforgiving process with an aura of virtue", "the only viable and desirable path", a kind of a universal panacea

capable of healing all the disease of the planet, or a giant current which, inexorably, will carry us forward, establishing the natural order of things, has no inevitable connotations, is not an "integral part of the future", and stretched over the 20th century, is not even a "correct objective attributed to a human face".

It was one of the causes of the astounding development, inconceivable some time ago, of technical and scientific knowledge that expands beyond any economic prediction (Oliver 1998), new technologies, information networks, high-tech technical means, ideas, knowledge, experiences that mankind has never experienced in the past. In turn, technical progress has been one of the driving forces of globalization reaching the unprecedented proportion today, "has globalization gone too far?" (Rodric 1997).

Today, even if we do not recognize it, it has huge limits, limits beyond which it cannot pass.

The choir of those who objectively recognize the gravity of these limits is growing larger and contains more and more sounds, and this without going to the assertions of some well-known analysts: "The acceptance of this absurd distortion of human institutions and objectives should be considered neither more nor less than an act of suicidal collective insanity" (Korten 1977) or "a form of economic genocide",

1. Obligations of Romania as a Member State of the European Union

Romania joined the 27 states, starting January 1, 2007 as a Member State of the European Union, the largest regional economic bloc. Once entering this large family of the European Union, Romania must align itself with the common trade policy, namely, the European Union will manage relations with countries outside the European Union, both commercial and investment, through the commercial and investment policy of the entire regional bloc, The European Union. While trade policy is an exclusive power of the European Union, this means that only the European Union as a whole, and not the separate Member States, considered individually, can legislate on trade, thus concluding international agreements. Romania's trade policy from the date of accession to the European Union will be regulated only by the European rules, which means withdrawing from the agreements Romania is part of (the European Agreement and the Central European Free Trade Agreement - and the European Free Trade Association - AELS - etc.), of course, besides the European Union and based on a Community legal framework that refers to the European Union's external trade relations.

The exclusive competence of the European Union through its scope is not only concerned with trade but also with:
- "goods and services;
- commercial property of intellectual property;
- Transport with everything related to this field;
- capital movements;
- different foreign investments, etc. "

As a consequence, starting with January 1, 2007 when Romania joined the European Union, Romania has the obligation to apply the common commercial policy with the European Union:
- "Common Customs Tariff;
- The Generalized Protection Scheme (GSP) of the European Union;
- commercial defense measures;
- preferential trade and defense agreements;
- commercial engagements within the WTO;
- for negotiations and the conclusion of international trade agreements, the European Commission (COM) negotiates on behalf of the European Union, with trading partners, third countries,"

The Generalized Protection Scheme consists of a well-established system of tariff preferences, which is granted by the European Union for certain products originating in developing countries. In this case, these products are subject to reduced customs duties or are not subject to this duty and have free access to the EU Member States.

As a result of the application of the common commercial policy, Romania dispensed with some benefits, which we will remember (Simion 2017):
- "development of Romanian exports of goods and services, including the opening and consolidation of new outlets and destinations;
- providing adequate protection for the Romanian goods and services industry, in particular through measures against unfair competition caused by certain imports from third countries;
- developing EU-level measures to combat discrimination or barriers to trade and the development of Romanian exporters of goods and services in markets outside the European Union etc."

Export from the European Community to any third country is free and without any quantitative restriction. This principle of export liberty does not restrict Member States from maintaining or introducing certain quantitative resilience or from the justified prohibition of certain exports on grounds such as public security or public morality or even public order etc. - In view of the Treaty the European Community (EC), it covers unrestricted export of industrial and agricultural products.

In order to prevent or potentially remedy certain critical situations caused by the absence of certain products considered essential or even to facilitate the fulfilment of international commitments which were at the expense of the Community or the Member States, we will call for appropriate safeguards. Such pricing measures may also have the role of limiting exports to certain third countries or even exporting from certain regions of the Community.

By Romania's accession to the European Union, it has among other obligations the application of the Common Customs Tariff, which has the role of:

- "avoid distorting trade by means of customs duties;
- avoid shifting trade according to the lower level of customs duties in certain countries;
- respond to the need to maintain control at the external border in order to function well
- the single market of the European Union, etc."

In applying the Common Customs Tariff to a particular nation, it is not necessary to adopt certain laws specific to the nation. The Common Customs Tariff applies to all EU Member States.

2. International Trade of Romania between 2016 and 2018

The European Union accounts for around 20% of world imports and exports, without taking into account intra-Community trade, and at the same time it plays a rather important role in promoting world trade that is based on the multilateral system promoted by the WTO.

Table 1. International trade of Romania as at 31.12.2017 compared to 31.12.2016

(million euro), 2017-provisional / 2016-significant data, (Simion 2017)

	01.01 2016	– 31.12 2017	Growth 2017 compared to 2016	%
Total export	57392,24	62641,91	5249,64	9, 15
Total import	67364,43	75598,44	8234,01	12,22
Trade balance	-9972,18	-12956,53		
Intracommunitary Export	43090,22	47481,63	4401,43	10,22
Intracommunitary Import	51950,55	57279,17	5328,62	10,26
Trade balance	-8860,33	-9797,54		
Extracommunitary Export	14312,02	15160,26	848,24	5,93
Extracommunitary Import	15413,87	18319,27	2905,40	18,85
Trade balance	-1101,85	-3159,01		

Source: Monthly Newsletter Romania - International Trade, no.12/2017

From Table 1, the total value of Romania's international trade at the end of 2017 amounted to EUR 138240,4 million, an increase of 10,8% as compared to 2016, out of which exports in 2017, with a value of EUR 62641.9 million recorded an increase of + 9.1% compared to 2016 and the same year-on-year increase of + 12.2% reached EUR 75598.5 million. From the above results we deduce that the deficit of Romania's trade balance with a percentage increase of 29.9% and this increase was from -9.972 million euro on 31 December 2016 to -12956.6 million at the end of 2017.

As regards the total intracommunity trade of Romania, it had a total increase of 104760,8 million euro, corresponding to a percentage increase compared to 2016 of 10,2%, by components, exports to the amount of 47481,6 million euro the end of 2017 saw an increase of 10.2% compared to 2016 and the import with the value of 57279.2 million euro recorded an increase of 10.3% compared to the previous year. Obviously, the negative balance of Romania's trade balance in relation to the partners in the Member States of the European Union had an increase in 2017 compared to the 10.5% year-on-year from -8860.3 million to -9797.0 million euro.

Finally, referring to total non-Community trade, with an increase of 12.6% in 2017 compared to 2016, it had a volume of 33479.5 million, out of which we had exports of 15160.3 million which represented an increase of + 5.9% over the previous year, and imports with a percentage increase of + 18.8% compared to 2016 amounted to 18319.3. For the two periods we have referred to, Romania's trade balance for trade with non-EU countries increased from EUR -1101.9 million to EUR -3159.0 million, a percentage representing an increase of + 186.7%.

From the presented data, there is a decrease in the volume of trade on the intra-Community relationship as compared to the volume of trade on the extra-Community relationship which led to a slight decrease of the volume of trade of Romania in the year 2017 compared to the previous year, with a percentage of +0.4 which led to a decrease from 76.2% in 2016 to 75.8% in the following year.

If we refer to the main groups of products, both exports and imports from Romania, absolute increases were recorded comparing the year 2017 with the previous year:

Table 2. Absolute increases in exports and imports (by products) in Romania in the year 2017 compared to 2016, in million euros

Name of the product	Export growth	%	Import growth	%
1.products of the construction industry of machines (including electrotechnics)	+3007,4	+10,6	+3004,3	+11,0
2, common metals and articles from these	+842,9	+18,8	+1203,3	+17,8
3. products of the chemical industry plastic products	+538,3	+10,5	+1341,9	+11,6
4 mineral products	+297,4	+13,7	+1231,0	+29,6
5. agri-food products	+245,0	+4,0	+608,6	+9,7
6. products of the wood industry, paper (including furniture)	+172,2	+3,7	+247,8	+7,4

Source: Monthly Newsletter Romania - International Trade, no. 12017

As far as Romania's exports and imports are concerned in 2017, 86.6% of the total export and 88.8% of the total imports take place with the European countries. The share of intracommunity trade both on export and import is 75.8%.

The cumulated total weight of the first 10 countries in total export from Romania in 2017 is 65.4%, and the first 10 countries with the respective weights in which Romania exported are: Germany (23.01%), Italy (11.2%), France (6.8%), Hungary (4.7%), Great Britain (4.1% (3.3%), Poland (3.1%), Spain (3.0%) and the Czech Republic (2.9%).

The first 10 countries with the percentage share of which Romania imported in 2017, countries of origin for extra-community imports and expedition for intracommunity imports on the other hand are: Germany (20.0%), Italy (10.0%), Hungary (7.5%), Poland (5.7%), France (5.3%), Turkey (4.0%), Austria (3.3%) and the Russian Federation (3.2%), with a cumulative share of 67.9% of total imports.

Considering the data provided by the Statistical Office of the European Commission (Eurostat), it is noticed that Romania imported in Germany in 2017, goods worth over EUR 15 billion, Italy EUR 7.6 billion, Hungary 5 , € 6 billion, Poland € 4.1 billion, France over € 4 billion, and from other countries Romania imported total goods worth € 39.1 billion.

Also, from the data provided by Eurostat, among countries in the European Union where Romania has made exports of goods, Germany amounted to 14.4 billion euros.

According to data provided by Eurostat, Romania totals EUR 5.4 billion in exports of goods in the first month of 2018, with a 15% increase over the same period of 2017, which places Romania with this increase exports of goods ranked 7th in the European Union.

The National Institute of Statistics states that commodity exports in Romania increased by 9.8% in the first quarter of 2018 compared to the same period of 2017 reaching EUR 16.99 billion at a rate below imports, which allowed an increase in commercial difficulty.

In March 2018, the value of exports amounted to 6.11 billion euros compared to 7.16 billion euros of imports, which led to a trade deficit of 1.05 billion euros, repeating that of March 2017, according to data provided by the National Institute of Statistics.

According to NIS data, an important weight in the structure of imports and exports in January-March 2018 was held by transport machinery and equipment (export 48.4% and 37% import) and manufactured goods (export 32.2% and import 30.6%). Exports in February 2018 had an increase of 7.6% and imports increased by 10.7% compared to the same month of 2017.

It is important to know that Romania imported timber and cork in the first month of 2018 worth 49.7 million euros, 19.4 more than in the same period of the previous year, according to the National Statistics Institute.

In Romania, wage growth implies increased purchasing power, leading to a trade deficit with trade in goods. Goods imports are rising when the economy cannot be flexible and adaptable to meet the needs of the population of goods and implicitly we have an increase in the deficit.

Transport services are a major component of trade in services and their value is increasing with the increase in the volume of goods that are imported or exported. According to the data provided by the National Bank of Romania, in the first months of 2018 the Romanian companies were exporting services, benefiting by 13.5% increase compared to the same months of 2017, amounting to 3.3 billion euros, and the sectors have recorded the highest growths: transport services with an approximate representation of 1/3 of total exports of services, other business services (which include, among other things, R & D services, consultancy, legal services, tax or accounting) and telecommunication, information and information services

Table 3. The evolution of some exports of services in January-February of the years 2017, 2018, by category (million euro).

Categories	2017	2018	2018 compared to 2017
- Transport services	867	1003	136
- Other business services	595	713	118
- Other telecomunications, IT and informational services	555	658	103
- Woodworking services	443	456	
- Tourism / travel	313	306	13
			-7

Source: National Bank of Romania, National Statistics Institute

Table 4. Evolution of surplus and deficit in external trade in goods and services in the first two months of the year between 2013 and 2018

Categories	2013	2014	2015	2016	2017	2018
- Surplus of foreign trade in services (mil.euro)	646	893	927	1214	1194	1188
- The deficit of foreign trade in goods (mil.euro)	-504	-566	-563	-991	-1256	-1617

Source: National Bank of Romania, National Statistics Institute

The category "other business services" recorded the largest increases in imports of services (approximately EUR 117 million in January-February reaching EUR 571 million in imports of services), followed by the categories "tourism (approximately € 94 million in the first two months of the year, reaching € 489 million) and then IT and telecommunications" (with a figure starting at € 86 million in the first few months, easing to 369 million euros).

From the data provided by National Bank of Romania, we conclude that in the January, February 2018, export service rhythm was higher than that of exports. During this period, the total value of exports of services amounted to EUR 2.1 billion, which meant an increase of 23% compared to the same months of 2017. Also from the same data for the same period, the balance of trade balance in international trade with services fell 0.5% in the same months of 2017 to 1.188 billion euros.

The 1.6 billion euros deficit in international commodity trade (in the first two months of the year, exports amounted to EUR 10.8 billion compared to imports of EUR 12.5 billion), is partly covered by the surplus EUR 1.2 billion of foreign trade in services. In order to reduce the trade deficit, the growth rate of exports should be below the growth rate of imports.

Romania's exports of services in 2017 had an increase of 14% compared to the previous year, amounting to 20 billion euros, a value which for Romania was a record, with a surplus of 8 billion euros. With a 9% increase over the previous year, goods exports amounted to € 62.6 billion compared to imports of goods that made € 75.5 billion, creating a trade deficit with goods worth about 13 billion euros.

Table 5. International Trade in Services, January-May (million)

Components	2017			2018		
	export	import	sold	export	improt	sold
Goods processing services	1180	-77	1103	1156	90	1066
Maintenance and repair services	125	123	2	127	124	3
Transport services	2424	990	1434	2518	1113	1405
Shipping	67	89	--22	67	89	-22
Airline	283	322	-59	119	301	-182
Road transport	11	1	10	13	4	9
Rail transport	1909	441	1468	2046	529	1517
Tourism / travel	789	1102	-313	816	1305	-489

Source: National Bank of Romania, National Statistics Institute

The economic growth of 6.9%, mainly due to Romania's domestic demand in 2017, gave hope for the development of the level of development to the other world states, thus, by default, goodwill. Net exports of both goods and services, which grew by 9.7% in real terms in 2017, and imports of goods and services with an increase of 11.3%, determined a negative contribution of 0.8% to increase Gross Domestic Product (RIB).

Evolution of modern services, such as "information and communications", with a dynamic growth of 10.9%, such as the branch determined by "professional, scientific and technical activities; administrative service activities, with a 9.9% increase in gross added value, contributed to Romania's economic growth of 6.9% in 2017 by 0.6% and 0.7%, respectively.

It is estimated for the current year 2018, an economic growth of Romania of 6.5%, which is expected mainly on the external demand. An average annual growth rate of Romanian economic growth is projected at 5.5% for the years 2019-2021, based mainly on domestic growth.

Exports of goods in the year 2017 with a growth of 9.1 compared to the previous year, with an increase of 12.2% of imports compared to the same period, generated a 29.9% increase compared to the same year 2016, the FOB-CIF trade deficit.

The export was, is and will be one of the basic components of the demand that ensures the economic growth of Romania, anyway, for any country. The increase in the export of goods is estimated in 2018 to 8.7% and the import of goods to 9.4% and the forecast trade deficit will be 7.3% of GDP.

An estimate for the period 2019-2021 shows an annual growth of 8.6% for exports of goods and an increase of 9.1 for imports, which suggests that in the year 2021, the estimated FOB-CIF trade deficit will reach 8% of GDP. By increasing trade flows to the European Union, it is estimated that goods exports to the European Union will increase from 75.8% to 79% in 2017 by 2021 and imports of goods in the same period will have a "rise negative, from 75.8% to 75.2%.

Table 6. Balance of the external sector. Convergence program between 2018 - 2021

% of GDP	2017	2018	2019	2020	2021
Net balance against the rest of the world	-2,2	-1,4	-0,9	-0,3	-0,1
Out of which					
- balance of services	-2,1	-2,0	-1,9	-1,7	-1,6
- the balance of primary and secondary earnings of secondary incomes	-1,2	-1,1	-0,9	-0,9	-0,8
- the capital account	1,2	1,8	2,0	2,3	2,3

Source: National Commission for Strategy and Prognoses

Romania's exports increased January-February by about 11.6% compared to imports, with an increase of 13.1% compared to similar months of 2017, which resulted in a decrease in the trade balance FOB-CIF with a deficit of EUR 1.7 billion higher than in 2017 in the same period.

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ASERS

THE LINK BETWEEN MIGRATION, REMITTANCES AND ECONOMIC GROWTH: EMPIRICAL EVIDENCE FROM ROMANIA

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Abstract.

The paper investigates the causal link between remittances and economic growth in Romania. Starting from the debates regarding the relative contribution of international migrants' remittances to sustainable economic development, this paper proposes an econometric analysis of the effects of remittances on the Romanian economy. The article shows that remittances have a positive effect on the current account of external balance of payments and they can replace external financial assistance flows, including foreign loans. Significant inflows of remittances can offset the current account deficit of the balance of payments, reducing the likelihood balance of payments crisis. At the same time remittances will increase aggregate demand, which has the effect of increasing inflation, currency appreciation and widening trade deficit. We showed also that remittances can exert positive influences on the process of investment, especially through the creation of numerous small enterprises.

Key words: migration; remittances; economic growth; investment

JEL Classification: F22; F24; O15; O47.

Introduction

Approached as a possible link between migration process and economic development, remittances topic raises a number of questions such as: What extent remittances can provide opportunities for investment for small business representatives such as individual entrepreneurs, firms with few partners, to whom it is limited the access to credit; Remittances can counteract procyclical effect of the economy through their ability to maintain or even increase in times of economic downturn of the countries? How can remittances create better and sustainable livelihoods for poorest people and how they can be better integrated in the national economy? How remittances can be combined with other funding mechanisms to potentiate economic development? What are the practices and policies that can enhance the development potential of remittances without discouraging migrants motivation to remit?

The crisis that manifested itself in the financial markets in 2008 led to a severe global economic recession that affected and still affects migrants and migration policies worldwide (Koehler, Laczko *et al.* 2010). With all the increased instability of the situation of migrants, remittances remained significant during and after the global economic downturn. Thus, they are maintained as an important source of income for families and play a crucial role of co-insurance or risk mitigation in tough times (Ratha 2013).

Remittances are invaluable sources of income and foreign exchange gain for many countries, especially those with barriers in terms of international trade. Among these developing countries, facing a continuous decline of the labor market, exporting labor in return for transfers of money represents an important component of the development strategy. The transfers are usually less volatile than private capital flows, and grow during a recession, helping to stimulate vulnerable economies (Ratha 2003). The probability that they reach in economic and social areas that are left relatively untouched by official development assistance and by private capital of foreign investors is high.

Moreover, remittances have proven to be a more sustainable source of foreign exchange for developing countries than other capital inflows such as foreign direct investment, public debt and official development assistance. However, the link between remittances and development remains complex, especially regarding the movement of people, which contributes to the spread of global interdependence at all levels - social, economic and political (Lubambu 2014).

1. Are Immigrant Remittance Flows a Source for Economic Development?

To assess the extent to which remittances contribute to economic development should be examined the effects at both microeconomic and overall impact on the economy and society in general. At the microeconomic level the impact is positive because financial remittances from abroad have provided a secure living for migrant families. Many people enjoy a higher standard of living, which would not be possible without remittances. However, the impact on the economy and society as a whole depends largely on whether remittance flows have been converted into productive investments. On the one hand there is a potential availability of migrants to invest. On the other hand, business is unattractive and often times even hostile, leading to failed efforts of migrants. Sometimes failures repeat and migrants lose confidence and hope in the success of their businesses. So they are forced by circumstances and the lack of alternatives to return to migration (CIVIS, IASCI, 2010).

Remittances may impact on economic growth in numerous ways:

- By changing the rate of capital accumulation. Remittances can not only increase the rate of capital accumulation, both physical and human, but also can reduce the cost of capital in the country of destination. Otherwise, additional loans may increase and lead to greater indebtedness. They may also have a role in stabilizing the economy or reducing volatility, and therefore reducing the risk premium that investors require it.

- By affecting total factor productivity growth. Remittances impact the efficiency of investment, depending on who is making the investment decision (Barajas *et al.* 2009). If the recipient makes the decision on behalf of the remitter, it is likely that the decision is not as efficient as one made by a skilled domestic financial intermediary in the case of formal capital inflow. Remittances may result in greater financial development. But they can also result in exchange rate changes – inflow of funds can result in 'the Dutch disease', i.e. currency appreciation and thus lower exports (Katsushi S. Imai *et al.,* 2012).

- Offsetting the additional demand for currency, following the development of foreign trade, remittances support maintaining exchange rate stability of the national currency and may even lead to currency appreciation. While foreign direct investment, portfolio investment and other capital flows to developing countries rise and fall cyclically, remittances have proved remarkably stable over a long period of time and even increased in response to economic crises. For example, remittances to developing countries continued to grow steadily in the years 1998-2010, when private capital flows have declined.

Money remittances made by migrants to their native country is an important source of foreign revenue for some developing countries and a substantial contribution to their GDP. Remittances can be used for imports of capital goods or provide investment funds for entrepreneurs. Also, remittances may increase family income needed to purchase consumer goods and services. Using remittances generate multiplier effects in the economy further, and if the spending, and if their savings. If saving, saving form counts: "keeping money at home", placing them in the banking system or other equivalent forms of saving and investment. Keep in mind that in an open economy, the multiplier effect is lower. In the case of remittance spending, has major importance supply structure covering solvent demand of recipients of remittances: if the offer consists of local products, the multiplier effect of remittances is greater than if they consume imported goods and services.

Migrants' savings behavior changes over time and is well-defined in the early stage of migration, when migrants often sacrifice their standard of living in order to save and remit more. Once it has been saved a certain amount of financial capital, migrants begin to change their savings behavior and remission. This change is

influenced by the fact that migrants live in an environment with higher standards of living obviously, than they know from home (especially if european destinations migration) but also because when remittance recipients reach a certain level of wealth, the family put less value on remitted money. Generally migrants begin to save more and to remit less.

Once families consumer demand is covered, remittances end up being saved, thus leading to increased savings. But for various reasons, mainly for psychological reasons, only part of the savings end up being saved in the banking sector. Some migrants savings are accumulated in cash and / or banking systems in the migration place. It is estimated that these savings withheld reach hundreds of millions of euros per year. Provided suitable incentives, guarantees and regulatory frameworks, these resources could be channeled into savings and investments in migrants' home countries, ultimately contributing to development (CIVIS, IASCI, 2010).

The channels through which remittances are transmitted to migrant workers can have positive effects on economic growth of their country of origin. Transmitted funds may finance investment dynamic or, when these financial resources are saved through financial institutions, local or international, this will generate a significant increase in the financial resources of these financial institutions. So, conditions will be created to increase the performance of these institutions by providing more loans to companies in their markets for short or long-term loans.

At the macroeconomic level, increasing the total capacity of investment funding determined by the entry of remittances in the country, plays a pro-cyclical role if migrant workers abroad have confidence in the local economic situation and if country's financial system encourages them to invest. At the same time, however, for some countries and under certain circumstances, remittances can play a role counter-cyclical, if the country of origin of migrant workers is a poor country, which is experiencing a period of economic crisis, these workers send more remittances to their families to help overcome these difficulties more easily (Hadeel Yaseen 2012).

One of the most important roles of remittances is their significant contribution to the fight against poverty. While increasing revenues it occurs also the reduction of the proportion of people living in poverty and even in the extreme poverty by meeting consumer demand family's receivers. We consider important to mention that foreign economic migration, with its complex characteristics, contribute broadly to poverty eradication under the concept of human poverty promoted by the United Nations, which examines poverty as a component of income poverty, emphasizing that equity, social inclusion, women's empowerment and respect for human rights are important for poverty reduction. Remittances contribute to economic growth in the long term when part of these funds is used to pay expenses for education and training for younger people from migrant families. As a consequence, in certain countries, remittances can in reality contribute to the accumulation of human capital, and then to the growth of total factor productivity of the local economy (Chami *et al.* 2003).

In this context we appreciate that the role that policies and institutions of countries receiving remittances have it is very important. Assuming that policies create incentives for investment in households and private economies in general, they will enhance international remittance flows. In a stimulating environment remittance will be used by their receptors to initiate business, to upgrade human capital (through spending on health care and education, etc.), and to save money in the formal financial system where the regulatory environment for business is properly, public sector corruption is low, and the financial sector is considered safe.

A country with such strong policies should be able to achieve a higher gain of international remittances (Catrinescu *et al.* 2006).

There is a widespread consensus in the scientific literature regarding the extremely poor quality of data on transfers of funds in the form of remittances. It is well known that many funds are transmitted through "informal" channels, such as service providers, transport providers, or through friends and family and not recorded in the balance of payments of many countries. In this situation, efforts to measure remittances are limited and official estimates greatly underestimate the actual flows.

2. Remittance and Migration Flows in Romania

More than 3 million Romanian have emigrated (constituting itself in 17% of the population), an important part of them choosing as destination the European Union. The first years after the fall of communism were characterized by emigration mainly based on ethnic criteria, the next period having as main destinations Spain, Canada and the United States (Chindea *et al.* 2008). After Romania joined the European Union (2007) and obtained the free movement of persons, specific to single market integration, migration of Romanians soared, the main destinations for Romanians being Italy, Spain, Germany and Hungary. These should be viewed with caution because, on the one hand the data relate only to Romanian citizens legally registered in the Member States, on the other hand some countries lacking relevant information. Thus, it should be noted that INS estimate the number of Romanian immigrants is only 2.5 million, while the World Bank and UN estimates the number of Romanian emigrants to 3.4 million persons. These differences can be explained by the fact that INS evaluate only the number of declared official, who spend more than 12 months abroad.

Every time talking about the exodus of Romanians present productivity losses, at the pension fund or the health problems caused by the departure abroad of the approximately 3.4 million people, showing that, potentially, every Romanian is a loss for the Romanian economy, but in any analysis must take into account the actual conditions, proving that not enough jobs are generated in Romania.

Romanians working abroad sent during 2006-2015 about 50.872 billion dollars in the country, the best years being 2007 and 2008, and the weakest in 2015, 2014 and 2010, according to World Bank data and estimates. The number of Romanian immigrants was 2.769 million in 2010, representing 13.1% of the total population, reaching 3430 in 2015, representing 17.2% of the total population according to World Bank data (Worldbank, 2016).

The amounts that Romanians abroad send to their relatives in the country today are much lower.The economic crisis has affected Romania, so many countrymen have decided to "spend" crisis abroad, where, although revenues are lower than during the boom, are still above the average in the country.

The amount of remittances grew strongly in 2005-2008, from 4.733 billion dollars in 2005 to 6.673 in 2006, 8.461 billion dollars in 2007 and 9.285 billion dollars in 2008. Subsequently, the amount fell sharply to 4.928 billion dollars in 2009, a level of 3.879 billion dollars in 2010 due to the economic crisis. A strong downward trend has been maintained in recent years, reaching 3.381 billion in 2014 and 3230 in 2015 (Worldbank, 2016).

Latest analysis of NBR show that Romanians remittances from abroad remained low after 2011, being one third lower than before the crisis. Money inflows of current transfers channel, mainly remittances, reached in 2011 about 4 billion euros. The latest World Bank data shows that still approximately 3.4 million Romanian are living and working abroad now.

Before the crisis, their remittances to the country represented a genuine power consumption, but the eurozone crisis has almost halved remittances.

There are two views on the effects of remission for the receiving country: a negative one - which highlights the dependence of the country of origin induced by remissions from abroad and distortions in the development process; the other one positive - remissions is a strong element of avoiding poverty and a source of economic development (Taylor 1999).

Both the quantity and destination of migrant's remission is determined on mobility strategies and plans to return to the country, which in turn depends on their expectations regarding the development of policy and the economic environment in Romania.

Reverse flow of remission - meaning remittances of foreign immigrants in Romania - even though record low values cannot be neglected. Especially since most of these outputs are determined by citizens from third countries, they should not be neglected citizens of third countries probably will lose as a result of subsequent amendments of EU immigration policy.

Remittances from various categories of income from work is distinguished by two main sources: income from employment based on bilateral agreements between Romania and other countries, concluded between the authorities, and income from employment by forms of direct / indirect labor relations (legal / semi-legal) or from other sources, transferred into the country through the banking system.

National Bank of Romania highlights cash flows either group of labor income (if the sender explicitly has specified amounts origin of performance of an activity based on a labor contract) or category of private transfers of individuals.

Transfers from workers abroad are much more significant if we take into account informal transfers. Absent from the information system in the field, especially "restrictions" banking system (banking system underdeveloped and disincentives for deposits / money transfers made by individuals) and fiscal (high taxation of labor income) discourages the declaration of full income, so statistical records take into account amounts 2-3 times lower than those actually obtained. But even in these conditionsthe total amount of transfers exceeded many times the volume of FDI. We therefore appreciate that, in the short term, for the national economy and to the persons involved is more effectively "export" temporary labor. This situation is not peculiar to Romania, meets also in other countries, including in transition (IOM, 2003a). The decision to send money home through formal or informal ways depends on a number of factors. One factor is the monetary cost of the transfer, along with the speed and delivery reliability. Migrants in most cases are using official channels to send money home, particularly fast transfer services.

Must be mentioned the existence of a public transfer effect, with global, regional and local effect on budgets concerned. Depending on the laws in force in the host country and bilateral agreements between states or special institutions will induce, most likely in Romania, a reduction in the volume of transfers to public social security, due to the decline in the number of taxpayers.

The economic impact of transfers result from the manner and efficiency of use in their home countries. Most of them is used to satisfy basic needs of subsistence, followed by spending on education, business investment of securities, acquisition of durables and starting small businesses. All these uses of remittances have a positive

impact on economic growth, either through positive influence on aggregate demand and production through consumption, either through savings and investment, which ultimately will help increase national income per capita.

The economic effect of remittances thus depend mainly on how they are used. Gains from working abroad have multiple destination:

- domestic consumption in the host country for the maintenance and restoration of working capacity: food, housing, clothing;
- transfers in the country as the form of currency. This will be used for different purposes:
  - For current consumption - support the family, including children's education, health care. These are household consumer expenditure conducted domestically. They are found (not explicitly) in household final consumption;
  - Savings and investment in durable goods: home, land, other assets (household equipment, automobiles, agricultural machinery and tools). Some of these (home) contributes to increasing national wealth;
  - Starting some microbusinesses or setting up family associations for profit (agrotourism cultural tourism, various types of services in rural and urban areas - repairs, maintenance, collection and processing of agricultural products in small factory located in rural areas etc.).

It is well to know that much of such money transfers are consumed in Romania for household current expenses, stimulating domestic demand for goods and services, but concentrate through imports rather than domestic products, less competitive in quality and / or price.

3. The Effects of Remittances on the Key Macroeconomic Variables

The model used is a modification of Glytsos' model (2002a, 2002b and 2002c). It is a model that quantifies the effects of remittances on the key macroeconomic variables such as private consumption (C), investment (I), import (M) and income (Y). There are three behavioral equations, namely the consumption function, the investment function and the import function as well as the national income function.

The structure of the model is presented as follows:

$$C_t = \alpha_0 + \alpha_1 Y_t + \alpha_2 C_{t-1} \tag{1}$$

$$I_t = \beta_0 + \beta_1 Y_t + \beta_2 K_{t-1} \tag{2}$$

$$M_t = \gamma_0 + \gamma_1 Y_t + \gamma_2 M_{t-1} \tag{3}$$

$$Y_t = C_t + G_t + I_t + E_t - M_t + R_t \tag{4}$$

where: Y stands for the sum of the GDP and the remittances (R); K stands for the gross domestic market of investments; G stands for government expenditure while t indicates time. In this model, C, I, M and Y are endogenous variables. The consumption equation is based on a model of partial adjustment. Investment is supposed to be a positive function of income as a substitute for profit and a negative function of the capital stock left. Import is a function of the income level while lagged import is an indicator of adjusting expectations. In the models with simultaneous equations, estimations based on the ordinary least squares (OLS) method are biased and inconsistent due to the correlation between the explanatory endogenous variables and the stochastic perturbation terms. In this case, the two stage least squares (TSLS) technique gives estimations which are consistent and efficient (Intriligator *et al.* 1996).

A fundamental hypothesis of the classic regression model is the one according to which right-hand-side variables (ex. explanatory variables) are not correlated with the model's innovations. (see http://www.cnp.ro/user/repository/econometrie.nivel1.v3.2.pdf). If this hypothesis is violated, both the OLS estimator as well as the WLS estimator (Weighted LS) are inconclusive. Hence, there is a series of well-known situations in which right-hand-side variables are correlated with innovations. A few classic examples emerge when:

- there are endogenously determined variables in the right-hand side of the equation as in the case of simultaneous equation models.
- right-hand-side variables are measured with errors as in the case of using proxy variables to approximate other unnoticeable variables.

For simplicity, we shall refer to those variables correlated with the residues as endogenous variables while those variables which are not correlated with the residues we shall refer to the as exogenous or predetermined variables.

The standard approach for the cases in which right-hand-side variables are correlated with residues is to estimate the regression equation by using the instrumental variables method. The idea behind the instrumental

variables is to find a set of variables called instruments of instrumental variables capable of fulfilling the following conditions:

- they are relevant, that is to say they are correlated with the explanatory variables in the equation;
- they are exogenous, that is to say they are not correlated with the errors.

These instrumental variables are used to eliminate the correlation between the right-hand-side variables and the innovations of the regression equation.

The **Two-stage least squares (TSLS)** method is a special case of the instrumental variables method. As the name implies, there are two distinct stages within the TSLS method. The first stage involves estimating an OLS regression for each variable of the model depending on the set of instrumental variables. The second stage represents a regression of the original equation with all variables substituted by values resulting from the first-stage regressions. The coefficients of this regression are the TSLS estimators of the regression model's parameters.

In order to calculate the TSLS estimator we must have at least as many instruments as equation coefficients. For econometric reasons any right-hand-side variables which are not correlated with errors should be included as instruments. The C constant is always an appropriate instrument so that Eviewsshall add it to the list of instruments.

In order to check the hypotheses of the regression model we shall use **the homoscesdasticity hypothesis of the residual variable**. To verify this hypothesis, we shall be using the White test. White (1980) obtained a consistent estimator of the heteroscedasticity of the variance-covariance matrix which gives accurate estimations of the standard errors of the linear regression model's parameters in the presence of unknown heteroscedasticity. Eviews gives the option to use the White estimator for the standard errors instead of the standard OLS formula for their calculation. If following the White test, a connection between the analyzed variables comes out then the errors of the model are heteroscedastic, otherwise they are homoscedastic. The Glejser test shall be used as well.

The model presented is estimated for Romania using annual data for the period between 1995 and 2015 with the help of the TSLS model.

Estimations for the TSLS model are presented in table 1 which can be found below. Table 1a presents the estimations resulted for the consumption equation; table 1b also presents the estimations resulted for the investment equation while table 1c presents the estimation resulted for the import equation of the structural model. The variables introduced in the model have been logarithmated beforehand.

Table 1. Estimation of the macro econometric model using the Two Stage Least Squares method

Explanatory variable	Consumption	Investment	Import
Y_t	0.4163	0.5409	0.5748
$C_t(-1)$	0.4748	–	–
$I_t(-1)$	–	0.4431	–
$M_t(-1)$	–	–	0.3949
Constant	1.1984	-0.4989	-0.1103
Adjusted R^2	0.9967	0.9890	0.9946
Durbin Watson	1.6450	1.6093	1.8733
Number of observations	20	20	20
Instrumental variables	$\hat{Y}$, C(-1)	$\hat{Y}$, I(-1)	$\hat{Y}$, M(-1)

Note: $\hat{Y}$ = Y – residual value

Table i

Dependent Variable: LC
Method: **Least Squares**
Date: 10/13/16   Time: 15:37
Sample (adjusted): 1996 2015
Included observations: 20 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LY	0.801187	0.150464	5.324760	0.0001
LC(-1)	0.120019	0.139041	0.863196	0.4000
C	0.593938	0.261733	2.269251	0.0366
R-squared	0.997875	Mean dependent var		11.81876
Adjusted R-squared	0.997625	S.D. dependent var		1.150544
S.E. of regression	0.056076	Akaike info criterion		-2.786735
Sum squared resid	0.053457	Schwarz criterion		-2.637375
Log likelihood	30.86735	Hannan-Quinn criter.		-2.757578
F-statistic	3990.718	Durbin-Watson stat		0.781363
Prob(F-statistic)	0.000000			

Table ii

Dependent Variable: LC
Method: **Two-Stage Least Squares**
Date: 10/13/16   Time: 19:47
Sample (adjusted): 1996 2015
Included observations: 20 after adjustments
Instrument specification: LY-RESID LC(-1)

Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LY	0.416315	0.208374	1.997920	**0.0620**
LC(-1)	0.474817	0.192425	2.467541	**0.0245**
C	1.198476	0.353046	3.394674	**0.0034**
R-squared	**0.997057**	Mean dependent var		11.81876
Adjusted R-squared	**0.996710**	S.D. dependent var		1.150544
S.E. of regression	0.065991	Sum squared resid		0.074031
F-statistic	2873.409	**Durbin-Watson stat**		**1.645077**
Prob(F-statistic)	0.000000	Second-Stage SSR		0.125231
J-statistic	4.82E-35	Instrument rank		3

He has chosen the significance level of 10%.

In order to verify the validity of the regression equation, furthermore we shall use two tests regarding the residual variables of the model.

Verification of heteroscedasticity amidst residual variables using the Glejser test:

Heteroskedasticity Test: Glejser

F-statistic	2.082577	Prob. F(2,17)	0.1553
Obs*R-squared	3.935860	Prob. Chi-Square(2)	**0.1397**
Scaled explained SS	3.947871	Prob. Chi-Square(2)	0.1389

Test Equation:
Dependent Variable: ARESID
Method: Least Squares
Date: 10/13/16   Time: 19:49
Sample: 1996 2015
Included observations: 20

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Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.071927	0.180763	-0.397910	0.6956
LY	0.147241	0.103917	1.416912	0.1746
LC(-1)	-0.145502	0.096027	-1.515219	0.1481

R-squared	0.196793	Mean dependent var	0.045981
Adjusted R-squared	0.102298	S.D. dependent var	0.040875
S.E. of regression	0.038728	Akaike info criterion	-3.527009
Sum squared resid	0.025498	Schwarz criterion	-3.377649
Log likelihood	38.27009	Hannan-Quinn criter.	-3.497852
F-statistic	2.082577	Durbin-Watson stat	1.282111
Prob(F-statistic)	0.155251		

The value of **Chi-Square** is 0.13 > 0.05, in consequence the errors of the model are not heteroscedastic. Verification of heteroscedasticity amidst residual variables using the White test:

Heteroskedasticity Test: White

F-statistic	1.730219	Prob. F(2,17)	0.2070
Obs*R-squared	3.382564	Prob. Chi-Square(2)	**0.1843**
Scaled explained SS	2.510294	Prob. Chi-Square(2)	0.2850

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 10/13/16   Time: 19:50
Sample: 1996 2015
Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000861	0.013031	0.066072	0.9481
LY^2	0.000645	0.000649	0.993080	0.3346
LC(-1)^2	-0.000698	0.000639	-1.091851	0.2901

R-squared	0.169128	Mean dependent var	0.003702
Adjusted R-squared	0.071379	S.D. dependent var	0.005443
S.E. of regression	0.005245	Akaike info criterion	-7.525459
Sum squared resid	0.000468	Schwarz criterion	-7.376099
Log likelihood	78.25459	Hannan-Quinn criter.	-7.496302
F-statistic	1.730219	Durbin-Watson stat	0.976886
Prob(F-statistic)	0.207033		

The value of **Chi-Square** is 0.18 > 0.05, in consequence the errors of the model are not heteroscedastic.

The above results are generated using Eviews 8; the 2nd stage of the TSLS method can be accomplished using two methods: the first method has the role to express the Ct endogenous variable as function of $\hat{Y}$ instrument and the predetermined C(-1) variable in the dialogue box of the equation in order to generate a result using the OLS method as shown by table 1a i; the second method expresses the endogenous variable depending on all independent variables of the structural equation using them as instruments within the "instruments list box", the instrumental $\hat{Y}$ variable and the exogenous predetermined C(-1) variable in order to generate a TSLS result as shown by table 1a ii. For both methods the estimations of the coefficients are the same; nevertheless, the statistical tests for estimating the validity of parameters and the presence of the serial correlation (values of t-statistic, R^2, d-statistics etc.) are different in both cases. The results show that the second method is more effective because it improves the statistical and econometrical tests for determining the level of significance and validity of the regression equation. As it concerns the estimations resulted in the case of coefficients, we can see that all coefficients are significant at the significance level of 10% and they point out the expected positive theoretical correlations between the dependent variable C and the independent variables Y and C(-1).

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Table 1b i

Dependent Variable: LI
Method: **Least Squares**
Date: 10/13/16   Time: 19:52
Sample (adjusted): 1996 2015
Included observations: 20 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LY	0.733761	0.209295	3.505870	0.0027
LI(-1)	0.286922	0.170808	1.679791	0.1113
C	-1.208951	0.802182	-1.507078	0.1501
R-squared	0.990664	Mean dependent var		10.83784
Adjusted R-squared	0.989566	S.D. dependent var		1.344232
S.E. of regression	0.137310	Akaike info criterion		-0.995676
Sum squared resid	0.320517	Schwarz criterion		-0.846316
Log likelihood	12.95676	Hannan-Quinn criter.		-0.966519
F-statistic	901.9803	Durbin-Watson stat		1.309375
Prob(F-statistic)	0.000000			

Table 1b ii

Dependent Variable: LI
Method: Two-Stage Least Squares
Date: 10/13/16   Time: 20:55
Sample (adjusted): 1996 2015
Included observations: 20 after adjustments
Instrument specification: LY-RESID LI(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LY	0.540920	0.219747	2.461561	**0.0248**
LI(-1)	0.443128	0.179274	2.471785	**0.0243**
C	-0.498942	0.840694	-0.593488	**0.5607**
R-squared	**0.990198**	Mean dependent var		10.83784
Adjusted R-squared	**0.989045**	S.D. dependent var		1.344232
S.E. of regression	0.140696	Sum squared resid		0.336523
F-statistic	856.2560	**Durbin-Watson stat**		**1.609334**
Prob(F-statistic)	0.000000	Second-Stage SSR		0.432306
J-statistic	2.29E-35	Instrument rank		3

In order to verify the validity of the regression equation, furthermore we shall use two tests regarding the residual variables of the model.

Verification of heteroscedasticity amidst residual variables using the Glejser test:

Heteroskedasticity Test: Glejser

F-statistic	1.658411	Prob. F(2,17)	0.2198
Obs*R-squared	3.265099	Prob. Chi-Square(2)	**0.1954**
Scaled explained SS	4.002027	Prob. Chi-Square(2)	0.1352

Test Equation:
Dependent Variable: ARESID
Method: Least Squares
Date: 10/13/16   Time: 20:57

Sample: 1996 2015
Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.965345	0.544270	1.773651	0.0940
LY	-0.253104	0.142004	-1.782377	0.0926
LI(-1)	0.210306	0.115891	1.814687	0.0873

R-squared	0.163255	Mean dependent var	0.089495
Adjusted R-squared	0.064814	S.D. dependent var	0.096337
S.E. of regression	0.093163	Akaike info criterion	-1.771456
Sum squared resid	0.147548	Schwarz criterion	-1.622097
Log likelihood	20.71456	Hannan-Quinn criter.	-1.742300
F-statistic	1.658411	Durbin-Watson stat	1.157672
Prob(F-statistic)	0.219807		

The value of Chi-Square is 0.19 > 0.05, in consequence the errors of the model are not heteroscedastic. Verification of heteroscedasticity amidst residual variables using the White test:

Heteroskedasticity Test: White

F-statistic	1.528967	Prob. F(2,17)	0.2451
Obs*R-squared	3.049101	Prob. Chi-Square(2)	**0.2177**
Scaled explained SS	3.417822	Prob. Chi-Square(2)	0.1811

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 10/13/16   Time: 20:57
Sample: 1996 2015
Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.108728	0.080338	1.353386	0.1937
LY^2	-0.002584	0.001713	-1.508748	0.1497
LI(-1)^2	0.002626	0.001625	1.615733	0.1246

R-squared	0.152455	Mean dependent var	0.016826
Adjusted R-squared	0.052744	S.D. dependent var	0.030409
S.E. of regression	0.029597	Akaike info criterion	-4.064837
Sum squared resid	0.014891	Schwarz criterion	-3.915477
Log likelihood	43.64837	Hannan-Quinn criter.	-4.035680
F-statistic	1.528967	Durbin-Watson stat	1.178109
Prob(F-statistic)	0.245123		

The value of Chi-Square is 0.21 > 0.05, in consequence the errors of the model are not heteroscedastic.

The estimation methods of results in tables 1b i and 1b ii for the regression equation of investment are similar to those obtained for the regression equation of consumption. As it concerns the estimations obtained in the case of coefficients, we can see that all coefficients are significant at the significance level of 50% and they point out the expected positive theoretical correlations between the dependent variable I and the independent variables Y and I(-1). According to the specialty literature, there should be a negative correlation between the dependent variable I and the predetermined independent variable I(-1), but this theory does not apply to this study.

Table 1c i

Dependent Variable: LM
Method: Least Squares
Date: 10/13/16   Time: 21:08
Sample (adjusted): 1996 2015

Included observations: 20 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LY	0.971503	0.220099	4.413937	0.0004
LM(-1)	0.066508	0.182733	0.363963	0.7204
C	-1.340455	0.698855	-1.918073	0.0721

R-squared	0.995984	Mean dependent var		11.31785
Adjusted R-squared	0.995512	S.D. dependent var		1.300862
S.E. of regression	0.087151	Akaike info criterion		-1.904869
Sum squared resid	0.129120	Schwarz criterion		-1.755509
Log likelihood	22.04869	Hannan-Quinn criter.		-1.875712
F-statistic	2108.113	Durbin-Watson stat		1.043040
Prob(F-statistic)	0.000000			

Table 1c ii

Dependent Variable: LM
Method: Two-Stage Least Squares
Date: 10/13/16   Time: 21:30
Sample (adjusted): 1996 2015
Included observations: 20 after adjustments
Instrument specification: LY-RESID LM(-1)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LY	0.574828	0.262152	2.192723	**0.0425**
LM(-1)	0.394947	0.217552	1.815411	**0.0871**
C	-0.110357	0.829295	-0.133074	**0.8957**

R-squared	**0.995217**	Mean dependent var		11.31785
Adjusted R-squared	**0.994654**	S.D. dependent var		1.300862
S.E. of regression	0.095113	Sum squared resid		0.153790
F-statistic	1764.162	**Durbin-Watson stat**		**1.873365**
Prob(F-statistic)	0.000000	Second-Stage SSR		0.233602
J-statistic	6.97E-37	Instrument rank		3

In order to verify the validity of the regression equation, furthermore we shall use two tests regarding the residual variables of the model.
Verification of heteroscedasticity amidst residual variables using the Glejser test:

Heteroskedasticity Test: Glejser

F-statistic	1.594664	Prob. F(2,17)	0.2319
Obs*R-squared	3.159420	Prob. Chi-Square(2)	**0.2060**
Scaled explained SS	3.728349	Prob. Chi-Square(2)	0.1550

Test Equation:
Dependent Variable: ARESID
Method: Least Squares
Date: 10/13/16   Time: 21:33
Sample: 1996 2015
Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.620788	0.497101	1.248817	0.2287
LY	-0.125814	0.156558	-0.803627	0.4327
LM(-1)	0.088921	0.129979	0.684120	0.5031

R-squared	0.157971	Mean dependent var	0.061727
Adjusted R-squared	0.058909	S.D. dependent var	0.063902
S.E. of regression	0.061991	Akaike info criterion	-2.586170
Sum squared resid	0.065329	Schwarz criterion	-2.436810
Log likelihood	28.86170	Hannan-Quinn criter.	-2.557013
F-statistic	1.594664	Durbin-Watson stat	2.182481
Prob(F-statistic)	0.231889		

The value of Chi-Square is 0.20 > 0.05, in consequence the errors of the model are not heteroscedastic.

Verification of heteroscedasticity amidst residual variables using the White test:

Heteroskedasticity Test: White

F-statistic	0.903276	Prob. F(2,17)	0.4238
Obs*R-squared	1.921195	Prob. Chi-Square(2)	**0.3827**
Scaled explained SS	2.449169	Prob. Chi-Square(2)	0.2939

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 10/13/16   Time: 21:33
Sample: 1996 2015
Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.086826	0.060352	1.438665	0.1684
LY^2	-0.001983	0.001635	-1.213145	0.2417
LM(-1)^2	0.001782	0.001526	1.168128	0.2589

R-squared	0.096060	Mean dependent var	0.007690
Adjusted R-squared	-0.010286	S.D. dependent var	0.014820
S.E. of regression	0.014896	Akaike info criterion	-5.437922
Sum squared resid	0.003772	Schwarz criterion	-5.288562
Log likelihood	57.37922	Hannan-Quinn criter.	-5.408765
F-statistic	0.903276	Durbin-Watson stat	1.824785
Prob(F-statistic)	0.423826		

The value of Chi-Square is 0.38 > 0.05, in consequence the errors of the model are not heteroscedastic.

The estimation methods of results in tables 1c i and 1c ii for the regression equation of import are similar to those obtained in the case of the regression equation of consumption. As it concerns the estimations obtained in the case of coefficients, we can see that all coefficients are significant at the significance level of 10% and they point out the expected positive theoretical correlations between the dependent variable M and the independent variables Y and M(-1).

The above formulas used to establish the impact and the dynamic multipliers come from the reduced form of the equations expressing the endogenous variables as a function of the predetermined variables in the model. The dynamic effects on the endogenous variables of the shocks within the exogenous variables are pointed out in table 2. In the paper of Intriligator *et al.* (1996), to which Tansel and Yasar refer in their study, the dynamic multipliers can be derived from the equations in their final form for the endogenous variables which are obtained through continuous substitutions for the dynamic terms.

Table 2. The impact and dynamic multipliers for the quantification of the effect of modifications with respect to remittances.

	Impact multipliers	Dynamic multipliers		
	Year 1	Year 2	Year 3	Year 4
Consumption	α_1 / A	$P\,(\alpha_1/A)$	$P^2\,(\alpha_1/A)$	$P^3\,(\alpha_1/A)$
Investment	β_1 / A	$M\,(\beta_1/A)$	$M^2\,(\beta_1/A)$	$M^3\,(\beta_1/A)$
Import	δ_1 / A	$N(\delta_1/A)$	$N^2\,(\delta_1/A)$	$N^3\,(\delta_1/A)$
Income	$((\alpha_1+\beta_1-\delta_1)/A)+1$	$((P\,(\alpha_1/A) + M\,(\beta_1/A) - N(\delta_1/A))$	$((P^2\,(\alpha_1/A) + M^2\,(\beta_1/A) - N^2\,(\delta_1/A))$	$((P^3\,(\alpha_1/A) + M^3\,(\beta_1/A) - N^3\,(\delta_1/A))$
	$A= 1- \beta_1-\alpha_1+\delta_1$	$M=\beta_2\,(1- \alpha_1+\delta_1)/A$	$N=\delta_2\,(1- \alpha_1 -\beta_1)/A$	$P=\alpha_2\,(1- \beta_1 +\delta_1)/A$

Table 3. Time distribution of the effects of percentage changes in remittances within the endogenous variables

	Impact multipliers	Dynamic multipliers		
	Year 1	Year 2	Year 3	Year 4
Consumption	0.6740	0.5357	0.4258	0.3384
Investment	0.8758	0.7278	0.6049	0.5027
Import	0.9306	0.5576	0.3341	0.2002
Income	1.6191	0.7059	0.6966	0.6409

α_1 = Marginal propensity to consume = 0.4163

α_2 = Marginal impact of previous consumption on current consumption = 0.4748

β_1 = Marginal propensity to invest = 0.5409

β_2 = Marginal impact of capital stock on investment = 0.4431

δ_1 = Marginal propensity to import = 0.5748

δ_2 = Marginal impact of previous imports on the current imports = 0.3949

δ_2 = Marginal impact of previous income on the current imports = 0.3949

The values of the above indicators are quite high in comparison with the values determined by Glytsos (2005).

Conclusion

The dynamic multipliers for income are obtained by adding up the consumption and investment multipliers and by droping the ones for import (Tansel and Yasar 2010). The dynamic multipliers determine the effect of a percentage change in remittances in year 1, with no additional increase in the following years, all other predetermined variables remaining unchanged. The results indicate the fact that the impact of remittances on consumption, investment and income is positive both in the short and in the long run. This positive impact and the dynamic effect of remittances on consumption and investment is in line with the reason of altruism and self-interest. Remittances are directed towards the increase in the welfare of emigrant's family members, who comes back home even during economic crises. Also, as emergency option, the emigrants send money back home to secure their wealth because they consider this practice to be the best option in terms of investment. The impact of remittances on consumption has a faster effect than the one on investment which reduces; the reason behind this fact is that a larger portion of remittances is consumed to that detriment of savings in order to satisfy future consumption needs. The changes in consumption, investment and import, generated by remittances, are reflected in the evolution

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of income. The impact multiplier for income is significant. As it concerns import, we can draw the conclusion that a part of remittances is used to finance further import.

From a political point of view, any decision made by the government to reduce the flow of remittances towards the economy will have a negative effect on the economic growth; this is due to the fact that the reduction of remittances diminishes both consumption and investment and jeopardizes their role as an integrative part of the economic growth. Any decision leading to the inflow of remittances will have a positive effect on these variables.
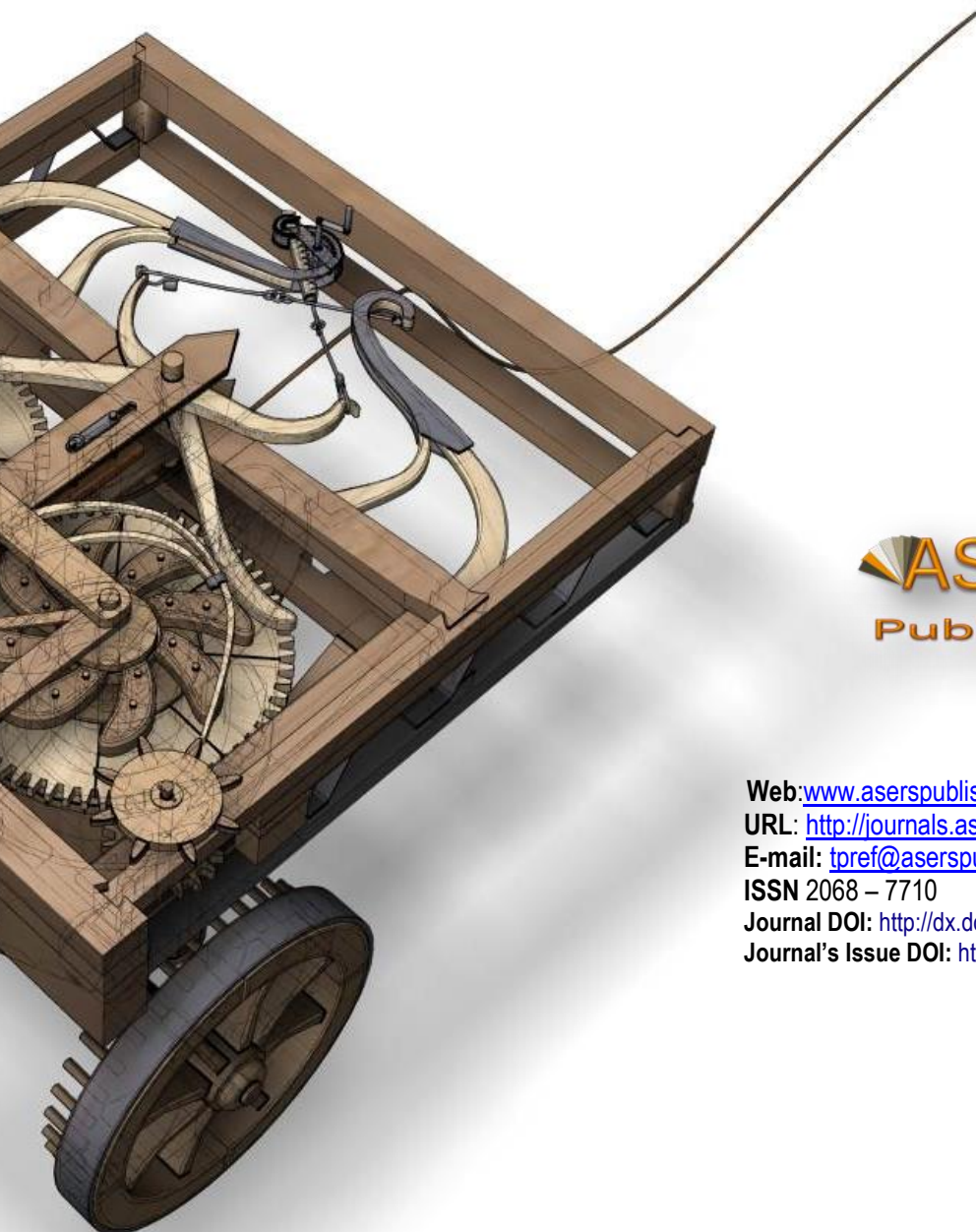
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